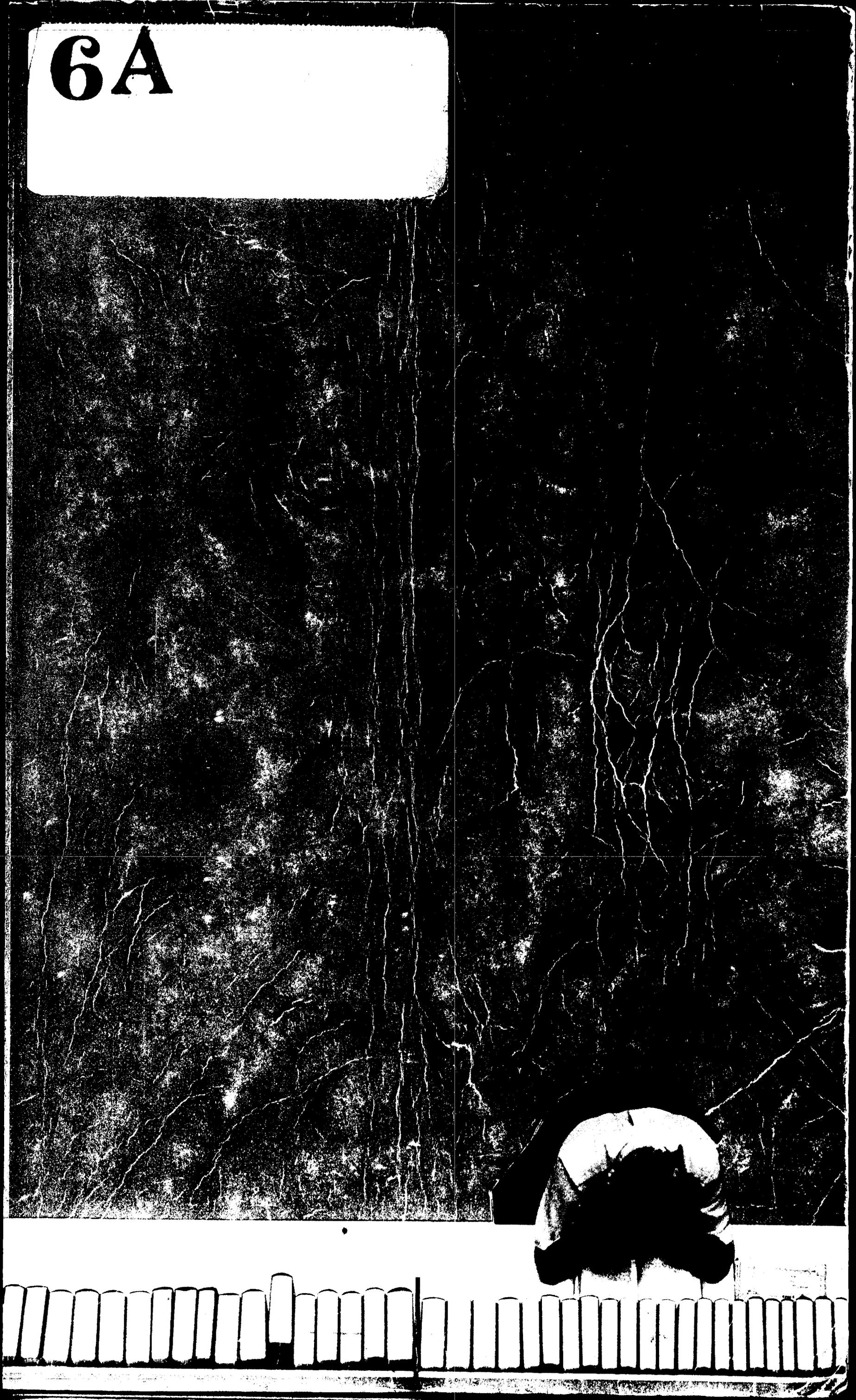
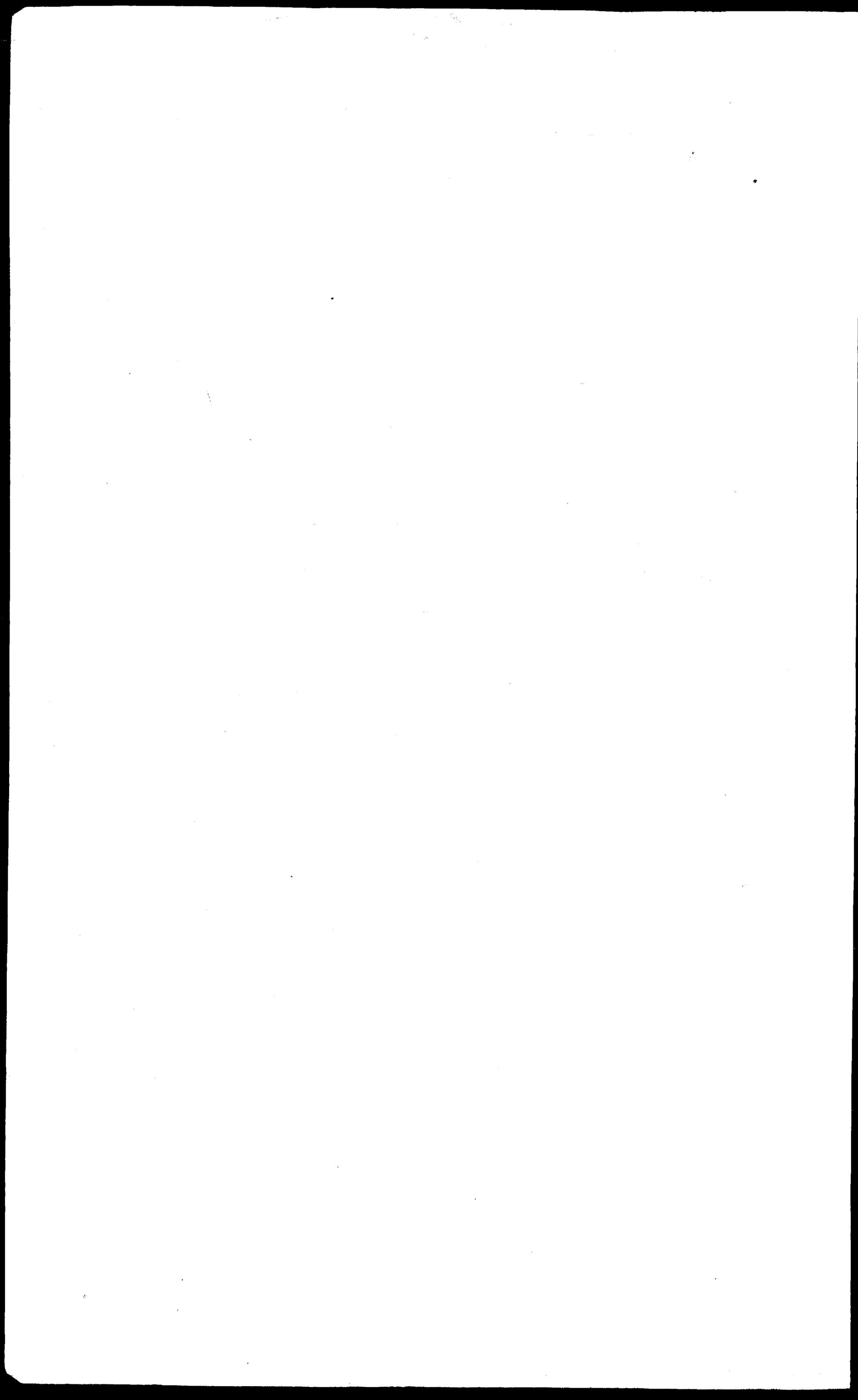


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**UNIVERSITY OF
UCSD
CALIFORNIA, SAN DIEGO**

1972-73 /

GENERAL CATALOG / FALL, WINTER, AND SPRING QUARTERS

UCSD

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Physics-Chemistry Building, Reville College.

ACADEMIC CALENDAR

1972-1973

FALL QUARTER 1972

QUARTER BEGINS MONDAY, SEPTEMBER 18
 INSTRUCTION BEGINS MONDAY, SEPTEMBER 25
 THANKSGIVING VACATION THURSDAY, NOVEMBER 23 AND FRIDAY, NOVEMBER 24

 INSTRUCTION ENDS SATURDAY, DECEMBER 2
 FREE DAY MONDAY, DECEMBER 4
 FINAL EXAMS TUESDAY, DECEMBER 5 THROUGH SATURDAY, DECEMBER 9
 QUARTER ENDS SATURDAY, DECEMBER 9
 CHRISTMAS HOLIDAYS FRIDAY, DECEMBER 22 AND MONDAY, DECEMBER 25
 NEW YEAR HOLIDAYS FRIDAY, DECEMBER 29 AND MONDAY, JANUARY 1

WINTER QUARTER 1973

QUARTER BEGINS THURSDAY, JANUARY 4
 INSTRUCTION BEGINS MONDAY, JANUARY 8
 ACADEMIC AND ADMINISTRATIVE HOLIDAY MONDAY, FEBRUARY 19
 INSTRUCTION ENDS SATURDAY, MARCH 17
 FREE DAY MONDAY, MARCH 19
 FINAL EXAMS TUESDAY, MARCH 20 THROUGH SATURDAY, MARCH 24
 QUARTER ENDS SATURDAY, MARCH 24
 ACADEMIC AND ADMINISTRATIVE HOLIDAY MONDAY, MARCH 26

SPRING QUARTER 1973

QUARTER BEGINS MONDAY, APRIL 2
 INSTRUCTION BEGINS MONDAY, APRIL 2
 MEMORIAL DAY HOLIDAY MONDAY, MAY 28
 INSTRUCTION ENDS SATURDAY, JUNE 9
 FREE DAY MONDAY, JUNE 11
 FINAL EXAMS TUESDAY, JUNE 12 THROUGH SATURDAY, JUNE 16
 QUARTER ENDS SATURDAY, JUNE 16
 Detailed information on final dates relating to academic and administrative procedures may be found in the SCHEDULE of CLASSES published quarterly and in the publication, GRADUATE STUDIES at UCSD.

1973-1974

FALL QUARTER 1973

QUARTER BEGINS MONDAY, SEPTEMBER 17
 INSTRUCTION BEGINS MONDAY, SEPTEMBER 24
 THANKSGIVING VACATION THURSDAY, NOVEMBER 22 AND FRIDAY, NOVEMBER 23

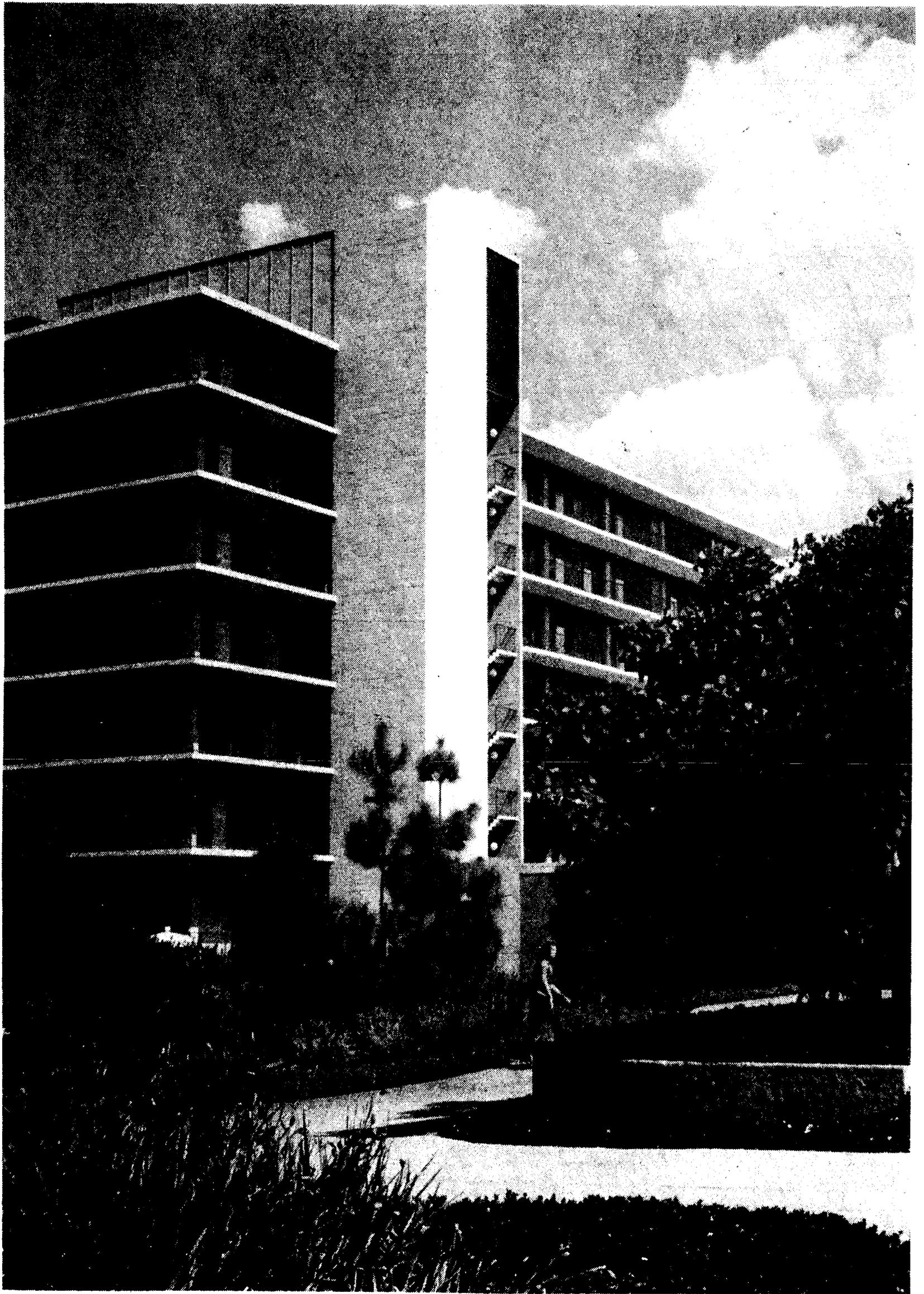
 INSTRUCTION ENDS SATURDAY, DECEMBER 1
 FREE DAY MONDAY, DECEMBER 3
 FINAL EXAMS TUESDAY, DECEMBER 4 THROUGH SATURDAY, DECEMBER 8
 QUARTER ENDS SATURDAY, DECEMBER 8
 CHRISTMAS HOLIDAYS MONDAY, DECEMBER 24 AND TUESDAY, DECEMBER 25
 NEW YEAR HOLIDAYS MONDAY, DECEMBER 31 AND TUESDAY, JANUARY 1

WINTER QUARTER 1974

QUARTER BEGINS THURSDAY, JANUARY 3
 INSTRUCTION BEGINS MONDAY, JANUARY 7
 ACADEMIC AND ADMINISTRATIVE HOLIDAY MONDAY, FEBRUARY 18
 INSTRUCTION ENDS SATURDAY, MARCH 16
 FREE DAY MONDAY, MARCH 18
 FINAL EXAMS TUESDAY, MARCH 19 THROUGH SATURDAY, MARCH 23
 QUARTER ENDS SATURDAY, MARCH 23
 ACADEMIC AND ADMINISTRATIVE HOLIDAY MONDAY, MARCH 25

SPRING QUARTER 1974

QUARTER BEGINS MONDAY, APRIL 1
 INSTRUCTION BEGINS MONDAY, APRIL 1
 MEMORIAL DAY HOLIDAY MONDAY, MAY 27
 INSTRUCTION ENDS SATURDAY, JUNE 8
 FREE DAY MONDAY, JUNE 10
 FINAL EXAMS TUESDAY, JUNE 11 THROUGH SATURDAY, JUNE 15
 QUARTER ENDS SATURDAY, JUNE 15
 Detailed information on final dates relating to academic and administrative procedures may be found in the SCHEDULE of CLASSES published quarterly and in the publication, GRADUATE STUDIES at UCSD.



Urey Hall, Reville College.

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The University of California

THE STATEWIDE INSTITUTION

The University of California was established in 1868 by an act of the State Legislature. It is a unique institution made up of nine campuses strategically located throughout the state. The first of these campuses was established at Berkeley, and others followed at San Francisco, Los Angeles, Davis, Santa Barbara, and Riverside. The most recently established campuses are at San Diego, Irvine, and Santa Cruz.

Each of these campuses has its own distinct character and personality. At the same time, the spirit of cooperation prevails in the necessary sharing of certain educational and research facilities, and in the common participation in statewide scientific institutes. It is possible for graduate students registered at one campus to take courses or do research at another campus of the University. Undergraduates on any UC campus may take advantage of the University's Education Abroad Program to study at a foreign university.

Any qualified student may obtain an education at the University of California. Instruction in the arts and sciences, as well as fundamental training for many of the professions, is available. At present, there is a choice of some two hundred curricula and majors that lead to degrees, certificates, or credentials. Each year approximately eight thousand students earn degrees at the bachelor or first professional level and another three thousand earn advanced degrees.

The University operates several major research stations, including the Lawrence Radiation Laboratory, Lick Observatory, and the Los Alamos Scientific Laboratory, and numerous agricultural experiment stations and extension offices. In addition to its regular program of instruction, the University provides educational services throughout the state in the form of continuing adult education programs, informational services for agriculture, and business and professional conferences and institutes.

THE ADMINISTRATION

The organization and government of the University is entrusted, under the State Constitution, to the Regents of the University of California. The Board of Regents is composed of twenty-four members, sixteen of whom are appointed by the Governor and eight of whom are ex officio members, by reason of the public offices they hold. The executive head of the University, in all its departments and on all its campuses, is the President. He and his staff direct the development of major policy for the entire institution. The Board of Regents appoints the President, and he is directly responsible to them. On each campus the chief administrative officer is the Chancellor, also appointed by the Regents. He and his staff are in charge of all activities on their particular campus.

Subject to the approval of the Board of Regents, the conditions for the admission of students and the granting of degrees and certificates are determined by the Academic Senate. The senate, which is composed of the faculty and certain administrative officers, also authorizes and supervises all courses of instruction in the academic and professional schools and colleges of the University.

THE SAN DIEGO CAMPUS

The Setting

The University of California, San Diego is situated near the northern limits of the city of San Diego. Occupying nearly a thousand acres, the campus site spreads from the seashore at the north side of La Jolla Cove, where the Scripps Institution of Oceanography is located, across a large portion of the adjacent Torrey Pines Mesa, high above the Pacific Ocean. Much of the land is wooded; to the east and north lie mountains, to the west the sea.

San Diego is California's oldest and second-largest city, with a metropolitan-area population of over a million. It has much to offer UCSD students and faculty in the way of cultural and recreational activities.

Within the city, and accessible to the campus, are scores of public beaches, including those of Mission Bay, an area that is being developed into one of the finest aquatic centers in the world. The nearby mountains offer skiing in the winter, hiking and camping the year around. Just beyond the mountains the vast and beautiful Anza-Borrego desert stretches to the Colorado River.

In downtown San Diego is Balboa Park, one of the largest city parks in the country and home of the world-famous San Diego Zoo. The Fine Arts Gallery of San Diego, the Timken Gallery, the Museum of Natural History, and other museums are located in the park. Here also stands the Old Globe Theatre, a replica of an Elizabethan playhouse, where community theatre is offered throughout the year and the renowned National Shakespeare Festival is held each summer.

The Community Concourse, featuring a 3,000-seat civic theatre and extensive convention and exhibition facilities, is located in the heart of the city, offering residents and visitors major musical and dramatic productions and providing a beautiful home for the San Diego Symphony, ballet, and opera.

A major sports stadium in nearby Mission Valley provides playing fields for San Diego's major league football and baseball teams. An indoor sports arena near Mission Bay is the home of San Diego's professional ice hockey team.

The city's attractions are many and varied. Theatre, museums, music, art, sports — all are available in San Diego.

The History

The San Diego campus of the University of California had its origins in the closing years of the 19th century when Berkeley zoologists selected La Jolla as the site for a marine station on the Pacific. This project, which eventually became the Scripps Institution of Oceanography, was made a part of the University of California in 1912. When, in the late 1950's, it was decided to establish a general campus of the University at San Diego, the Scripps Institution — with its distinguished though small staff of scientists — formed the nucleus of the new enterprise.

At first, only graduate studies and degrees in the physical and natural sciences were offered. In the fall of 1964 the campus accepted its first undergraduates, offering a basic lower-division curriculum to prepare students for majors in the humanities, the social sciences, the biological sciences, the physical sciences and mathematics.

The Future

As the San Diego campus grows, a series of interrelated colleges will be established. Each college will accommodate approximately 2,300 students and provide a wide variety of both undergraduate and graduate programs. The objective is to give students and faculty the opportunity of working together in small academic units while at the same time enjoying the advantages of a major university. Three colleges — Revelle, John Muir, and The Third College — are now in operation. Scholars and researchers of international reputation in the humanities, the social sciences, and the natural sciences have been attracted to the UCSD faculty. The University's graduate students are drawn from the upper ranks of the nation's finest colleges and universities and from institutions of comparable standing throughout the world. The San Diego campus offers its students an opportunity for intimate association with some of the greatest names in American education today.

The University Library

The University Library of the University of California, San Diego consists of the Central University Library, the Science and Engineering Library, the Biomedical Library, the Scripps Institution of Oceanography Library, and the Cluster I Undergraduate Library. The Library contains more than 900,000 volumes and receives 20,000 periodical and other serial publications.

The Central University Library, occupied in 1970, consists of the general and specialized graduate collections in the arts, humanities, and social sciences. The Library's Special Collections of rare and valuable books include important collections of the Renaissance, D. H. Lawrence, Ernest Hemingway, Baja California, and the Spanish Civil War.

The Science and Engineering Library, in Urey Hall, contains strong collections in aeronautics, astrophysics, atomic energy, chemistry, electronics, engineering, instrumentation, mathematics, missiles research, physics and space sciences.

The Biomedical Library, in the Basic Sciences Building of the Medical School, contains research collections in biology and medicine. A branch of the Biomedical Library is maintained at the University Hospital.

The Scripps Institution of Oceanography Library has outstanding collections in oceanography, marine biology and undersea technology, and also specializes in geology, geophysics and zoology publications.

The Cluster I Undergraduate Library, in the Humanities-Library Building, has a general collection to serve the basic needs of undergraduate students.

The Computer Center

During the 1972-73 academic year, the UCSD Computer Center will be operating two major computer systems: The CDC 3600 computer, which has been in operation since 1964, and a newer Burroughs B6700 system with extensive facilities for communications with remote devices. Together the systems have brought an expansion of services into a variety of computing fields not previously served on campus.

The central facility provides computing services to be used in connection with instruction in many fields, in connection with research activities, and in connection with campus administration. Most students and staff do their own programming. Open-shop access to the central computer is available to any programmer via any one of a number of remotely located Input/Output terminals. Large programs are run on a closed shop basis by a professional operations staff. Non-credit programming courses are offered at frequent intervals in several programming languages, and at several levels of sophistication. These courses supplement the credit courses which are offered by several academic departments on computer programming and methods. The Center also provides consultants to aid programmers on special problems.

The Computer Center regularly engages in the development of newer and more advanced systems. Most of this development is for software to run on present or planned equipment. Both students, on part time employment status, and full time staff members participate in the development work. Frequently, part time employment in the Center provides support for students working on advanced degrees in Information and Computer Science. Projects currently under way relate to: (a) communications between the central facility and remotely located small computers; (b) general purpose data management systems; (c) systems to make the computer more useful in educational applications.

THE INSTITUTES AND CENTERS

At UCSD there are several institutes and centers established to promote advanced research programs and to provide opportunities for graduate student support in several broad disciplines, sometimes spanning the areas of knowledge encompassed by several academic departments. The senior staff of these units consists of faculty members in related academic departments. The study programs of graduate students supported by institutes and centers are administered by the academic departments in which they are enrolled. The institutes and centers which are operative at present at UCSD are described below; new units will be created as the campus grows.

Institute of Geophysics and Planetary Physics

The San Diego branch of the University-wide Institute of Geophysics was established in 1960. Present research activities emphasize the study of the earth's strain field by measurements of gravity, tilt, displacement, and longitudinal strain; of normal modes of the earth; of tides, waves, turbulence, and the circulation in the atmosphere and oceans.

The Institute does not grant degrees, but makes its facilities available to graduate students from various departments who have chosen to write their dissertations on problems of the earth. Members of the Institute staff now hold joint appointments with the Departments of the Scripps Institution of Oceanography, Applied Mechanics and Engineering Sciences, Physics, and Applied Physics and Information Science.

Institute for Information Systems

The Institute for Information Systems (IIS) is a center for collaborative research for departments concerned with all aspects of information theory, communications research, systems analysis, and related topics. The cooperating units are the Departments of Aerospace and Mechanical Engineering Sciences, Applied Physics and Information Science, Linguistics, Mathematics, Psychology, and the Computer Center. The work of IIS will be concerned with such topics as information theory, detection theory, information storage and retrieval, general linguistics, human information processing, probability theory, coding in the nervous system, and brain models. Apart from individual and cooperative research projects, the activities of the Institute include interdisciplinary seminars, postdoctoral research and instruction, conferences, and research workshops.

Center for Human Information Processing

The Center is an autonomous unit of the Institute for Information Systems. It is intended to provide facilities for research for members of the Department of Psychology in the areas of perception, psychophysics, attention, memory, detection theory, psychoacoustics, information integration, social psychology, and cognitive functions. The Center participates in interdisciplinary work with the departments in the Institute for Information Systems. The work of the Center concentrates on research projects, postdoctoral studies, workshops, conferences, and discussions.

Institute of Marine Resources

The Institute of Marine Resources was established in 1954 to provide a center for the interest of all members of the University of California concerned with marine resources. Its programs involve research as well as education and public service. Marine resources are considered to include not only the materials that come from the sea, such as the minerals, fish, and seawater itself, but also the capacities of the sea for transportation, recreation, waste disposal, production of energy, and the processes that extend or limit these uses. The broad objective of the Institute is to accumulate and disseminate knowledge of the sea's resources. This requires study not only of the contents and nature of the ocean and its boundaries, but also the social, legal, economic, and political aspects of its uses. There are many opportunities for graduate students, as the diversity of these subjects indicates.

Institute for Pure and Applied Physical Sciences

This Institute is an interdisciplinary research unit which brings together members of the Departments of Applied Physics and Information Science, Applied Mechanics and Engineering Sciences, Physics, and Scripps Institution of Oceanography. The Institute is concerned with aerospace sciences, nuclear physics, hydrodynamics, molecular and

solid-state physics, theory of liquids, spectroscopy, radiation transport, and numerical methods. Specific subjects of research include turbulence research, superconductivity, ferromagnetism, phase stability and melting points, plasma physics, hydromagnetics, high-temperature gas dynamics, fluid mechanics, nuclear structure and reactions, ionospheric and atmospheric physics, laser physics, atomic and molecular structure and reactions, and numerical analysis.

Selected studies on pollution problems and atmospheric physics have been initiated recently.

Institute for Studies in Developmental Biology

The object of this Institute is to promote teaching and research in the field of developmental biology. Various disciplinary groups within the biomedical sciences are associated with the Institute. The common aim of these groups is to study developmental problems in different types of organisms, with approaches ranging from the molecular to the behavioral. Current research and instructional programs are in the field of developmental genetics, photobiology, reproductive biology, cyto-differentiation, biochemical embryology, tissue-tissue interactions, and morphogenesis of subcellular components.

University Extension

University of California Extension is a self-supporting system through which the University endeavors to meet the lifelong educational needs of the adult population. Courses are offered in several communities throughout the county in addition to San Diego and the La Jolla campus. This year's enrollment is estimated at 24,000.

University Extension offers many of the academic and cultural resources of the University to the community as well as a broad range of its own programs.

Programs in education, business, social services, government, science and the humanities are aimed at helping professionals update their knowledge and prepare for advancement.

University Extension also offers personal enrichment and involvement in current issues for the individual who seeks continued growth and learning. Lecture series, seminars, workshops and field trips are some of the approaches used. Both credit and non-credit courses are offered.

Concurrent Registration

Concurrent Registration allows persons in the community to enroll in regular University classes through Extension, and a limited number of regular students — graduate and undergraduate — in turn to enroll in Extension courses.

Students who wish to enroll in Extension courses must petition through the provost's office of their college or division. The number of openings will equal the number of Extension students enrolled in courses in a given college or division. Contact your provost's office for additional information.

Veterans may use educational benefits available to them under state and federal laws to enroll in Extension courses provided courses are part of prescribed educational objectives approved by the Veterans Administration.

EXPLORE a quarterly catalog listing University Extension courses is available at the Extension office on Matthews Campus or will be mailed free to your home. For a copy of EXPLORE or enrollment information write University of California Extension, P.O. Box 109, La Jolla, CA 92037 or telephone (714) 453-2000, extension 2061.

THE SCHOOL OF MEDICINE

The developing School of Medicine offered its first internship and residency programs in July, 1966, and enrolled the Charter Class of undergraduate medical students in September, 1968. The fifth Freshman Class will be enrolled in September, 1972. The Charter Class graduated in June, 1972. The Basic Science Building, Administrative Wing, and Biomedical Library of the Medical School Complex on the La Jolla campus are completed, and the Veteran's Administration Hospital opened in February, 1972. The Clinical Sciences Building and Campus Clinical Center are being planned. As the building program and faculty acquisition approach "steady state", undergraduate student enrollment will increase to 96, for a total annual enrollment of almost 400.

The UCSD School of Medicine curriculum takes advantage of unique opportunities for integration of teaching and research that exist on this campus, where the medical school and the university are developing simultaneously. According to the Medical School's academic master plan, some positions are assigned to the general campus for faculty whose scientific interests relate to medicine and human biology. These faculty members are appointed to the campus Departments of Aerospace and Mechanical Engineering Sciences, Biology, Chemistry, Economics, Mathematics, Physics, Psychology, Scripps Institution of Oceanography, and Sociology. They occupy School of Medicine space, teach in the medical curriculum, create special courses, and contribute to interdisciplinary teaching emphasizing areas of their disciplines most useful to medical students.

The main purpose of the curriculum is to develop critical, objective, and humane physicians equipped to meet change and to continue self education. Students acquire understanding of basic medical sciences and clinical disciplines, and are encouraged to choose their own specialized areas of interest for eventual development into careers in the broadly diversified medical community. Individual student capabilities are enhanced through access to the best facilities and personalized counselling. Thus, the curriculum provides flexibility; form and content are adapted to individual needs of each student.

The curriculum is divided into two major components: the Core Curriculum and the Elective programs. The two are pursued concurrently throughout the four years of schooling, the Core Curriculum predominating in the early years, and the Elective Program in the later. The Core Curriculum includes those aspects of medical education deemed essential to every medical student regardless of background or ultimate career direction. In the first two years, this part of the work includes courses in Biomathematics, Cell Biology and Biochemistry, Organ Physiology and Pharmacology, Neurosciences, Pathology, Microbiology, and Epidemiology, Human Anatomy, Social and Behavioral Sciences, and an Introduction to Clinical Medicine. At faculty option, students with advanced training in a core discipline may take additional work in this or another area, utilize available time to overcome deficits in preparation, or begin independent study. In the last two years, core courses in clinical medicine include the major clinical specialties taught in hospital settings, clinics, and diverse health-centered programs in the community. The student is involved in the clinical facilities for much of the time he is engaged in learning diagnosis and therapy. The role of medicine and of the physician in society is also studied.

Elective programs provide choices suited to each student's background, ability, and career objectives. Each student is expected to choose a "Concentration Area" suited to his needs, and combining didactic, clinical, field, library and research experiences at UCSD or elsewhere. Electives occupy about a fourth of the student's time in the first two years and more than half his time in the last two years. A written report covering work in the Concentration Area and prepared as though for publication must be presented before the end of the fourth year as a requirement for graduation.

SELECTION FACTORS

Selection is based on the applicant's scholastic record, letters of recommendation, performance on the Medical College Admission Test, and personal interviews.

To ensure that applicants with the potential to become qualified physicians are not refused admission simply because of financial need or remedial academic deficiency, the school enrolls a limited number of promising disadvantaged students in a specially designed program.

A complete catalogue and information on the foregoing programs is available upon request to:

The Office of Student Affairs
 UCSD School of Medicine
 University of California, San Diego
 La Jolla, California 92037

PROGRAMS FOR PROSPECTIVE MEDICAL STUDENTS

UCSD offers no special premedical major. An undergraduate student considering medicine as a career may choose any major or concentration leading to the Bachelor's Degree, provided he elects those additional courses which the medical school of his choice may require for admission. Admission requirements differ among medical schools, but most desire a solid foundation in the natural sciences — Biology, Chemistry, Physics, Mathematics — and a broad background in the Humanities, Social Sciences and Communication skills. A premedical/dental advisory program is available through the campus-wide Career-Education Planning Services.

The Faculty of the School of Medicine

NAME	TITLE	DEPARTMENT
Abrass, Itamar B., M.D.	Associate Professor	Medicine
Akeson, Wayne H., M.D.	Professor	Surgery
Alazraki, Naomi P., M.D.	Assistant Professor-in-Residence	Radiology
Alksne, John F., M.D.	Professor	Surgery/Neurosurgery
Allison, William S., Ph.D.	Assistant Professor	Chemistry
Ando, Toshiyuki, M.D., D. Med. Si.	Assistant Professor	Pediatrics
Ashburn, William L., M.D.	Associate Professor	Radiology
Baily, Norma A., Ph.D.	Professor	Radiology
Barondes, Samuel H., M.D.	Professor	Psychiatry
Barrett-Conner, Elizabeth L., M.D.	Assistant Professor	Community Medicine/Medicine
Becker, Michael A., M.D.	Assistant Professor-in-Residence	Medicine
Bendixen, Henrik H., M.D.	Professor	Surgery
Benirschke, Kurt, M.D.	Professor	Ob-Gyn/Pathology
Bernstein, Eugene F., M.D., Ph.D.	Professor	Surgery
Bickford, Reginald, M.B.	Professor	Neurosciences
Bloor, Colin M., M.D.	Associate Professor	Pathology
Bluestein, Harry G., M.D.	Assistant Professor-in-Residence	Medicine
Braude, Abraham I., M.D., Ph.D.	Professor	Medicine
Brown, W. Virgil, M.D.	Assistant Professor	Medicine
Bullock, Theodore H., Ph.D.	Professor	Neurosciences
Bush, James W., M.D.	Assistant Professor	Community Medicine
Cicourel, Aaron, Ph.D.	Professor	Sociology
Connor, James D., M.D.	Associate Professor	Pediatrics
Coppage, William S., Jr., M.D.	Professor-in-Residence	Medicine
Covell, James W., M.D.	Associate Professor	Medicine
Davies, I. John, M.D.	Assistant Professor	Ob-Gyn
Deftos, Leonard J., M.D.	Associate Professor-in-Residence	Medicine
Dennis, Edward A., Ph.D.	Assistant Professor	Chemistry
Deutsch, J. Anthony, Ph.D.	Professor	Psychology
Dilley, Ralph B., M.D.	Assistant Professor	Surgery
Doolittle, Russell F., Ph.D.	Associate Professor	Surgery
Dutton, Richard W., Ph.D.	Professor	Biology
Elliott, Max L., M.D.	Assistant Professor	Pathology
Elovson, John, Ph.D.	Assistant Professor	Biology
Elsner, Robert W., Ph.D.	Associate Professor	Pediatrics/SIO
Evans, John W., M.D., Ph.D.	Associate Professor	Mathematics
Fanestil, Darrell D., M.D.	Associate Professor	Medicine
Fierer, Joshua, M.D.	Assistant Professor-in-Residence	Medicine
Friedkin, Morris E., Ph.D.	Professor	Biology
Friedman, Paul J., M.D.	Associate Professor	Radiology
Friedman, William F., M.D.	Associate Professor	Pediatrics/Medicine
Friedmann, Theodore, M.D.	Assistant Professor	Pediatrics
Fronek, Arnost, M.D., Ph.D.	Professor	AMES
Fung, Yuan-cheng B., Ph.D.	Professor	AMES
Galambos, Robert, M.D., Ph.D.	Professor	Neurosciences
Garsia, Adriano M., Ph.D.	Professor	Mathematics
Geiduschek, E. Peter, Ph.D.	Professor	Biology
Getoor, Ronald K., Ph.D.	Professor	Mathematics
Gill, Gordon N., M.D.	Assistant Professor	Medicine
Gittes, Ruben F., M.D.	Professor	Surgery
Gluck, Louis, M.D.	Professor	Pediatrics
Goulian, Mehran, M.D.	Professor	Medicine
Greenhoot, Jerry H., M.D.	Assistant Professor-in-Residence	Surgery/Neurosciences
Griffith, John D., M.D.	Associate Professor-in-Residence	Psychiatry
Grobstein, Clifford, Ph.D.	Professor, Dean of the School	Biology
Gross, Richard C., M.D.	Assistant Professor	Medicine
Hagadorn, James E., Ph.D.	Assistant Professor-in-Residence	Medicine
Halasz, Nicholas A., M.D.	Professor	Surgery
Hamburger, Robert N., M.D.	Professor	Pediatrics
Hammel, Harold T., Ph.D.	Professor	SIO
Harwood, Ivan R., M.D.	Assistant Professor	Pediatrics
Hillgard, Steven A., Ph.D.	Assistant Professor-in-Residence	Neurosciences
Hougie, Cecil, M.B.	Professor	Pathology
Intaglietta, Marcos, Ph.D.	Associate Professor	AMES
Itano, Harvey A., M.D., Ph.D.	Professor	Pathology
Jones, Oliver W., M.D.	Associate Professor	Medicine
Judd, Howard L., M.D.	Assistant Professor	Ob-Gyn
Judd, Lewis L., M.D.	Associate Professor	Psychiatry
Kagnoff, Martin F., M.D.	Assistant Professor	Medicine
Kaplan, Nathan, Ph.D.	Professor	Chemistry
Kisch, Arnold, M.D.	Associate Professor	Community Medicine
Kniazeff, Alexis J., D.V.M., Ph.D.	Professor	Medicine
Kripke, Daniel, M.D.	Associate Professor-in-Residence	Psychiatry
Kung, Faith H., M.D.	Assistant Professor-in-Residence	Pediatrics
Lampert, Peter W., M.D.	Professor	Pathology
Lange, G. David, Ph.D.	Assistant Professor	Neurosciences
Lasser, Elliott C., M.D.	Professor	Radiology
Lein, Allen, Ph.D.	Professor	Medicine
Liebow, Averill A., M.D.	Professor	Pathology
Lindsley, Dan L., Ph.D.	Professor	Biology
Livingston, Robert B., M.D.	Professor	Neurosciences
Loeb, Peter M., M.D.	Assistant Professor	Medicine
Mandell, Arnold J., M.D.	Professor	Psychiatry
Masouredis, Serafeim P., M.D., Ph.D.	Professor	Pathology
Mayer, Steven E., Ph.D.	Professor	Medicine
McLaughlin, Ambrose P., III, M.D.	Assistant Professor	Surgery/Urology
Mendelsohn, John, M.D.	Assistant Professor	Medicine
Mendoza, Stanley A., M.D.	Assistant Professor	Pediatrics
Menn, Stuart J., M.D.	Assistant Professor-in-Residence	Medicine

Miyai, Katsumi, M.D., Ph.D.	Assistant Professor	Pathology
Moser, Kenneth M., M.D.	Associate Professor	Medicine
Naftolin, Frederick, M.D.	Assistant Professor	Ob-Gyn
Nahum, Alan M., M.D.	Associate Professor	Surgery
Nesbitt, Muriel, Ph.D.	Assistant Professor	Biology
Nguyen-Huu, Xoung, Ph.D.	Associate Professor	Physics/Biology/ Chemistry
Nyhan, William L., M.D., Ph.D.	Professor	Pediatrics
O'Brien, John S., M.D.	Professor	Neurosciences
O'Neil, Thomas M., Ph.D.	Associate Professor	Physics
Orloff, Marshall J., M.D., Ph.D.	Professor	Surgery
O'Rourke, Robert A., M.D.	Assistant Professor	Medicine
Pappelbaum, Stanley J., M.D.	Assistant Professor	Medicine/Pediatrics
Penn, Nolan E., Ph.D.	Professor	Psychiatry
Peskin, Gerald W., M.D.	Professor-in- Residence	Surgery
Peters, Richard M., M.D.	Professor	Surgery
Peterson, Kirk L., M.D.	Assistant Professor	Medicine
Robb, James A., M.D.	Assistant Professor	Pathology
Robinson, Arthur B., Ph.D.	Assistant Professor	Biology
Rosenberg, Roger N., M.D.	Associate Professor	Neurosciences
Ross, John, Jr., M.D.	Professor	Medicine
Roth, Thomas F., Ph.D.	Assistant Professor	Biology
Russell, Percy J., Ph.D.	Associate Professor	Biology
Ryan, Kenneth J., M.D.	Professor	Ob-Gyn
Schauble, James F., M.D.	Associate Professor	Surgery
Schneider, Jerry A., M.D.	Associate Professor	Pediatrics
Schneiderman, Lawrence J., M.D.	Associate Professor	Community Medicine/ Medicine
Seegmiller, Jarvis E., M.D.	Professor	Medicine
Sell, Stewart, M.D.	Associate Professor	Pathology
Shimkin, Michael B., M.D.	Professor	Community Medicine
Silverman, Norman R., M.D.	Assistant Professor	Radiology
Simon, Allan L., M.D.	Assistant Professor	Radiology
Simon, Harold J., M.D., Ph.D.	Associate Professor	Community Medicine
Sobel, Burton E., M.D.	Associate Professor	Medicine
Solis, Faustina, MSW	Associate Professor- in-Residence	Community Medicine
Spooner, Charles E., Ph.D.	Associate Professor	Neurosciences
Steinberg, Daniel, M.D., Ph.D.	Professor	Medicine
Stokes, Joseph, III, M.D.	Professor	Community Medicine
Suwa, Kunio, M.D.	Assistant Professor	Surgery
Swanson, Patricia L., M.D.	Professor-in- Residence	Pathology
Sweetmor, Laurence, Ph.D.	Assistant Professor- in-Residence	Pediatrics
Sybers, Harley D., M.D., Ph.D.	Assistant Professor	Pathology
Talner, Lee B., M.D.	Assistant Professor	Radiology
Taylor, Palmer W., Ph.D.	Assistant Professor	Medicine
Tenzel, James H., M.D.	Assistant Professor- in-Residence	Psychiatry
Tisi, Gennaro M., M.D.	Assistant Professor	Medicine
Tschirgi, Robert D., M.D., Ph.D.	Professor	Neurosciences
Varon, Silvio, M.D., Eng.D.	Professor	Biology
Vatner, Stephen F., M.D.	Assistant Professor- in-Residence	Medicine
Vernon, Wayne, Ph.D.	Assistant Professor	Physics
von Essen, Carl F., M.D.	Professor	Radiology
Wahrenbrock, Eric A., M.D.	Assistant Professor	Surgery
West, John B., M.D., Ph.D.	Professor	Medicine
Wheeler, Henry O., M.D.	Professor	Medicine
Wohl, Herbert, M.D.	Associate Professor	Medicine
Wolf, Sanford R., M.D.	Assistant Professor	Psychiatry
Yager, Joel, M.D.	Assistant Professor- in-Residence	Psychiatry
Yen, Samuel S. C., M.B.	Professor	Ob-Gyn
Yoder, Richard D., M.D.	Assistant Professor	Community Medicine
York, Charles J., D.V.M., Ph.D.	Associate Professor	Pathology
Zettner, Alfred, M.D.	Professor	Pathology
Zvaifler, Nathan J., M.D.	Professor	Medicine
Zweifach, Benjamin W., Ph.D.	Professor	AMES

The Scripps Institution of Oceanography

The Scripps Institution was originally an independent biological research laboratory. It became an integral part of the University of California in 1912 and at that time was given the Scripps name in recognition of the interest and financial support of Miss

Ellen Browning Scripps and Mr. E. W. Scripps. The scientific scope of its research has grown to embrace physical, chemical, geological and geophysical studies of the oceans as well as biological studies. Continuing investigations are conducted of the topography and composition of the ocean bottom, of waves and currents, and of the flow and interchange of matter between seawater and the ocean bottom or the atmosphere. Its own research ships have extended the geographic scope from the Institution's beach and the adjacent coastal waters to all of the world's oceans.

The education program has grown hand in hand with the research program. Instruction is on the graduate level only and students are not usually admitted except as candidates for the Ph.D. Although there is a rapid rate of increase, there are less than a thousand persons with graduate degrees in oceanography currently active as marine scientists, of whom a significant portion are Scripps graduates. Their studies are marked by a high degree of interdisciplinary and international collaboration. Many nationalities are represented among the staff and student body.

Cruises of the Institution's six research ships vary from local, limited-objective trips to round-the-world expeditions. For example, a year-long expedition to conduct interdisciplinary research in the eastern South Pacific is planned for *R/V Thomas Washington* during 1972.

Academic work is conducted through the SIO Department and its seven curricular groups: — biological oceanography, physical oceanography, marine biology, geological sciences, marine chemistry, geophysics, and applied ocean sciences. The 70 professors are complemented by an academic staff of more than a hundred research scientists, many of whom have a regularly scheduled part in the instructional program.

Investigations supported by contracts and grants funded from extra-University sources, primarily Federal, cover a wide latitude of marine research. The general research effort is conducted by three divisions, designated Marine Biology Research Division, Ocean Research Division, and Geological Research Division. The diversity of their work is extended by three Federally-sponsored laboratories: the Marine Physical Laboratory, the Physiological Research Laboratory, and the Visibility Laboratory, and by other specialized groups such as the Advanced Ocean Engineering Laboratory and the Deep Sea Drilling Project and by the Marine Life Research Group, sponsored by the State of California. A scientific support unit provides essential services and facilities to all research units of the Institution.

Newly established at Scripps Institution is the Ford Foundation-supported Center for Marine Affairs. The program functions at the postdoctoral level, and specialists from the social sciences, government, and other fields outside the natural sciences participate in team studies of important problems in marine affairs, such as the determination of the future utilization of ocean resources and man's relationship to them in terms of social, economic, technological, and political areas.

Organizationally separate, but sharing close affiliation with and proximity to Scripps, are the University of California's Institute of Geophysics and Planetary Physics and Institute of Marine Resources. The Southwest Fisheries Center, located on the San Diego campus, is one of 30 major laboratories and centers operated by the National Marine Fisheries Service, a component of the newly created National Oceanic and Atmospheric Administration of the U.S. Department of Commerce. SFC also is headquarters for the Inter-American Tropical Tuna Commission. There is also a developing relationship with the UCSD School of Medicine, as exemplified by joint faculty appointments and the establishment of a Neurobiology Unit.

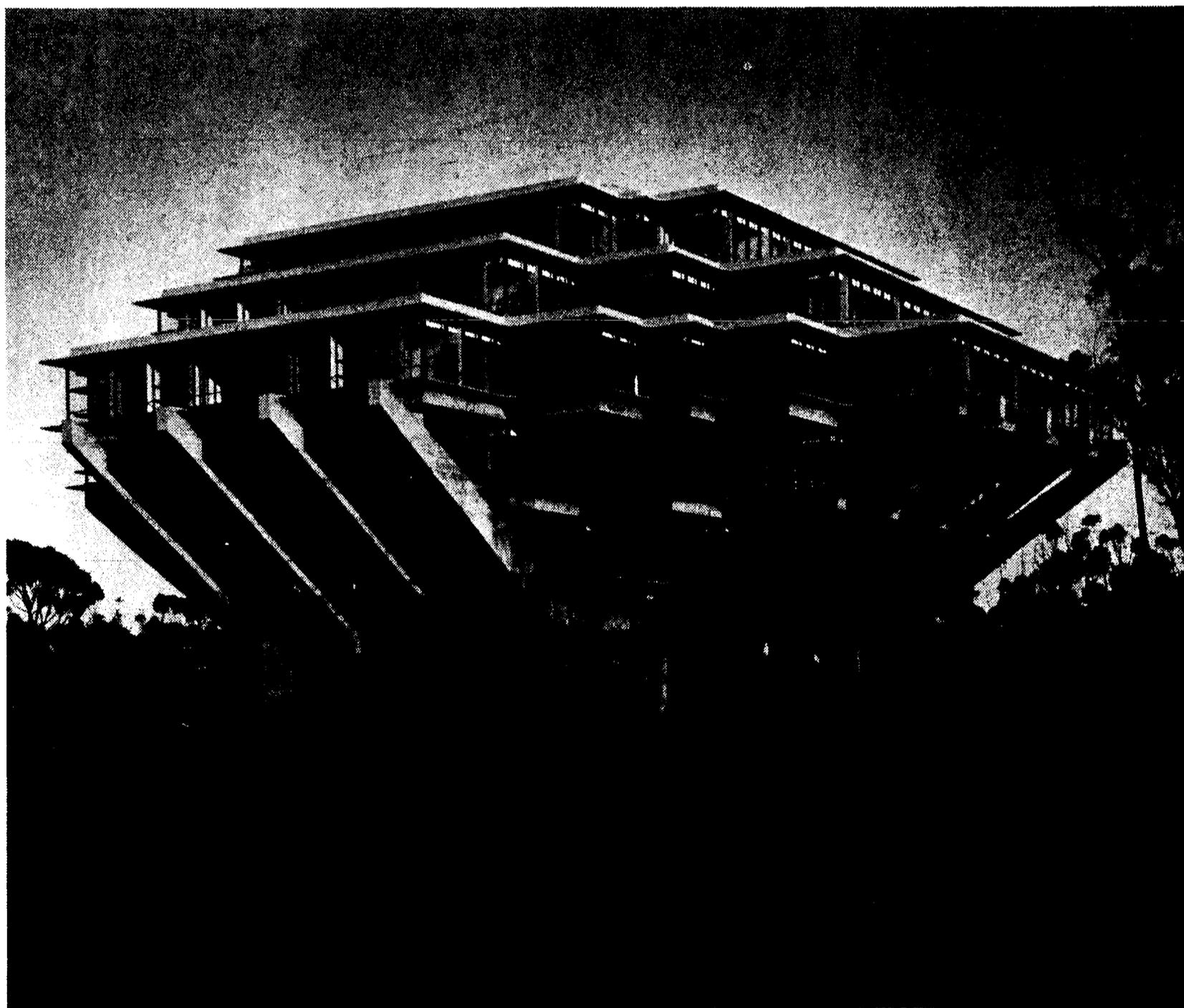
The combination of a large scientific staff and extensive facilities provides an extraordinary opportunity for the small student body (approximately 175) to enjoy close contact with existing oceanographic concepts and active participation in research.

The Faculty of Scripps Institution of Oceanography

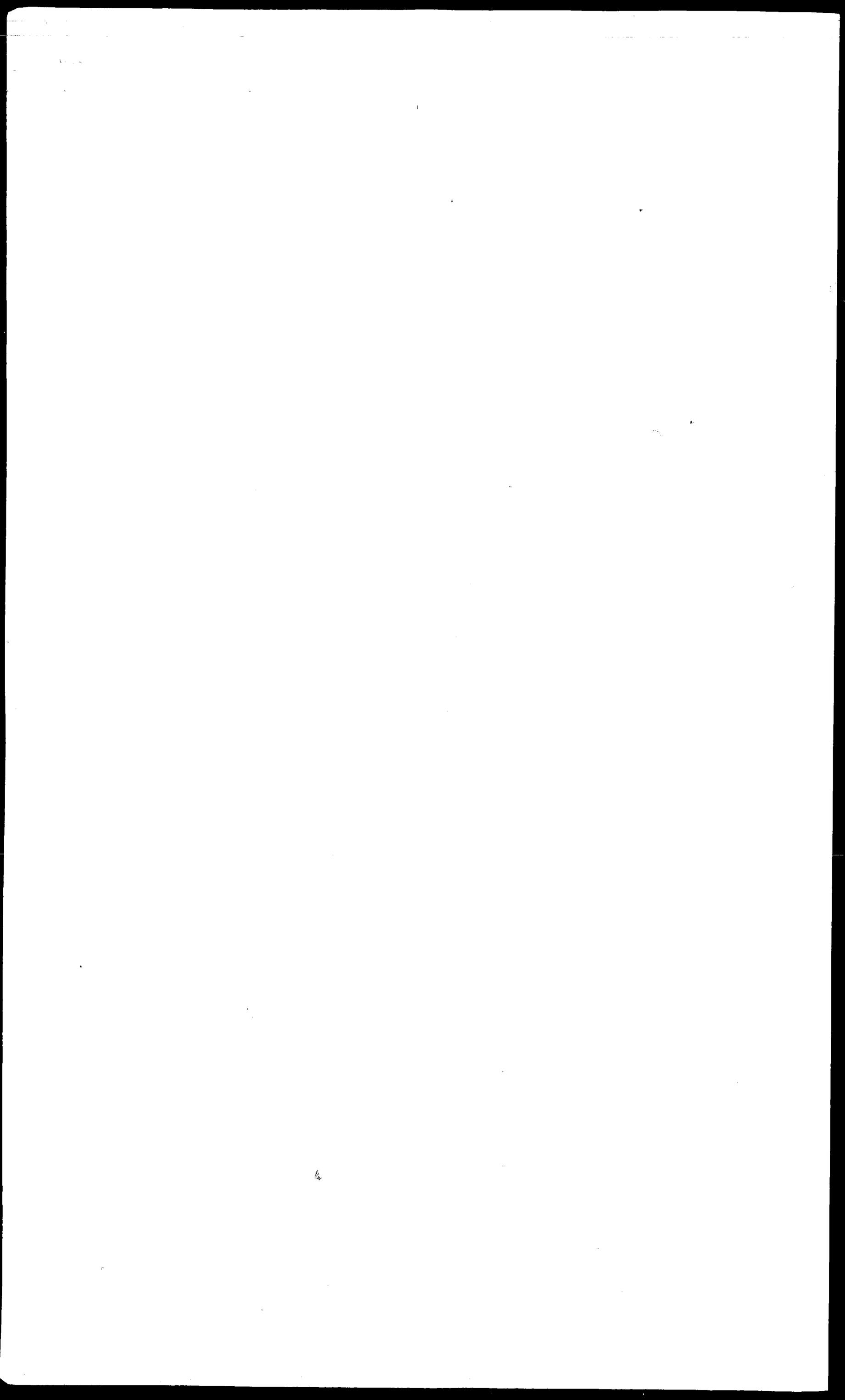
NAME	TITLE	DEPARTMENT
Anderson, Victor C., Ph.D.	Professor	APIS
Arrhenius, Gustaf O., Ph.D., D.Sc.	Professor	SIO
Arthur, Robert S., Ph.D.	Professor	SIO
Backus, George E., Ph.D.	Professor	SIO
Bada, Jeffrey, Ph.D.	Assistant Professor	SIO
Benson, Andrew A., Ph.D.	Professor	SIO
Berger, Wolfgang H., Ph.D.	Assistant Professor	SIO
Bradner, Hugh, Ph.D.	Professor	AMES
Bramlette, Milton N., Ph.D.	Professor Emeritus	SIO
Brune, James N., Ph.D.	Professor	SIO
Bullard, Edward C., Ph.D.	Professor	SIO
Bullock, Theodore H., Ph.D.	Professor	Neurosciences
Cox, Charles S., Ph.D.	Professor	SIO
Craig, Harmon, Ph.D.	Professor	SIO
Curry, Joseph R., Ph.D.	Professor	SIO
Davis, Russ E., Ph.D.	Assistant Professor	SIO
Dayton, Paul K., Ph.D.	Assistant Professor	SIO
Duntley, Seibert Q., Sc.D.	Professor	SIO
Eckart, Carl, Ph.D.	Professor Emeritus	SIO/Physics
Elsner, Robert W., Ph.D.	Associate Professor	SIO/Pediatrics

Engel, A. E. J., Ph.D.	Professor	S10
Enright, James T., Ph.D.	Associate Professor	S10
Epel, David, Ph.D.	Associate Professor	S10
Fager, E. W., Ph.D., D. Phil.	Professor	S10
Faulkner, D. J., Ph.D.	Assistant Professor	S10
Fox, Denis L., Ph.D.	Professor Emeritus	S10
Gibson, Carl H., Ph.D.	Associate Professor	AMES/S10
Gieskes, Joris M. T. M., Ph.D.	Assistant Professor	S10
Gilbert, J. Freeman, Ph.D.	Professor	S10
Goldberg, Edward D., Ph.D.	Professor	S10
Hammel, Harold T., Ph.D.	Professor	S10/Medical
Haubrich, Richard A., Ph.D.	Professor	S10
Hawkins, James W., Jr., Ph.D.	Associate Professor	S10
Haxo, F. T., Ph.D.	Professor	S10
Hendershott, Myrl C., Ph.D.	Assistant Professor	S10
Hessler, Robert R., Ph.D.	Associate Professor	S10
Holland, Nicholas D., Ph.D.	Assistant Professor	S10
Hubbs, Carl L., Ph.D.	Professor Emeritus	S10
Inman, Douglas L., Ph.D.	Professor	S10
Isaacs, John D., B.S.	Professor	S10
Johnson, Martin W., Ph.D.	Professor Emeritus	S10
Keeling, Charles D., Ph.D.	Professor	S10
Lal, Devendra, Ph.D.	Professor	S10
Lewin, Ralph A., Ph.D.	Professor	S10
McGowan, John A., Ph.D.	Associate Professor	S10
Menard, Henry W., Jr., Ph.D.	Professor	S10
Mudie, John D., Ph.D.	Assistant Professor	S10

Mullin, Michael M., Ph.D.	Associate Professor	S10
Munk, Walter H., Ph.D.	Professor	S10
Newman, William A., Ph.D.	Associate Professor	S10
Nierenberg, William A., Ph.D.	Professor, Dean of the Institution	Physics
Parker, Robert L., Ph.D.	Assistant Professor	S10
Peterson, Melvin N. A., Ph.D.	Associate Professor	S10
Phleger, Fred B., Ph.D.	Professor	S10
Raitt, Russell W., Ph.D.	Professor	S10
Rakestraw, Norris W., Ph.D.	Professor Emeritus	S10
Revelle, Roger R., Ph.D.	Professor Emeritus, Director Emeritus	S10
Rosenblatt, Richard H., Ph.D.	Associate Professor	S10
Scholander, P. F., M.D., Ph.D.	Professor	S10
Shepard, Francis P., Ph.D.	Professor Emeritus	S10
Shor, George G., Jr., Ph.D.	Professor	S10
Somero, George N., Ph.D.	Assistant Professor	S10
Spiess, Fred N., Ph.D.	Professor	S10
Taft, Bruce A., Ph.D.	Assistant Professor	S10
Vacquier, Victor, M.A.	Professor	S10
Van Atta, Charles W., Ph.D.	Associate Professor	AMES/S10
Volcani, Benjamin E., Ph.D.	Professor	S10
Wheelock, Charles D., M.S.	Professor Emeritus	S10
Winterer, Edward L., Ph.D.	Professor	S10
Wooster, Warren S., Ph.D.	Professor	S10
ZoBell, Claude E., Ph.D.	Professor	S10



Central University Library.



Revelle College

Revelle College, the first college on the UCSD campus, was named in honor of Dr. Roger Revelle, former University-wide Dean of Research, and for many years Director of UCSD's Scripps Institution of Oceanography.

Formerly called the School of Science and Engineering and later First College, Revelle College was established in 1958. After being temporarily housed on the Scripps campus, Revelle moved into its first complete buildings during the 1963-64 academic year. In 1960 Revelle began a graduate program in the physical sciences. From that beginning, it rapidly developed its humanities and social science programs, and today the teaching program reflects a broad spectrum of learning.

THE EDUCATIONAL PHILOSOPHY

With the establishment of Revelle College, the faculty was given a rare opportunity to shape an undergraduate curriculum that would, insofar as any educational program can, prepare its students for the modern world. From the outset of planning the curriculum, the faculty asked: What sort of knowledge must students have if they are to be liberally educated? In what areas? To what depth? How specialized must that education be in the undergraduate years?

The educational philosophy of Revelle College was developed in response to such fundamental questions. Its undergraduate program is based on the assumption that a student who is granted the Bachelor of Arts degree will have attained:

1. An acceptable level of general education in mathematics, foreign language, the physical, biological, and social sciences, the fine arts and the humanities.
2. Preprofessional competence in one academic discipline.
3. An understanding of an academic area outside his major field.

To this end, a lower-division curriculum has been established which should enable the student to acquire an understanding of the fundamental problems, methods, and powers of the humanities and the arts, the social and behavioral sciences, mathematics, and the natural sciences.

The lower-division curriculum assumes that an undergraduate should not concentrate heavily in a special field until he has had a chance to learn something about the various fields that are open to him. His general education must, then, be thorough enough for him to see the possibilities of those fields. Early in his career, he should know, as it were, three languages: his own, a foreign language, and the universal language of mathematics. He will learn more about his own culture in a two-year humanities sequence, an introduction to major literary, philosophical, and historical documents which requires the regular writing of essays. He will study a foreign language as a spoken, vital means of communication; studying that language, he will come to know something of the general nature of language itself. And he will study mathematics as part of general education and as preparation for a required sequence of courses in the physical and biological sciences. Finally, he will, as a sophomore, study the social and behavioral sciences. He will also have some elective time in which he can take courses in disciplines that he would like to explore further. Once he has completed this program, he will be ready for the relatively more specialized work of the upper division.

During the student's upper-division years (junior and senior), his main effort will be devoted to intensive work in his major field at a level of competence that will enable him to continue his study in the graduate division.

The student's general education will not, however, stop at the end of the sophomore year; in addition to his major, every upper-division student will do a substantial fraction of his course work in an area of learning distinctly different in content and method from that of the major. (Generally, the following will be considered "areas of learning" in the above sense: mathematics and natural sciences; the social sciences; humanities.) The courses that the student elects for this noncontiguous minor must compose an integrally related complex which will equip him for continued informal study in adult life.

Revelle College stresses the broad character of its curriculum. Every student, for example, is required to achieve a certain competence in calculus. The emphasis on calculus and physical science is in some respects a deviation from educational theory of the last hundred years. The older "general education" theory demanded that scientists achieve a reasonable competence in the social sciences and humanities. The rising importance of science justifies the application of the theory to non-scientists as well.

Four years of college can at best yield only a limited knowledge; the major task is to train the student so that he can adapt quickly and effectively to the rapidly changing world.

THE GENERAL EDUCATION REQUIREMENTS

Revelle College students are required to demonstrate an acceptable level of basic knowledge in the humanities, fine arts, social sciences, language, mathematics, and the physical and biological sciences before entering a major academic field for specialization during the junior and senior years. They will reach the required level through a set of courses that comprise approximately 80 per cent of their work in the lower division (first two years).

Students are encouraged to meet the requirements of the lower division and the major requirements of the upper division as rapidly as possible. The entire program, including the general education requirements of the upper division, is designed to be completed in four years. Variations within the program will occur, of course, depending on the student's interests, prior training, and ability to make use of individual study. Those who demonstrate superior achievement and competence in an academic area may take advanced courses and individual-study programs that give them an opportunity to complete degree requirements in fewer than four years.

Lower Division

In order to fulfill the minimum lower-division requirements in the principal fields of knowledge, the student takes a recommended set of courses, the prerequisites for which have been met by the general admission standards of the University.

The lower-division general education requirements are as follows:

1. Satisfaction of the general University Subject A requirement.
2. Three courses in mathematics (calculus).
3. Three courses in a social science.
4. Five courses in the natural (physical and biological) sciences.
5. Verbal and reading proficiency in a modern foreign language.
6. Seven courses in humanities and the fine arts.

Subject A. Satisfaction of the University requirement in Subject A (see *Interdisciplinary Courses: Humanities; Subject A.*)

Mathematics. Mathematics has for centuries held an important place in education, in the sciences, and in the humanities. As an integral part of his liberal education, the student will be brought into contact with a significant area of mathematics. Furthermore, he will gain the facility to apply mathematics in his studies of the physical, biological and behavioral sciences.

Two beginning-year course sequences are offered for Revelle College students. Freshmen enrollment in these sequences is dependent on the student's high school and college preparation in mathematics as well as his future plans.* Both sequences include integral and differential calculus and linear algebra. (See *Departments of Instruction: Mathematics.*)

* Students who have completed college courses in calculus or who present Advanced Placement Credit in Mathematics may not receive credit for mathematics courses which duplicate their advanced standing work.

Social Sciences. Until a single, integrated social science course sequence may be devised to meet this requirement, students will choose a lower-division course sequence offered by the Departments of Anthropology, Economics, Political Science, Psychology, or Sociology. The sequence Philosophy 20-21-22 may also be used to fulfill this requirement. (See *Departments of Instruction.*) One sequence must be taken in its entirety in order to satisfy the requirement.

Natural Sciences. The Natural Science sequences present the fundamental concepts of modern physical science and biology. For the student who may major in one of these disciplines, the courses provide a background and preparation for further study; for those students who will continue their studies outside the sciences, they offer an opportunity to gain a certain understanding and appreciation of current developments in these fields.

Two sequences are offered. A student enrolls in one or the other sequence depending on his prior preparation in mathematics and his SAT and Mathematics Achievement Test scores. Five courses in one sequence will satisfy the natural sciences requirement. (See *Interdisciplinary Courses: Natural Sciences.*)

Language. Requirements are in terms of levels of proficiency that must be attained by the student, rather than in terms of a certain course or number of courses that must be passed.

- A. Oral proficiency. By the end of his sophomore year the student is expected to have demonstrated his ability to carry on ordinary conversation comfortably in

a modern foreign language. The skill aimed at is what would be adequate for the student to continue his education by participating in substantive courses conducted in the foreign language, e.g., the courses offered by the Department of Literature on this campus or courses offered to native speakers of the language in their own country.

- B. Reading proficiency. By the end of his sophomore year the student is expected to have demonstrated his ability to read ordinary material — e.g., newspapers and popular literature — in a foreign language. The level aimed at is that which college students in this country normally attain by the end of their second year of training in the language.

The normal preparation for lower-division language proficiency will be language courses in the student's freshman year. With normal high school preparation in language most students will require about a year of course work to prepare for the examination, but some students will take less time and some more, because of differences in ability, industry, and previous language work in high school, on other campuses, or in informal extra-curricular activities (e.g., foreign movies, language clubs, language tables) involving the language.

To assist the student in attaining the required language proficiencies, three special kinds of aid are offered:

1. Self-instructional materials and equipment, which the student can use to advance his proficiency at his own optimum speed.
2. A program of small tutorial classes, conducted by native speakers of the language. A student's assignment to a new tutorial class will be a measure of his increased proficiency; the classes will be recomposed weekly to maintain homogeneity of class membership, permitting each class to be conducted at the highest level possible for each of its members.
3. Instruction by linguistic scientists about language and the learning of languages. This instruction is intended to broaden the scope of the student's education as well as to assist him in his own language study.

A student who is not yet proficient after completing Language 1, 2, 3 or 4, 5, 6 may gain the requisite proficiency by taking one of the Literature 10 courses.

Humanities. The humanities sequence introduces the student to his cultural heritage. It rests on the principle that this heritage is best found in the great documents of Western Civilization in which it has assumed concrete form. The student is invited to confront these literary, philosophical and historical documents directly; through lectures, group discussions, themes, and conferences he will learn to interpret them, to discover their interrelations, and to perceive their continuity.

The sequence opens with the study of Judaeo-Grecian beginnings and traces the development of Western Civilization forward again to the present. **Essential to the course are the student's themes;** in these he will be asked to come to direct and personal terms with what he has read, and to acquire the skills of clear and cogent expository writing. For the courses to be taken in fulfillment of this requirement see *Humanities*.

Fine Arts. One course is required and is usually taken in the freshman or sophomore year. Students may choose a course from Drama, Music, or Visual Arts. (See *Departments of Instruction*.)

FRESHMAN YEAR		
FALL	WINTER	SPRING
Humanities 2 Language	Humanities 3 Language	Humanities 4 Language
Mathematics 1A or 2A	Mathematics 1B or 2B	Mathematics 1C or 2C
Fine Arts* or Elective or Natural Science 1A	Natural Science 1B or 2A	Natural Science 2B or Elective
SOPHOMORE YEAR		
FALL	WINTER	SPRING
Humanities 5 Natural Science 1C or 2C	Humanities 6 Nat. Sci. 1D or 2D	Humanities 1 Nat. Sci. 1E or 2E
Social Science Elective/Language	Social Science Elective/Language	Social Science Elective/Language

* A student may enroll in a course in drama, music or visual arts to meet the Fine Arts requirement in any of the six quarters in which he has room to schedule a class that interests him.

Upper Division

The Major

All undergraduate majors offered at UCSD are available to Revelle College students. Departments which have their headquarters in Revelle College are Aerospace and Mechanical Engineering Sciences, Biology, Chemistry, Economics, Literature, Philosophy, and Physics.

The major program requires a minimum of twelve to fifteen upper-division courses, depending on the department in which the major is taken. (See *Departments of Instruction*.)

As changes in major requirements occur, students are expected to satisfy the new requirements insofar as possible. Hardship cases should be discussed with the departmental adviser, and petitions for adjustment submitted to the Provost when necessary.

Restricted Electives

In addition to the major requirements, departments may require a student to pass a number of courses in his general area of learning. The requirement is intended to give breadth as well as depth to the student's major. The major program and related elective choices may total up to eighteen courses in the upper division.

The Noncontiguous Minor

In addition to the major and any restricted electives, Revelle College students are required to complete a noncontiguous minor—a coherent grouping of six courses in an area of studies other than that of the major. For the purposes of this requirement, the humanities, the social sciences, and the natural sciences (including mathematics) will be considered three different areas. The requirement may be met in either of the following ways:

1. *Project minor.* Such a minor centers on a problem or period chosen by the student after consultation with his minor adviser. It may be interdepartmental, so that the courses constituting it may be selected from various departmental offerings. However, the "center of gravity" of such a minor must be in a given department, that department being in an area other than the student's major. Every minor program of this kind must be approved by a minor adviser.
2. *Departmental minor.* Such a minor consists of six courses taken within one department outside the area of the student's major. The student will consult with the minor adviser of the chosen department and determine with him which courses will constitute the minor. Every departmental minor must be approved by the minor adviser of the department.

No more than three lower-division courses may be included in a minor program.

Each department will designate a minor adviser. Minor programs are subject to approval by the Provost.

The Graduation Requirements

In order to graduate from Revelle College, a student must:

1. Satisfy the lower-division general education requirements (including Subject A).
2. Complete a major consisting of at least 12 upper-division courses.
3. Complete a noncontiguous minor consisting of 6 courses (no more than 3 may be lower division).
4. Satisfy the University of California requirement in American History and Institutions. (See *Rules and Procedures: American History and Institutions*.)
5. Pass at least 48 courses (192 quarter units).*
6. Attain a C average (2.0) or better in all work attempted in the University of California (exclusive of University Extension). Individual departments may require a C average in all upper-division courses in the major attempted in the University.
7. Meet senior residence requirement. (See *Rules and Procedures: Senior Residence*.)

Upon satisfaction of the graduation requirements, Revelle College will recommend that the student be awarded the degree Bachelor of Arts.

* A maximum of twelve units of 300 or 400 series courses from University Extension may be applied on the B.A. degree in Revelle College.

Honors in Revelle College

Provost's Honors will be awarded each quarter to students who complete the previous quarter's program with distinction according to criteria established by the Executive Committee of the College.

The Executive Committee of Revelle College will award College Honors with the bachelor's degree to students with a superior overall grade-point average at graduation. The honors designations are Honors, High Honors, and Highest Honors. To be eligible for College Honors, a student must have completed at least 20 courses (80 quarter units) in the University of California and have the recommendation of his major department.

Honors earned will be recorded on each student's diploma.

Transfer Students

Transfer students accepted by Revelle College will, in general, be held to the lower-division general education requirements and to the lower-division prerequisites for a major. The general education requirements, however, will be interpreted in a manner which considers the student's total educational program. The Provost, in consultation with appropriate departments, will evaluate the credentials of each transfer student on an individual basis. Transfer without penalty will be authorized upon approval of the Provost and the responsible department. Some departments may require a transfer student with senior standing to satisfy a residence requirement within the major department. Students should consult their major advisers about the minimum number of courses required for this purpose.

In order to transfer to Revelle College from another college or school within the

University of California, a student will be required to have a C (2.0) average or better on all work attempted at any University of California campus. (See *Admission to the University: Advanced Standing.*)

The Faculty of Revelle College

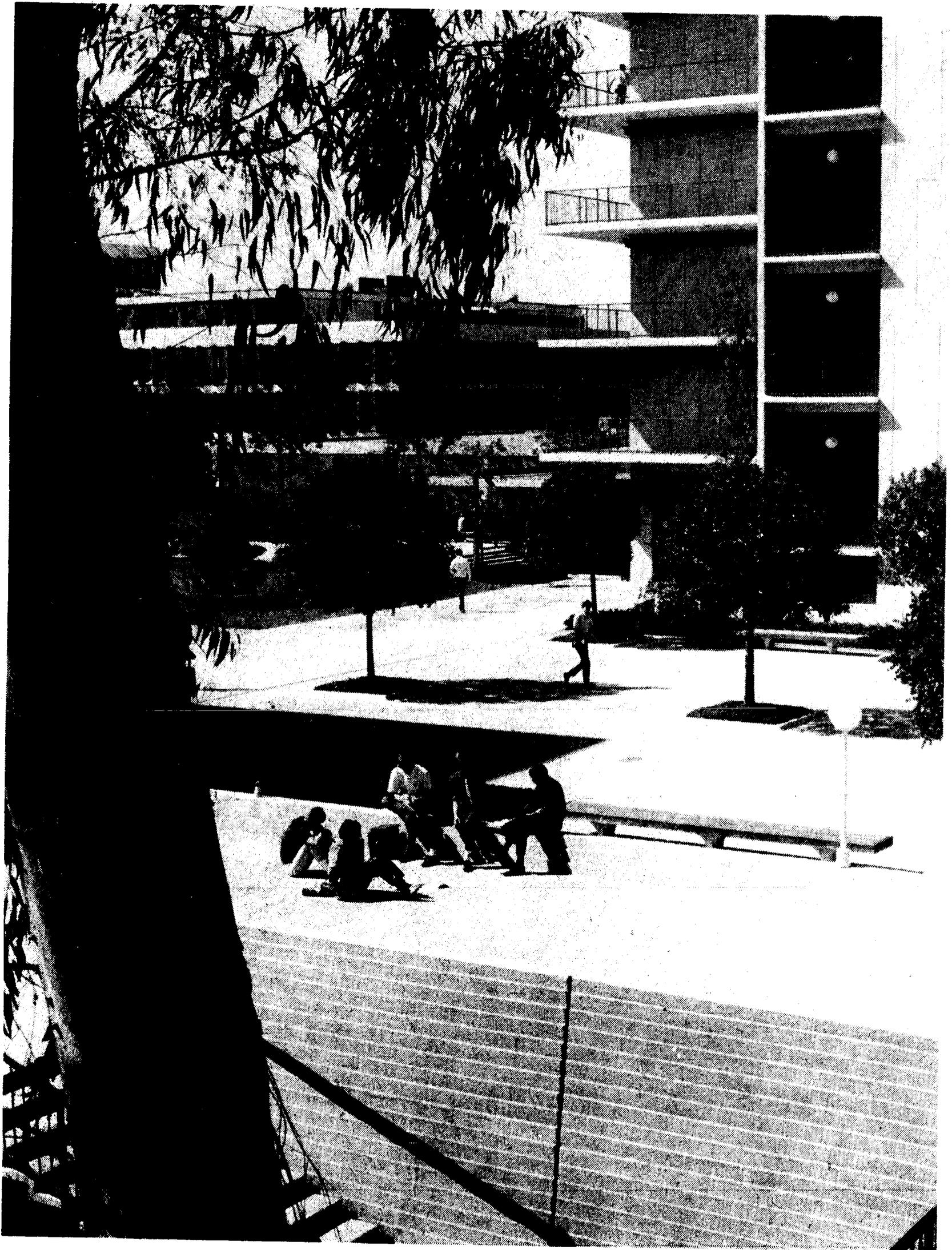
NAME	TITLE	DEPARTMENT	NAME	TITLE	DEPARTMENT
Abelson, John N., Ph.D.	Assistant Professor	Chemistry	Livingston, Robert B., M.D.	Professor	Neurosciences
Anagnostopoulos, Giogios, Ph.D.	Assistant Professor	Philosophy	Loomis, William F., Jr., Ph.D.	Assistant Professor	Biology
Ariotti, Piero E., Ph.D.	Assistant Professor	Philosophy	Lovberg, Ralph H., Ph.D.	Professor	Physics
Arnold, James R., Ph.D.	Professor	Chemistry	Luke, Jon C., Ph.D.	Assistant Professor	Mathematics
Attiyeh, Richard E., Ph.D.	Associate Professor	Economics	Ma, Shang-keng, Ph.D.	Associate Professor	Physics
Bear, Donald V. T., Ph.D.	Associate Professor	Economics	Makkreel, Rudolph A., Ph.D.	Assistant Professor	Philosophy
Behar, Jack, Ph.D.	Associate Professor	Literature	Malinovich, Stanley, Ph.D.	Assistant Professor	Philosophy
Bishop, Errett A., Ph.D.	Professor	Mathematics	Malmberg, John H., Ph.D.	Professor	Physics
Block, Barry, Ph.D.	Associate Professor	Physics	Mark, Thomas, Ph.D.	Assistant Professor	Philosophy
Blume, Bernhard, Ph.D.	Professor Emeritus	Literature	Marti, Kurt, Ph.D.	Assistant Professor	Chemistry
Bond, Frederick T., Ph.D.	Associate Professor	Chemistry	Masek, George E., Ph.D.	Professor	Physics
Bradner, Hugh, Ph.D.	Professor	AMES	Matthias, Bernd T., Ph.D.	Professor	Physics
Brueckner, Keith A., Ph.D.	Professor	Physics	Mayer, Joseph E., Ph.D.	Professor	Chemistry
Burbidge, E. Margaret, Ph.D.	Professor	Physics	McIlwain, Carl E., Ph.D.	Professor	Physics
Burbidge, Geoffrey, R., Ph.D.	Professor	Physics	Mehlhop, Werner A. W., Ph.D.	Assistant Professor	Physics
Butler, Warren L., Ph.D.	Professor	Biology	Meinwald, Jerrold, Ph.D.	Professor	Chemistry
Casalduero, Joaquin, Ph.D.	Professor Emeritus	Literature	Miles, John W., Ph.D.	Professor	AMES
Catalan, Diego (M-P), Ph.D.	Professor	Literature	Miller, David R., Ph.D.	Associate Professor	AMES
Cespedes, Guillermo, Ph.D.	Professor	History	Miller, Stanley L., Ph.D.	Professor	Chemistry
Chen, Joseph Cheng-Yih, Ph.D.	Associate Professor	Physics	Moore, Stanley, Ph.D.	Professor	Philosophy
Chodorow, Stanley A., Ph.D.	Assistant Professor	History	Nachbar, William, Ph.D.	Professor	AMES
Clark, Leigh B., Ph.D.	Assistant Professor	Chemistry	Nauen, Franz G., Ph.D.	Assistant Professor	History
Conlisk, John, Ph.D.	Associate Professor	Economics	Newmark, Leonard D., Ph.D.	Professor	Linguistics
Craig, Harmon, Ph.D.	Professor	SIO	Nguyen-Huu, Xuong, Ph.D.	Associate Professor	Physics/Biology/ Chemistry
Crowne, David K., Ph.D.	Associate Professor	Literature	Norman, Donald A., Ph.D.	Professor	Psychology
Dijkstra, Abraham J., Ph.D.	Assistant Professor	Literature	Olafson, Frederick A., Ph.D.	Professor	Philosophy
Doolittle, Russell F., Ph.D.	Associate Professor	Chemistry	Olfe, Daniel B., Ph.D.	Professor	AMES
Dunseath, Thomas K., Ph.D.	Associate Professor	Literature	O'Neil, Thomas M., Ph.D.	Associate Professor	Physics
Elliott, Robert C., Ph.D.	Professor	Literature	Orr, Daniel, Ph.D.	Professor	Economics
Ellis, Albert T., Ph.D.	Professor	AMES	Patterson, Richard R., Ph.D.	Assistant Professor	Mathematics
Fahey, Robert C., Ph.D.	Associate Professor	Chemistry	Pawula, Robert F., Ph.D.	Associate Professor	AMES
Feher, George, Ph.D.	Professor	Physics	Pearce, Roy H., Ph.D.	Professor	Literature
FitzGerald, Carl H., Ph.D.	Assistant Professor	Mathematics	Penner, Stanford S., Ph.D.	Professor	AMES
FitzGerald, Carl H., Ph.D.	Assistant Professor	Mathematics	Perrin, Charles L., Ph.D.	Associate Professor	Chemistry
Frankel, Theodore T., Ph.D.	Professor	Mathematics	Peterson, Laurence E., Ph.D.	Professor	Physics
Frankel, Theodore T., Ph.D.	Professor	Mathematics	Piccioni, Oreste, Ph.D.	Professor	Physics
Freddin, Donald R., Ph.D.	Associate Professor	Physics	Popkin, Richard H., Ph.D.	Professor	Philosophy
Freeman, Gary L., Ph.D.	Assistant Professor	Biology	Ramanathan, Ramachandra, Ph.D.	Assistant Professor	Economics
Fung, Yuan-cheng, Ph.D.	Professor	AMES	Ramm, Wolfhard, Ph.D.	Assistant Professor	Economics
Gibson, Carl H., Ph.D.	Associate Professor	AMES/SIO	Rand, Sinai, Ph.D.	Associate Professor	AMES
Goodkind, John M., Ph.D.	Associate Professor	Physics	Randel, Fred V., Ph.D.	Assistant Professor	Literature
Goodman, Murray, Ph.D.	Professor, Acting Provost of the College	Chemistry	Reissner, M. Erich, Ph.D.	Professor	AMES
Gould, Robert J., Ph.D.	Associate Professor	Physics	Roberson, Robert E., Ph.D.	Professor	AMES
Green, Melvin H., Ph.D.	Associate Professor	Biology	Rumelhart, David E., Ph.D.	Assistant Professor	Psychology
Grobstein, Clifford, Ph.D.	Professor	Biology	Russo, J. Edward, Ph.D.	Assistant Professor	Psychology
Halkin, Hubert, Ph.D.	Professor	Mathematics	Saltman, Paul D., Ph.D.	Professor	Biology
Hamburger, Robert N., M.D.	Professor	Pediatrics	Scales, Ronald D., Ph.D.	Assistant Professor	Philosophy
Harris, Seymour E., Ph.D.	Professor	Economics	Schane, Sanford A., Ph.D.	Associate Professor	Linguistics
Harrison, Newton A., M.F.A.	Associate Professor	Visual Arts	Scheffler, Immo E., Ph.D.	Assistant Professor	Biology
Hartline, Daniel K., Ph.D.	Assistant Professor	Biology	Schmalensee, Richard L., Ph.D.	Assistant Professor	Economics
Hawkins, James W., Ph.D.	Associate Professor	SIO	Schneider, Alan M., Sc.D.	Professor	AMES
Hawkins, James W., Ph.D.	Associate Professor	SIO	Schrauzer, Gerhard N., Ph.D.	Professor	Chemistry
Hayashi, Masaki, Ph.D.	Associate Professor	Biology	Schultz, Sheldon, Ph.D.	Professor	Physics
Hegemier, Gilbert A., Ph.D.	Associate Professor	AMES	Selverston, Allen I., Ph.D.	Assistant Professor	Biology
Helinski, Donald R., Ph.D.	Professor	Biology	Sham, Lu Jeu, Ph.D.	Associate Professor	Physics
Holbrook, John A., Ph.D.	Assistant Professor	Mathematics	Shenk, Norman, Ph.D.	Associate Professor	Mathematics
Hooper, John W., Ph.D.	Professor	Economics	Shore, Herbert B., Ph.D.	Assistant Professor	Physics
Intaglietta, Marcos, Ph.D.	Associate Professor	AMES	Shuler, Kurt E., Ph.D.	Professor	Chemistry
Jackson, Gabriel, Ph.D.	Professor	History	Singer, S. Jonathan, Ph.D.	Professor	Biology
Kamen, Martin D., Ph.D.	Professor	Chemistry	Smallwood, Dennis E., Ph.D.	Assistant Professor	Economics
Kaplan, Nathan O., Ph.D.	Professor	Chemistry	Smith, Donald R., Ph.D.	Associate Professor	Mathematics
Kirkpatrick, Susan, Ph.D.	Assistant Professor	Literature	Sorenson, Harold W., Ph.D.	Associate Professor	AMES
Kohn, Walter, Ph.D.	Professor	Physics	Stein, Wayne A., Ph.D.	Associate Professor	Physics
Kraut, Joseph, Ph.D.	Professor	Chemistry	Stern, Herbert, Ph.D.	Professor	Biology
Kroll, Norman M., Ph.D.	Professor	Physics	Stroll, Avrum, Ph.D.	Professor	Philosophy
Langacker, Ronald W., Ph.D.	Associate Professor	Linguistics	Suess, Hans E., Ph.D.	Professor	Chemistry
Lee, Edward N., Ph.D.	Associate Professor	Philosophy	Suhl, Harry, Ph.D.	Professor	Physics
Lettau, Reinhard, Ph.D.	Professor	Literature	Swanson, Robert A., Ph.D.	Professor	Physics
Libby, Paul A., Ph.D.	Professor	AMES	Szanto, George H., Ph.D.	Assistant Professor	Literature
Liebermann, Leonard N., Ph.D.	Professor	Physics	Thompson, William B., Ph.D.	Professor	Physics
Lin, Shao-Chi, Ph.D.	Professor	AMES	Travis, William P., Ph.D.	Associate Professor	Economics
Linck, Robert G., Ph.D.	Assistant Professor	Chemistry	Traylor, Teddy G., Ph.D.	Professor	Chemistry
			Urey, Harold C., Ph.D.	University Professor Emeritus	Chemistry
			Van Atta, Charles W., Ph.D.	Associate Professor	AMES
			Vernon, Wayne, Ph.D.	Assistant Professor	Physics
			Vold, Robert L., Ph.D.	Assistant Professor	Chemistry
			Weare, John H., Ph.D.	Assistant Professor	Chemistry

Wheatley, John C., Ph.D.
 Wheeler, John C., Ph.D.
 Wierschin, Martin W., Ph.D.
 Williams, Forman A., Ph.D.
 Williamson, Stanley G., Ph.D.
 Wilson, Curtis A., Ph.D.
 Wilson, Kent R., Ph.D.

Professor Physics
 Assistant Professor Chemistry
 Associate Professor Literature
 Professor AMES
 Associate Professor Mathematics
 Professor History
 Associate Professor Chemistry

Wohlleben, Dieter K., Ph.D.
 Wong, David Y., Ph.D.
 Wright, Andrew, Ph.D.
 Zimm, Bruno H., Ph.D.
 Zweifach, Benjamin W., Ph.D.

Assistant Professor
 in-Residence Physics
 Professor Physics
 Professor Literature
 Professor Chemistry
 Professor AMES



A small outdoor class meeting in Urey Plaza, Revelle College.

Muir College

In the fall of 1967, John Muir College, second of the colleges planned for UCSD, admitted its first students. The college was named for John Muir, the California naturalist, geologist, and writer. Born in Dunbar, Scotland, in 1838, Muir was educated in Scotland and at the University of Wisconsin. He explored the Sierra Nevada Mountains, Alaska, and the Arctic regions and worked for many years in the cause of conservation and the establishment of national parks and forests. His books are still widely read for their vivid and engaging descriptions of the land and the people of early California. Muir made his home in Martinez, California. He was awarded an honorary degree by the University of California in 1913. He died in 1914.

THE CHARACTER OF THE COLLEGE

John Muir College seeks to be an institution of a special kind. First of all, it intends to be an academic community: its members are engaged upon inquiry and the sharing of ideas. At the same time a majority of its members are young adults who need to define themselves in relation to the physical world and the society in which they live. Self discovery, when undertaken in the midst of academic pursuits and opportunities, can be unusually profound and meaningful, especially if learning is truly joined with living, if knowledge gained in the classroom, the library, and the laboratory can in some real way be applied to the experience of the Muir student and the problems of contemporary society.

These are grand intentions. Simply announcing them does not make them so. The connection between learning and living, for example, is not always easy to maintain. Work is needed, and students are expected to share in it. They help to conceive and design new courses. They serve on the John Muir College Council and the Curriculum Review and Development Board; these are concerned with the general governance of the College and its academic program. They act as house advisors in the residence halls and as discussion leaders in the Contemporary Issues program. They help to formulate and administer the rules under which they live. They share in the decisions affecting allocations of resources. They are active members of the community.

Appropriately, therefore, the general education requirements and the curriculum as a whole encourage active rather than passive learning. Active learning necessitates self-education and opportunities for independent study. The major programs provide many forms of this. They are not confined to the last two years, but may be undertaken by students of the college whenever the departments or the directors of interdisciplinary majors judge them to be ready. Those students who choose not to pursue a major will be expected to complete projects that demand much independent investigation.

The Graduation Requirements

To receive a bachelor's degree from John Muir College a student must:

1. Meet the general University requirement in Subject A. (See *Admission to the University*.)
2. Meet the Muir College requirement in writing proficiency. This requirement asks that the student demonstrate an ability to write English according to standards appropriate for all college work.
3. Satisfy the University of California requirement in American History and Institutions. (See *Rules and Procedures: American History and Institutions*.)
4. Pass 45 four-unit academic courses or their equivalent. Eighteen of the 45 courses must be upper-division level. The residency requirement is that nine of the last eleven courses passed must be taken as a student in the College.
5. Fulfill the general education requirements described below.
6. Show some form of concentration and focus of study. Ordinarily this is accomplished by completing a departmental major. Students in the College may attempt any major to which they can gain admission. A student who does not choose to meet this requirement by means of a departmental or interdisciplinary major must complete a special project. As the name implies, this is a specialized form of concentration. It normally consists of a combination of regular course work and independent study. Each such project must be approved by the Provost. (See the paragraph *Major Programs and Special Projects*.)

The General Education Requirements

The Muir College general education program is most easily described in terms of the following table:

SOCIAL SCIENCES
Psychology 10, 11, 14
Linguistics 1 A, B, C

FINE ARTS
Music 1 A, B, C
Drama 11, 12, 13

Economics 1 A, B, C
Economics 2 A, B, C
Anthropology 22, 23, 24
Sociology 1A, 1B, 10

MATHEMATICAL SCIENCE

Math 1 A, B, C
Math 2 A, B, C
Math 2 B, C, D
Math 2 B, C, E
Math 5 A, B, C

NATURAL SCIENCE

Biology 6, 7, 8, 10, 11 (3 of 5)
Science 3 A, B, C
Science 4 A, B, C
APIS 20 A, B, C

EXPERIMENTAL AND INTERDISCIPLINARY COURSES

Cultural Traditions:

Oceania

Caribbean

Judaic Studies

Visual Arts 15A, 15B, 15C, 88
Visual Arts 17, 18, 19

HUMANITIES

English 21, 22, 23
Literature-1 A, B, C
Literature 3 A, B, C
History 1 A, B, C
History 5 A, B, C
Philosophy 20, 21, 22
Philosophy 30 A, B, C

LANGUAGE LEARNING

Any three of the following:

Language 1, 2, 3, 4, 5, 6
Literature 10, 11, 11

used only as a Humanities sequence

used only as a Humanities sequence

used only as a Humanities sequence

Each student is required to complete one-year sequences from four of the six categories: two from the right side (Fine Arts, Humanities, Language) and two from the left (Mathematical Science, Natural Science, Social Science). A sequence from the Interdisciplinary and Experimental group may be substituted for one in the category to which it is assigned.

The courses listed are those that have been approved for 1972-73 by the Muir College Curriculum Review and Development Board. Each year this board, consisting of faculty and students, determines which of the course offerings of the various departments may be used in the general education program. The basic criterion is that a year sequence must be a unified and coherent treatment of a single subject or topic. The following points should be noted.

1. Only complete sequences may be applied to the general education requirement. Ordinarily an entire sequence is taken in one academic year.
2. More advanced courses may, with the consent of the Provost, be substituted for those listed.
3. The same sequence may be used both to satisfy part of the general education program and to meet a departmental requirement or prerequisite.
4. Units obtained from Advanced Placement and similar examinations may not be used to satisfy the general education requirements.
5. The sequences offered in the Interdisciplinary and Experimental category will generally change each year.
6. Courses taken to satisfy the general education requirement may, in general, be taken for a letter grade or pass/not pass.

This general education program was established by the faculty of the College to guide the students toward a broad and liberal education while allowing them substantial choice in the development of that education. It should be understood that this freedom carries with it the responsibility on the part of the student for careful planning. Almost all of the major programs at UCSD have a pattern of prerequisites, some of them quite extensive. A student who does not plan well could find, in his junior year, that he has access to few majors without doing additional lower-division work. With careful planning, he may have access to a wide range of majors. Students of the college are encouraged to consult regularly with the academic counselors in the Office of the Provost as well as with members of the faculty concerning the selection of appropriate courses. Some examples of the choices which must be made are given in the paragraph *Major Programs*.

For students who transfer to Muir College from another institution, the general education requirements will be interpreted in this way: two semester courses or three quarter courses in a subject represented on the approved list will normally be accepted as completing one of the four required sequences. The Office of the Provost makes an evaluation of prior work for each student at the time of his first enrollment.

Major Programs and Special Projects

Students in Muir College may attempt any major to which they can gain admission. It was remarked above that many majors have precise and often extensive lower-division prerequisites. This means that the student should plan his lower-division work carefully. Since many students change their plans concerning a major, it is often useful to plan with regard to general areas of interest rather than a specific major. Each academic department has, in its section of this catalog, a paragraph entitled *The Major Program*. Students are encouraged to read these carefully, for they indicate both the extent of the prerequisites and the nature of the upper-division program. The following points are useful to keep in mind:

1. A substantial command of at least one modern foreign language is required by several departments (e.g., Linguistics, Literature) and many others recommend such study to their majors.
2. Specific science courses are required by many departments. For example, *Mathematics* and *APIS* require Science 4A, 4B, 4C; *Biology* requires Science 3A, 3B, 3C, and 4A, 4B, 4C.
3. The physical and life sciences, together with certain of the social sciences (*Economics* and *Psychology*) require at least one year of calculus.

The Muir Special Project major is intended for students who have specific talents and interests which are not accommodated by one of the departmental majors. A project normally includes both regular course work and independent study; taken together, this must represent the same amount of work as an ordinary major. The project may be one of two kinds: creative work of some sort (e.g., a book of poetry, a collection of musical compositions) or a detailed program of study and research in a particular area. The latter results in a long paper representing a synthesis of the knowledge and skill acquired. In either case, a regular member of the faculty must serve as adviser to a student doing the project. It should be understood that the demands of a Special Project are great and a project is not appropriate for a student who simply does not want the discipline of a normal major. Further information may be obtained from the Office of the Provost.

The Faculty of Muir College

NAME	TITLE	DEPARTMENT
Alazraki, Jaime, Ph.D.	Professor	Literature
Alfven, Hannes, Ph.D.	Professor-in-Residence	APIS
Altman, Allen B., Ph.D.	Assistant Professor	Mathematics
Anderson, Donald W., Ph.D.	Professor	Mathematics
Anderson, Norman, Ph.D.	Professor	Psychology
Antin, David, M.A.	Associate Professor	Visual Arts
Axford, W. Ian, Ph.D.	Professor	APIS
Bailey, Frederick G., Ph.D.	Professor	Anthropology
Banks, Peter M., Ph.D.	Associate Professor	APIS
Barkan, Leonard, Ph.D.	Assistant Professor	Literature
Barnouw, Jeffrey, Ph.D.	Assistant Professor	Literature
Benamou, Michel, Ph.D.	Professor	Literature
Booker, Henry G., Ph.D.	Professor	APIS
Bowles, Kenneth L., Ph.D.	Professor	APIS
Brody, Stuart, Ph.D.	Assistant Professor	Biology
Brown, Natalie, Ph.D.	Assistant Professor	Literature
Campbell, James L., M.S.	Assistant Professor	Music
Campbell, Laughlin A., Ph.D.	Assistant Professor	Mathematics
Chapin, Paul G., Ph.D.	Assistant Professor	Linguistics
Chen, Mathew, Ph.D.	Assistant Professor	Linguistics
Chrispeels, Maarten J., Ph.D.	Assistant Professor	Biology
Cicourel, Aaron, Ph.D.	Professor	Sociology
Cohen, Alain J. J., Ph.D.	Assistant Professor	Literature
Cohen, Harold	Professor	Visual Arts
Coles, William A., Ph.D.	Assistant Professor	APIS
Collins, Randall, Ph.D.	Assistant Professor	Sociology
D'Andrade, Roy G., Ph.D.	Professor	Anthropology
Deutsch, J. Anthony, Ph.D.	Professor	Psychology
Dolin, Edwin F., Jr., Ph.D.	Assistant Professor	Literature
Donald, John D., Ph.D.	Assistant Professor	Mathematics
Douglas, Jack D., Ph.D.	Associate Professor	Sociology
Ebbesen, Ebbe B., Ph.D.	Assistant Professor	Psychology
Erdelsky, Philip J., Ph.D.	Assistant Professor	Mathematics
Erickson, Robert, M.A.	Professor	Music
Evans, John W., M.D., Ph.D.	Associate Professor	Mathematics
Fantino, Edmund J., Ph.D.	Associate Professor	Psychology
Farber, Manny	Professor	Visual Arts
Farrell, Peter, M.M.	Professor	Music
Fejer, Jules A., D.Sc.	Professor	APIS
Fillmore, Jay P., Ph.D.	Assistant Professor	Mathematics
Fitzgerald, Raymond, Ph.D.	Professor	APIS
Flanigan, Francis J., Ph.D.	Assistant Professor	Mathematics
Fussell, Edwin S., Ph.D.	Professor	Literature
Gaburo, Kenneth L., D.M.A.	Professor	Music
Gaffney, Floyd, Ph.D.	Acting Associate Professor	Drama
Golber, David L., Ph.D.	Assistant Professor	Mathematics
Gragg, William B., Ph.D.	Associate Professor	Mathematics
Green, David M., Ph.D.	Professor	Psychology
Guillen, Claudio, Ph.D.	Professor	Literature
Gusfield, Joseph R., Ph.D.	Professor	Sociology
Halpern, Francis R., Ph.D.	Associate Professor	Physics
Helstrom, Carl W., Ph.D.	Professor	APIS
Holland, John J., Ph.D.	Professor	Biology
Howell, Stephen H., Ph.D.	Assistant Professor	Biology
Hudson, Gary, M.F.A.	Assistant Professor	Visual Arts
Humble, Keith, Dip. in Music	Associate Professor	Music
Jacobs, Irwin, Sc.D.	Professor	APIS
Jameson, Fredric R., Ph.D.	Professor	Literature
Jordan, David, Ph.D.	Assistant Professor	Anthropology
Klima, Edward S., Ph.D.	Professor	Linguistics
Korevaar, Jacob, Ph.D.	Professor	Mathematics
Kuroda, Sige-Yuki, Ph.D.	Associate Professor	Linguistics
Langdon, Margaret H., Ph.D.	Assistant Professor	Linguistics
Ledden, Patrick J., Ph.D.	Assistant Professor	Mathematics
Leonard, John G., Ph.D.	Assistant Professor	History
Levy, Robert I., Ph.D.	Professor	Anthropology
Lewak, George J., Ph.D.	Assistant Professor	APIS
Lohmann, Adolf W., Ph.D.	Professor	APIS
Lowe, Keith D., Ph.D.	Assistant Professor	Literature
Luo, Huey-Lin, Ph.D.	Assistant Professor	APIS
Lyman, Stanford M., Ph.D.	Professor	Sociology
Manaster, Alfred B., Ph.D.	Associate Professor	Mathematics
Mandler, George, Ph.D.	Professor	Psychology
Marin, Louis, Agrigation	Professor	Literature
Masry, Elias, Ph.D.	Assistant Professor	APIS
Metzger, Thomas A., Ph.D.	Assistant Professor	History
Mills, Stanley E., Ph.D.	Professor	Biology
Munsinger, Harry L., Ph.D.	Associate Professor	Psychology
Nee, Thomas B., M.A.	Associate Professor	Music
Ngubo, Anthony, M.A.	Assistant Professor	Sociology
Obeyesekere, Gananth, Ph.D.	Professor	Anthropology
Ogdon, Wilbur L., Ph.D.	Professor	Music
Oliveros, Pauline, A.B.	Assistant Professor	Music
Orloff, Marshall J., M.D.	Professor	Surgery
Parrish, Michael E., Ph.D.	Assistant Professor	History
Price, Paul A., Ph.D.	Assistant Professor	Biology
Rappaport, Armin, Ph.D.	Professor	History
Reynolds, George S., Ph.D.	Professor	Psychology
Reynolds, Roger, M.M.	Associate Professor	Music
Rodin, Burton, Ph.D.	Associate Professor	Mathematics
Rohrl, Helmut, Ph.D.	Professor	Mathematics
Rosenblatt, Murray, Ph.D.	Professor	Mathematics
Rotenberg, Manuel, Ph.D.	Professor	APIS
Ruiz, Ramon E., Ph.D.	Professor	History
Rumsey, Victor H., D.Eng.	Professor	APIS
Sato, Gordon H., Ph.D.	Professor	Biology
Saville, Johathan, Ph.D.	Assistant Professor	Literature
Savitch, Walter J., Ph.D.	Assistant Professor	APIS
Schalkwijk, J. Pieter, Ph.D.	Assistant Professor	APIS
Scheiber, Harry N., Ph.D.	Professor	History
Schwartz, Theodore, Ph.D.	Associate Professor	Anthropology
Sharpe, Michael J., Ph.D.	Assistant Professor	Mathematics
Silber, John J., Ph.D.	Professor	Music
Small, Lance W., Ph.D.	Associate Professor	Mathematics
Smith, Douglas W., Ph.D.	Assistant Professor	Biology
Smith, Timothy, Ph.D.	Assistant Professor	Linguistics
Soulé, Michael E., Ph.D.	Assistant Professor	Biology
Spiro, Melford E., Ph.D.	Professor	Anthropology
Stewart, John L., Ph.D.	Professor, Provost of the College	Literature
Swartz, Marc J., Ph.D.	Professor	Anthropology
Teilhet, Jehanne H., M.A.	Assistant Professor	Visual Arts
Todd, Michael C., M.A.	Assistant Professor	Visual Arts
Tschirgi, Robert, M.D., Ph.D.	Professor	Neurosciences
Turetzky, Bertram J., M.A.	Assistant Professor	Music
Van Fleet, Ellen, M.A.	Assistant Professor	Visual Arts
Wagner, Arthur, Ph.D.	Professor	Drama
Warschawski, Stefan E., Ph.D.	Professor	Mathematics
Wavrik, John J., Ph.D.	Assistant Professor	Mathematics

Wesling, Donald T., Ph.D.
 Wilden, Anthony G., Ph.D.
 Wilhelmy, Roland, Ph.D.

Associate Professor Literature
 Assistant Professor Literature
 Assistant Professor Psychology

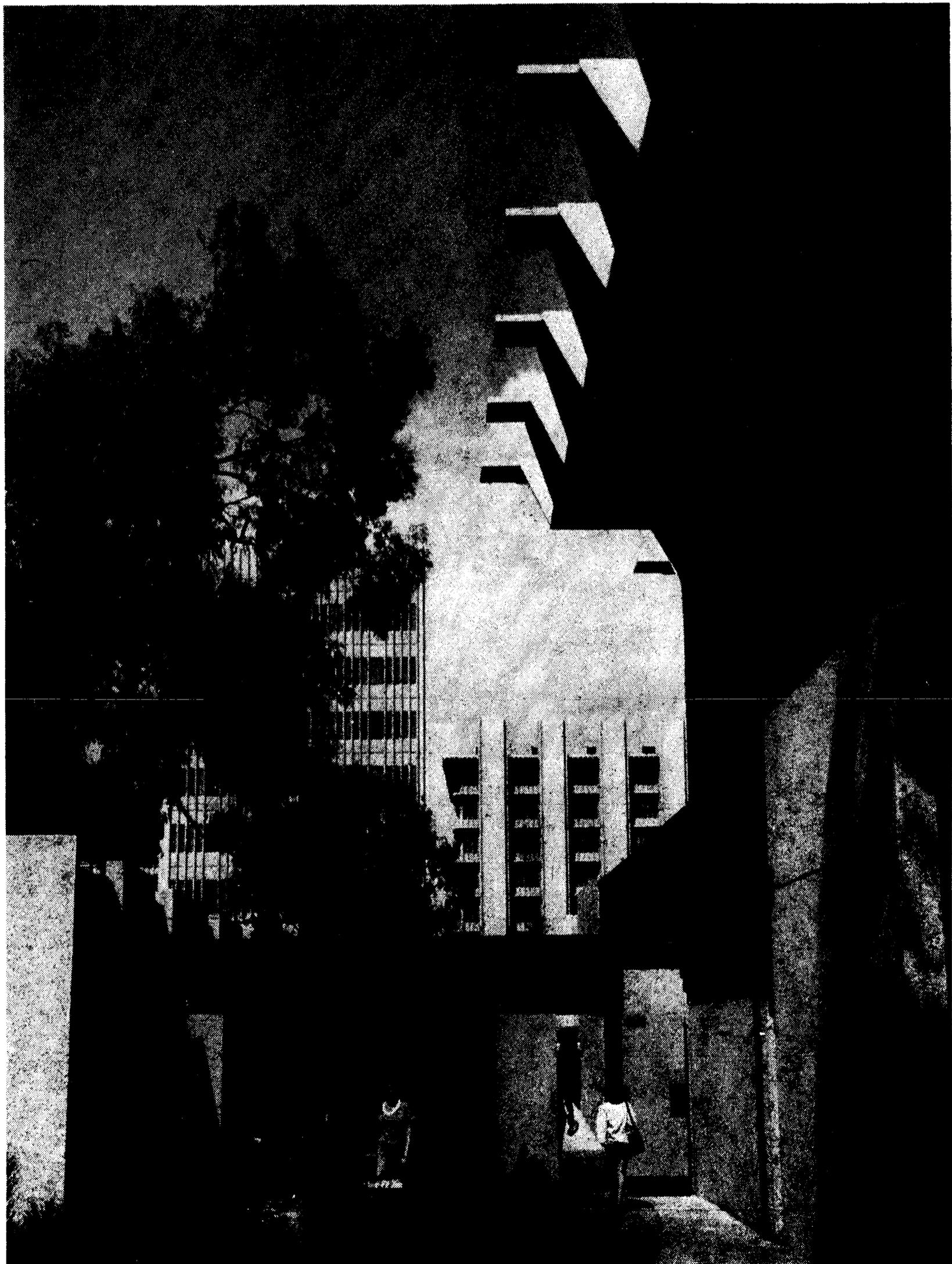
Yip, Wai-lim, Ph.D.
 York, Herbert F., Ph.D.

Assistant Professor Literature
 Professor Physics

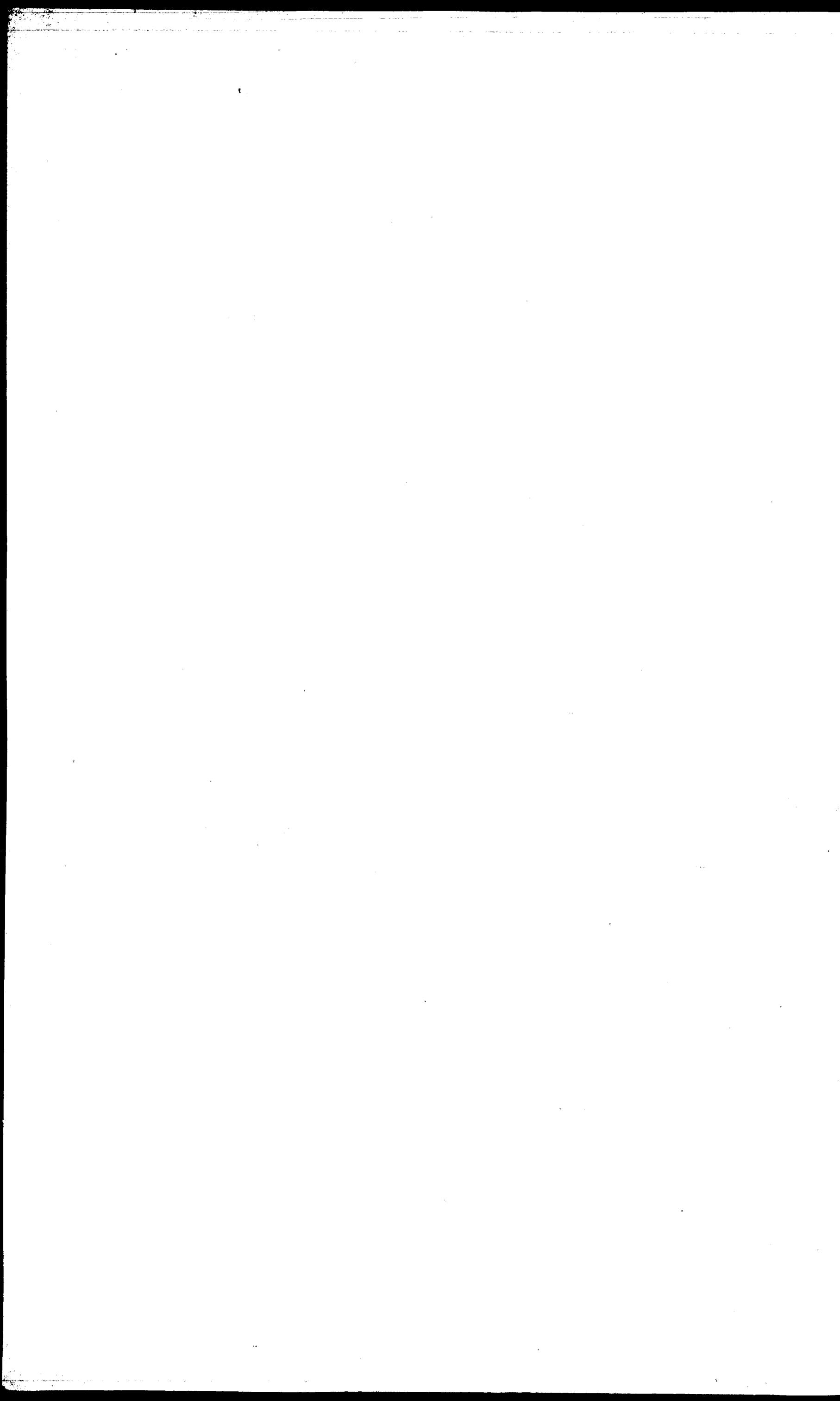
* * *

Honorary Fellows of the College

Hannes Ahven, *Scientist and Nobel Laureate*
 Georg von Bekesy, *Psychologist and Nobel Laureate*
 Ernst Krenek, *Composer*
 Ernest Mandeville, *Philanthropist*
 William McGill, *Psychologist and Educator*
 Jonas Salk, *Scientist*
 Claude E. Shannon, *Mathematician*
 Earl Warren, *Jurist and Statesman*
 Robert Penn Warren, *Poet and Novelist*



Gymnasium and John Muir College.



Third College

The Third College admitted its first students in the Fall of 1970. The Third College is unique in several respects. It is dedicated to the education of large numbers of minority youth who possess the will and the potential to become leading citizens within their own communities, to alleviate contemporary, social and economic problems and, in so doing, to provide public benefit to our society at large. Joint student-faculty participation is a major role in the development and operation of the college.

EDUCATIONAL AIMS OF THIRD COLLEGE

The Academic Plan developed for Third College has as its primary emphases the education of minority students, and the study and alleviation of contemporary social problems. Today, our society is in the process of a moral, social and technological evolution. Youth feels alienated from prevailing institutions and concepts. Ethnic minorities are separated from the mainstream of society by frightening social and economic barriers. The deterioration of our physical environment and the impact of an overwhelming technology are increasingly affecting values and ways of our daily life. Rapid communication and economic and political interdependence among all people on the earth demand that our thinking expand from national to world-wide dimensions. These grave problems require the education of citizens who will be committed to their solution, will learn to analyze them objectively and will acquire the technical competence to cope with them. This is the educational aim of Third College.

Organizational Structure of the College

It is essential to the success of Third College that a cohesive college community be developed. Students and faculty will need to cooperate closely in all aspects of the college, with a fundamental educational role assigned to students. Because they are participating to this extent in the educational program of the college, it is clear that student perceptions of the successes and failures of the program will be both appropriate and valuable. In order that these perceptions be quickly translated into modifications of the program, it is essential that students have a clear voice in the decision-making bodies of the college.

Student participation in the planning of the college has been extensive. The Academic Plan of the college was drafted by joint student-faculty committees, with many of the concepts originating from the students. This high level of student participation continues in the governance of the college.

THE GENERAL EDUCATION REQUIREMENTS

Third College students are expected to complete the following set of core courses:

1. Three quarters (12 units) in Science and Technology covering Biology, Chemistry, and Physics
2. A three-quarter (12 units) sequence in Urban and Rural Studies
3. A three-quarter (12 units) sequence in Third World Studies
4. A two-quarter (8 units) sequence in Communications
5. Two quarters (8 units) in Mathematics
6. One quarter (4 units) in Composition

It is strongly recommended that students take the core courses in sequence during their freshman (and sophomore) year at Third College. All required Third College courses are (4) quarter-units each.

Language

Third College does not require proficiency in a foreign language for graduation, however, a student's disciplinary major may require a foreign language. Therefore, concurrent with the selection of a major, the student should establish which foreign language is required or recommended for that major. For further information refer to the major program under the respective department of instruction.

Transfer Students

Transfer students accepted by Third College will, in general, be held to the lower-division general education requirements and to the lower-division prerequisites for a major. The general education requirements, however, will be interpreted rigorously only for those subjects that are directly related to the students proposed major. The Provost, in consultation with appropriate departments, will evaluate the credentials of each transfer student on an individual basis. Transfer without penalty will be authorized upon approval of the Provost and the responsible department.

In order to transfer to Third College from another college or school within the University of California, a student will be required to have a C (2.0) average or better on all

work attempted at any University of California campus. (See *Admission to the University: Advanced Standing*.)

THE THIRD COLLEGE PROGRAMS AND CORE COURSES

The following are the Third College Programs which cover the core courses of the college. For further information and course descriptions refer to these titles under *Departments of Instruction*.

1. **SCIENCE AND TECHNOLOGY** The Science and Technology basic sequence is designed to provide all students with a fundamental background in biology, chemistry and physics. The relationship and importance of these disciplines to the human organism and its environment is stressed. The Health Sciences major, the Biology major in Third College, is the first specialized science program of the College and is designed to prepare students for medical or dental schools or careers in the allied health professions.
2. **URBAN AND RURAL STUDIES** Urban and Rural Studies investigates the many interdependent factors which determine the structure and quality of life in urban and rural areas. Examples of central factors in this program are economic distribution of private and governmental monies, the responsiveness of the society to varying cultural, environmental, and ecological needs, and the participation of the individual and groups in determining policy and allocation of resources and services.
3. **THIRD WORLD STUDIES** Third World Studies seeks to provide students with information and an understanding of external Third World cultures and of the problems facing Asian American, Black, Chicano, and Native American peoples in the past and present. The psychological, sociological, and economic factors determining the progress of the Third World are studied in depth.
4. **COMMUNICATIONS** Communications provides students with a focus for inquiry into the institutions, media, and forms of human behavior that together influence the development of individual and group consciousness. At the same time, the program affords students the chance to experiment and expand their skills in using communications media.
5. **MATHEMATICS** The intent of the mathematics requirement is to provide students with the basic mathematic principles and problem-solving skills necessary in preparation for an advanced academic setting and to acquaint students with the important role which mathematics plays in present-day society.
6. **COMPOSITION** Composition is designed to sharpen the student's communicative skills through the written word by focusing on the basic language patterns and special needs of students (particularly of minority students) and dealing with them on a tailored basis. (See course listing: *Communications 10*).
7. **TEACHER EDUCATION** Recognizing the campus-wide need for teacher training, a TEACHER EDUCATION PROGRAM has been developed and will open in the Fall 1972, under the auspices of Third College. This teacher credentialing program will have a bicultural and bilingual emphasis; focusing on the interrelationship of language, culture, and learning particularly as applied to the education of minorities. An official outline and details of the courses for the Teacher Education Program will be provided in subsequent publications.

In addition, a Bilingual Sequence is being developed under the Third World Studies Program. Beginning in 1972-73 new courses will be offered in such areas as *Spanish for Chicanos, Chicano Dialectology, Chicano Literature, and Spanish Phonetics*. An official listing of these new courses will be provided in subsequent publications.

THE MAJORS

Third College students may pursue a wide range of majors offered by departments at UCSD. In addition, Third College students may elect a major in any of the interdisciplinary programs of the college — Communications, Urban and Rural Studies, Health Science, or Third World Studies (planned).

The following are the majors available to Third College students:

- Anthropology
- Applied Mechanics and Engineering Sciences
- Chemistry
- Communications
- Economics
- Health Sciences (Biology)
- History

- Linguistics
- Literature
- Mathematics
- Music
- Philosophy
- Physics
- Psychology
- Sociology
- Third World Studies (planned)
- Urban and Rural Studies
- Visual Arts

Students in Third College are expected to satisfy the major requirements and complete the required courses set by the department offering the major. For further information and course descriptions refer to the respective Department of Instruction.

THE GRADUATION REQUIREMENTS

To receive a bachelor's degree from Third College a student must

1. Satisfy the general University requirement in Subject A, English composition.
2. Satisfy the general University requirement in American History and Institutions.
3. Complete and pass 180 units of work with at least a "C" average;
4. Satisfy the core courses (general education) requirements; and
5. Complete a departmental, interdisciplinary, or individual major.

The Faculty of Third College

NAME	TITLE	DEPARTMENT
Alexander, Edward, Ph.D.	Assistant Professor	Chemistry
Barrera, Mario, Ph.D.	Assistant Professor	Political Science
Blanco, Carlos, Ph.D.	Professor	Literature
Brown, Willie C., Ph.D.	Assistant Professor	Biology
Diaz, Arthur, Ph.D.	Assistant Professor	Chemistry
Dutton, Richard, Ph.D.	Professor	Biology
Escobedo, Richard, Ph.D.	Assistant Professor	Mathematics
Fortes, P. A. George, M.D., Ph.D.	Assistant Professor	Biology
*Frazer, William R., Ph.D.	Professor	Physics
Heifetz, Robert J., Ph.D.	Associate Professor	Urban and Rural Studies
Justus, Joyce E., Ph.D.	Assistant Professor *	Anthropology
Khan, Ismith M., M.A.	Assistant Professor	Literature

Madrid, Arturo, II, Ph.D.	Assistant Professor	Literature
Mehan, Hugh B., Ph.D.	Assistant Professor	Sociology
Penn, Nolan E., Ph.D.	Professor	Psychiatry
Pinon, Ramon, Jr., Ph.D.	Assistant Professor	Biology
Raskin, Jeffrey F., M.A.	Assistant Professor	Visual Arts
Real, Michael R., Ph.D.	Assistant Professor	Communications
Reynolds, Edward, Ph.D.	Assistant Professor	History
Schiller, Herbert I., Ph.D.	Professor	Communications
Simon, Melvin I., Ph.D.	Associate Professor	Biology
Solis, Faustina, M.S.W.	Associate Professor	Community Medicine
Thiess, Frank B., Ph.D.	Lecturer	Mathematics
Thomas, Charles W., II, Ph.D.	Professor	Urban and Rural Studies
T'sou, Benjamin K., Ph.D.	Assistant Professor	Linguistics
Varon, Silvio S., M.D.	Professor	Biology
Watson, Joseph W., Ph.D.	Associate Professor, Provost of the College	Chemistry
Wong, Paul, Ph.D.	Assistant Professor	Sociology
Yguerabide, Juan, Ph.D.	Associate Professor	Biology

* * *

Barriteau, Roger F., M.A.	Lecturer	Philosophy
Gandy, Oscar H., Jr., M.A.	Lecturer	Communications
Kleinberg, Susan J., M.A.	Acting Assistant Professor	History
Moss, Robert C., Jr., B.A.	Assistant Supervisor	Physical Education
Munoz, Diego R., Ph.D.	Lecturer	Mathematics
Ngubo, Anthony, M.A.	Lecturer	Sociology
Ogawa, Roy H., Ph.D.	Acting Assistant Professor	Mathematics
Sanchez, Rosaura, M.A.	Acting Assistant Professor	Literature
Siembieda, William J., M.C.P.	Lecturer	Urban and Rural Studies
White, James E., B.A.	Acting Assistant Professor	Mathematics
Wright, Will H., M.A.	Acting Assistant Professor	Communications/ Sociology

* * *

Ernesto Galarza, Ph.D.	Honorary Fellow of Third College	(Novelist and Educator)
Roger S. Ruffin, LL.B.	Senior Lecturer	(Jurist)
Samuel D. Selvon	Lecturer	(Novelist and Educator)
Milton J. Silverman, J.D.	Lecturer	(Lawyer)

*On leave 1972-73

Graduate Studies

GRADUATE DEGREES OFFERED AS OF 1972-73

Anthropology	M.A.,	Ph.D.
Applied Physics	M.S.,	Ph.D.
Biology	M.S.,	Ph.D.
Chemistry	M.S.,	Ph.D.
Earth Sciences	M.S.,	Ph.D.
Economics		Ph.D.
Engineering Sciences:		
Aerospace Engineering	M.S.,	Ph.D.
Applied Mechanics	M.S.,	Ph.D.
Bioengineering	M.S.,	Ph.D.
Engineering Physics	M.S.,	Ph.D.
History	M.A.,	Ph.D.
Information and Computer Science	M.S.,	Ph.D.
Linguistics	M.A.,	Ph.D.
Literature, Comparative		Ph.D.
Literature, English and American		Ph.D.
Literature, French		Ph.D.
Literature, German		Ph.D.
Literature, Spanish		Ph.D.
Marine Biology	M.S.,	Ph.D.
Mathematics	M.A.,	Ph.D.
Music	M.A.,	Ph.D.
Neurosciences	M.A.,	Ph.D.
Oceanography	M.S.,	Ph.D.
Philosophy	M.A.,	Ph.D.
Physics	M.S.,	Ph.D.
Physiology and Pharmacology		Ph.D.
Psychology	M.A.,	Ph.D.
Sociology		Ph.D.
Visual Arts	M.F.A.	

The Nature of Graduate Instruction

Graduate courses normally carry a number in the 200 series and may be conducted in any of several ways:

1. As formal courses;
2. As seminars in which faculty and students present critical studies of selected problems within the subject field.
3. As independent reading or study under faculty supervision;
4. As research projects conducted under faculty supervision.

Work toward the Ph.D. degree requires a considerable amount of independent study and research. Therefore, students are allowed great flexibility in enrollment subject only to certain broad restrictions. (See the *Graduate Student Handbook*.)

Advisers

Normally the major department assigns every new graduate student an adviser to assist him in planning his degree program. A student may change his adviser at a later stage in his program by mutual agreement of all concerned.

GENERAL REQUIREMENTS FOR ADVANCED DEGREES

Preparation

The background of a candidate for a graduate degree should be substantially equivalent to that provided by an appropriate undergraduate major in his field. If the candidate's preparation is found to be deficient, or if it fails to provide a proper foundation for advanced work, he must devote some time to certain undergraduate courses selected in consultation with his departmental adviser. In this case a longer period of residence may be required than would otherwise be necessary.

Foreign Language Requirement

Most departments require students to demonstrate proficiency in one or more foreign languages. Before receiving the master's degree, or before taking the Qualifying Examination for advancement to candidacy for the Ph.D. degree, the student must satisfy any formal foreign language requirements established by his department and approved by the Graduate Council. Therefore, it is strongly recommended that students take the foreign language examinations required early in their graduate careers. Students are advised to become adequately prepared in required languages before entering graduate school or their programs may be delayed.

In addition to formal language requirements, some departments and faculty committees may require special language proficiency appropriate for specific programs. Under such circumstances, the testing of proficiency is the department's responsibility, and no record of the results is kept in the Office of Graduate Studies.

The foreign language examinations at UCSD are supervised by the Department of Linguistics, as agents of the Graduate Council of the UCSD Division of the Academic Senate. Special reading courses in most of the required foreign languages are available for students who wish to prepare for examinations. Students who have taken the Graduate School Foreign Language Test (GSFLT) of the Educational Testing Service (ETS) in French, German, Russian or Spanish within three years of the date they first enroll in Graduate Studies at UCSD may petition to have their scores used at UCSD. ETS examinations are administered at a cost of \$10.00 each.

Graduate student foreign language examinations are outlined below:

Reading Examination in French, German, Russian, or Spanish

For French, German, Russian, and Spanish, students should go to the UCSD Testing Office (in the Registrar's Office) to make application to take the GSFLT offered five times a year by the ETS of Berkeley, California.

Reading Examination in Other Languages

For languages *other than* French, German, Russian, Spanish, or English, the student should arrange to take a special reading examination. He must file his application to take this examination with the Office of the Department of Linguistics at least a month before he proposes to take the examination, so that a qualified examiner can be found and arrangements can be made for the test. A student who fails this examination will ordinarily not be allowed to repeat it before three months have elapsed. On repetition, a new application form must be made out. The student may not take the examination more than three times in any one language.

Oral Examination

A graduate student whose department accepts thorough oral and reading proficiency in one language to satisfy a language requirement must first pass the reading examination in the language. To take the oral examination, the student should fill out an application form at the Office of the Department of Linguistics two weeks before the end of a quarter and arrange a time to take an oral proficiency test during the last week of the quarter.

English as a Foreign Language

A graduate student who is not a native speaker of English and whose department accepts English proficiency in satisfaction of one of his language requirements must present a satisfactory score (550) of the TOEFL administered by the ETS to satisfy the requirement in English. A foreign student who wishes to satisfy a language requirement in this way should apply immediately to the UCSD Testing Office for registration to take the examination at one of the four administrations offered each year.

Certification of Native Language

A graduate student who wishes to be certified as a native speaker of a language other than English in order to meet a language requirement in his department should arrange for a short personal interview at the Department of Linguistics.

Standards of Scholarship

Only courses in which the student receives grades of A, B, C, P (Passed), or S (Satisfactory) are counted toward satisfaction of the requirements for a graduate degree. In addition, a graduate student to continue in good standing must maintain a minimum grade-point average of 3.0 (B) in all courses taken in graduate status at UCSD. Failure to do so makes a student subject to dismissal, and ineligible for graduate degrees.

THE MASTER'S DEGREE

Program of Study

The master's degree can be earned in either of two ways, one requiring a thesis and the other a comprehensive examination. Some departments offer both plans and others only one. (See department sections.) With the concurrence of his adviser, a student may select one of the two plans for fulfillment of the requirements for the master's degree.

Plan I: Thesis Plan Credit must be obtained for 36 quarter units, distributed as follows: at least 12 units in graduate courses in the major field, 6 additional units in graduate courses, 12 units in graduate or upper-division courses, and at least 6 research units which lead to a master's thesis to be approved by a committee of three faculty members appointed by the Dean of Graduate Studies.

Thesis

Students studying under Plan I (Thesis Plan) must prepare their thesis in accord with the "Instructions for the Preparation and Submission of Doctoral Dissertations and Masters' Theses" which is available through the Office of the Registrar. Reprints from publications which have resulted from thesis research may be used in part or in whole in lieu of the usual thesis format if procedures set forth in the "Instructions" are respected. The University Librarian is responsible to the Graduate Council for conformity to the criteria established for thesis preparation.

Plan II: Comprehensive Examination Plan Credit must be obtained for 36 units, at least 14 of which must be in graduate courses in the major field, 10 additional units in graduate courses and 12 units in graduate or upper-division courses. (299-Research is not acceptable under this plan.) A comprehensive master's examination administered by the candidate's major department must be passed.

Advancement to Candidacy

A formal application for advancement to candidacy for the master's degree must be filed with the Office of the Registrar and must be approved by the major department concerned and by the Dean of Graduate Studies. Advancement to candidacy shall be accomplished before the start of the quarter in which the degree will be conferred.

Residence Requirement

The minimum residence requirement is three academic quarters at least one of which must follow advancement to candidacy. Normally the entire program must be completed in residence at UCSD.

GRADUATE WORK AT OTHER CAMPUSES OF THE UNIVERSITY OF CALIFORNIA

With the approval of the department concerned and the Dean of Graduate Studies work completed at other campuses of the University of California may satisfy one of the three quarters of the residence and one-half the quarter units required for the master's degree at UCSD.

Graduate Work Completed Elsewhere

With the approval of the department concerned and of the Dean of Graduate Studies a maximum of eight quarter units of credit for work completed at another institution may be applied toward a master's degree at UCSD.

THE MASTER OF FINE ARTS DEGREE

Program of Study

The Master of Fine Arts program in studio work is offered in several areas; painting, sculpture, graphics, film, or computer media, and is granted under a Modified Thesis Program, Plan III. There will be no written final examination, but great weight will be given to the student's final presentation and to his oral examination.

Thesis

Plan III. Modified Thesis Program. Credit must be obtained for 72 quarter units, distributed as follows:

- A. 12 units for research and preparation leading to the student's final presentation and awarded at time of presentation,
- B. 6-12 units in 500 level teaching courses (all students must teach between 3 and 6 courses during the two-year period),
- C. 6 units (one per quarter for six quarters) participating in the graduate seminar, and
- D. 42-48 units for course work. Of these courses, not more than six may be taken from approved upper-division courses.

Residence Requirement

The program of study covers a period of at least two years (six quarters) and the student must be in residence for the entire period. In exceptional circumstances, he may be given a Leave of Absence but the period involved will not change the residence requirement of two years.

Advancement to Candidacy

A formal application for advancement to candidacy for the Master of Fine Arts Degree must be filed with the Office of the Registrar and must be approved by the major department concerned and by the Dean of Graduate Studies. Advancement to candidacy shall be accomplished before the start of the quarter in which the degree will be conferred.

Master of Fine Arts Degree in Visual Arts

The Master of Fine Arts degree is a terminal degree in the Visual Arts. It consists of a two year program aimed primarily at students who are already on their way to becoming artists and at certain students from other disciplines with specially relevant backgrounds who wish to participate productively in the reevaluation of art through criticism or art making. The program emphasizes the continual reevaluation of the meaning and nature of art making, stressing the strategies and roles of the artist in the art situation. It allows for the exploration of various genres and media, including painting, sculpture, photography, event making, computer media and conceptual work; but no genre, however hallowed, is considered either inevitable or intrinsically necessary, and, consequently, techniques are stressed only to the degree that they are requisite to the accomplishment of a valued aim of a particular artist.

THE DOCTOR OF PHILOSOPHY DEGREE

The degree, Doctor of Philosophy, is awarded by the University of California to candidates who have mastered in depth the subject matter of their discipline and displayed, in addition, an ability to make original contributions to knowledge in their field. More generally, the degree constitutes an affidavit of critical aptitude in scholarship, imaginative enterprise in research, proficiency and style in communication including, in most departments, proficiency in teaching.

Program of Study

The student's program of study is determined in consultation with his adviser who supervises his activities until the appointment of his Doctoral Committee. Each student's program of study, designed with flexibility for individual needs and interests, lies within the scope of the departmental program which has been approved by the Graduate Council. There are no unit requirements for a Ph.D. degree.

A doctoral program generally involves two stages. The first stage requires at least three academic quarters of residence, and is spent in fulfilling the requirements established by the Graduate Council and by the major department (course work, teaching, departmental examinations, etc.). When the department considers the student ready to take the Qualifying Examination, it arranges for the appointment of a Doctoral Committee. When the student passes the qualifying examination administered by the Doctoral Committee and is advanced to candidacy, the first stage is complete. The second stage is devoted primarily to research and to the preparation of the dissertation. At least three academic quarters must elapse from the date of advancement to candidacy to the taking of the final examination.

Residence Requirement

The residence requirement for the degree, Doctor of Philosophy, is six quarters. At least three of the six quarters must be in continuous residence at UCSD. (See the *Graduate Student Handbook*.)

Qualifying Examination and Doctoral Committee

Upon nomination of the concerned department, a doctoral committee is appointed by the Dean of Graduate Studies acting on behalf of the Graduate Council. This committee after it is formally appointed and approved conducts the qualifying examination, supervises and passes upon the dissertation, and conducts the final oral examination. The committee consists of five or more members selected in accord with Senate Regulations. For a variety of reasons a doctoral committee may have to be reconstituted by the Dean of Graduate Studies in accord with departmental nomination.

Unless the reports of the doctoral committee on the various examinations are unanimous, the Dean of Graduate Studies shall be called upon to review the case and report his findings to the Graduate Council which shall determine appropriate action.

Advancement to Candidacy

A formal application for advancement to candidacy for the doctorate must be made through the Office of the Registrar and must be approved by the chairman of the student's doctoral committee, by the major department concerned, and by the Dean of Graduate Studies. Application should be made immediately upon satisfactory completion of the qualifying examination. A fee of \$25 must be paid with the application. Advancement to candidacy shall be accomplished at least three quarters prior to the final examination.

Dissertation

A dissertation is required of every candidate for the Ph.D. degree. It must bear on his major area of study, show evidence of his ability to do independent research, and be approved by the candidate's doctoral committee.

Candidates engaged in dissertation research often find it desirable or expedient to publish, prior to the conferring of the degree, certain findings that later will be incorporated in the dissertation. Under such circumstances, appropriate reference to the earlier publication should be included in the dissertation. The final dissertation must

be prepared in accord with procedures set forth in "Instructions for the Preparation and Submission of Doctoral Dissertations and Masters' Theses" available from the Office of the Registrar and reprints from such prior publications may be used either in part or in whole in lieu of the usual dissertation format.

A draft of the dissertation must be submitted to each member of the doctoral committee at least four weeks before the final examination. Two official copies of the approved dissertation must be filed with the Registrar for deposit in the University Library.

Final Examination

The candidate's final examination is conducted by his doctoral committee. The examination is oral and deals primarily with the dissertation. The report of the final examination is not approved by the Dean of Graduate Studies until the dissertation has been accepted by the University Librarian, who is responsible to the Graduate Council for conformity to the criteria established for dissertation preparation. Approval of the "Report on Final Examination..." represents the final step in a candidate's doctoral program.

The Candidate in Philosophy Degree

Several of the departments with programs leading to the Ph.D. recommend the award of the intermediate degree of Candidate in Philosophy when the student is advanced to candidacy for the Ph.D. The minimum residence requirement for the C. Phil. degree is four quarters, three of which, ordinarily the last three, must be spent at UCSD.

Students are not admissible to graduate study if they intend taking the C. Phil. degree as terminal.

Joint Doctoral Programs

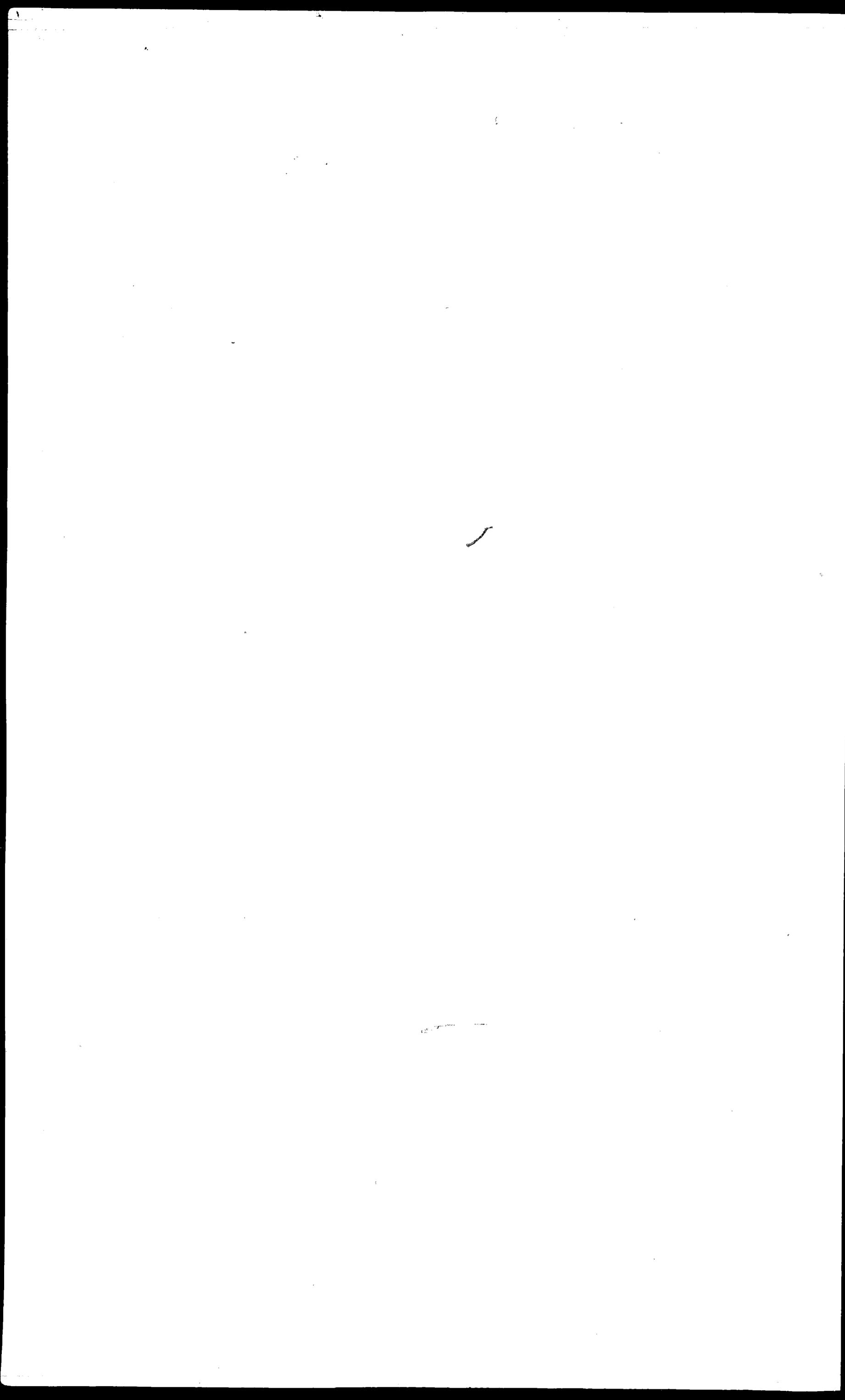
Certain departments in the several campuses of the University of California cooperate with similar departments in the California State Colleges to offer joint programs of study leading to the doctorate. Individuals interested in such joint programs should consult the relevant department at either institution for details. At UCSD, a joint program in Chemistry is currently offered in conjunction with San Diego State College and is described in the *Graduate Student Handbook*.

Dating of Advanced Degrees and Diplomas

The diploma is dated as of the last day of the quarter in which the student completes all requirements for the degree. If the student completes all requirements after the last day of the quarter, and prior to the first day of the following quarter his diploma is dated as of the last day of the following quarter. The diploma is mailed to the student approximately three months after the end of the quarter in which the degree is awarded.



Dr. Joseph Kraut, Professor of Chemistry.



Admission to the University

UNDERGRADUATE STANDARDS OF ADMISSION

The admission requirements of the University of California are based on two principles:

1. That the best assurance of success in the University is shown by high quality of scholarship in previous work.
2. That the study of certain specified subjects will give the student both good preparation for study in the University and reasonable freedom in choosing his field of specialization.

All communications concerning undergraduate admission should be addressed to the Office of Admissions, 102 Matthews Campus, University of California, San Diego, La Jolla, California 92037.

Application for Admission

An application for admission should be filed with: Office of Admissions, 102 Matthews Campus, University of California, San Diego, La Jolla, California 92037.

Application forms may be obtained from the Office of Admissions after the opening date for acceptance of applications (see below). Deadlines will depend on the number of applications filed in accordance with enrollment quotas and cannot be announced in advance. The applicant is strongly urged to file his application as soon after the opening date as possible to insure orderly processing of his records.

Undergraduate applications (including regular and intercampus transfer) may be filed for the fall quarter after November 1, for the winter quarter after July 1, and for the spring quarter after October 1. For information concerning Summer Session, contact the Summer Session Office, 504 Matthews Campus, University of California, San Diego, La Jolla, 92037.

Admission requirements are uniform on all campuses of the University. Admission entitles the student to attend the campus of his choice if the required facilities are available. Since applications will be processed and acted upon in only one Office of Admissions, applications should not be directed to more than one campus. Fees submitted with duplicate applications will not be refunded.

If after an applicant has filed for admission, his plans change, and he prefers to register on a different campus, he must write to the Director of Admissions, 570 University Hall, University of California, Berkeley, California 94720, indicating the campus at which he now wishes to register and the reason for his change. His records will be transferred to the campus he indicates, provided facilities are available there. Such requests must be received within the filing periods shown above. These filing periods apply to all undergraduate applicants (regular and intercampus transfer).

Application Fee

A nonrefundable fee of \$20 is charged for each application for admission filed. Remittance by bank draft or money order, payable to *The Regents of the University of California*, must be attached to the application.

An applicant who is not eligible for admission or one who has been admitted but fails to register in the term for which he applied, and who thereafter desires to attend the University, must submit a new application for admission, with a \$20 fee.

Transcripts of Record

Each applicant is responsible for requesting the high school from which he graduated and each college he has attended to send official transcripts of record directly to the Office of Admissions where his application is on file.

Those applying as entering freshman should ask the high school to submit, as soon as possible, preliminary transcripts showing the complete record through the sixth semester and listing courses in progress or planned. In every case, a final transcript, which includes a statement of graduation and a list of courses and grades for the seventh and eighth semesters, will be necessary.

Those applying in advanced standing should arrange for the graduating high school to send immediately to the Office of Admissions a complete and final transcript including a statement of graduation. Transcripts from the last college attended should include a statement of good standing or honorable dismissal. A preliminary transcript should show work in progress.

Any additional schools attended after an application for admission has been filed are considered to be part of the applicant's record and must be reported to the Office of

Admissions. Transcripts and other documents submitted become the property of the University and cannot be returned.

Notification of Admission

Applicants for admission to the fall quarter will be notified regarding admission beginning about February 15, and most will have been notified by May 15. Applicants for the winter and spring quarters will be notified as soon as possible following receipt of all appropriate transcripts. (Delays may occur if required documents or fees have not been received by the Office of Admissions.)

Those admitted will be required to return a *statement of intention to register, together with a nonrefundable fee of \$50, which will be credited to the university registration fee if the student registers in the quarter for which he applied. A student who fails to register in the quarter for which he was admitted and who thereafter applies and is admitted to a subsequent quarter, must return a new statement of intention to register together with the nonrefundable fee of \$50.00.*

Application For Readmission

The deadline for all returning students to file an application for readmission is eight weeks prior to the first scheduled day of the quarter (see *Academic Calendar*). Transcripts for work taken at other institutions must be submitted as part of the application.

A nonrefundable fee of \$20 is charged for each application for readmission filed. Remittance by bank draft or money order, payable to *The Regents of the University of California*, must be attached to the application.

Subject A: English Composition

Every undergraduate must demonstrate an acceptable level of ability in English composition. This requirement may be met by:

1. Achieving a score of 550 or better in the CEEB Achievement Test in English composition, or
2. Achieving a grade of 5,4, or 3 in the College Entrance Examination Board (CEEB) Advanced Placement Examination in English, or
3. Entering the University with credentials showing the completion of an acceptable college-level course of 4 quarter units or 3 semester units in English composition with a grade of C or better.

Satisfaction of the Subject A requirement is determined by the Office of Admissions. Students not meeting the requirement in one of the ways described above must enroll in a special course designed to clear the Subject A requirement during their first quarter of residence in the University. (See *Interdisciplinary Courses: Subject A.*) A fee of \$45 is charged for the course. Students whose work is of superior quality may, on recommendation of the Committee on Subject A, be permitted to withdraw from the course at a date to be determined by the Committee. Such students are regarded as having satisfied the Subject A requirement. A student who does not complete the course with a mark of Satisfactory must repeat the course each term while he is regularly enrolled until a mark of Satisfactory is given him. Satisfaction of the Subject A requirement is prerequisite to taking any further course involving English composition and to receipt of the bachelor's degree.

Foreign Students

All foreign students, unless their native language is English, must take an English examination which is administered by the Office of International Education before the beginning of each quarter. Failure to pass the examination may result in the student being required to enroll in courses designed for those whose native language is not English.

Preparation for University Work

In addition to the high school subjects required for admission to the University, certain preparatory subjects are recommended for many University curricula to give the student an adequate background for his chosen field of study. Lack of a recommended high school course may delay graduation from the University. Details of these recommendations will be found in the bulletin *Prerequisites and Recommended Subjects*, which is ordinarily in the hands of high school and junior college counselors and which may be obtained from the campus Office of Admissions or the University Dean of Educational Relations, University Hall, University of California, Berkeley, California 94720.

A student needing additional preparation is advised to attend one of the many excellent California junior colleges. There he can take courses applicable toward the requirements of the college or school of the University in which he wishes to enroll.

Freshman Standing

An applicant for admission to freshman standing is one who has not registered in regular session in any college-level institution since graduation from high school.

If, at the time of high school graduation, the applicant does not meet the requirements given below for admission to freshman standing or does not qualify by examination, he must meet the requirements for admission to advanced standing. An exception to this regulation will be made only if the student's deficiency was the result of his not having studied one or more required high school subjects. Such a student can sometimes remove the deficiency during the summer; he should consult the Office of Admissions in advance.

Admission to Freshman Standing

An applicant for admission to freshman standing must meet the requirements listed below.

Graduation from High School

An applicant who has been graduated from a California high school with the required scholarship average in the prescribed courses will be admitted to the University. When a resident of California has been graduated from a high school outside California, the acceptability of the record is determined by the Office of Admissions.

Subject Requirements

A. HISTORY, 1 UNIT This must consist of 1 unit of United States History, or one-half unit of United States History and one-half unit of civics or American Government.

B. ENGLISH, 3 UNITS These must consist of three units of English composition, literature and oral expression.

C. MATHEMATICS, 2 UNITS These must consist of two units of subjects such as elementary algebra, geometry, intermediate and advanced algebra, trigonometry, calculus, elementary functions, matrix algebra, probability, statistics, or courses combining these topics, but excluding arithmetic and such nonacademic subjects as shop mathematics and business mathematics.

D. LABORATORY SCIENCE, 1 UNIT This must consist of a tenth- eleventh- or twelfth-grade year course in one laboratory science. Both semesters must be in the same subject field.

E. FOREIGN LANGUAGE, 2 UNITS These must be in one language. Any foreign language with a written literature is acceptable.

F. ADVANCED COURSE, 1 (OR 2) UNITS This must be chosen from the following:

Mathematics, a total of 1 unit of second-year algebra, solid geometry, trigonometry, or an advanced course for which trigonometry is a prerequisite. Foreign language, either 1 additional unit in the same foreign language offered under e or 2 units of another foreign language. Science, 1 unit in any laboratory science in addition to the science offered under d.

ELECTIVES Additional elective units to complete the minimum of 15 standard entrance units are also required.

Scholarship Requirements

At least a B average is required in courses taken after the ninth year used to meet the subject requirements. Grades received in elective courses or in courses taken in the ninth year or earlier are not used in computing this average. Subject requirements are satisfied by courses in which a grade of C or higher has been assigned. Grades are considered on a semester basis, except from schools that give only year grades. Grades are accepted as they appear on the transcript.

In determining the B average, a grade of A in one course will be used to balance a C in another, but an A may not be used to compensate for D, E, or F grades.

Courses taken prior to the ninth year in which a grade of D or lower is received may be repeated to establish subject credit and improve the scholarship average; however, courses taken in the ninth year in which a grade of D or lower is received may be repeated to establish subject credit only and will not affect scholarship.

Courses taken after the ninth year in which a grade of D or F is received may be repeated to establish subject credit. Courses may be repeated in an amount not to exceed a total of 1 unit of the a-to-f pattern. Grades earned in such repetitions will not be counted higher than a C in determining scholarship average.

Examination Requirements

As a requirement for admission all Freshmen applicants and advanced-standing applicants who have earned less than 12 units of college credit subsequent to high school graduation must submit scores from the following examinations given by the Educational Testing Service for the College Entrance Examination Board: (1) the Scholastic Aptitude Test, (2) three achievement tests, which must include English, social studies or foreign language, and mathematics or science.

An applicant whose scholarship average in the required high school subjects is 3.00 to 3.09 inclusive, must achieve a minimum total score of 2500 on the required examinations. The test results of applicants with a grade-point average of 3.10 or higher will be used for purposes of counseling, guidance, placement, and satisfaction of Subject A if possible.

Admission by Examination Alone

An applicant ineligible for admission to freshman standing on the basis of his high school record, and who has not attempted college work subsequent to high school (except during the summer session immediately following graduation), may qualify for admission by examination. See also under *Nonresident Applicants*, this section.

To qualify by examination, the applicant must present scores in the Scholastic Aptitude Test (S.A.T.) and three Achievement Tests, which must include:

1. English Composition
2. Social Studies for Foreign Languages
3. Mathematics or Sciences

The tests may be taken whenever the applicant is ready. The Achievement Test in English composition cannot be used to satisfy the Subject A requirement unless taken after completion of the eleventh grade. The tests may be repeated if necessary without special limitation other than that the verbal and mathematics scores on the Scholastic Aptitude Test must be from the same sitting. The total score on the Scholastic Aptitude Test must be at least 1100; the scores on the three Achievement Tests must total at least 1650; and the score on any one Achievement Test must not be less than 500.

Arrangements to take the tests should be made with the Educational Testing Service, P.O. Box 1025, Berkeley, California 94701, or P.O. Box 592, Princeton, New Jersey 08540. The fees are to be paid to the Educational Testing Service. Scores will be regarded as official only if they are received by the Office of Admissions directly from the Educational Testing Service.

TEST DATES

SCHEDULED

November 4	SAT only
December 2	SAT and ACHIEVEMENT
January 13	SAT and ACHIEVEMENT
March 3	SAT and ACHIEVEMENT
April 7	SAT only
May 5	ACHIEVEMENT only
July 14	SAT and ACHIEVEMENT

Applicants should arrange to take the tests as early as possible so that the scores can be reported in time to be considered for admission.

Advanced Placement Tests

Credit is allowed at the time of admission for completion of the College Entrance Examination Board Advanced Placement Tests with scores of 5, 4, or 3. For information about the application of this credit to the college general education requirements, check the appropriate Provost's office.

Advanced Standing

An applicant who has registered in a junior college, a four-year college, a university, extension classes of college level, or any comparable institution since graduation from high school is subject to regulations governing admission to advanced standing. However, an advanced-standing applicant who has earned less than 12 units of college credit subsequent to high school graduation must satisfy the examination requirement for freshman applicants as described above. The applicant may not disregard his college record and apply for admission to freshman standing.

Admission to Advanced Standing

An applicant for admission to advanced standing must meet the requirements listed below:

The requirements for admission to advanced standing vary in accordance with the high school record of the applicant. Each applicant, however, must present from the last accredited college or university attended a statement of good standing and an academic record with a grade-point average of C (2.0) or better. If the record established in any one accredited institution is below a C (2.0) average, an additional unit and scholarship requirement will be imposed on subsequent credit completed to offset the deficit incurred. In addition, the applicant must meet one of the following conditions:

1. An applicant who was eligible for admission to the University in freshman standing may be admitted at any time he has established an overall grade-point average of C (2.0) or better.
2. An applicant who was ineligible for admission to the University in freshman standing, but whose only deficiency arose from not having studied one or more of the required high school subjects, may be admitted when he has (a) satisfied the subject requirements for admission to freshman standing with a grade of C or better in the appropriate courses, and (b) established an overall grade-point average of C or better.

Exception: Deficiencies in subject requirements will be waived in an amount not exceeding 2 high school units if the applicant has established a minimum of 84 acceptable quarter units or 56 acceptable semester units passed with a grade-point average of 2.4 or better. Subject deficiencies in excess of 2 units must be satisfied.

3. An applicant who was ineligible for admission to the University in freshman standing because of low scholarship or a combination of low scholarship and incomplete subject preparation (omission, or by grades of D or lower) may be admitted when the following conditions are met:

- a. He has established a minimum of 84 acceptable quarter units or 56 acceptable semester units passed with a grade-point average of 2.4 or better.
- b. He has satisfied, by appropriate courses, subject requirements for admission to freshman standing, except that subject deficiencies will be waived in an amount not exceeding 2 high school units.

Credit for Work Taken in other colleges

The University grants unit credit for courses consistent with its curriculum that have been completed in colleges and universities accredited by appropriate accrediting agencies.

As an integral part of the system of public education of California, the University accepts, at full unit value, approved transfer courses completed with satisfactory grades in the public junior colleges of the state. Frequently, students who intend to complete their advanced studies at the University will find it to their advantage to complete the first two years of their college course in one of the many excellent California public junior colleges. Total credit for attendance at a junior college shall not exceed 105 quarter units or 70 semester units. As a matter of procedure, when more than 105 quarter units are completed at a junior college, subject credit will be granted but units in excess of 105 will be deducted from the total.

Each college at UCSD has its own set of breadth requirements (see college descriptions). These requirements consist of a certain number of units and courses covering a variety of fields. The courses so indicated may be taken at the University of California or elsewhere. The list of courses and their descriptions may be used by prospective transfer students as a guide in selecting courses of similar content and purpose offered in their own institutions. Students attending a California junior college should consult their counselors to determine which junior college courses are appropriate and are accepted in satisfaction of the breadth requirements by the college of the University in which they plan to enroll.

The decision regarding the acceptability of courses taken at an institution other than the University rests with the Office of Admissions. The decision regarding the applicability of such course work in satisfaction of degree requirements rests with the provost of the college in which the student plans to enroll.

Students applying for admission who have earned more than 145 quarter units should consult with the appropriate college Provost.

College-Level Examination Program

The College-Level Examination Program (CLEP) has been established to enable those who have reached the college level of education outside the classroom through correspondence study, television courses, on-the-job training, and other means, traditional or nontraditional, to demonstrate their achievement and to use the test results for college credit or placement. It is hoped that the program will serve adults who until now have not had any systematic way of validating the learning they have acquired.

The program includes two kinds of examinations. The *General Examinations* measure achievement in five basic areas of the liberal arts: English Composition, Humanities, Mathematics, Natural Sciences and Social Sciences-History. Each examination has a time limit of 75 minutes except English Composition, which takes one hour.

The *Subject Examinations* measure achievement in specific college courses. Each examination consists of a 90-minute objective test.

Local test center is at San Diego State College, Room 228, Administration Building, 5402 College Avenue, San Diego 92115; test officer: Michael Irwin. Candidates apply to CEEB for information but direct their registration form to the test center of their choice.

Nonresident Applicants

It has been necessary to place some limitation on enrollment of applicants who are not residents of California; therefore, only those of exceptional promise will be eligible for admission. The requirements below are designed to admit nonresident applicant whose standing, as measured by scholastic records, is in the upper half of those who would be eligible under the rules for California residents.

Admission by High School Record

Graduation from High School. The acceptability of records from high schools outside California will be determined by the Office of Admissions.

Subject Requirements. The same subject pattern as for a California resident is required.

Scholarship Requirements. The scholarship requirements for a resident applicant apply to a nonresident applicant, except that the scholarship average must be 3.4 or higher in the required high school subjects.

Examination Requirement

A nonresident applicant must take the same College Entrance Examination Board tests required of a resident applicant (see above). The test scores submitted will be used for purposes of counseling, guidance, placement, and when possible, satisfaction of the Subject A requirement.

Admission by Examination Alone

A nonresident applicant who is ineligible for admission to freshman standing and who has not attempted college work subsequent to high school (except during the summer session immediately following high school graduation) may qualify for admission by examination. The requirements for a resident applicant apply to a nonresident applicant, except that the scores on the three Achievement Tests must total at least 1725.

Admission to Advanced Standing

In addition to the regular admission requirements, a nonresident applicant for admission to advanced standing must have maintained a grade-point average of 2.8 or higher in college subjects attempted and acceptable for transfer credit. If the applicant did not have at the time of high school graduation an average of 3.4 or higher in courses satisfying the required subject pattern, he must present a minimum of 84 acceptable quarter units or 56 acceptable semester units passed with a grade-point average of 2.8 or higher.

Admission of Undergraduate Foreign Students

Undergraduate foreign students must have sufficient command of English to benefit from study conducted in that language. To demonstrate this, every student whose native language is other than English must take the *Test of English as a Foreign Language* (TOEFL) prior to coming to the United States. Arrangements for the test may be made by writing to the Educational Testing Service, P.O. Box 1025, Berkeley, California 94701, or P.O. Box 592, Princeton, New Jersey 08540. The results of this test will be used to determine whether the applicant's command of English is sufficient to enable him to pursue his studies effectively. Foreign students whose command of English is slightly deficient will be required to take a non-credit English course, and, therefore, a reduced program. For this reason, foreign applicants are strongly advised to perfect their English before coming to the United States.

In addition to an adequate English language background, the foreign student must have adequate funds to cover all fees, living and other expenses, and transportation connected with his stay in the United States. He should bear in mind that expenses are likely to be heaviest at the beginning. (see *Contents for fees and expenses.*)

Admission regulations are basically the same for foreign students as for domestic students. It is recognized, however, that often a foreign student cannot fulfill all of the subject requirements although he will be expected to demonstrate adequate preparation for his chosen field. Only those applicants who present evidence of above average scholarship achievement will be considered for admission.

For information concerning health insurance requirements for foreign students, see *Contents for Health Service.*

Limited Study

Applicants who do not meet the requirements for admission to regular undergraduate or graduate studies may be interested in enrollment in regular UCSD courses on a *space available* basis through the UC Extension Division. This arrangement is known as *concurrent registration* and further information may be obtained through the Extension Division office on campus.

GRADUATE STANDARDS OF ADMISSION

General Requirements

An applicant for admission to the University for graduate studies and research must present evidence of his preparation and capacity for advanced work in one of the departments of instruction. He should hold a bachelor's degree or the equivalent, and his background should be comparable to that provided by an appropriate undergraduate program in the University of California.

Applicants are evaluated in terms of their scholastic qualifications and preparation for their proposed major field of study. A scholastic average equivalent to B or better in an acceptable undergraduate program is required. If an applicant has done graduate work, no matter where, he must have a grade-point average of 3.0 in that work. The Dean of Graduate Studies or the prospective major department may deny admission if the applicant's scholastic record is undistinguished, if his preparation is judged inadequate as a foundation for advanced work, or if the department's facilities are already filled to capacity.

Readmission

Returning students applying for readmission must submit a new application eight weeks prior to the first scheduled day of the quarter, and transcripts for any academic work taken since they last enrolled in the University of California, San Diego and a nonrefundable application fee of \$20. Such students are also urged to submit recommendations and other evidence that they can continue to meet UCSD's academic standards.

Reapplication

Applicants renewing a previously-filed application must submit a new application and similar documents covering the period since they last applied. Such applicants are urged to contact their prospective major department with respect to required information in addition to such documents but will not be required to pay another application fee within two years.

Procedures

A prospective graduate student should file with his proposed major department a completed application form, a nonrefundable application fee, payable to the Regents of the University of California, three letters of recommendation, scores on the verbal and quantitative tests of the Graduate Record Examination (GRE) if required by the department, and a transcript of his record from each college and university attended. Official admission will not be granted until the application fee has been received. In addition, the Confidential Financial Statement must be submitted by foreign students.

Information concerning the Graduate Record Examination can be obtained from the Educational Testing Service, P.O. Box 1502, Berkeley, California 94701, Phone: 415-849-0950, or P.O. Box 955, Princeton, New Jersey 08540.

A single form is used to apply both for admission and for fellowships and assistantships. This form and all supporting materials should be filed with the applicant's prospective major department at least two months before the opening of the quarter in which he plans to enroll. *Applicants seeking financial assistance must file all materials by February 1.* The forms and detailed instructions may be obtained from the departments, from the Office of Admissions, or from the Office of Graduate Studies and Research. Some departments have special requirements; applicants are urged to communicate with their prospective major departments as early as possible.

Applicants from Other Countries

Applicants from outside the United States must satisfy the same requirements for admission as native applicants. In addition to an acceptable professional background, such applicants must have sufficient command of the English language to benefit from graduate study at UCSD. *They must also possess sufficient funds to cover all fees, transportation, and living expenses connected with their stay at the University.* (A Confidential Financial Statement must be filed with the application.)

Since education outside the United States is often based upon systems or methods different from our own, it is important that a foreign applicant submit evidence that his academic background is substantially equivalent to that provided by an acceptable undergraduate program in the United States.

Applicants must submit original plus translation of official transcripts of all previous academic work including certification of degrees received or of your status upon leaving each institution. Each transcript must bear the seal of the issuing institution. If your school conducts examinations in subject fields rather than in courses, please submit your official examination record for each level of academic achievement which you have attained, class placement if available, and official records of any examinations or degree statements.

An applicant from outside the United States should arrange to have his application form and all supporting materials in the hands of his prospective major department at least four months before the beginning of the quarter in which he plans to enroll, with the exception of the Fall Quarter deadline of February 1. A deadline of February 1 for submitting these materials applies to domestic and foreign students alike who are seeking financial assistance.

Every applicant whose native language is not English and whose undergraduate education was conducted in a language other than English must take the "Test of English as a Foreign Language (TOEFL)" before coming to UCSD. Arrangements for taking this

test are made through the Educational Testing Service, P.O. Box 1025, Berkeley, California 94701, Phone: 415-849-0950, or P.O. Box 592, Princeton, New Jersey 08540. An applicant who scores below 400 will not be admitted. With a score of 400 to 449 an applicant may be admitted conditional upon enrollment in an intensive summer language program in the United States (equivalent to the program at the University of California at Santa Barbara) during the summer before entrance to UCSD for graduate studies. An applicant scoring between 450 and 549 may be admitted but he will be required to take an English proficiency test — speaking, listening comprehension, and composition — to be administered by the Department of Linguistics upon entrance on campus. If the applicant does not pass that examination, he will be required to enroll in a course in English as a foreign language (offered by the Department of Linguistics) each quarter until he does pass the examination. An applicant who scores 550 or above will be admitted without condition. However, a department may require a student admitted without condition to take the English as a foreign language course if he is found to have problems in English.

The TOEFL scores are not required for those students who have a B.A. or M.S. from an accredited American institution or from an English-speaking foreign institution as listed in the *International Handbook of Universities* and/or the *Commonwealth Universities Yearbook*. Questionable cases are referred to the Office of Graduate Studies and Research for review.

Foreign students are required to obtain health insurance for dependents who accompany them. Suitable insurance policies and additional information are available at the Student Health Service.

Applicants from outside the United States who are granted admission are urged to write to the UCSD Office of International Education, International Center, Matthews Campus, which can assist them in making a smooth transition from their undergraduate education abroad to graduate studies and research at UCSD.

Non-Degree Status

Most students are enrolled for degrees, but under special circumstances others may be admitted for non-degree graduate study to take course work only. Such students must meet the same admission requirements as those who intend to earn degrees and must apply to and be accepted for admission to a specific department.

Applicants with marginal records or program deficiencies may not be admitted in the category but may consider admission as a special undergraduate student.

Duplication of Degrees

Normally, duplication of degrees is not permitted. However, a student may petition the Graduate Council *in advance* for exceptions to this policy if the degree desired is in a field of study distinctly different from the field in which the first degree was obtained. A professional degree is not regarded as a duplicate of an academic degree.

Postdoctoral and Visiting Scholars

The University provides opportunities for scholars to do postdoctoral work with members of the UCSD faculty. All interested candidates should make arrangements with the relevant department or research unit.

The University of California has always been hospitable to faculty members and researchers from other institutions who wish to visit UCSD during sabbatical leaves and leaves of absence. Facilities for study are made available whenever possible. Arrangements should be made through the relevant department or research unit.

Rules and Procedures

REGISTRATION

After a student is officially admitted (see *Admission to the University*), he may register for classes. A student is not officially registered for classes each quarter until he has completed the entire registration procedure, which includes:

1. Consultation with academic adviser as required and the securing of any necessary permissions.
2. Filing of completed enrollment and information cards with the Registrar's Office.
3. Payment of fees at the Cashier's Office (including any outstanding debts from previous quarter).

Detailed instructions will be published prior to each quarter's registration in the *Schedule of Classes*.

Undergraduate Student Registration Classifications

Regular students are classified as freshmen, sophomores (upon completion of 40.5 quarter units), juniors (upon completion of 84 units), or seniors (upon completion of 135 units). Limited and special students (except for university employees) are not being accepted at this time because of enrollment limitations.

Graduate Student Registration

Every candidate for a higher degree is required either to register each quarter until all degree requirements are fulfilled (including the thesis or dissertation and final examination) and the degree is awarded or to obtain a formal leave of absence. (See *Leave of Absence* in the *Graduate Student Handbook*.)

If a graduate student fails to register or is absent without leave, the University will presume that he has withdrawn from Graduate Studies. He may apply for readmission at a later date, but cannot be assured of acceptance.

New and continuing students will be assessed late fees if not enrolled/ registered by the Registrar's deadlines.

Continuing students must enroll during the week designated for them by the Office of the Registrar (see *Schedule of Classes*). Enrollment packets are sent directly to the student's mailing address. A \$10 late filing fee will be assessed if the student does not enroll (file his enrollment packet including appropriate signatures) with the Scheduling Office within the week set aside (Cashier's Office closes daily at 3:30 p.m.)

In addition, a \$10 late payment fee will be assessed if the student has not completed his registration (paid his fees) prior to 3:30 p.m. on the second day after the start of the quarter.

New students must enroll by 5:00 p.m. of the second day after the start of the quarter or pay a late filing fee of \$10.

A student who has not registered (enrolled and paid fees, including late fees if required) by the end of the second week of the quarter (Registrar's deadlines) will have to apply and be readmitted.

Registration in the Final Quarter

for the Award of the Degree

Under current policy, all graduate students are required to register in the final quarter in which they expect their degrees or graduate certificates to be awarded.

With respect to the interval between quarters, if a student is registered for the preceding quarter and completes all requirements before the first day of instruction in the next quarter, he is not required to reregister to receive his degree dated the end of the following quarter. However, he must petition for waiver of the requirement that he be registered in the following quarter. During the interim between the completion of all requirements for the degree and the date of its award, Certificates of Completion (required for employment or other purposes) are issued by the Registrar to certify the student's eligibility for the degree. When the award of a degree is expected at the end of a given quarter, but special circumstances over which the student has no control prevent the completion of all requirements before the first day of instruction in the next quarter, a student may petition the Dean of Graduate Studies for a waiver of registration for that quarter. Such petitions must be accompanied by a letter from the Graduate Adviser or Department Chairman elaborating the exceptional circumstances of the case. Consideration is necessarily limited to situations in which the faculty is responsible for delay in reading the thesis or dissertation.

A student who has completed all of his requirements for a graduate degree except for the final or comprehensive examination and/or for filing of his dissertation or thesis and who has no further occasion to use University laboratory, library or other facilities, should be on a formal leave of absence. At the time of his final or comprehensive

examination, he should petition the Dean of Graduate Studies for authorization to pay a \$50.00 Filing Fee for his Doctoral Dissertation/ Master's Thesis in lieu of registration during the quarter in which his degree is to be awarded.

Medical Evaluation

All new students, graduate or undergraduate, and all students returning to the San Diego campus after an absence of three or more successive quarters must submit to the Student Health Service a completed medical history form.

Such students must also submit, prior to their arrival on campus, evidence of the result of a tuberculin skin test performed within the six month period before the first day of classes. The result of a recent chest x-ray will not be accepted in lieu of the tuberculin skin test unless the student already has documentary evidence of a positive reaction to the tuberculin skin test.

The medical history form with instructions for its completion is mailed to all new students in advance of registration (e.g., in June for fall registrants).

Late Registration

Students will be assessed a late filing fee of \$10 if they have not filed their completed enrollment and information cards with the Registrar's Office by the announced deadlines. Students will also be assessed a late fee of \$10 if they have not paid their Registration Fees by the deadline. (See *Academic Calendar* for announced deadlines, and *Schedule of Classes*.)

Identification Card

After payment of Registration Fees, each student will receive a validated Identification Card which is evidence that he is a registered student at UCSD and which entitles him to library privileges, student health card, and other University privileges. In addition, the card provides for the undergraduate, identification for Associated Student functions.

If the validated card is lost, a duplicate may be obtained from the Cashier's Office for \$3.00.

Schedule of Classes

The *Schedule of Classes* may be purchased at the Bookstore and is issued quarterly, approximately six weeks after the beginning of the previous quarter. Quarterly calendar and latest registration information are included in each issue.

In order to receive credit for courses undertaken the courses must be listed on the student's official study-list card in the Registrar's Office.

Unapproved withdrawal from, or neglect of, a course listed on the official study-list card will result in a failing grade. (See *Change of Program: Undergraduates* and *Change in Program* in the *Graduate Student Handbook*.)

Study-List Limits: Undergraduates

The normal *undergraduate* program consists of an average of four courses each quarter for four years. For students claiming veteran's benefits, 12 units is considered full-time.

While four courses are suggested as the maximum number to be taken during any one quarter, a superior student may take more.

Part-time or full-time employment would, of course, place limits on a student's course load. (See *General Information for students: Employment*.)

Study-List Limits: Graduates

A *graduate* student in a regular quarter is limited to 16 credits when he takes only undergraduate courses, to 12 credits when he takes only graduate courses, and to a total made up in the proper proportion of 12 to 16 — as, for example, 6 graduate and 8 undergraduate — when he takes both undergraduate and graduate courses.

Research assistants and others employed approximately half time shall register each quarter for three-quarters of these limits; if their half-time employment significantly involves research or other activities which are awarded graduate credit, the graduate adviser of the student may authorize registration for 100 per cent of these limits. Thus graduate students holding appointments requiring the status of a full-time graduate student shall so register. Students engaged full time in other occupations are limited to 6 credits.

Teaching units (500 series) above the maximum (12 units) are not considered an overload.

Study lists exceeding these limits require advance approval of the Dean of Graduate Studies by submitting a general petition detailing circumstances.

Credit for residence for advanced degrees in a given quarter requires a graduate student to complete satisfactorily six or more units in that quarter.

Change of Program: Undergraduates

After an official Preferred Program card has been filed with the Office of Registrar, an undergraduate may add or drop courses or change sections of a course by executing an *Add/Drop card* available from the Office of the Registrar. In making such changes the student must adhere to the following time and fee schedule:

Preliminary drop/add dates, immediately following the enrollment for continuing students	ADD or DROP	No Fee
First and second week of classes	ADD or DROP	No Fee
(Also change from grade to P/NP or from P/NP to a grade during 1st or 2nd week)		No Fee
Third through sixth week of classes	DROP ONLY	\$3 Fee

For undergraduates permission to add or drop a course requires the approval of the instructors involved (except during preliminary drop/add dates). Permission to change sections within a course requires only the approval of the instructors involved.

Properly executed *Add/Drop cards* must be deposited in the Office of the Registrar if an undergraduate student is to be relieved of responsibility for dropped courses and credited for added courses.

Change of Program: Graduates

After an official preferred program card has been filed with the Office of the Registrar, a graduate student may add or drop courses or change sections of a course during the first and second week of classes without fee and by executing an *Add/Drop card* available from the Office of the Registrar. Approval for these changes requires only the approval of the instructors involved and the student's adviser.

During the third and subsequent weeks of classes a graduate student may alter his official study-list by paying a \$3 fee and by executing an *Add/Drop card* which must be accompanied by a petition explaining the circumstances involved. The petition must be approved by the student's adviser, by the chairman of the student's major department and by the Dean of Graduate Studies.

Properly executed *Add/Drop cards* and petitions as required must be deposited in the Office of the Registrar if a graduate student is to be relieved of responsibility for dropped courses and credited for added courses.

GRADES

Grades in courses (graduate or undergraduate) are defined as follows: A, excellent; B, good; C, fair; D, barely passing; F, not passing (failure); and E or I, undetermined (work of passing quality but incomplete). The designations P, passed, and NP, not passed, are used in reporting grades on some courses. (See *Special Grade Options*.) The designations S and U are used in reporting satisfactory and unsatisfactory work in certain individual study and research or other work undertaken by graduate students. NR indicates that the instructor has not reported a grade. When an NR appears, the student should contact his instructor immediately and request that a grade be submitted for the course.

All grades except E or I (incomplete) are final when filed by an instructor in his end-of-term course report. An exception is the correction of a clerical error. No term grade except E or I may be revised by re-examination.

Undergraduates may repeat courses only when grades of D, F, or NP were received. Degree credit for courses so repeated will be given only once but the grade assigned at each enrollment shall be permanently recorded. In computing the grade point average of an undergraduate with repeat courses, in which he received a D, F or NP only the most recently received grades and grade points shall be used for the first 16 units repeated. In case of further repetitions, the grade point average shall be based on all grades assigned and on total attempted.

Repeat registration of graduate students for formal courses in which the content does not change is discouraged. However, repeat registration for teaching courses, special topic courses, seminars, independent study, and research occurs regularly in graduate study.

Graduate students desiring to alter their grade point averages by repetition of courses must petition the Dean of Graduate Studies to replace all grades in such courses by Satisfactory/Unsatisfactory. Approval of the petition must be obtained from the student's major department.

Incomplete Grades: Undergraduates (I)

The Academic Senate regulations state that the *incomplete grade I* for undergraduates shall be disregarded in determining a student's grade point average except at point of graduation when he must have an overall 2.0 (C) on all work attempted at the University of California.

The grade *Incomplete* may be assigned in undergraduate courses when a student's work is of passing quality, but incomplete for good cause.

The form *Request to Receive Grade I* must be filed by the student and approved by his instructor. The form shall state time and date of examination and/or when assigned course work will be completed. After obtaining approval from the instructor, a student must pay a \$5 fee at the Cashier's Office. An I grade not removed by the mutually agreed upon time will be lapsed into F by the Registrar.

An undergraduate F assigned because a student failed to submit the *Request for*

Incomplete form may be changed to I providing that the delay in submitting the request form was for verified illness or other emergency beyond the student's control.

Incomplete Grades: Graduates (E)

If a graduate student receives an *Incomplete grade E*, the grade will be ignored temporarily in calculating the scholastic status of the student, i.e., the units are omitted in the unit total as well as in the grade-point calculation. An *Incomplete* may be assigned only when a student's work is of passing quality but incomplete for reasons beyond his control, e.g., illness.

An *Incomplete* which has not been removed by the end of the next quarter after it was incurred shall lapse into an F and shall enter the computation of the student's grade-point average.

To remove an E grade, the student must complete a petition (available from the Office of the Registrar) and pay a fee of \$5 at the Cashier's Office. This completed petition must be received by the Registrar's Office no later than 5:00 p.m. on the *day instruction ends* in the quarter following that in which the course is taken. (The Cashier's Office closes daily at 3:30 p.m.)

Special Grade Options: Undergraduates

Passed/Not Passed

The *Passed/Not Passed* option is designed to encourage undergraduate students to venture into courses which they might otherwise hesitate to take because they are uncertain about their aptitude or preparation. Under such regulations as each College may determine, a student in good standing may take up to an average of one course per term on a *Passed/Not Passed* basis. Enrollment under this option must take place within the first two weeks of the course. A grade of *Passed* shall be awarded only for work which otherwise would receive a grade of C or better. Units passed shall be counted in satisfaction of degree requirements, but such courses shall be disregarded in determining a student's grade-point average.

After the study-list packet has been filed, the *Add/Drop card* will be used to change from Grade to P/NP, or vice versa. The instructor's signature will be required on this card. The last day to add courses will be the final date to make this change.

Muir College policy regulations state that:

1. Courses to be counted toward a departmental major or as prerequisites to the major may be taken on a *Passed/Not Passed* basis only with the consent of the department chairman or his designated representative.
2. Courses taken to be counted toward a special project (in lieu of a departmental major or toward an interdisciplinary major) may be taken on a *Passed/Not Passed* basis only with the consent of the faculty adviser of the project (or interdisciplinary major) and the Provost.

Revelle College policy regulations state that a student registered in *Revelle College* shall have the privilege of enrolling, with the permission of the instructor on an average of one course each quarter on a *Passed/Not Passed* basis, with the following provisions:

1. The course may not be used in satisfaction of any lower-division *Revelle College* breadth requirement except Fine Arts. For example, students who have completed the requirement of one year of calculus (through Mathematics 1C or 2C) may take other Mathematics courses on a P/NP basis. (Language 1 and 2 may not be taken for P/NP.)
2. The course may not be an upper-division course in the student's major department. Individual departments and/or advisers may authorize exceptions to this regulation, particularly for contiguous-area courses (required for the major, but given outside the major department).

In general, the *Revelle* faculty feels that students should be encouraged to use this option for courses taken in fulfillment of the minor. All courses taken as electives may be taken on a *Passed/Not Passed* basis consistent with the restrictions above.

Third College policy regulations state that:

1. Courses to be counted toward a departmental major as prerequisites to the major should not be taken on a *Passed/Not Passed* basis.
2. All courses taken as electives may be taken on a *Passed/Not Passed* basis while at the same time, the restrictions on the majors must be observed. The *Passed/Not Passed* grade system can be used best in helping a student develop a minor.

All *Third College* students must comply with the University of California ruling which allows an average of one course per quarter, or three courses per academic year on a *Passed/Not Passed* basis.

Special Grade Options: Graduates

Passed/Not Passed

A graduate student in good standing, with prior approval of the instructor concerned, and with the approval of his adviser, may take up to an average of one course per quarter outside his major department on a *Passed/Not Passed* basis. Units passed shall be counted in satisfaction of degree requirements, but the grades *Passed/Not Passed* shall be disregarded in determining a student's grade-point average. Enrollment under this option must take place at the beginning of the course.

Satisfactory/Unsatisfactory

In certain graduate courses approved by the department and by the Graduate Council the grades of *Satisfactory* and *Unsatisfactory* may be used. Courses currently so approved are identified in the several course listings in this catalog. Instructors and students in these courses should agree early in the quarter on the marking basis to be followed but no indication of this option is necessary until grade reporting at the end of each quarter. For calculating grade-point averages, units with *S/U* grades shall not be counted. No credit will be allowed for work marked *Unsatisfactory*.

Grade Points

Grade points are assigned on a four-point basis: A, 4 points per unit; B, 3 points per unit; C, 2 points per unit; D, 1 point per unit; E, F, and I, zero points. Each undergraduate course counts 2 or 4 units, and graduate courses range from 1 to 12 units each. (See course descriptions under *Departments of Instruction*.) Grade-point average is computed by dividing the total number of grade points earned by the total unit value of courses attempted. *P*, *NP*, *S*, *U*, *NR*, *I*, and *E* grades are excluded in computing grade-point average.

Credit by Examination

With the instructor's approval, undergraduate students in good standing may petition to obtain credit for some courses by examination. There will be a \$5 fee for each Credit by Examination Petition submitted. For further information, consult the Office of the Provost.

Final Examination

Final examinations are obligatory in all undergraduate courses except laboratory courses, or their equivalent, as individually determined by the Committee on Courses.

Each such examination shall be conducted in writing, whenever practicable, and must be completed by all participants within the announced time shown in the *Schedule of Classes* for the quarter in question. These examinations may not exceed three hours duration.

In laboratory courses, the department concerned may at its option require a final examination subject to prior announcement in the *Schedule of Classes* for the term.

Final Grades

As soon as possible after the end of each quarter, final grades will be mailed by the Registrar's Office. Students should carefully examine the transcript for omissions and clerical errors and get in touch with their instructor in case of error.

SCHOLASTIC REQUIREMENTS: UNDERGRADUATES

The scholastic status of all UCSD undergraduates is governed by the following provisions.

1. A student is subject to probation if at the end of a term his grade point average or his cumulative grade-point average is less than 2.0 (c).
2. He is subject to disqualification for enrollment if his grade-point average for the quarter is below 1.5, or if he has completed two consecutive terms on academic probation.

Continued registration of an undergraduate who is subject to academic disqualification, is at the discretion of the Faculty of his College. On the San Diego campus the faculties normally delegate this responsibility to the Provost.

If the Provost feels the student will be able to overcome his academic deficiency, he will allow the student to continue on probation.

A student who has been dismissed or who is on probation and wishes to transfer from one campus of the University to another, must obtain the approval of the Dean or Provost into whose jurisdiction he seeks to transfer. After completing a transfer the student is subject to the supervision of the Dean or Provost on the new campus. See *Intercampus Transfer* below.

SCHOLASTIC REQUIREMENTS: GRADUATES

For good standing and eligibility for an advanced degree, a graduate student must maintain a grade-point average of 3.0 (B), computed on the total unit value of all courses undertaken for grade-point credit in graduate status at the University. A graduate student is subject to dismissal if his overall grade-point average falls below 3.0 (B) at any time, or if his work in any two consecutive terms falls below a 3.0 average. Only courses in which a student receives grades of A, B, C, P (pass) or S (satisfactory) are allowed toward satisfaction of the requirements for a degree. (Grades of *Incomplete* (E) are not considered in the computation of grade-point average for graduate students.)

AMERICAN HISTORY AND INSTITUTIONS

A knowledge of American History and of the principles of American Institutions under the federal and state constitutions is required of all candidates for the bachelor's degree. This requirement may be met in any one of the following ways:

1. One high school unit in American History, or 1/2 high school unit in American History and 1/2 high school unit in civics or American Government.
2. By passing any one quarter course of instruction accepted as satisfactory by the Committee on American History and Institutions. Courses suitable for fulfilling the requirement are: any United States history course and Political Science 10, 11, or 12.
3. By passing an examination to be conducted twice each year by the Committee on American History and Institutions. The student will have no more than two opportunities to pass the examination. A student who fails in the second attempt will be obliged to satisfy the requirement by passing one of the designated courses.
4. By presenting proof of having received a grade of 3 or higher on the Advanced Placement Test in American History administered by the Educational Testing Service of Princeton, New Jersey.
5. By presenting proof of having satisfied the present requirement as administered at another collegiate institution within the state.
6. By presenting proof of successful completion of a one quarter or one semester course in either American History or American Government at a junior college within the state.
7. By presenting proof of successful completion of a one quarter or one semester course in either American History or American Government at a recognized institution of higher education, junior colleges included, in another state.
8. An alien attending the University on an F-1 or J-1 student visa may, by showing proof of his temporary residence in the United States, petition for exemption from this requirement through the office of his college Provost.

SENIOR RESIDENCE FOR THE BACHELOR'S DEGREE

Each candidate for the Bachelor's Degree must complete 36 of the final 45 units in residence in the College or School of the University of California in which the degree is to be taken.

Under certain circumstances, such as when a student attends classes on another UC campus or participates in the UC Education Abroad Program, exceptions may be granted by the Provost.

Approval for Enrollment Beyond 192 Units

The minimum unit requirement for the bachelor's degree is 192 quarter units in Revelle College and 180 quarter units in Muir and Third Colleges. A student is expected to complete the requirements for graduation within this minimum unit requirement.

Beginning in the Fall Quarter, 1971, in order to insure adequate supervision over the programs of those students who, for good educational reasons, extend their undergraduate training beyond the minimum, a student who has attempted more than 192 quarter units of college work will not be permitted to register without the approval of the Provost of his college.

APPLICATION FOR UNDERGRADUATE DEGREE

Every undergraduate, at the beginning of each quarter during his senior year, is required to file an *Undergraduate Degree Application Card*. This enables the Provost of the college to determine whether or not the program the student is undertaking will satisfy degree requirements. The student will be notified of any deficiency.

INTERCAMPUS TRANSFER: UNDERGRADUATES

An undergraduate who is now, or was previously, registered in a regular session at any campus of the University of California, and has not since registered at any other institution, may apply for transfer in the same status to another campus of the University. The student who wishes to transfer must file an application on his present campus. Application forms for intercampus transfer are available in the Registrar's Office. Application period for Fall Quarter, 1973 opens November 1, 1972; for Winter Quarter, 1974, July 1, 1973; and for Spring Quarter, October 1, 1973. A nonrefundable \$20 fee is charged for each application submitted.

INTERCAMPUS EXCHANGE PROGRAM: GRADUATES

A graduate student registered on any UC campus who wishes to take courses or do research on another campus may become an Intercampus Exchange Graduate Student with the approval of his adviser, the chairman of the host department and of the two Deans of Graduate Study involved. He is not admitted to graduate studies at the host campus, but continues to be considered a graduate student on his home campus.

Application forms for the Intercampus Exchange program for graduate students may be obtained from the Registrar's Office and must be submitted quarterly. Students planning to apply should make all necessary arrangements with appropriate faculty on the host campus before submitting the application.

To avoid penalties for late filing of enrollment cards at the host campus, the application should be completed and filed with the Registrar of the host campus at least three weeks before the opening of the quarter.

OFF-CAMPUS STUDY: GRADUATES

(Other than Intercampus Exchange Program)

The research and study programs of registered graduate students may require them to be off-campus for extended periods. Approval for periods beyond five weeks during one quarter must be obtained from the Dean of Graduate Studies by a petition endorsed by the student's adviser and department chairman. This petition should outline the program of work which he proposes to do and his reasons for wishing to pursue this program.

A student beyond his first year who holds a fellowship and wishes to study or do research off campus while continuing to hold his fellowship must, in addition to the above, comply with the rules and regulations governing the award and is required to remain a registered student at UCSD, carrying the required number of units during all quarters involved. Approval for his program of such off-campus study is secured in the manner described above. In addition, as required by his contract, such student must obtain in advance the approval of Graduate Studies if he wishes to hold a remunerative appointment or award along with his fellowship during such period of off-campus study.

The regulations concerning additional awards and compensation for employment as outlined under the Financial Assistance section apply to off-campus study as well as on campus.

CONCURRENT ENROLLMENT

Concurrent enrollment in regular sessions at another institution or in University Extension while enrolled on the San Diego campus is permitted only when approved in advance by the Provost of the student's college. For concurrent enrollment in regular sessions at another institution or to take a University Extension course for credit, a graduate student must obtain the approval of his graduate adviser, the department chairman, and the Dean of Graduate Studies via petition in which he details reasons for his request.

LEAVE OF ABSENCE: GRADUATES

In accordance with the concept of continuous registration, a graduate student who leaves the University for a specific period of time, with the intention of resuming his studies later, must obtain a formal Leave of Absence before leaving the campus. In lieu of registration, the student shall obtain a Request for Leave of Absence from his department, secure the appropriate signatures, and file the approved request with the registrar along with his Student Identification card prior to the second week of instruction of the quarter with which the leave begins. If a student who is already registered (enrolled for classes and fees paid) finds it necessary to leave the University during the quarter and intends to return at a later date, he should obtain both an approved Leave of Absence and a Withdrawal or he will receive nonpassing grades in all courses in which he is enrolled. A leave of absence should be for a stated period, not to exceed three years, military and Action Corps service excepted. A student may request an extension by obtaining a new Request for Leave of Absence prior to the expiration of his leave. A leave of absence is cancelled if a student registers prior to termination date or receives approval to pay the \$50 filing fee in lieu of registration. Upon his return after a leave of absence, he must take a reentrant physical examination prior to registration.

A student who fails to file a Request for Leave of Absence on time or who allows leave to expire will be considered withdrawn and must apply formally for readmission.

A graduate student on leave of absence status may not make use of any University facilities nor place demands upon faculty time during the period of his leave. He may not be employed by the University in any capacity nor may he hold a fellowship, traineeship, or similar appointment which is administered by the University.

WITHDRAWAL FROM THE UNIVERSITY: UNDERGRADUATES

If an undergraduate student decides to withdraw from the University after he has paid his registration fees, he must file a Request for Withdrawal form with the Registrar's Office before leaving the campus. This form serves two purposes: (1) a refund of fees, if appropriate; (2) withdrawal from classes without penalty of F grades. Undergraduate students who decide to withdraw after the completion of one quarter and before registration fees have been paid for a subsequent quarter need not file a Request for Withdrawal since they will be automatically withdrawn.

RETURNING TO THE UNIVERSITY: UNDERGRADUATES

An undergraduate student in good standing may elect to be absent from any one quarter of the academic year without losing his continuing students status, as long as he does not attend another college or university during his period of absence. To

register for the quarter following the absence, students should contact the Registrar's Office, 102 Matthews Campus.

An undergraduate student absent for more than one quarter must apply for readmission as a returning student. If the student was in good standing at the time he left and applies for readmission at least 8 weeks prior to the beginning of the quarter, he will be guaranteed readmission.

WITHDRAWAL FROM THE UNIVERSITY: GRADUATES

A graduate student withdrawing from the University during a quarter must obtain an approved Withdrawal before leaving the campus. He can obtain a Request for Leave of Absence and/or Withdrawal from his department, secure the appropriate signatures, and file the approved request with the Registrar along with his Student Identification Card. A registered student who fails to file a Request for Withdrawal on time shall receive a nonpassing grade in each course in which he enrolled, thus jeopardizing his eligibility for readmission. In cases of illness or emergency, a Request for Withdrawal should be made as soon as the student decides not to continue. Normally a student is expected to file his Request for Withdrawal two weeks before the end of the quarter. If a student intends to return to UCSD, he should file a Request for a Leave of Absence as well; otherwise he must later apply for readmission.

BAR FROM REGISTRATION

A student may be barred from registering for classes for the following reasons.

1. Failure to respond to official notices.
2. Failure to settle financial obligation when due or to make satisfactory arrangements with the Business Office.
3. Failure to complete the physical examination.
4. Failure to present certification of degrees/status on leaving previous institution(s).
5. Failure to comply with admission conditions.

Each student who becomes subject to a bar-from-registration-action is given advance notice and ample time to deal with the situation. However, if the student fails to respond, action will be taken without further notice and he is entitled to no further services of the University except assistance toward reinstatement.

An undergraduate student wishing to have his status restored must secure a petition from the Provost or Dean who requested the barring action. Reinstatement is not final until this petition has been accepted by the Registrar.

A graduate student wishing to have his status restored must correct the problem, and as soon as the office which initiated the bar notifies the Office of Graduate Studies that this has been resolved, the bar will be removed.

TRANSCRIPT OF RECORDS

A \$2 fee is charged for each transcript of a student's record. Additional copies, if ordered at the same time, are \$1 each. Applications for a transcript of record should be submitted to the Registrar several days in advance of the time needed. An application for a transcript must bear the student's signature; transcripts will be released only upon signed request of the student.

PRESERVATION OF RECEIPTS

All receipts of payments made to the Cashier, whatever their nature, should be carefully preserved. Not only do they constitute evidence that financial obligations have been discharged, but they may support a claim that certain documents or petitions have been filed.

REFUND OF FEES

Students who withdraw from the University during the first five weeks of instruction will receive refunds of registration fees, educational fees, student activity fees, and nonresident tuition fees (if such have been paid) on the following basis:

Prior to one day of instruction:

New undergraduate students	.....	All but \$50 Statement of Intent to Register Fee
Continuing students	.....	All but \$10
1 to 14 days	.....	80% of total paid
15 to 21 days	.....	60% of total paid
22 to 28 days	.....	40% of total paid
29 to 35 days	.....	20% of total paid

The schedule of refunds refers to the calendar days, beginning with the first day of instruction (1 day). Percentages listed should be applied to tuition, University Registration fee, Educational fee, and other student fees. The nonrefundable portion of these fees paid by continuing and readmitted students, effective prior to the first day of instruction, shall be \$10. A student who deferred his educational fee should contact the Business Office to schedule repayment of remaining debt.

The effective date for calculating a fee refund is the last day the student attended

any University class. Claims for refund of fees must be presented during the fiscal year (July 1 to June 30) in which claim is applicable. To obtain a refund, the student must surrender his identification card.

RULES GOVERNING RESIDENCE

Nonresident Tuition Fee. Students who have not been legal residents of California for more than one year immediately prior to the opening day of the quarter in which they register are charged, along with other fees, a tuition fee of \$500 for the quarter. Legal residence is the combination of *physical presence* in California and the *intention* of making it one's permanent home, coupled with the relinquishment of legal residence in any other state. The student who is within the state primarily for educational purposes does not gain the status of legal resident regardless of the length of his stay in California. In general, the unmarried minor (any person under 18 years) derives legal residence from his father; or from his mother if the father is deceased; or, in the case of divorced parents, from the parent awarded legal custody by the court. The married woman derives legal residence from her husband from the date of marriage provided, however, that a California resident woman who is permanently separated from her husband or who marries a nonresident who lives in California does not lose her residence. (California Government Code Section 244 and Education Code Sections 23054-23060 and the Standing Orders of the Regents.)

Presence in California for more than one year does not, in itself, entitle a person to resident classification. This fact is called to the attention of the following classes of

students: (1) those under 19 whose parents are not California residents; (2) servicemen stationed in California who were not California residents at the time of entry into the military service; (3) alien students who first must qualify for permanent residence status according to the applicable laws of the United States.

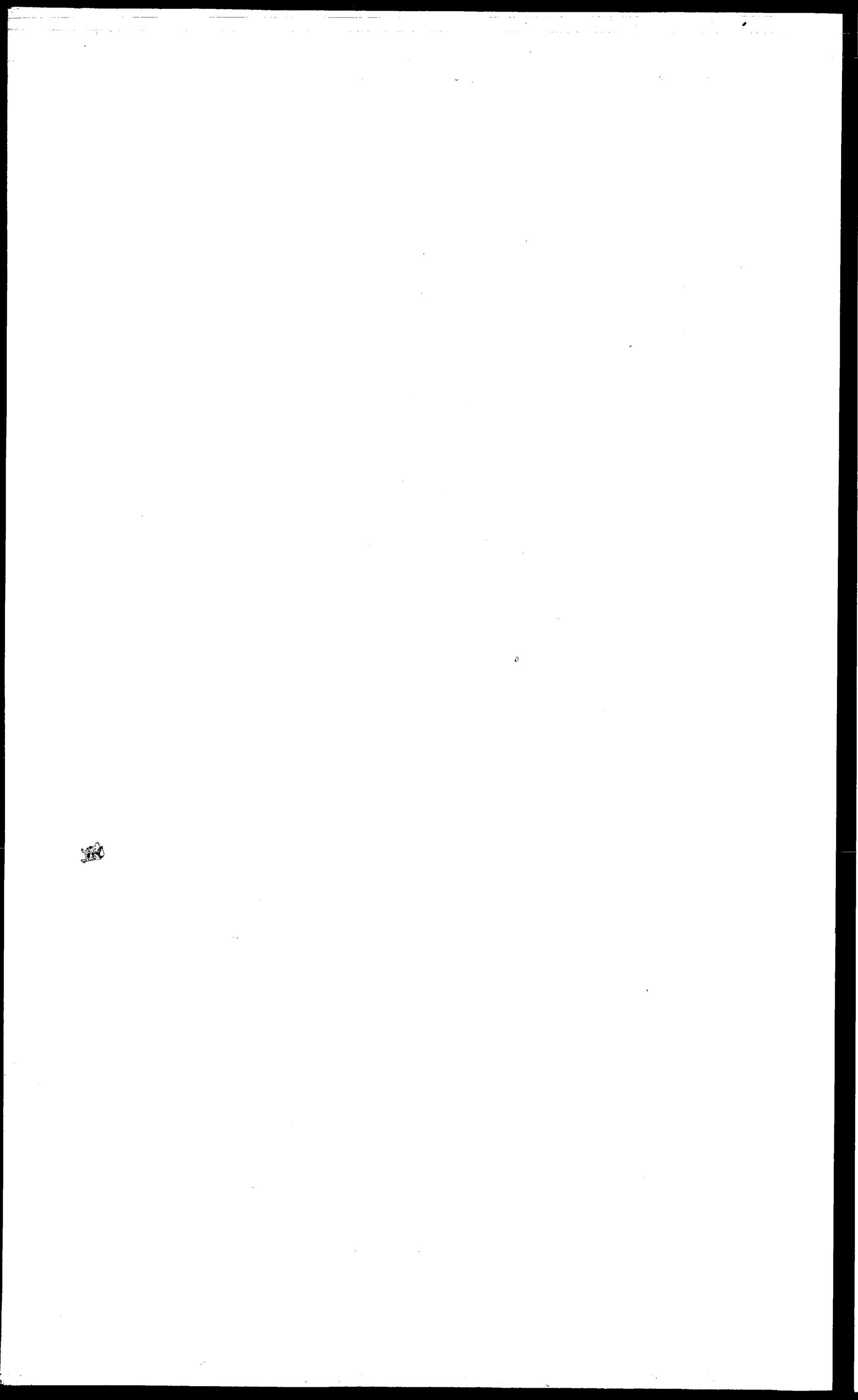
Exemption from payment of the nonresident tuition fee is available to the unmarried minor whose natural or adoptive parent is in the active military service of the United States and is stationed in California on the opening day of the quarter for which he registers, or is stationed outside the United States immediately after having been stationed on active duty in California. This waiver is also available to the spouse of a member of the military service of the United States with an active duty station as described above.

New and returning students are required to fill out a *Statement of Legal Residence*, a form that is included with the Letter of Admission. Their status is determined by the Attorney in Residence Matters deputy who is located in the Registrar's Office. Inquiries from prospective students regarding residence requirements for tuition purposes can be made by writing to the Attorney in Residence Matters, 590 University Mall, University of California, Berkeley, California 94720. *No other University personnel are authorized to supply information relative to residence classification.*

Those classified incorrectly as residents are subject to reclassification as nonresidents. If incorrect classification results from false or concealed facts, the student is subject to University discipline and is required to pay all back fees he would have been charged as a nonresident. Resident students who become nonresidents must immediately notify the Attorney in Residence Matters or his deputy. Application for a change in classification with respect to a previous quarter will not be received.



Dr. R. Walker Fillius, research physicist (right) with Gregory Schmidt, a project engineer, and a duplicate of instrument which was aboard Pioneer F. spacecraft flight to Jupiter.



GENERAL INFORMATION FOR STUDENTS

FEES AND EXPENSES

The exact cost of attending the University of California, San Diego, will vary according to personal tastes and financial resources of the individual. Generally, the total expense for three quarters, or a college year, will average about \$2,600 for residents of California and \$4,100 for nonresidents (including foreign students).

It is possible to live simply and to participate moderately in the life of the student community on a limited budget. The best that the University can do to assist the student in planning his budget is to indicate certain and probable expenses.

Estimated Expenses for Undergraduate Residents of

	California			
	FALL QUARTER	WINTER QUARTER	SPRING QUARTER	TOTAL
University Registration Fee				
Fee	\$100.00	\$100.00	\$100.00	\$ 300.00
Educational Fee	100.00	100.00	100.00	300.00
Student Center Fee	6.00	6.00	6.00	18.00
Board and Room in Residence Halls*				
Residence Halls*	408.00	408.00	408.00	1224.00
Books (Approx.)	75.00	75.00	75.00	225.00
Personal Expenses†	150.00	150.00	150.00	450.00
Total	\$839.00	\$839.00	\$839.00	\$2517.00

*Figures given for each quarter are one-third of estimated total; actual payments vary according to the quarter and depend upon type of room, type of meal plan, and method of payment.

†Includes laundry, clothing, medical costs not covered by student health insurance, recreation, transportation, etc.

In addition to the above expenses, graduate and undergraduate nonresidents are required to pay an additional nonresident tuition fee of \$500 per quarter or \$1500 per year. (Exemptions may be granted to dependents of military personnel or University faculty.) See *Rules and Procedures: Rules Governing Residence, and Fees, Tuition and Legal Residence Requirements* in the *Graduate Student Handbook*.

University Registration Fee

The university registration fee is currently \$100 per quarter for graduates and undergraduates. This fee, which must be paid at the time of registration, covers certain expenses for use of library books, for recreational facilities and equipment, for registration and graduation, for all laboratory and course fees, and for such consultation, medical advice, and hospital care or dispensary treatment as can be furnished by the Student Health Service or by health and accident insurance purchased by the University. No part of this fee is refunded to students who do not make use of these privileges. Exemption from this fee may be granted for surviving children of certain deceased California firemen or policemen. Students should check with the Financial Aids Office for full ruling.

In addition, there is a Student Center Fee of \$6 per quarter for graduates and undergraduates to be used for the construction and operation of one or more student centers in the near future.

Reduced Registration Fee

One-half of the established registration fee may be paid by:

Graduate students whose research or study requires them to remain outside the State of California throughout the quarter.

Authorization for this privilege is secured by petition which must be approved by the Dean of Graduate Studies.

One-third of the established registration and educational fees may be paid by:

Students who are full-time employees of the University, as provided for in Personnel Rules, Rule 16, July, 1969. Authorization for this privilege is secured from the Personnel Manager for staff employees and from Academic Personnel for academicians.

Educational Fee

The Educational Fee was established for all students beginning with the Fall Quarter, 1970. Fee per quarter, 1972-73: undergraduates — \$100.00 graduates — \$120.00. Resident students with demonstrated financial need may defer payment of the Educational Fee by accepting an obligation to repay, at a later date, the sum deferred. Students interested in this provision should contact the Financial Aids Office, Building 250, Matthew Campus.

Tuition Fee

All students are classified as residents or nonresidents of the State of California for tuition purposes. No tuition is charged to students classified as residents of California. Nonresidents, however, are required to pay the currently quarterly tuition fee irrespective of the number of courses taken (See *Rules and Procedures: Rules Governing Residence*).

Every new or returning student is required to fill out a statement of legal residence in order to determine his residence classification for fee purposes. Students will not be admitted without this statement on file at the Registrar's Office.

Graduate students may apply through their department for scholarships toward their nonresident tuition. Applications for such scholarships are made in the same way as for fellowships and assistantships, and awards are made primarily on the basis of ability.

Miscellaneous Expenses, Fees, Fines and Penalties

Books and stationary average about \$50 per quarter. However, students should also be aware of the following possible expenses:

Statement of Intent to Registrar Fee (new undergraduate).....	\$50.00
Application Fee.....	20.00
Changes in Study List after Announced Dates.....	3.00
Duplicate Registration and/or Other Cards from Enrollment Packet.....	3.00
Duplicate Student Card.....	3.00
Reinstatement Fee.....	10.00
Request to receive Grade I.....	5.00
Removal of Grade E.....	5.00
Special Course Subject A.....	45.00
Advancement to Candidacy for Ph.D.....	25.00
Transcript of Record.....	2.00
Late Filing of Announcement of Candidacy for B.A.....	10.00
Late Filing of Enrollment Cards.....	10.00
Late Registration.....	25.00
Returned Check Collection.....	5.00

Filing Fee

Under certain circumstances a candidate for a master's degree or doctor's degree may pay a filing fee of \$50 in lieu of registration in his final quarter. Authorization for this privilege is secured by petition which must be approved by the Dean of Graduate Studies. (See *Registration in Final Quarter* in the *Graduate Student Handbook*.)

Penalty Fees

Fees are charged for actions which occur after the normal deadline dates. To avoid such penalty fees, students should complete all arrangements in advance of the deadlines shown in the Calendar.

Parking Fee

Students who park motor vehicles on the campus are subject to parking fees. Parking Permits are sold by the University Cashier. A copy of the Campus Parking Regulations may be obtained from the Cashier at the time of permit purchase.

FINANCIAL ASSISTANCE

All undergraduate financial assistance, loans, grants, and work-study, and all graduate loans and work-study are processed by the Financial Aids Office. A *Parents' Confidential Statement* or other appropriate document substantiating need will be required of all students seeking financial assistance. Applications for all forms of financial aid described below should be submitted by March 15. Applications received after that date will be considered on a late priority.

FINANCIAL ASSISTANCE: UNDERGRADUATES

The University of California, San Diego, expects that the student and his family will bear as much of the necessary cost of the students' education as their circumstances will permit. In those cases where resources are insufficient to meet a normal budget, the Financial Aids Office will attempt to help students find supplemental financial aid. Applications and requests for information should be addressed to: Financial Aids Officer, University of California, San Diego, La Jolla, California 92037. (Phone 453-2000, ext. 1946.)

Students should have enough funds with them at the beginning of the fall quarter to

cover registration fees, books, and initial housing costs, as scholarship and loan checks will not be available until after registration.

No student should leave the University for financial reasons until exploring all possible avenues of aid with the Financial Aids Office or the counselor of his college.

Scholarships

The Committee on Undergraduate Scholarships and Honors awards more than two hundred scholarships each year to undergraduate students enrolled on the San Diego campus. These scholarships are donated by private individuals, organizations, corporations, and by the Regents of the University.

All scholarship awards are made on a competitive basis, consideration being given to scholastic achievement, financial need (except for students applying for Regent's Honoraria), and promise. Eligibility for a scholarship is determined from the applicant's statements on his application form, appropriate letters of recommendation, official transcripts, and the Parents' Confidential Statement.

Applying for a Scholarship

Applications are available in the Financial Aids Office. Completed applications for the following academic year must be returned between December 1 and January 15. Applications postmarked or presented in person after January 15 will not be accepted.

Parents' Confidential Statement

To permit an evaluation of need, parents of all entering and continuing students who apply for scholarships are required to provide financial information on the *Parents' Confidential Statement*. New students may obtain this form from their high school or college counselor. Continuing students may obtain a special form from the Financial Aids Office. This form must be filed by December 1 with the College Scholarship Service, P.O. Box 1025, Berkeley, California 94701 (or P.O. Box 176, Princeton, New Jersey 08540), and must indicate that a report is to be sent to the University of California, San Diego. A word of caution: the filing of the Parents' Confidential Statement does not constitute an application for a scholarship.

Announcement of Awards

Awards are announced by June 1. Most scholarships are awarded for one year; financial assistance for succeeding years will depend upon the student's academic performance in the University and continuing need. Unsuccessful applicants for scholarships beyond the first year should consult the Financial Aids Office. Every effort will be made to offer other assistance, such as long-term loans, part-time work, grants, etc.

Regents', President's, and Chancellor's Scholarships

The highest honor that may be conferred upon an undergraduate student is the awarding of a Regents', President's, or Chancellor's Scholarship.

Regents' Scholarships are granted by the President of the University of California and the Chancellor of the San Diego campus, consideration being given to academic excellence and promise. Regents' Scholars receive an initial honorarium of \$100, dormitory assignment preference, and an annual stipend to cover the difference between student resources and the yearly standard cost of education.

President's Scholarships, granted by the President of the University of California, are awarded to students of exceptional academic achievement who demonstrate financial need. A President's Scholar can receive up to \$500 stipend.

Chancellor's scholarships, based on scholastic achievement and promise, are unique to the San Diego Campus, and are issued in the name of the Chancellor. New and continuing students may be considered for this award which consists of a \$100 honorarium only. Since need is not a requirement, no financial information is necessary.

All scholarship applicants are reviewed for these three major awards. An applicant who wishes to be considered for an honorarium only need not submit a Parents' Confidential Statement.

President's Undergraduate Fellowship Program

This program is designed to assist unusually talented undergraduate students to carry out special studies and projects under faculty supervision. The prospective fellow and his faculty sponsor will submit a project proposal, including a tentative budget, preceding the academic year for which the award will be made. The Chancellor, acting with the advice of the Committee on Undergraduate Scholarships and Honors, will select the fellows by June 1 each year. Stipends will be based on need, to be determined by the cost of the project and the student's own resources.

Educational Opportunity Grants

The Higher Education Act of 1965 made provisions for Educational Opportunity Grants to assist students of exceptional financial need in obtaining a college education. Awards to students meeting University admissions requirements are based upon financial need, and may vary from \$200 to \$1000 per year, but in every case must be less than one-half the total aid required. The remainder may consist of a scholarship, a loan, or part-time employment. Each student receiving an Educational Opportunity Grant will be offered sufficient matching and supplemental financial assistance to meet his total financial need according to the Parents' Confidential Statement.

College Work-Study Program: Undergraduates

This Federally financed program provides funds for student employment by the University or by public and private non-profit organizations. Students from low-income families and other students who would not be able to attend college without this assistance are eligible for referral to job interviews. Once employed, the student may work

up to forty hours a week during the summer and other vacation periods, and up to fifteen hours a week during weeks of classes and examinations, until financial need, as determined by the financial aids officer, has been met, and as long as his work is satisfactory and he continues to be a full-time student in good standing at the University.

The Work-Study Program provides experience in many fields, including city planning, mental health, community service in economically depressed areas, recreation, library work, experimental sciences (chemistry, physics, biology, oceanography and related fields), hospital and business administration, and office work. Pay varies from minimum wage to \$3.50 per hour.

FINANCIAL ASSISTANCE: UNDERGRADUATES AND GRADUATES

Application forms and requests for information should be addressed to the Financial Aids Officer, University of California, San Diego, La Jolla, California, 92037.

President's Work-Study Program

This University financed program provides funds to finance student employment at UCSD to a student who is in need of earnings in order to pursue his course of study. He must be a full-time enrolled student except when employed in the summer when he must have been admitted to or be continuing in the University as a full-time student. The established need analysis, Financial Aid Application forms and the *Parents' Confidential Statement* will be used to determine the student's eligibility for employment and the maximum wages he can earn. His wages together with his resources and other financial aid cannot exceed his established need. Wages paid are to be commensurate with the skills required and the work performed, and where possible the employment will relate to the student's career objectives. A student may work up to 40 hours per week during the summer and vacation periods and an average of 20 hours per week during weeks of classes and examinations.

University of California Grant Program

The University of California Grant-in-Aid Program provides non-repayable grants-in-aid to students with demonstrated financial need without reference to grade point average.

LOANS

Loans are not intended to provide full support, but should be used to supplement other resources. Students with financial need are encouraged to request loan assistance as supplementary aid. Information about all available loans may be obtained from the Financial Aids Office.

Educational Fee Loan

Students who are residents of the State of California who demonstrate financial need may qualify for a deferral of the Educational Fee. Educational Fee loans, depending upon need, can range from \$100 to \$300 per year for undergraduates and \$120 to \$360 per year for graduates. Each student who receives financial aid from the University Financial Aid Office will be offered this Educational Fee loan as part of his award.

Repayment of the Educational Fee shall begin nine months subsequent to the completion of student's higher education including four years of graduate study. A student who terminates his higher education will be required to begin payment of his loan nine months subsequent to his termination.

Repayment period shall not exceed ten years, and the Note will bear interest at the rate of 3 per cent per annum beginning nine months after the student leaves school. Minimum repayment is \$30, plus interest, per calendar quarter. Interest shall not accrue, and payments need not be made in whole or part for a maximum of four years while a student is serving on active duty in the armed forces of the United States, Peace Corps, or VISTA.

Payment of the entire amount of the principle and accrued interest may be made at any time without penalty at the option of the student.

To apply for the Educational Fee Loan, a student must submit to the Financial Aids Office an Application for Financial Aid, a Parents' Confidential Statement, and or other appropriate document substantiating need.

Short-Term Loans

These funds, made possible by gifts to the University, are granted in small amounts to help students in short-term emergencies, and usually must be repaid within thirty days to one year.

Regents' Loan Funds

These funds are provided by The Regents of the University to full-time students. The amount of this loan is determined by financial need. Eligible students may receive up to \$1,000 per academic year. Students, regardless of age, are required to obtain a co-signer. Foreign students may apply for this loan. Regents' Loans, normally repayable in five years, bear an interest rate of 3 per cent on the unpaid balance, beginning upon graduation or withdrawal from the University.

National Defense Education Act Loan

A student is eligible for a National Defense Student Loan if he is a United States citizen or holds an immigrant visa and is carrying at least one-half the normal full-time academic workload. An undergraduate student may apply for up to \$1000 a year to a total of \$5000 for his undergraduate career. A graduate or professional student

may apply for up to \$2500 annually with a \$10,000 maximum for his graduate career. Loans are granted for educationally related expenses and are intended to supplement a student's resources in order to meet standard costs of attending the University.

Repayment of NDEA loans begins nine months after graduation or withdrawal from the University and may be extended over a ten-year period at 3 per cent interest on the unpaid balance. Prior to June 30, 1970, members of the armed forces, members of the Peace Corps, and VISTA may have their repayment deferred up to three years. Loans advanced after April 13, 1970, and for each consecutive year of active military service in the Armed Forces of the United States after June 30, 1970, will qualify for a 12 1/2 percentum cancellation plus any accrued interest per year with a maximum of up to 50 per cent cancellation plus interest. Up to 50 per cent of the loan (and interest thereon) may be forgiven for borrowers who enter the teaching profession, at the rate of 10 per cent for each year of full-time teaching in a public or non-profit elementary or secondary school or in an institution of higher education. Borrowers who elect to teach in certain eligible schools located in low-income areas may qualify for cancellation of their entire obligation at the rate of 15 per cent per year.

Federally Insured Loans

This loan is available to full-time students who are citizens or nationals of the United States, or persons who are in the United States for other than a temporary purpose and intend to become permanent residents thereof. Students may borrow up to \$1500 per academic year with a total maximum of \$7500 for all years of school. The Federal Government guarantees the loan to the lender in case of death or default of the borrower and if eligible will pay the full rate of interest on the loan up until nine months after he or she is no longer enrolled as a full-time student. Interest is calculated at seven per cent per annum and accrues from the date of loan issue. To be eligible for the Federal assistance in interest payments, your 'adjusted' family income must be under \$15,000. Repayment starts between nine to twelve months after you leave school with a minimum monthly payment of \$25 with up to a maximum of 10 years of repayment. During repayment the borrower will pay the interest. Repayment may generally be deferred if you are continuing your education in another accredited institution. During such periods of deferment, the Federal Government will continue to pay the interest if your "adjusted" family income is under \$15,000. This loan can be obtained from a participating bank, savings and loan or credit union. Students who may require this assistance should bank where such a loan is available.

Federally insured Student Loan Applications are available in the Financial Aids Office beginning July 1, 1972, for the 1972-73 academic year.

FINANCIAL ASSISTANCE: GRADUATES

In addition to the grant-in-aid, loan, and work-study programs described above, several other kinds of financial assistance are available to UCSD graduate students. These include fellowships, traineeships, scholarships, and assistantships which are described below. Further details about these awards are given in the *Graduate Studies Announcement* which may be obtained from the departmental offices or from the Office of Graduate Studies and Research.

Fellowships and Traineeships

Fellowship and traineeship stipends are tax-free awards granted for scholarly achievement and promise and are made to enable a student to pursue graduate studies and research without requiring him to render any services. The stipends accompanying different awards are not all alike, but for the most part they are not less than \$1800 for the nine-month academic year, or \$2400 for twelve months. Unless explicitly stated otherwise, all fellows and trainees whose appointments are administered by the Office of Graduate Studies and Research are exempt from tuition and registration fees. A fellow or trainee is required to register for a full program of graduate study and research and may not engage in remunerative employment without the permission of the Dean of Graduate Studies.

The principal types of fellowships and traineeships are:

1. Regents' Fellowships
2. Graduate Fellowships
3. Departmental Traineeships and Fellowships
4. San Diego Fellowships
5. Dissertation Fellowships
6. Tuition/Fee Scholarships

Assistantships

Graduate students who maintain qualifying grade-point averages may be employed by the University of California, San Diego, on a part-time basis to assist in the academic programs of the University. Such employment takes the form of an assistantship for which a taxable salary is paid. Experience has shown that most Research Assistants and those Teaching Assistants whose major departments require teaching experience for the doctorate may obtain a tax refund upon application to the Internal Revenue Service.

Application Procedures

Application materials with instructions can be obtained from an academic department office or from the Office of Admissions, University of California, San Diego, La Jolla, California 91037. Only one application form is needed to apply for admission and for any or all of the following types of financial aid: fellowships, traineeships, assistantships (teaching, language, or research). The form and all supporting materials are to be returned to the applicant's prospective major department.

In order for a student to be considered for a fellowship, traineeship, or graduate scholarship for the ensuing academic year, his application and supporting materials, including scores on the aptitude tests of the Graduate Record Examination, must be received on campus before February. Applications for assistantships will be accepted after that date, but many departments offer assistantships at the same time they consider applications for fellowships. Therefore, applicants for such appointments are strongly urged to submit their applications as early as possible. The award of fellowships and similar awards for the following academic year will be announced not later than April 1. UCSD adheres to the practice of the Association of American Universities and the Council of Graduate Schools of the United States in that successful applicants for fellowship-type awards have until April 15 to accept or decline the offers. If a student accepts an award from one of the member universities before April 15, and if he subsequently receives another offer, he may accept the second award, provided he resigns from the first one by April 15.

Special Doctoral Opportunities Program

UCSD seeks to attract for its graduate programs students of outstanding potential who are broadly representative of differing social, cultural, and ethnic backgrounds. We are presently increasing our efforts to recruit such students and to give them the financial support necessary for success in their programs of study and research here.

We also welcome as applicants students whose records and letters of recommendation indicate that they are capable of successfully carrying on graduate study but whose formal preparation indicates that they will need a certain amount of transitional study in order that they may realize their capabilities. A special program of financial assistance for such students was established for 1970-71 and we hope to continue it.

Fellowships and Loans From Outside the University

There are also numerous fellowships sponsored outside the University for which application must be made directly to the sponsoring agency. A bulletin describing graduate fellowships and dissertation research support is published in September, updated monthly, and distributed to all registered graduate students. Since a large number of deadlines occur in the fall, students are encouraged to apply for fellowships during the first few weeks of the Fall Quarter. A Fellowship Adviser is available in the Office of Graduate Studies for consultation. Veterans who wish to explore the benefits provided by the United States and the State of California should contact the appropriate federal or state offices or the Office of Special Services at UCSD.

STUDENT EMPLOYMENT OFFICE

The Student Employment Office services UCSD students, alumni, and students' spouses for employment opportunities. Many categories of jobs are listed both on campus and in the neighboring communities. Students interested in employment must complete an information sheet for use in the Student Employment Office. Employment CANNOT be arranged by correspondence as the majority of jobs are available at the time they are listed and must be filled immediately. "Live-in" positions, whereby a student may exchange work for room and/or board in a private home, are listed when available. A file is maintained of students' skills and lists of students interested in childcare, tutoring, and yard work are kept for "on-call" situations.

The Student Employment Office is also the personnel office for students working on campus. Undergraduates taking a full course load may not be employed on campus for more than 15 hours per week during academic sessions without an exception from this office. Freshmen are encouraged to avoid employment during their first quarter at UCSD. Freshmen with financial difficulties are urged to confer with a counselor in the Financial Aids Office. Foreign students will be asked to obtain a work permit from the Office of International Education before applying for referrals. Work-Study placement is handled through the Student Employment Office. Students with work-study awards should report to this office during the first week of classes.

CAREER-EDUCATION PLANNING SERVICES

Career-Education Planning Services offers a wide variety of counseling and information services to UCSD students and alumni to assist them in making their education and career plans. Included are:

Individual and group counseling to assist students in learning about themselves, occupations, and professions in relation to their personal career planning. Objective test instruments dealing with interest and/or personality traits are utilized, as appropriate, in the counseling process.

A premedical advisory program to assist students in planning their undergraduate programs and in making application for admission to medical/dental schools. Counseling and information relative to other health science professional schools also provided.

Career seminars designed to provide an opportunity for students, staff members

and representatives of the employing community to exchange information in an educational setting. Arranged interviews for students with employers in industry, business, government, and education. Assistance in learning job-seeking techniques. Descriptive material of enterprises and employers.

Permanent teaching files for candidates for college teaching positions. Files for students interested in non-academic positions and for students applying to graduate school.

A library including career information, graduate and undergraduate school guides and catalogs, guides on graduate fellowship programs, foreign study, and specialized schools, directories of potential employers, civil service information, current job listings, information on salary and employment trends.

OFFICE OF INTERNATIONAL EDUCATION

The Office of International Education has both foreign and domestic functions. It is responsible for the proper documentation of all non-citizens on the campus, whether they be foreign students, postdoctoral fellows, or faculty. In addition to the official documentation required, the Office of International Education assists with hospitality programs, counseling, and other needs of the foreign community. All new students, researchers, and faculty who are citizens of a country other than the United States are asked to call at the Office of International Education, International Center, Matthews Campus, as soon after their arrival on campus as possible and to bring their passports with them so that their visa status may be verified.

Departments are required to advise the Office of International Education whenever either a new foreign faculty member is due on campus or a new foreign student has been accepted.

Education Abroad Program

The Education Abroad program offers opportunities to undergraduate and graduate students of the University of California to study in universities overseas. It is administered for the entire University by the Santa Barbara campus and serves also as a source of information on all types of educational exchange experiences.

At present, the program is established on campuses in Jerusalem, Beirut, Göttingen, the United Kingdom, Dublin, Bordeaux, Madrid, Paris, Hong Kong, Lund, Bergen, Padua, Tokyo, Mexico and Nairobi and Accra.

The Study Centers' primary purpose is to provide a sound academic experience in a different educational system. They also enable the University of California students to become deeply involved in the language and culture of the host country.

Eligibility requirements are: upper-division standing in the University at the time of participation; proficiency in the language of the country plus one year additional study in the language or literature of France, Germany, Italy, or Spain. The language requirement varies for all other centers, but all require special preparation; an overall 2.75 grade-point average (except for the United Kingdom where a 3.0 grade-point average is required); seriousness of purpose; and an indication of ability to adapt to a new environment. Transfer students are eligible if they meet the language requirement and have completed at least one language course in the University of California. (The language requirement is not applicable to the centers in Hong Kong, Japan, Israel, and Lebanon, but study of the languages of those countries will be required as part of the program.) Special arrangements can be made for the participation of graduate students.

The participants will spend from nine to eleven months abroad, including a special orientation program, six or seven weeks of intensive language preparation where applicable, a full academic year in the university of their choice, and some vacation travel.

Each student will be concurrently enrolled on his home campus in the host university and will receive full academic credit for courses satisfactorily completed.

The Regents endeavor to bring this year abroad within the reach of all students, regardless of their financial resources.

Applications for 1973-74 will be accepted from October 9, 1972 through January 12, 1973. (Applications for the United Kingdom and Ireland must be filed no later than November 17, 1972.)

Further information is available from the Director, Education Abroad Program, 1205 South Hall, University of California, Santa Barbara, or the Dean of International Education, International Center, Matthews Campus, University of California, San Diego.

Other Overseas Programs

Information about other overseas study, travel or work opportunities is available in the Office of International Education.

HOUSING

Listings and brochures for a variety of living accommodations at or near the University are available through the Housing Office. Information is sent routinely with Admissions applications to prospective students and campus housing applications are automatically sent to each student accepted at the UCSD campus.

Accepted students returning the housing application cards included with the University acceptance letter should carefully read the instructions included with the application. Applications for the various types of campus housing are accepted and filed

according to the chronological date received. The Office of Housing Administration will gladly furnish additional information upon request.

The University strongly encourages all freshmen to live on campus their first year at UCSD. Residence hall accommodations are available in Revelle and Muir Colleges and on the Matthews campus for Third College students. The Residence Hall Contract provides for mandatory food service with an option of either 19 or 14 meals per week.

In addition, Muir College offers apartment living to all returning upper division UCSD students on a priority basis. All residence halls are arranged on the suite plan, with six to ten students sharing a common study-living area. Both single and double rooms are available, with priority for singles given to returning students. Costs vary with the type of accommodation.

Apartments for married students consist of 56 one-bedroom units and 31 two-bedroom units in the Coast complex and 256 two-bedroom units in the Mesa complex. All two-bedroom apartments are reserved for students with children. The apartments in both complexes are unfurnished except for stoves, refrigerators, disposals, and livingroom drapes. Only the Mesa units are carpeted. Coin-operated washers and dryers are supplied in the community buildings on the apartment grounds. Monthly rental prices including utilities are \$100 for the one-bedroom units, \$110 for the Coast two-bedroom units and \$120 for the Mesa two-bedroom units. Please write to the Office of Housing Services for apartment applications and brochures.

There are no accommodations for single graduate students except for 19 studio apartments in the Coast complex. There is a long waiting list for these.

The Housing Office will assist others in finding suitable accommodations in the surrounding communities of Clairemont, Del Mar, La Jolla, Pacific Beach, or Solana Beach. Rates per month vary from \$70 for a room to \$125 and up for an apartment or room and board. Apartments or houses may be shared for a price range of \$50 to \$100 per student. Students should call in person at the Housing Office to request assistance for specific off-campus listings.

OFFICE OF RELIGIOUS AFFAIRS

The Office of Religious Affairs is the cooperative venture of the religious community to provide religious counseling, help coordinate the activities of the various religious student groups, arrange speakers and programs of interest to the general campus, and serve as a theological resource for the educational enterprise.

OFFICE OF SPECIAL SERVICES

The Office of Special Services provides assistance to students in three areas. Any questions relating to these areas should be referred to this office.

Selective Service

One of the primary functions of the Office of Special Services is to service the students in all matters pertaining to the Selective Service System. Certification of enrollment is forwarded to local Selective Service Boards upon the request of any male student. It should be noted, however, that the Selective Service Act of 1971 provides student deferments only for undergraduate students who were attending college full-time during the academic year 1970-71 (including summer session).

Counseling is available to assist the student in understanding his rights, obligations, and options under the Selective Service law and in establishing his entitlement to applicable deferments or classifications. Both individual counseling and group seminars are available to discuss topics as diverse as Conscientious Objection and participation in service programs.

Veterans' Affairs

Information regarding Veterans' Educational Assistance and Veterans' Dependents' Educational Benefits may be obtained in the Office of Special Services. If you have any questions before you arrive on campus, contact your nearest Veterans Administration Office. Be certain to check in with the Special Services Office on your arrival at UCSD. Students who are already receiving benefits under the G.I. Bill or dependents' programs should come to the Special Services Office immediately after initial registration, and every quarter thereafter while registered at the University.

Handicapped Students

A new service the Special Services Office is providing is aid to students with physical handicaps. Any students who feel that, because of physical problems they may have, they need assistance in obtaining information, tutors, or any other services with which to make their stay at UCSD more profitable or comfortable, should contact this office whenever they feel the need.

STUDENT HEALTH SERVICE

A comprehensive health care program for students is included among the benefits provided by the University Registration Fee.

A well-qualified medical staff is in attendance at the Health Center on campus to care for the physical and emotional needs of students. Students are encouraged to come to the Health Center to discuss any problem, and are assured of professional and confidential attention. Appointments may be made in person or by telephone. Outpatient service is available from 8:00 a.m. to 11:30 a.m. and 1:00 p.m. to 4:30 p.m., Monday through Friday. Emergency care is made available after hours.

Infirmity care is provided at the Health Center for illness not requiring hospitalization. Upon prior authorization from a Student Health Service physician, hospitalization, surgery, and specialist consultation can be obtained as necessary through a Student Health insurance program. The faculty of the School of Medicine and the facilities of the University Hospital are extensively utilized in providing this care.

Entering students are required to complete a medical history form prior to registration. The information submitted to the Student Health Service is kept confidential and

is carefully reviewed to help provide optimal health care. Every possible effort is made to assist students with handicaps or chronic conditions. It should be noted, however, that pre-existing illnesses are not covered by the Student Health insurance plan.

A comprehensive and economical insurance policy is available for students for any one unregistered quarter. Registered students may purchase a similar policy for their dependents. Information may be obtained at the Student Health Center after arrival on campus.

SYMBOLS AND NOTATIONS USED IN COURSE LISTINGS

Course Numbers

Lower Division

Courses numbered 1 through 99 are designed for freshmen and sophomores but may be taken by more advanced students.

Upper Division

Courses numbered 100 through 199 are designed for junior and senior students but are open to other students who have sufficient background and the consent of the instructor in charge. Prerequisites for courses should be carefully noted.

Graduate

Courses numbered 200 through 299 are designed for graduate students but are open to upper-division students with the instructor's signature.

Courses numbered 500 through 599 are for graduate students only.

Examples

89. Chemical Structures S An introduction to the structure of biologically important molecules. The course scopes the structural aspects common to simple molecules and complex biological molecules. Prerequisite: Science and Technology 1B and instructor's consent.

184. Semantics of Human Communication S The environmental relationships and intentions characteristic of human and biological communication systems. Prerequisites: Communications 1A, 1B, 1C, advanced standing, or consent of instructor.

218. Advanced Biochemistry (3) Advanced topics and recent advances in biochemistry for students already familiar with the subject matter of elementary courses. Prerequisites: physical and organic chemistry and Chemistry 211 or equivalent.

500. Apprentice Teaching Apprentice teaching in undergraduate courses given or participated in by the Visual Arts Department.

Course Units

Undergraduate courses, unless designated differently, are 4 unit courses.

The number of units for graduate courses is specified directly after each course title by the number in parentheses.

Examples

255. Crustal Evolution (3) The properties, origin and evolution of the rocks in the earth's crust. Prerequisite: one year of graduate study in Scripps Institution of Oceanography, or consent of instructor.

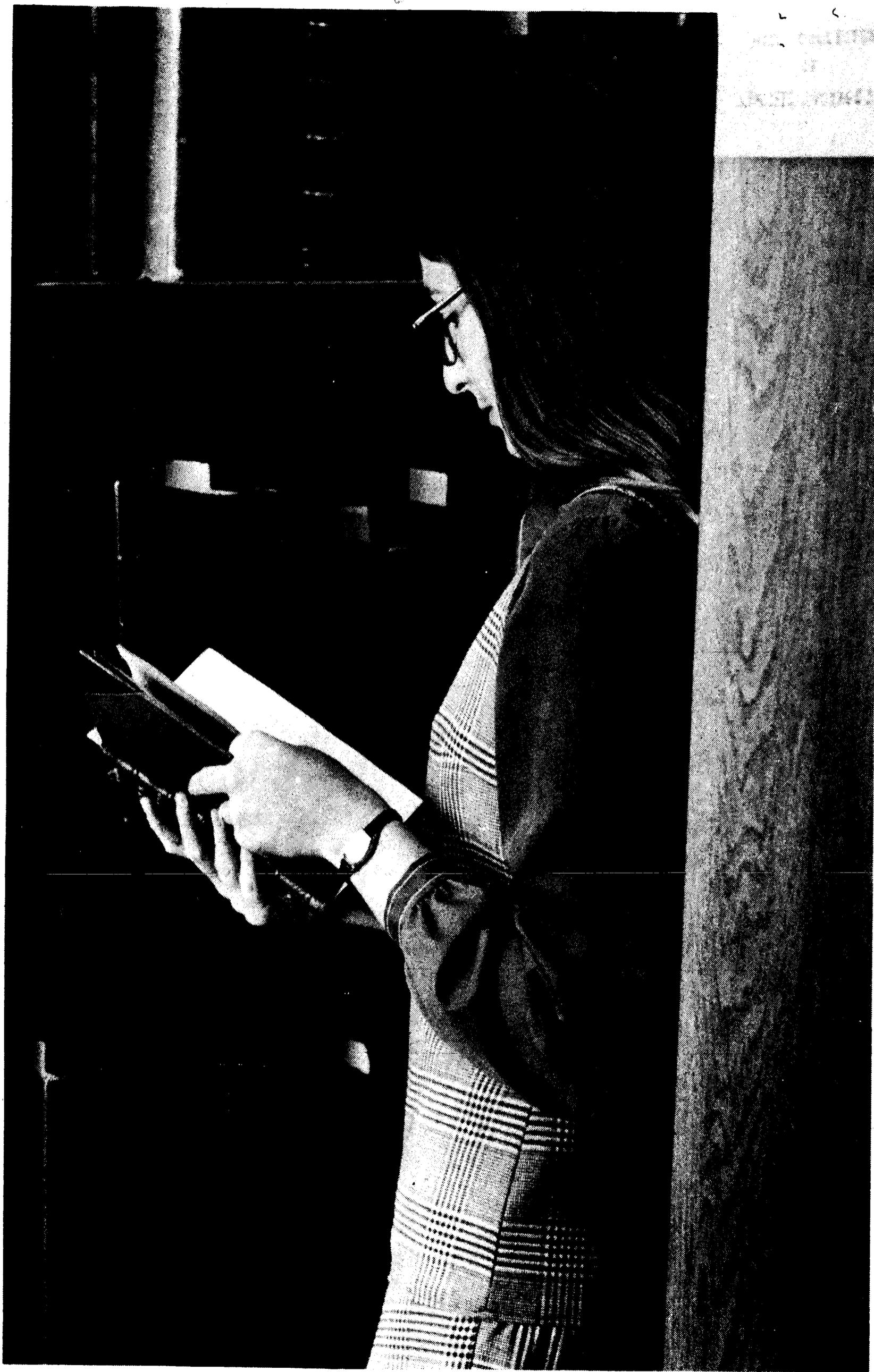
Course Quarter

The F, W, or S notations following a course title stand for the Fall, Winter, and Spring academic quarters and indicate the quarter or quarters in which the course is normally offered.

Examples

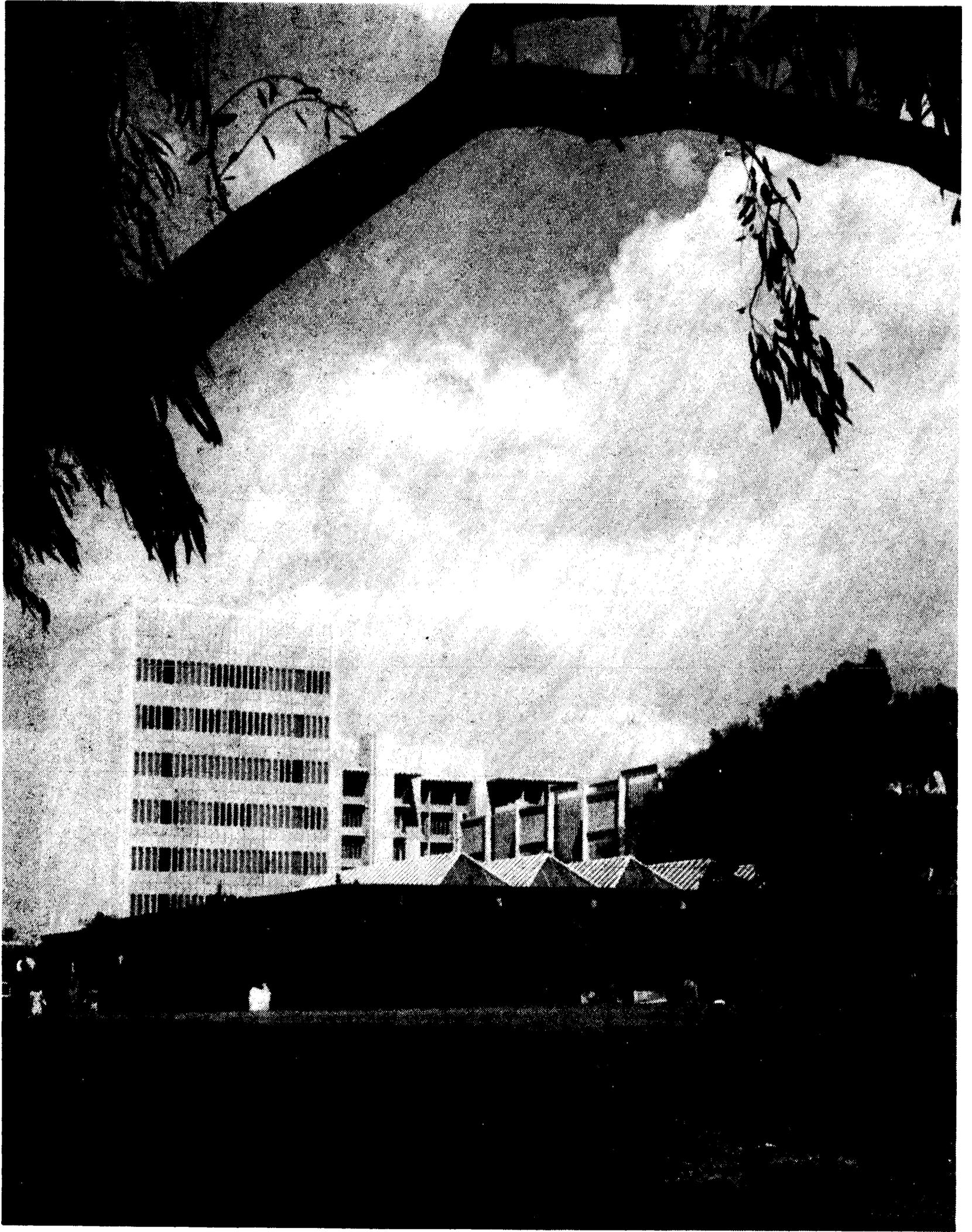
128. Principles and Practice of Conducting F (Performance and Technology) The theory and practice of conducting as related to the study of instrumental and choral literature. Prerequisite: consent of instructor.

130A-130B-130C. Seminar in Chamber Music Performance F,W,S (Performance and Technology) Performance of representative chamber music literature. Prerequisites: proficiency on a musical instrument and consent of instructor through audition. May be repeated for credit.



Library Assistant Jacqueline Coolman works in the Hill Collection of Pacific Voyages, part of the Special Collections section in the Central University Library.

Departments of Instruction



Natatorium with Muir College in background.

APPLIED MECHANICS AND ENGINEERING SCIENCES

Office: 5202 Urey Hall

†H. Bradner, Ph.D., Professor of Engineering

Physics and Geophysics

A.T. Ellis, Ph.D., Professor of Applied Mechanics

A. Fronek, M.D., C.Sc., Professor of Bioengineering

Y.C. Fung, Ph.D., Professor of Bioengineering
and Applied Mechanics

*P.A. Libby, Ph.D., Professor of Aerospace Engineering

S.C. Lin, Ph.D., Professor of Engineering Physics

*J.W. Miles, Ph.D., Professor of Applied Mechanics

and Geophysics

W. Nachbar, Ph.D., Professor of Applied Mechanics

D.B. Ofte, Ph.D., Professor of Aerospace Engineering

S.S. Penner, Ph.D., Professor of Engineering Physics

E.M. Reissner, Ph.D., Professor of Applied Mechanics

(Chairman of the Department)

R.E. Roberson, Ph.D., Professor of Engineering Sciences

*A.M. Schneider, Sc.D., Professor of Engineering Sciences

F.A. Williams, Ph.D., Professor of Aerospace Engineering

*B.W. Zweifach, Ph.D., Professor of Bioengineering

C.H. Gibson, Ph.D., Associate Professor of Engineering

Physics and Oceanography

*G.A. Hegemier, Ph.D., Associate Professor of Applied Mechanics

M. Intaglietta, Ph.D., Associate Professor of Bioengineering

*D.R. Miller, Ph.D., Associate Professor of Engineering Physics

*R.F. Pawula, Ph.D., Associate Professor of Engineering Sciences

S. Rand, Ph.D., Associate Professor of Engineering Physics

H.W. Sorenson, Ph.D., Associate Professor of Engineering

Sciences

*C.W. Van Atta, Ph.D., Associate Professor of Engineering Physics

and Oceanography

* * *

F.H. Champagne, Ph.D., Associate Research Engineer, Lecturer

J.M. Covell, M.D., Associate Professor of Medicine and Bioengineering

D.L. Franklin, Associate Professor of Medicine and Bioengineering

in Residence

C.A. Friehe, Ph.D., Assistant Research Engineer

K. Fronek, C.Sc., Associate Research Bioengineer, Lecturer

J.N. Lanir, Ph.D., Assistant Research Bioengineer

R.M. Peters, M.D., Professor of Surgery and Bioengineering

N.R. Silverman, M.D., Assistant Professor of Radiology

and Bioengineering

K.G.P. Sulzmann, Ph.D., Research Engineer and Lecturer

C.P. Wang, Ph.D., Assistant Research Engineer, Lecturer

J.B. West, M.D., Ph.D., Professor of Medicine and Bioengineering

*On leave winter and spring 1972-73

**On leave 1972-73

The current instructional and research programs emphasize bioengineering, gas dynamics, fluid mechanics, solid mechanics and structures, and systems science. The graduate program is characterized by strong interdisciplinary relationships with the Departments of Physics, Mathematics, Biology, and Chemistry, with the School of Medicine, and with associated campus institutes such as the Institute for Geophysics and Planetary Physics, the Institute for Pure and Applied Physical Sciences, the Space Sciences Laboratory, and the Scripps Institution of Oceanography.

The Undergraduate Program

The Department of Applied Mechanics and Engineering Sciences offers programs of study at the upper-division level leading to the degree Bachelor of Arts (Applied Science). These programs emphasize engineering science and thus provide basic training for engineers in aerospace, civil, and mechanical engineering, in systems engineering, and in bioengineering. It is expected that a majority of AMES graduates will pursue further, specialized studies in graduate school.

There are three undergraduate programs: The Applied Mechanics program provides training in solid and fluid mechanics and in dynamics with application to the engineering fields based on mechanics, i.e., aerospace, civil, and mechanical engineering. The Systems Science program provides the student with the fundamental concepts and tools required for the analysis and/or synthesis of complex and broad engineering, physical, and social systems, e.g., as they arise in industry, governmental agencies, and hospitals. The Bioengineering program prepares the student either for the engineering aspects of medical care and/or research or for professional training in medical school.

All students who expect to major in one of the AMES programs are strongly advised to take Mathematics 2D and 2E in their sophomore year. Students considering either the applied mechanics or the bioengineering programs are also advised to take Natural Science 2F in their sophomore year. All AMES undergraduates are required to develop a basic competence in the use of a digital computer to solve scientific and technical problems in their upper-division courses. They may learn programming in any of the following ways: (a) a formal course, such as APIS 10, (b) a computer-center, non-credit

programming course, (c) computational experience in connection with a laboratory project, (d) self-study.

As a minimum graduation requirement, a student qualifying for a major in AMES must pass eighteen courses, each of which is either in the AMES Department, or is on an AMES-approved list of technical electives, or is an elective selected in consultation with his AMES faculty adviser. Normally, nine of these courses must be at the level of the 100 series or higher in the AMES Department (or in Biology or Chemistry, in the case of Bioengineering). A more flexible program can be arranged, but deviations from this rule require approval by the AMES faculty adviser. Transfer students who have taken equivalent courses elsewhere may have transfer credit approved towards the minimum graduation requirement, but they must pass at least six upper-division or graduate courses (each graduate course having three or more quarter-units) in AMES; more than six AMES courses may be required of transfer students at the discretion of the AMES faculty adviser.

The requirement of nine AMES courses satisfied by the required courses in each regular AMES undergraduate program. The required courses in these programs are to be supplemented by electives that may be selected either from the list of approved technical electives for each program or in contiguous and/or noncontiguous areas in consultation with the AMES faculty adviser. Students with superior records are expected to take courses beyond the minimum number—with special emphasis on the offerings of Applied Physics and Information Science, Biology, Chemistry, Mathematics, and Physics.

To fulfill the departmental scholastic requirement, the grade-point average for the eighteen-course, minimum graduation requirement must be at least 2.0.

Applied Mechanics Program

A student following the Applied Mechanics program is required to take a coordinated group of eight courses in fluid dynamics (AMES 101A-101B), solid mechanics and structures (AMES 130A-130B), particle and rigid-body dynamics (AMES 121A), thermodynamics (AMES 110), linear systems analysis (AMES 163A), and problem-solving methodology in applied mechanics (AMES 150A). In addition, a three-course sequence is required in applied mathematics (AMES 105A-105B-105C). The applied mechanics program also requires four more advanced courses, normally AMES 101C, 130C, 121B, and 150B, although students with special interests may substitute alternative courses by petition.

Electives to fulfill minimum graduation requirements are to be chosen from among the list of Technical Electives shown below. Superior students are encouraged to supplement the minimum program with additional technical electives. Electives are to be chosen in consultation with the AMES faculty adviser. In special cases, the faculty adviser may recommend a program that differs from that scheduled below.

Systems-Science Program

A student following the System Science program is required, in his junior year, to take a one-year sequence, AMES 163A-163B-163C, dealing with linear systems. He is also required to take a one-year sequence, APIS 105A-105B-105C, to extend his knowledge of the mathematical tools utilized in AMES 163A-163B-163C. A third sequence dealing with a physical or engineering system is also required. This requirement can be satisfied by the sequence AMES 100, 121A-121B or by APIS 161A-161B-161C. Other sequences may be substituted with the consent of the student's adviser.

In the senior year the student completes his study of linear control systems with AMES 141A and undertakes the study of nonlinear systems in AMES 141B. Linear, stochastic control systems are studied in AMES 141C. Preparation for AMES 141C as well as the study of other stochastic systems is provided in AMES 162A-162B-162C.

Graduation requirements are fulfilled with courses from the list of approved technical electives and are to be chosen in consultation with the AMES faculty adviser. Superior students are encouraged to supplement the program with additional technical electives.

Bioengineering Program

A student following the Engineering program in Bioengineering is required, during his junior year, to take a one-year sequence in applied mathematics, AMES 105A-105B-105C, and a one-year sequence in mechanics, with applications to biology and physiology, AMES 100, 172, 173. In view of the growing importance of computer science in modern hospitals and in biomedical research, a one-year sequence APIS 161A-161B-161C, is also required. A systematic overview of biology, Biology 101A-101B, is essential and can be taken during either the junior or senior year. A student planning to take additional electives in biology, such as neurobiology (Biology 121), or an introduction to physiology (Biology 129), should take Biology 101A-101B during his junior year. It is important that bioengineers have a working knowledge of electronic circuits, and APIS 163A-163B-163C is required during the senior year. The elective course AMES 180A-180B-180C, Principles of Bioengineering, includes the application of electronic and other techniques to biomedical measurements. Other listed electives are intended to provide some depth in biology, chemistry, or information science. A student's program is to be selected in consultation with his faculty adviser; where necessary, certain substitutions may be made.

The Premedical program is intended primarily to meet the minimum requirements for a student planning to enter medical school. The curriculum is also suitable for a student planning to enter graduate school in bioengineering, physiology, or neurosciences.

APPLIED MECHANICS

	Fall	Winter	Spring
Junior Year	AMES 105A AMES 130A AMES 163A **	AMES 105B AMES 130B AMES 121A	AMES 105C AMES 130C* AMES 121B*
Senior Year	AMES 101A AMES 110	AMES 101B AMES 150A†	AMES 101C* AMES 150B*†
Technical Electives	AMES 100 AMES 141A AMES 142A AMES 149A AMES 156 AMES 162A AMES 180A APIS 101A APIS 161A Chem. 130 Math. 2E Math. 131A Math. 170A Math. 180A Phys. 100A Phys. 130A	 AMES 141B AMES 142B AMES 149B AMES 156 AMES 162B AMES 163B AMES 172 AMES 180B APIS 101B APIS 119A APIS 161B Chem. 131 Math. 2E Math. 131B Math. 170B Math. 180B Math. 181A Phys. 100B Phys. 130B	AMES 111 AMES 132 AMES 141C AMES 142C AMES 149C AMES 156 AMES 162C AMES 163C AMES 173 AMES 180C APIS 101C APIS 119B APIS 161C Chem. 132 Math. 2E Math. 131C Math. 170C Math. 180C Math. 181B Phys. 100C Phys. 130C

* Students may petition to replace any of AMES 101C, 121B, 130C, and 150B by alternative courses.

** Mathematics 2D if not completed in sophomore year; Mathematics 2E is a recommended elective.

† These courses will first be offered in 1973-74.

BIOENGINEERING: ENGINEERING MAJOR

	Fall	Winter	Spring
Junior Year	AMES 100 AMES 105A AMES 142A**	AMES 172 AMES 105B AMES 142B**	AMES 173 AMES 105C AMES 142C**
Senior Year	AMES 163A Biol. 101A*	AMES 163B Biol. 101B*	AMES 163C
Technical Electives	AMES 101A AMES 110 AMES 180A APIS 164A Biol. 129 Chem. 130 Chem. 140A	AMES 101B AMES 180B AMES 271B APIS 164B Biol. 121 Chem. 131 Chem. 140B	AMES 101C AMES 180C AMES 271C APIS 164C Chem. 132

* It is suggested that those students who intend to take additional biology electives take Biology 101A-101B, in the junior year.

** APIS 161A, 161B, and 161C should be taken in 1972-73.

BIOENGINEERING: PREMEDICAL

	Fall	Winter	Spring
Junior Year	AMES 105A* Biol. 101A Chem. 140A** Chem. 143A (lab)	AMES 105B Biol. 101B Chem. 140B	AMES 105C Biol. 101C
Senior Year	AMES 100 Biol. 129	AMES 172 Biol. 121	AMES 173 Biol. 123 or 172
Technical Electives	AMES 101A AMES 180A APIS 161A*** Chem. 130 Phys. 100A Phys. 171	AMES 101B AMES 180B APIS 161B Chem. 131 Phys. 100B Phys. 172	AMES 101C AMES 180C AMES 297 APIS 161C Chem. 132 Phys. 100C

* Mathematics 2D, if not completed in sophomore year.

** Natural Science 2F, 2FL

*** APIS 10 is suggested as prerequisite

SYSTEMS SCIENCE

	Fall	Winter	Spring
Junior Year	AMES 100 (or APIS 161A)	AMES 121A (or APIS 161B)	AMES 121B (or APIS 161C)
	AMES 105A AMES 163A* **	AMES 105B AMES 163B*	AMES 105C AMES 163C*
Senior Year	AMES 141A AMES 162A* (or APIS 162A)	AMES 141B AMES 162B* (or APIS 162B)	AMES 141C AMES 162C* (or APIS 162C)
Technical Electives	AMES 101A AMES 130A AMES 142A AMES 146A AMES 180A APIS 164A APIS 165 Econ. 100A Math. 131A Math. 170A	AMES 101B AMES 130B AMES 142B AMES 146B AMES 180B APIS 164B APIS 166 Econ. 100B Math. 131B Math. 170B	AMES 101C AMES 130C AMES 142C AMES 146C AMES 180C APIS 164C APIS 167 Econ. 100C Math. 131C Math. 170C

* The courses, AMES 162A-162B-162C and AMES 163A-163B-163C, are equivalent to APIS 162A-162B-162C and APIS 163A-163B-163C, respectively. Thus, the stated requirements for AMES 162A-162B-162C and AMES 163A-163B-163C are satisfied by satisfactory completion of APIS 162A-162B-162C and APIS 163A-163B-163C.

** Mathematics 2D, if not completed in the sophomore year.

The Graduate Program

Admission is in accordance with the general requirements of the Graduate Division. Candidates with bachelor's or master's degrees in mathematics, the physical sciences, or any branch of engineering are invited to apply. The Department strongly recommends that all applicants submit scores from the Graduate Record Examination. This is essential if they seek financial aid.

The Department of Applied Mechanics and Engineering Sciences offers graduate instruction leading to the M.S. and Ph. D. degrees in Engineering Sciences with specialization in each of Aerospace Engineering, Applied Mechanics, Bioengineering, and Engineering Physics.

In addition, as an interdepartmental Ph. D. program in Applied Ocean Sciences is offered jointly with the Scripps Institution of Oceanography and the Department of Applied Physics and Information Science. All aspects of man's purposeful and useful intervention into the sea are included. Students in this program receive the Ph.D. with specialization in Engineering Physics upon completion of normal departmental requirements and certain other requirements stipulated by an interdepartmental faculty committee. AMES undergraduate students who contemplate graduate work in Applied Ocean Sciences are advised to take physical science and mathematics electives, and to seek admission into some of the Scripps core courses, 210A (Physical Oceanography), 240 (Marine Chemistry) and 270A (Biological Oceanography).

The instructional and research programs are characterized by strong interdisciplinary relationships with the Departments of Mathematics, Physics, and Chemistry, and with associated campus institutes such as the Institute for Pure and Applied Physical Sciences and the Institute of Geophysics and Planetary Physics, and Scripps Institution of Oceanography.

Master's Degree Program

The Department offers the M.S. degree under both the Thesis Plan I and the Comprehensive Examination Plan II (see *Graduate Division: Master's Degree*). A strong effort is made to schedule M.S.-level course offerings so that students may obtain their M.S. degree in one year of full-time study or two years of part-time study.

Course requirements are left flexible in order to permit the student and his adviser to develop the most beneficial program. The Department accepts a maximum of two extension courses (3 quarter-units each) at the 100 level towards the M.S. degree provided that (a) approval of the Graduate Council and the student's adviser is obtained and (b) the courses have either an exact counterpart in AMES or else are approved by faculty members in AMES who have professional competence in the particular field. Specific departmental requirements for the M.S. degree are as follows:

1. A course of study must include 36 units of credit and must be approved by the student's adviser. Credit must be obtained for at least 15 quarter-units of AMES 200 level courses, not including AMES 205, 206, and 299. Students studying under Plan I also must obtain credit for 6 units of AMES 299 (research). Students studying under Plan II may not apply AMES 299 units toward the M.S. degree. No more than 12 units of upper-division, 100-level courses may be taken for the M.S. degree.
2. Students must have an average of B or higher in the courses taken to fulfill requirements for the M.S. degree.
3. The thesis under Plan I is reviewed by a thesis adviser and two other faculty

members appointed by the Dean of Graduate Studies. The review is normally an oral defense of the thesis.

4. The comprehensive examination under Plan II is conducted by the adviser and at least two other faculty members appointed by the Department Chairman. The examination committee normally conducts an oral or written examination in the candidate's discipline of specialization. A student working toward the Ph.D. degree who has successfully passed one area of the department's Ph.D. examination need not take the comprehensive examination for the M.S. degree.

Successful candidates receive the M.S. degree in Engineering Sciences with a designated specialization in Aerospace Engineering, Applied Mechanics, Engineering Physics, or Bioengineering.

Doctor's Degree Program

The AMES Ph.D. program is intended to prepare students for a variety of careers in research and teaching. As such, research is initiated as soon as possible, commensurate with the student's background and ability. There are no formal course requirements for the Ph.D.; however, most students, in consultation with their advisers, develop course programs that will prepare them for the AMES departmental examination and for their dissertation research.

A departmental examination is given to each Ph.D. candidate prior to his formal Ph.D. qualifying examination. This departmental examination normally is taken after the completion of three quarters of full-time graduate work and seeks to examine the student's academic and research ability. It is administered by a committee consisting of four or more AMES faculty members, appointed by the Department Chairman on the basis of nominations made by the student's adviser. To insure the breadth required of a Ph.D. candidate, the committee normally examines the student in four areas of specialization within engineering science.

After satisfactory completion of the departmental examination, a graduate student in AMES must pass the formal Ph.D. qualifying examination administered by the student's doctoral committee (See *Graduate Division: The Ph.D.*)

There is no formal foreign-language requirement for doctoral candidates. A student is expected to master whatever language is needed for the pursuit of his own research.

Successful candidates are awarded the Ph.D. degree in Engineering Sciences, with one of the special fields, Bioengineering, Aerospace Engineering, Engineering Physics, and Applied Mechanics designated.

Candidate in Philosophy Degree

AMES Ph.D. students who have passed their Ph.D. qualifying examination and have advanced to candidacy are awarded the Candidate in Philosophy Degree. (See *Graduate Division: Candidate in Philosophy Degree.*)

COURSES

LOWER DIVISION

40. The Ideas of Systems Analysis F Nature of systems, basic concepts underlying system design and behavior prediction. Synthesis problems, systematic exploration of alternatives. Modeling and evaluation problems, value measures, constraints. Qualitative and quantitative applications of the systems approach in societal and technical contexts.

UPPER DIVISION

100. Continuum Mechanics F An introduction to continuum mechanics of both living and nonliving bodies. The laws of motion and free-body diagrams. Stresses. Deformation. Compatibility conditions. Constitutive equations. Properties of common fluids and solids. Derivation of field equations and boundary conditions. Four hours lecture. Prerequisites: completion of the Natural Sciences Sequence or Science Sequence, co-registration of AMES 105A.

101A. Fluid Mechanics F Potential-flow theory with application to airfoils and wings; hydrostatics, atmospheric structure, and other aspects of geophysical fluid mechanics; equations for compressible flows and for viscous flows. Four hours lecture. Prerequisites: AMES 100, Mathematics 120, and prerequisite or co-registration in AMES 110.

101B. Fluid Mechanics W Compressible-flow theory, including generalized one-dimensional flow and wave phenomena; theory of inviscid reacting flows. Four hours lecture. Prerequisite: AMES 101A.

101C. Fluid Mechanics S Continuation of 101B. Viscous-flow theory, including boundary-layer theory; transport phenomena; applications in biophysics and in combustion and propulsion theory. Four hours lecture. Prerequisite: AMES 101B.

105A-105B-105C. Introduction to Mathematical Physics F-W-S Fourier series, elementary partial differential equations, calculus of variations, complex variables, and integral transforms with applications to problems in particle and rigid-body dynamics, vibrations, wave motion, electric circuits, heat conduction, and fluid dynamics. Prerequisites: Mathematics 20; Natural Science 1E or 2E.

110. Thermodynamics I First and second laws and selected applications, e.g., thermochemistry, heat capacities and heats of reaction, engine cycles, etc. Four hours lecture. Prerequisite: junior standing, or consent of instructor.

111. Thermodynamics II S Extension of 110, topics selected from chemical thermodynamics, adiabatic flame temperatures; engine performance evaluation; fuel

cells and secondary power units; thermodynamic functions for ideal gases; low-temperature thermodynamics; information theory; irreversible thermodynamics; metallurgical applications. Four hours lecture. Prerequisites: AMES 110, and prerequisite or co-registration in AMES 101A.

120A. Dynamics Particle dynamics; conservation laws; work, energy, and power; collision; systems of particles; motion in a moving frame, Coriolis and centrifugal forces. Generalized coordinates; Lagrange's equations. Variable mass. Oscillations. Introduction to rigid-body dynamics; planar motion; three-dimensional motion of free symmetric bodies. Four hours lecture. Prerequisite or co-registration: Mathematics 110A.

120B. Electromechanical Systems F Linear systems theory. Classical circuit theory. State-variable and frequency domain analysis of linear systems with applications to electrical, mechanical, and thermal systems. Four hours lecture. Prerequisite or co-registration: Mathematics 120.

121A. Dynamics I W Kinematics of particles and rigid bodies; acceleration in noninertial frames; particle dynamics, motion in central force fields, orbital mechanics; conservation laws for energy, linear and angular momentum; generalized coordinates and Lagrange's equations. Examples oriented towards engineering problems. Four hours lecture; coordinated experiments and demonstrations. Prerequisite: Mathematics 20.

121B. Dynamics II S Introduction to rigid body dynamics; planar motion of rigid bodies, three-dimensional motion of axially-symmetric bodies, stability of motion; matrix analysis of small oscillations in multi-degree-of-freedom systems, eigenvalue and eigenvector determination, forced oscillations, oscillations in continuous elastic systems. Four hours lecture; coordinated experiments and demonstrations. Prerequisites: AMES 121A, APIS 105A or Mathematics 110A; Mathematics 2E recommended.

130A. Solid Mechanics I F Equilibrium of particles and rigid bodies. Statically determined trusses. Elasticity and strain in one-dimensional tension and compression. Statically indeterminate problems. One-dimensional visco-elasticity and plasticity. Plastic limit design. Pressure vessels. Torsion of circular shafts. Stresses and deflections in beams. Limit design of beams. Four hours lecture; coordinated experiments and demonstrations.

130B. Solid Mechanics II W Two-dimensional stress and strain. Transformation laws, field equations and constitutive relations. Exact solutions for simple beam problems. Polar coordinate problems. Extremum principles. St. Venant torsion theory. Three-dimensional stress and strain. Four hours lecture; coordinated experiments and demonstrations. Prerequisite: AMES 130A.

130C. Solid Mechanics III S Linear and non-linear one-dimensional theory of beams. Symmetric bending of circular plates and shells. Moderately large deflections of plates. Solutions for small deflections of rectangular plates. Four hours lecture; coordinated experiments and demonstrations. Prerequisite: AMES 130B.

132. Structural Analysis Principles of matrix analysis of elastic truss and frame structures, development of force and displacement methods, introductory treatment of finite element analysis of structures and use of computer programs. Four hours lecture. Prerequisite: AMES 130B.

140A. Automatic Control Systems F Multi-degree-of-freedom linear systems; eigenvalues, eigenvectors, normal coordinates. Classical procedures for automatic feedback control systems; transfer functions; stability; Bode, Nichols, Nyquist, and root locus plots. Examples from biological, electrical and mechanical systems. Brief overview of field of systems dynamics and control. Prerequisite: AMES 120B or consent of instructor.

140B. Automatic Control Systems W Generalized concepts of system performance analysis based on frequency, transient, and error coefficient methods; compensation with lead or lag networks; gain-phase and pole-zero plots. Linear sampled-data systems; Z-transforms. Associated laboratory involving analog and/or hybrid computer and automatic control devices. Prerequisite: AMES 140A.

140C. Automatic Control Systems S Introduction to nonlinear systems; quasilinearization; describing functions; phase-plane analysis; Lyapunov functions. Introduction to random processes for time-invariant linear systems. Introduction to state-space characterization of dynamic systems. Computer simulation of nonlinear systems. Prerequisite: AMES 140B.

141A. Linear Control System Theory F Extension of AMES 163C. Routh criterion. Minimum- and non-minimum phase systems. Simulation of systems on analog computer. Automatic digital plotting of Nyquist and Bode plots. Z-transforms for sampled-data systems. State-variable methods for multiple-input, multiple-output systems. Prerequisite: AMES 163C.

141B. Nonlinear Methods in Systems Analysis W Oscillations in quasilinear systems, phase plane methods, Liapunov stability theory, external excitation. Illustrations from automatic control and other electromechanical systems. Prerequisites: AMES 163A-163B-163C.

141C. Introduction to Stochastic Control Systems S Stochastic state models, minimal variance control strategies, prediction and filtering theory, spectral factorization, stochastic linear regulator problem, separation theorem. Prerequisites: AMES 162A, AMES 141A.

142A. Computer Methods in Engineering Science Analysis of physical systems leading to matrix operations, simultaneous linear equations, eigenvalue problems and nonlinear equations, with their digital computer solutions. The physical context includes electromechanical networks, control systems, structures. Prerequisites: APIS 105A-105B-105C and APIS 10, or consent of instructor.

- 142B. Computer Methods in Engineering Science** Analysis of physical systems leading to ordinary and partial differential equations, with their digital computer solutions. The physical context is the dynamics of discrete and continuous electrical and mechanical systems. Prerequisite: AMES 142A.
- 142C. Computer Methods in Engineering Science** Digital simulation of one or more realistic, complex physical systems. This portion of the course has a project format. Prerequisites: AMES 142A-142B.
- 146A-146B-146C. Introduction to Optimization Theory** F-W-S Introduction to optimization theory and its role in engineering and physical systems. Basic results of mathematical programming, calculus of variations and optimal control theory are developed and are discussed for a wide variety of applications. Prerequisites: Mathematics 2E, Mathematics 110.
- 149A-149B-149C. Air Pollution** F-W-S Sources, components, chemistry, dynamics, and medical effects of air pollution. Laws. Standards. Control and testing. The role of energy. Mass transit as a partial solution. Economic incentives as a control strategy. The decision making process--the role of the citizen, government, industry. Prerequisites: Mathematics 2A-2B-2C-2D; five courses in the material (physical and biological).
- 150A. Topics in Applied Mechanics I** Presentation of series of problems from various branches of applied mechanics illustrating methodology. Examples are: structural stability, aeroelastic response, non-linear oscillations, heat conduction and moving boundaries. Four hours lecture; coordinated experiments and demonstrations. Prerequisites: AMES 101B, AMES 120B, AMES 130B.
- 150B. Topics in Applied Mechanics II** Continuation of AMES 150A taking up additional examples. Four hours lecture; coordinated experiments and demonstrations. Prerequisite: AMES 150A.
- 156. Rigid Body Dynamics** F Three dimensional rigid body dynamics. Representation of rotations; angular velocity and kinematical differential equations, Euler dynamical equations. Special cases of classical and modern problems with application to spacecraft and gyroscopic devices. Four hours lecture. Prerequisite: Consent of instructor.
- 160. Quantitative Studies of Environmental and Social Problems** S A course of lectures designed to acquaint undergraduates with factual information on important contemporary issues. Three hours lecture. Prerequisite: junior standing.
- 162A-162B-162C. Statistical Communication Theory** F-W-S Review of probability theory: combinatorial analysis, generating functions, random variables, distributions, expectations, limit theorems. Stochastic processes: correlation functions, spectral densities, the Gaussian process, orthonormal expansions, mean-square filtering. Elements of information theory: entropy, mutual information, channel capacity, coding. Prerequisite: AMES 163C.
- 163A-163B-163C. Linear Systems and Circuits** F-W-S Network analysis, Kirchhoff's laws, topological and state-space methods, linear systems, exponential transforms, convolution integrals, sinusoidal steady-state analysis, equivalent networks, time-discrete systems, applications. Prerequisites: Mathematics 2D and 2E; APIS 105A-105B-105C or Mathematics 110A-110B, 120 taken concurrently.
- 170. AMES Laboratory** F Laboratory program in aerospace, mechanical engineering sciences and bioengineering. Modern lab techniques. Statistics and interpretation of data. Formulation of experiments. Students are introduced to modern laboratory equipment and required to formulate a project of research under the close supervision of a faculty member for AMES 171. Prerequisite: consent of instructor.
- 171. Advanced AMES Laboratory** (0-4) W-S Experimental research under close guidance of an AMES faculty member. Study of a special problem in aerospace sciences, mechanical engineering or bioengineering selected by the student. Hours by arrangement. This is a two-quarter course with the grade to be given after the completion of the second quarter. Prerequisite: AMES 170 or consent of instructor.
- 172. Biomechanics** W Application of mechanics to biological systems. Basic mechanical properties of living tissues such as the blood, mucus, blood vessels, tendons, skin, muscles, bone, cartilage, and other tissues. Mechanics of organs such as the heart, the lung, the arteries, kidney, ureters, microscopic blood vessels, etc. Injury, prosthesis, and compatibility. Prerequisite: AMES 100.
- 173. Bioengineering: Transport Phenomena** W Transport phenomena in biological systems treated from the viewpoint of statistical mechanics and fluid dynamics. Diffusion through biological structures. The mechanisms of membrane action. Non-equilibrium thermodynamics analysis of biological transport phenomena. Suitable for students in biology interested in engineering analysis of biological systems. Three hours lecture. Prerequisite: consent of instructor.
- 180A. Principles of Bioengineering** F Principles of biomedical instrumentation. Electrical properties of smooth, skeletal, and cardiac muscle cells. Nervous control. In-vivo energy sources. Four hours lecture. Prerequisites: upper-division standing, medical school student, or consent of instructor.
- 180B. Principles of Bioengineering** W Production and properties of x-rays. Absorption of radiation. Radiation therapy. Diagnostic radiology. Radiological health, exposure limits, protection, survey and monitoring. Four hours lecture. Prerequisites: upper-division standing, medical school student or consent of instructor.
- 180C. Principles of Bioengineering** S Ultrasound and its biomedical applications. Basic principles of artificial organs. Material compatibility. Special devices. Bio-telemetry. Four hours lecture. Prerequisites: upper-division standing, medical school student, or consent of instructor.
- 198. Directed Group Study** (2-4) F-W-S Directed group study on a topic or in a field not included in the regular department curriculum, by special arrangement with a faculty member. Prerequisite: consent of instructor.
- 199. Independent Study for Undergraduates** (4) F-W-S Independent reading or research on a problem by special arrangement with a faculty member. Prerequisite: consent of instructor.

GRADUATE

- 205. Graduate Seminar** (0) F-W-S All graduate students in AMES are expected to attend the biweekly departmental research conference. On alternate weeks, all graduate students should attend a departmental seminar of their choice dealing with current topics in fluid mechanics, solid mechanics, bioengineering, or guidance and control. (Satisfactory/Unsatisfactory grades only.)
- 206. Physical Principles and Problems** (1) W Principles of applied science illustrated by problems in mechanics, dynamics, electricity, optics, thermodynamics, etc. Presentation of individual research. Preparation of interdepartmental oral examination.
- 210A-210B-210C. Introductory Fluid Mechanics** (3-3-3) F-W-S Physical properties of fluids; kinematics; potential flow; wing theory; surface waves; gas dynamics; shock waves; Navier-Stokes equations; boundary layers; turbulence. Prerequisites: undergraduate fluid mechanics and thermodynamics, or consent of instructor.
- 211A. Propulsion: Air-breathing Engines** (3) F Propulsion of aircraft, missiles, and boosters by air-breathing engines, including cycle analysis, characteristics of engine components, and matching of engine components to produce an efficient engine. Prerequisites: undergraduate fluid mechanics and thermodynamics, or consent of instructor.
- 211B. Propulsion: Chemical Rockets and Mission Analysis** (3) W Solid- and liquid-propellant rocket engines, combustion processes, motor design and performance; rocket configurations; mission analyses; optimization calculations. Prerequisite: AMES 211A.
- 211C. Propulsion: Nuclear and Electric** (3) Principles of nuclear, electrothermal, electrostatic and electromagnetic propulsion; high-temperature gas flows; electromagnetic momentum and energy equations, Ohm's Law; applications to electric thrusters. Prerequisites: AMES 211B, undergraduate electricity and magnetism; or consent of instructor.
- 220A. Physical Gas Dynamics** (3) F Kinetic theory of neutral gases; transport properties; principles and applications of statistical mechanics. Prerequisites: AMES 210A-210B-210C, Mathematics 110A-110B, 120, Physics 140, or consent of instructor.
- 220B. Physical Gas Dynamics** (3) W Principles of electrodynamics and quantum mechanics; theories of atomic and molecular structure; perturbation method in quantum mechanics; semiclassical treatment of radiation; scattering phenomena; transition probabilities; vibrational relaxation; dissociation; ionization, and recombination. Prerequisites: AMES 220A, Physics 130A-130B, or consent of instructor.
- 220C. Physical Gas Dynamics** (3) S Shock waves and detonation waves; explosions and hypersonic flow; experimental methods in high-temperature gases; shock tubes; atomic and molecular beams; selected topics such as chemical reactions and relaxation processes in turbulent flow interaction of radiation with ionized gases and gas lasers. Prerequisite: AMES 220B, or consent of instructor.
- 221A. Opacity Calculations** (3) F Basic laws for radiant-energy emission from gases, liquids, and solids; spectral absorption coefficients, line shapes, curves of growth; theoretical and experimental methods for estimating opacities of uniform and non-uniform gases. Prerequisite: consent of instructor.
- 221B. Radiative Transfer Theory** (3) W Fundamental quantities and the equation of transfer; methods of solving radiative transfer problems for gray and non-gray gases; nonstationary problems. Prerequisite: AMES 221A, or consent of instructor.
- 221C. Radiation Gas Dynamics** (3) S Conservation equations of gas dynamics including a radiation field. The effect of radiative transfer on acoustic waves, shock-wave structure, and boundary layers; radiative cooling in the shock layers of high-velocity re-entry vehicles; radiative transfer effects on convection and turbulence. Prerequisite: AMES 221B, or consent of instructor.
- 222A-222B-222C. Advanced Fluid Mechanics** (3-3-3) F-W-S Contemporary problems in broad areas of fluid mechanics, e.g., surface waves, hydrodynamic stability, boundary layers with mass and heat transfer, turbulent-flow theory, multiphase systems, hypersonic-flow theory, shock-wave structure, theory of reacting flows, etc. Prerequisites: AMES 210A-210B-210C, 211A-211B-211C, Mathematics 110A-110B, 120, or consent of instructor.
- 223. Applications of Plasma Dynamics** (3) Energy conversion, unsteady and quasi-steady electromagnetic propulsion; MHD shocks and ionizing shocks; principles of photoelectric, thermoelectric, thermionic and electromagnetic energy conversion. Prerequisite: AMES 211C.
- 225. Selected Topics in Plasmadynamics** (3) Discussion of research areas under current investigation in plasmadynamics. Three hour lecture. Prerequisite: consent of instructor.
- 231A. Foundations of Solid Mechanics** (3) F Cartesian tensors; specification of stress, instantaneous motion, and infinitesimal strain; conservation principles; typical constitutive equations; specification of finite strain. Prerequisite: AMES 130B, or consent of instructor.

- 231B. Elasticity (3) W** Basic field equations; typical boundary value problems; uniqueness of solutions; torsion, flexure, and other simple problems; variational principles. Prerequisite: AMES 231A, or consent of instructor.
- 231C. Anelasticity (3)** Mechanical models of viscoelastic, plastic, and viscoplastic behavior in simple shear or uniaxial stress. Constitutive laws for three-dimensional states of stress and strain. Application to selected technological problems. Prerequisite: AMES 231B, or consent of instructor.
- 232. Matrix Methods in Structural Analysis (3)** Elements of matrix algebra; application of transfer matrix and force and displacement methods to linear and nonlinear problems. Application of finite elements techniques to elastic and anelastic problems. Prerequisite: AMES 231C, or consent of instructor.
- 233A. Advanced Elasticity (3)** Two-dimensional problems and complex variable methods; fundamentals of plate theory; application of potential theory to some three-dimensional problems; elastic waves, problems involving finite deformations. Prerequisite: AMES 231B, or consent of instructor.
- 233B. Advanced Plasticity (3)** Classification of plastic solids; behavior of plastic structures; limit analysis; plastic design and optimization; finite plastic deformation; application to technological forming processes; dynamic problems. Prerequisite: AMES 231C, or consent of instructor.
- 233C. Advanced Viscoelasticity (3)** Stress analysis problems for mixed and moving boundary conditions; temperature effect and irreversible thermodynamics; creep buckling; wave propagation; nonlinear constitutive equations. Prerequisite: AMES 231C, or consent of instructor.
- 234. Experimental Stress Analysis (3) W** Theory and technique of standard and newly developed methods; laboratory experience using modern instrumentation such as strain gages, capacitive piezoelectric and piezoresistive devices, and surface coatings; application of photoelasticity, laser interferometry, and holography to problems in static and dynamic elasticity and plasticity. Ultra-high-speed measurements will be emphasized. Prerequisite: consent of instructor.
- 235A-235B. Theory of Shells (3-3) F-W** General mathematical formulation of the theory of thin elastic shells: linear membrane and bending theories; small strain and finite rotation theories; shells of revolution; shallow shells; selected static and dynamic problems; survey of recent advances. Prerequisite: AMES 231B, or consent of instructor.
- 236. Structural Stability (3) F** Stability analysis of structural elements under steady, oscillatory, and impulsive loadings. Elastic and anelastic stability problems. Prerequisite: AMES 235A, or consent of instructor.
- 237. Vibrations of Structures (3)** Free and forced vibration of structural elements; frequency analysis; aeroelasticity and flutter analyses of wings, panels, shells. Prerequisites: AMES 210A and 233C, or consent of instructor.
- 238. Stress Waves in Solids (3) F** Linear wave propagation: plane waves; reflection and refraction; dispersion induced by geometry and by material properties. Application of integral transform methods. Selected topics in nonlinear elastic, anelastic and anisotropic wave propagation. Prerequisites: AMES 231A-231B-231C, or consent of instructor.
- 246A-246B-246C. Optimal Control Theory (3) F-W-S** Optimization theory and application with emphasis on topics of optimal control. Mathematical programming, necessary and sufficient conditions for optimality, computational algorithms. Maximum principle for optimal control systems, state and control variable constraints, reachable sets. Computational techniques for solution of optimal control problems. Prerequisite: AMES 146, or consent of instructor.
- 248A-248B-248C. Time Series Analysis (3) F-W-S** Regression analysis, trends and Smoothing, moving average and autoregressive processes. Stationary processes and spectral analysis, discrete Fourier transforms, digital filtering. Stochastic model building, spectral density and transfer function estimation, identification. Prerequisites: AMES 162, 163, or consent of instructor.
- 250A. Astrodynamics and Rocket Navigation (3) F-W-S** Practical application of celestial mechanics to vehicle analysis; elements of a two-body orbit; elliptical, parabolic, hyperbolic orbits. Coordinate systems; orbit transfer in single-force field and multiple-force field systems; optimal plane change; lunar flights; interplanetary flight; low-thrust vehicles. Prerequisites: AMES 120A or equivalent and consent of instructor.
- 251A. Guidance of Aerospace Vehicles (3) F-W-S** Survey of guidance problems; definitions, mission phases, guidance requirements, intercept (proportional navigation and homing), explicit and implicit guidance, rendezvous, methods of steering, steering control and stability, introduction to optimal steering laws. Prerequisites: AMES 141C, AMES 250A, or equivalent and consent of instructor.
- 251B. Gyrodynamics and Inertial Navigation Systems (3) F-W-S** Behavior of gyros and accelerometers; inertial navigation systems equations for cruise and orbiting vehicles; Schuler tuning, error analysis. Alignment; gyrocompassing on fixed and moving vehicles; four-gimbal, three-gimbal, and strapdown systems. Prerequisites: AMES 141C or equivalent and consent of instructor.
- 253A. State-Space and Time-Domain Approach to Control Theory (3)** Utility of time-domain methods in control system analysis and design. Matrix polynomials, functions of matrices, matrix differential equations, transfer function matrices, the fundamental (state-transition) matrix, canonical representation of dynamic systems. Controllability, observability. Stability analysis. Prerequisites: AMES 140C, Mathematics 2E.
- 256A. Advanced Rotational Dynamics (3) F-W-S** Topic chosen independently each year. Examples are classical and modern problems of rotation under specified excitation, stability of rotation and special equilibria, computer-oriented dynamical formalisms. Student may register for course more than once. Prerequisites: AMES 156 and consent of instructor.
- 256B. Spacecraft Attitude Control (3) F-W-S** The space environment and its role in attitude control of aerospace vehicles. Torques, including gravitational and magnetic. Inertial and optical sensors. Actuators. Design considerations in passive and active control. Prerequisites: AMES 156, and consent of instructor.
- 256C. Gyroscopic Stabilization and Sensing (3) F-W-S** Gyrostabilization of vehicles: ships, monorails, spacecraft; gyroscopic sensing of direction and vertical, with applications. Prerequisites: AMES 156, and consent of instructor.
- 264A-264B. Filtering and Random Processes in Control (3-3)** Extensive treatment of random processes in linear feedback systems, including optimum design; estimation theory, Wiener and Kalman filtering. Extensive treatment of nonlinear systems in the presence of a random noise. Prerequisites: feedback control theory and AMES 294A, or consent of instructor.
- 271A. Structure and Function of Tissue (3) F** A general survey will include examples of structure-function relationships at the cell and tissue level. Emphasis will be placed on components of the vascular system and related structures such as endothelium, erythrocytes, leucocytes, cardiac, smooth and skeletal muscle, connective tissue, basement membranes, and peripheral nerve cells. Prerequisite: consent of instructor.
- 271B. Circulatory System (3) W** Morphology and physical concepts of behavior of heart, large blood vessels, vascular beds in major organs and the microcirculation. Included will be the physical principles of blood flow, work of heart, electrophysiology of heart, pulse waves, descriptions of particular vascular beds and their biological and hemodynamic importance. Integration of separate components through nervous and humoral controls will be analyzed. Prerequisite: consent of instructor.
- 271C. Respiration and Cardio-Pulmonary Reflexes (3) S** General concepts and principles of morphology of lung and component structures, pulmonary gas exchange, cardio-pulmonary reflexes, and integrative action of nervous system on the pulmonary and respiratory system. Prerequisite: consent of instructor.
- 272. Bioengineering: Biomechanics and Systems Analysis (3)** Applications of continuum mechanics and systems analysis to specific problems such as wave propagation in blood vessels, stability theory, pressure-flow relationships, autoregulation, elasticity of red blood cells, mechanics of flow in small blood vessels, and geometry of vessels in relation to their behavior. Prerequisite: consent of instructor.
- 274. Advanced Cell Physiology (3)** An advanced course in selected areas of cell physiology for bioengineering, medical and biology students. Discussion of several special types of cells; endothelium, smooth-muscle cells, lymphocytes, neutrophils, platelets, macrophages, etc. The ultrastructure and biochemical characteristics of these cell types will be considered. Emphasis will be placed on quantitative measurements and analyses based on mathematical and physical principles. Prerequisite: consent of instructor.
- 275. Selected Topics in Bioengineering (3)** Discussion of research areas under current investigation in the bioengineering group. Visiting scientists will be invited to cover topics of current interest. Prerequisite: consent of instructor.
- 276. Laboratory Projects in Bioengineering (3) F** Theory of statistical inference, analysis, and design of experiments; data handling by digital computers, video tape recording, etc. Theory and application of optical and electronic instrumentation. The course will consist of lectures, conferences, and demonstrations, as well as the student's own selected laboratory project for study in depth. Prerequisite: consent of instructor.
- 277. Microcirculation in Health and Disease (2)** Structural and functional aspects of transport and blood-tissue exchange in key organs during states such as circulatory shock, bacterial toxemia, hypertension. Also physical and ultrastructural techniques used to analyze small vessel dynamics. Prerequisite: consent of instructor.
- 278. Advanced Biomechanics (3) W** Modern development of biomechanics at an advanced mathematical level. Treatment of problems of current interest in greater depth. Problems will be selected from circulation, microcirculation, cardiac and pulmonary mechanics, muscle mechanics. Prerequisites: AMES 272, and knowledge in applied mathematics and the mechanics of fluids and solids with a minimum at the level of AMES 100, AMES 101A-101B-101C, 130A-130B, Mathematics 110A-110B, 120.
- 279. Selected Topics in Biophysics (3)** Selected topics in biophysics with emphasis on the structure and function of biological membrane, electron and ion transport, excited states, wave propagation, muscle contraction, and photosynthesis. Prerequisites: AMES 272, and knowledge in applied mathematics and the mechanics of fluids and solids with a minimum at the level of AMES 100, 101A-101B-101C, 130A-130B, Mathematics 110A-110B, 120.
- 294A. Methods in Applied Mechanics (3) F** Probability distribution functions; statistical independence; functions of random variables; characteristic functions; correlation functions; time averages; sampling; the central limit theorem; spectral analysis; the Gaussian random process; narrow-band processes, linear systems; random walks, the Fokker-Planck-Kolmogorov equations and Brownian motion. Prerequisites: Mathematics 110A-110B, 120, or consent of instructor.
- 294B. Methods in Applied Mechanics (3) W** Motion of discrete and

continuous conservative systems; boundary-value problems of dynamics, eigenfunctions and eigenvalues; applications of integral transform methods, Green's functions, and calculus of variations. Stability of continuous systems. Prerequisites: Mathematics 110A-110B, 120, or consent of instructor.

294C. Methods in Applied Mechanics (3) S Continuation of 294B. Diffusion processes and transport phenomena (elliptic and parabolic equations, integral equations). Application of asymptotic expansions and singular perturbation techniques. Prerequisite: AMES 294B, or consent of instructor.

296. Independent Study (3-3-3) F-W-S

297. Research Techniques (1-6,1-6,1-6) F-W-S A course designed to present the techniques of research through organized lectures, special assignments and instruction on the techniques of selected research projects. Prerequisite: consent of instructor.

298. Directed Group Study (1-4) F-W-S Directed group study on a topic or in a field not included in regular department curriculum, by special arrangement with a faculty member. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

299. Graduate Research (1-12,1-12,1-12) F-W-S (Satisfactory/Unsatisfactory grades only.)

ANTHROPOLOGY

Office: 8012, Humanities and Social Sciences Building

F.G. Bailey, Ph.D., Professor of Anthropology

Roy G. D'Andrade, Ph.D., Professor of Anthropology

Robert I. Levy, M.D., Professor of Anthropology

Gananath Obeyesekere, Ph.D., Professor of Anthropology

*Melford E. Spiro, Ph.D., Professor of Anthropology

Marc J. Swartz, Ph.D., Professor of Anthropology

(Chairman of the Department)

Theodore Schwartz, Ph.D., Associate Professor of Anthropology

David K. Jordan, Ph.D., Assistant Professor of Anthropology

Joyce E. Justus, Ph.D., Assistant Professor of Anthropology

James Peacock, Ph.D., Visiting Associate Professor

(Winter and Spring 1973)

*On leave 1972-73

* * *

The Major Program

The Department of Anthropology offers courses in all major areas of social (including cultural and psychological) anthropology with special emphasis on culture change, development anthropology, comparative politics, comparative religion, culture and personality, and culture theory. In all instances, problems are examined within a comparative perspective, drawing upon materials from a variety of culture areas, and, more especially from Sub-Sahara Africa, Asia, Middle America, the Middle East, and Oceania. Students who major in anthropology can expect to acquire important substantial knowledge of the major culture areas of the world (especially the non-Western world) and a theoretical understanding of the processes of stability and change in cultural, personality, and social systems.

The normal sequence of courses for the major in anthropology includes the required "systems" sequence (Anthropology 105,106,107), and nine additional upper-division courses in anthropology.* Since all or some of the courses comprising this sequence are prerequisites for some upper-division courses, students are strongly advised to complete this sequence in their junior year.

Since anthropology has close affinities with a number of other disciplines, anthropology majors are urged to elect courses in other departments related to their special interests, especially the Departments of History, Linguistics, Literature, Philosophy, Psychology, and Sociology. Anthropology majors will be assisted by the department advisors in selecting a program designed for their own interests and needs.

*For students who have declared a major in anthropology prior to 1 January 1970, up to four (4) of these twelve (12) courses may be taken in other departments with the approval of the anthropology undergraduate advisor.

The Graduate Program

The Department of Anthropology provides broad training in social, cultural, and psychological anthropology. The aim of the graduate program is to train students in that range of theory and method necessary for the study of human communities in their cultural, social, and psychological aspects, and in their interrelationships. Consistent with this aim, the program stresses a broad approach to social behavior, social, cultural and personality organization, and systems of human thought.

Doctor's Degree Program

For Ph.D. candidacy the Department requires no fewer than three continuous quarters of residence (with a minimum registration of six units — or two courses — per quarter), and an additional and subsequent six courses (typically requiring an additional academic year) exclusive of T.A. or R.A. credit. The Department also requires demonstration of competence in a scholarly language other than English. (See below: Language Requirement.) With respect to subject matter, the Department stipulates that

students must complete the following minimal schedule of required courses, if they have not already had them, before being advanced to Ph.D. candidacy: a minimum of six elective courses, in addition to

1. Three quarters of Systems (Anthropology 205,206,207)

2. Three quarters of Research Seminar (Anthropology 208, 209, 210)

3. One quarter of linguistics*

4. One quarter of statistics (can be satisfied by Anthropology 212)

*Typically, Linguistics 100.

Additional courses may be required, depending upon the needs and special interests of particular students. Any courses taken outside the Department of Anthropology (including courses required by Departmental regulations) must be approved by the student's Advisor. Departmental requirements may be reduced in view of substantial previous anthropological training (normally equivalent to one year of training in anthropology). Students entering with a B.A. in anthropology can typically expect to spend a minimum of two years in residence prior to advancement to candidacy; those entering with an M.A. in anthropology can typically expect to spend a minimum of one year. In either case the student will be advanced to Ph.D. candidacy when he has completed his Oral Qualifying Examination (see below), the above-mentioned Departmental requirements, and his minimum residence of no fewer than three continuous quarters.

Language Requirement

The language requirement will be met by examination. Students submitting French, German, Russian, or Spanish for examination will take standardized Educational Testing Service tests administered several times a year through the Registrar's Office. The Department has set 500 as the minimum passing score in these examinations. Students submitting other languages for examination will be examined by the Linguistics Department so long as personnel are available to administer the test. All tests are based on reading knowledge only. Every student must have the approval of his Departmental Committee for the language on which he wishes to be examined.

Progression to the Degree

The first year is devoted to general studies in anthropology, including the Systems sequence (Anthropology 205-206-207) and the Research sequence (208, 209, 210).

At the end of the first year the student will stand for a written *General Examination* covering the materials presented in the Systems and Research sequences. The examination will be prepared by the instructors of the Systems and Research courses, and will be read by the entire faculty. The results of this examination, together with the competence displayed in his course work, will determine whether the student will be permitted to proceed with the doctoral program.

Assuming satisfactory progress in the degree program and adequate fulfillment of academic responsibility, the student will continue with the doctoral program after this point, although he may be required to repeat some subsequent work.

The second year: normally some time during the second year the student in consultation with the Graduate Adviser will form his Departmental Committee. (See below: *The Student's Committees*.) Under the supervision of his Departmental Committee, and following a time schedule agreed upon with them, the student will prepare a written research proposal.

The research proposal will set forth a specific research project (normally involving fieldwork). At a time to be determined in consultation with his Departmental Committee, the student will stand for an *Oral Qualifying Examination* before his Doctoral Committee, accompanied by other members of faculty attending optionally. (See below: *The Student's Committees*.) This examination will question the student over general areas of anthropology related to the specific issues raised by his research proposal. The proposal presentation will typically occur during the third year. The Oral Qualifying Examination may be taken several times as may be necessary to attain the required level of success.

Upon completion of his research project the student will write a dissertation. He will then take his final Dissertation Orals. The examination may not be conducted earlier than three quarters from the date of his advancement to candidacy. Revisions may be indicated, requiring this examination to be taken more than once.

Teaching

In order to acquire adequate teaching experience, all students are required to participate in the teaching activities of the Department at least one quarter a year in every year of residence.

The Student's Committees

Entering students will normally discuss their training and consult with the Graduate Adviser. During the second year the student will choose a Departmental Committee in consultation with the Graduate Adviser, consisting of a committee chairman and at least two other faculty members. Typically all three members will be from the Anthropology Department. The Departmental Committee will be the student's primary advisory group.

In addition, each student will have a Doctoral Committee which will serve as an examining board and be responsible for conducting the Oral Qualifying Examination and the Dissertation Orals. The Doctoral Committee will consist of five or more members, normally including the student's Departmental Committee and two members from outside the Department.

COURSES

LOWER DIVISION

The Department of Anthropology cooperates in the teaching and administration of the Third College Third World Studies program. The anthropology offerings (which, from year to year, will rotate among Africa, Asia, Middle America, and Oceania), will both satisfy the Muir College Social Science requirement, and provide elective lower-division courses in anthropology.

7. The Individual and Culture Anthropological perspectives on the effects of various socio-cultural contexts on individual experience. The emphasis will be on data from non-Western and technologically simple societies.

12. Chinese Society and Culture A description and interpretation of the major institutions and culture patterns of traditional China.

15. Society and Culture in West Africa An introduction to West Africa, with particular emphasis on the role of pre-existing society and cultures in the emergence and development of the modern African States.

20. Introduction to Anthropology Contributions of anthropology to the understanding of man and culture and of human similarities and differences, and the relevance of tribal and peasant cultures to the understanding of the problems of the modern world. Two hour lecture, one hour discussion.

20E. Introduction to Anthropology (Seminar) This seminar is designed to deal with the same problems and cover the same material as Anthropology 20. However, in this experimental version the course will be taught through a seminar including not more than 20 students and a senior member of our department. Lecturing will be de-emphasized and instruction will emphasize student discussion and papers.

22. Introduction to the Study of Man F An introduction to the anthropological approach to the understanding of human behavior, with an examination of data from a selection of societies and cultures. Not open to students who have completed Anthropology 20.

23. Social Structure and Change W Examination of the problem of the maintenance of and change in human societies and other groups; factionalism, acculturation, assimilation, social evolution, urbanization, religious movements, and economic development.

24. Religion, Symbolism, Ideology and Personality S Examination of the roles of symbolism and ideology in human life with particular attention to religion and other organized systems of belief and practice.

UPPER DIVISION

103. Problems in Chinese Ethnology F Course will consider a different general area of the ethnology of China each year. In 1972-73 the focus will be on the analysis of the Chinese family. In 1973-74 the focus will be on the analysis of Chinese folk religion. Prerequisite: Anthropology 12, or permission of instructor.

105. Analysis of Social Systems F A systematic analysis of social systems, and of the concepts and constructs required for cross-cultural and comparative study of human societies. Prerequisite: Anthropology 20 or 22.

106. Cultural Systems W This course considers the nature of culture; its evolution, forms and processes; the variation and distribution of its content among the individuals of a society; the evaluation of cultures as adaptive and fulfilling systems. Prerequisites: Anthropology 20, 22, or 100, and consent of instructor.

107. Personality Systems in Anthropological Theory S Consideration of inter-relationships of aspects of individual personality and various aspects of sociocultural systems. The relation of sociocultural contexts to motives, values, cognition, personal adjustment, stress and pathology, and to qualities of personal experience will be emphasized. Prerequisites: Anthropology 20 or 22, 105 and 106.

108. Psychological Aspects of Modernization W A consideration of the experiences of individuals undergoing modernization. Emphasis is on working through life history materials that reveal the fantasies, symbols, ideologies, mental illnesses and cultural movements of individuals experiencing modernization in varied societies. Prerequisite: Anthropology 20 or 22.

109. Political Anthropology A critical evaluation of the major anthropological works on political behavior and political systems with an emphasis on establishing more adequate means for understanding the dynamics of politics as seen at the local level. Prerequisite: Anthropology 105 or permission of the instructor.

111. Development Anthropology F An anthropological perspective on the problems of development in formerly primitive or peasant societies. The course considers cultural, social and psychological factors affecting development in the newly emerging national states as well as the continuing development in industrial societies. Conditions and effects of rapid social and cultural change under conditions of social movements, industrialization, urbanization, population growth and environmental crises are also examined. An evolutionary and systems approach to planned and unplanned change. Prerequisites: Anthropology 20 or 22, upper-division standing.

112. Mathematical Anthropology W This course is designed to provide an introductory survey of how mathematics is used in the study of society and culture. Mathematical applications from probability theory, statistics, algebra and logic will be presented, covering formalization of both data analysis and theory construction. The course does not require mathematical maturity on the part of the student. Prerequisites: Anthropology 20 or 22, upper-division standing.

113. Evolution of Consciousness S A survey of stages in the evolution of society and of such forms of consciousness as religion, the arts, and ideology.

Writings considered include those of Durkheim, Erikson, Levi-Strauss, and Weber. Prerequisite: Anthropology 20 or 22.

114. Family, Childhood and Society A comparative and analytic study of the relationship between family structure and childhood experience, and their effects on social and cultural systems. Prerequisite: Anthropology 107 or equivalent.

116. Urban Anthropology W The evolution, form, systemics and culture of the city as artifact and environment for its component individuals, groups and communities, explored in terms of the methods and perspectives of anthropology.

117. Religious Cults and Social Movements S Religious cults and social movements will be studied particularly as they enter into rapid cultural and social change. Relations between cults and movements in form and process will be examined in a variety of specific cases. Prerequisites: advanced standing and permission.

118. Cognitive Anthropology F Course will consider the relation between cultural behavior and cognitive processes. Selected topics from the fields of ethnoscience, semantic and grammatical analysis, decision making, and belief systems will be discussed. Prerequisite: Anthropology 20 or 22 or equivalent.

119. Social and Cultural Change Theories of social evolution, diffusion, acculturation, pattern dynamics, innovation, revitalization and revolution, and modernization are examined, and illustrated with cross-cultural materials.

120. Buddhism and Society Buddhism as an ideology and an institution in relationship to the society, culture, and personality in which it is found. Prerequisites: upper-division standing; major in social science or humanities.

121. Introduction to the Analysis of Kinship This course will focus on the major British, French, and American theories concerning the nature and function of kinship institutions. A range of ethnographic studies will be covered, and implications of kinship studies to the general theories of society and culture discussed. Prerequisites: Anthropology 20 or 22, upper-division standing.

122. Social Theory W The course will deal with the social theories of some major figures in social science: Marx, Weber, Parets, Simmel, Durkheim, G.H. Mead. Their relevance for current theory will be discussed in detail. Prerequisites: Anthropology 20 or 22; senior standing.

123. Culture and Personality Relationships between personality, society and culture are examined under various models and methods ranging from characterizations of whole cultures and corresponding basic personality structures to empirical studies of distributions of personality characteristics in societies. Normal and abnormal behavior and the epidemiology of personality disorders are also considered.

125. Language and Culture This course explores language acquisition, idiolects, social dialects, levels of linguistic usage, language and old world view, the role of language in cultural interaction and social structure, and planned language change, including language problems in new nations and at an international level.

127. Race, Culture and Identity Consideration of race, ethnicity, and culture as these are conceived and used by men in various societies to form the bases of individual and group identities.

128. Peasant Organization and Conflict A study of peasant social and political movements with emphasis on the effects of village organization and the relations between village and urban society. Prerequisites: Anthropology 20 or 22 or Anthropology 105 and 107.

134. The Cultural Analysis of American Behavior Selected topics, such as kinship, sex roles, occupational goals, and medical practices, as culturally learned propositional systems. Social and individual functions of these propositional systems will also be considered. Prerequisite: Anthropology 20 or 22.

135. Indian Society W A study of the social structure of India, with particular reference to caste and political organization. Prerequisite: upper-division standing.

136. Caribbean Society and Culture A study of the comparative implications of migration, slavery and colonialism and the contributions of various immigrant groups to the development of national cultures.

138. Contemporary Chinese Society Transformations in Chinese society in the present century, with emphasis on continuity and disjuncture between traditional and communist China.

139. East Asia in the Perspective of Social Anthropology A consideration of selected aspects of the cultures and social organizations of China and of states heavily influenced by China (i.e., Korea, Japan, Vietnam).

140. Ethnography of Polynesia A study of some of the social, cultural and psychological characteristics of Polynesian peoples. Prerequisite: upper-division standing.

141. Religion and Society S A comparative study of religion as a cultural system. The analysis will focus on the relationship between religion and its social and psychological determinants, and its social and psychological functions. Materials are drawn from Western and non-Western, and primitive and high religions alike. Prerequisites: Anthropology 20 or 22, upper-division standing.

143. Education and Society S An examination of the evolution of the school as an institution in non-Western society, with special emphasis on the role of the school as a culture transmitting agency. Prerequisite: Anthropology 20 or 22 or consent of instructor.

151. Seminar in Political Anthropology S An examination of political processes at the local level with emphasis on examining supports for various aspects

of the processes considered (e.g., leadership, factionalism, etc.). Readings will stress case studies and theory. Prerequisites: upper-division standing, permission of instructor.

157. Culture, Deviance, and Psychopathology F A consideration of variations in definitions of, responses towards, and variation in frequency and form of deviant behavior and psychopathology in various cultural contexts. Prerequisite: Anthropology 7 or 20 or 22.

158. Psychoanalytic Anthropology F A critical examination of the anthropological works of Freud and of selected Freudian anthropologists and an assessment of their influence on anthropological theory. Prerequisites: Anthropology major; Anthropology 105, 106 and 107.

198. Directed Group Study (2 or 4) F-W-S Directed group study on a topic or in a field not included in the regular departmental curriculum by special arrangement with a faculty member. Prerequisites: consent of instructor and upper-division standing.

199. Independent Study F-W-S Independent study and research under the direction of a member of the staff. Prerequisite: special permission of instructor.

GRADUATE

201. Seminar in Theories of Aggression (3) Current theories of aggression in the behavioral sciences, and their application to the comparative analysis of society.

202. Interaction of Psychology, Culture, and Personality F This seminar will consider the relationships between social, cultural, and personality (especially motivational) forces. The emphasis will be on examining how motives are harnessed by existing social and cultural content and structures rather than on how the latter produce the former.

205. Analysis of Social Systems (6) F A systematic analysis of social systems, and of the concepts and constructs required for cross-cultural and comparative study of human societies. Prerequisite: graduate standing in social science or humanities.

206. Theory and Analysis of Social Systems (6) W The course will intensively survey theories of the nature of culture, its forms and transformations and the analysis of culture in behavior. Prerequisite: Anthropology 205.

207. Personality Systems in Anthropological Theory (6) S Consideration of inter-relationships of aspects of individual personality and various aspects of sociocultural systems. The relation of sociocultural contexts to motives, values, cognition, personal adjustment, stress and pathology, and to qualities of personal experience will be emphasized. Prerequisites: Anthropology 205 and 206.

208. Methodological Foundations of Anthropological Research (3) W This is the first quarter of a three-quarter required sequence in research methods in anthropology. It explores the theoretical and logical foundations of anthropological research with special attention to research design and problems of explanation. (Satisfactory/Unsatisfactory grades only.)

209. Research in Psychological Anthropology (1-6) F An introduction to a wide range of techniques including interview, observation and testing leading to psychological inferences about groups and individuals in a cross-cultural context. This course is a part of the three-quarter sequence in methodology in anthropology. (Satisfactory/Unsatisfactory grades only.)

210. Research Seminar (1-6) S This seminar provides graduate students with an opportunity to use and discuss the main field methods in social and cultural anthropology and to consider the problems associated with these methods. The genealogical method, various types of interviewing, and observational techniques will be among those discussed and employed by students in the practicum which is part of the course. (Satisfactory/Unsatisfactory grades only.)

212. Mathematical Anthropology (3) F This course is designed to provide an introductory survey of how mathematics is used in the study of society and culture. Mathematical applications from probability theory, statistics, algebra and logic will be presented, covering formalization of both data analysis and theory construction. The course does not require mathematical maturity on the part of the student.

216. Theory and Methods in Urban Anthropology (3) W The course will survey relevant theory, methods and research opportunities and needs in the comparative, systemic, or problem related research in both Western and non-Western urban settlements.

217. The Primitive Mind (3) W The course will consider the "primitive mind" from two aspects: first, as part of the Western ideology of "primitivism" and second, in terms of the empirical research bearing on special qualities of mentation in simple society.

218. Cognitive Anthropology (3) F This course will consider the relation between cultural behavior and cognitive processes. Selected topics from the fields of ethnoscience, semantic and grammatical analysis, decision making, and belief systems will be discussed. Prerequisite: graduate standing in anthropology or psychology.

220. Buddhism and Society Buddhism as an ideology and an institution in relationship to the society, culture, and personality in which it is found. Prerequisite: graduate student in social science or humanities.

221. Introduction to the Analysis of Kinship (3) This course will focus on the major British, French, and American theories concerning the nature and function

of kinship institutions. A range of ethnographic studies will be covered, and implications of kinship studies to general theories of society and culture discussed.

222. Overview of Basic Anthropological Theory All first year students will be required to undertake an intensive review and integration of basic anthropological theories to bring together their first year's work. An examination will be given. (Satisfactory/Unsatisfactory grades only.)

223. Culture and Personality A graduate level survey of relationships between personality, society and culture which are examined under various models and methods ranging from characterizations of whole cultures and corresponding basic personality structures to empirical studies of distributions of personality characteristic in societies. Normal and abnormal behavior and the epidemiology of personality disorders are also considered.

230. Aspects of Conflict and Unrest F-W-S (Satisfactory/Unsatisfactory grades only.)

234. The Cultural Analysis of American Behavior (3) Covers a range of topics in American culture focusing primarily on shared propositional systems. Research using informants will be required.

235. Caste and Stratification W An examination of theories which purport to explain the Indian caste system; their relation to theories of stratification in other societies; caste, race and class.

241. Religion and Society (3) S A structural-functional analysis of religious belief and ritual, with special emphasis on modes of explanation. Readings will stress the anthropological classics. Prerequisites: graduate standing, major in social sciences or humanities.

243. Education and Society (3) S A structural-functional analysis of education with particular emphasis on the role of education in the processes of modernization and development. Prerequisites: Anthropology 205, 206.

251. Seminar in Political Anthropology (3) An examination of political processes at the local level with emphasis on examining supports for various aspects of the processes considered (e.g., leadership, factionalism, etc.). Readings will stress case studies and theory. Prerequisites: graduate standing, major in social science.

255. The Anthropology of Modernization Theories of modernization with reference to particular case studies. Methodological considerations in the study of modernization from the perspective of anthropology.

258. Psychoanalytic Anthropology F A critical survey of the psychoanalytic approach to selected topics in anthropology, such as totemism, religion, social character, and so on. Readings will consist of the anthropological works of Freud and of Freudian anthropologists. Prerequisite: Graduate standing in anthropology.

297. Research Practicum (1-4) F-W-S Supervised advanced research studies with individual topics to be selected according to the student's special interests.

298. Independent Study (1-12) F-W-S (Satisfactory/Unsatisfactory grades permitted.)

299. Thesis Research (1-12) F-W-S Prerequisite: Ph.D. candidate.

500. Apprentice Teaching (1-4) F-W-S The course, designed to meet the needs of graduate students who serve as TA's, includes analyses of texts and materials, discussion of teaching techniques, conducting discussion sections, formulation of topics and questions for papers and examinations, and grading papers and examinations under the supervision of the instructor assigned to the course. Participation in the undergraduate teaching program is required for the Ph.D. degree. The amount of teaching required is equivalent to the duties expected of a 0.25 teaching assistant for three academic quarters. Enrollment for 2 units in this course documents the requirement for each quarter. (Satisfactory/Unsatisfactory grades only.)

APPLIED PHYSICS AND INFORMATION SCIENCE

Office: 3216 Applied Physics and Mathematics Building
Victor C. Anderson, Ph.D., Professor of Applied Physics
(Sea Grant College)

W. Ian Axford, Ph.D., Professor of Applied Physics

Henry G. Booker, Ph.D., Professor of Applied Physics

Kenneth L. Bowles, Ph.D., Professor of Applied Physics

(Director of the Computer Center)

† Jules A. Fejer, D.Sc., Professor of Applied Physics

Carl W. Helstrom, Ph.D., Professor of Applied Physics

(Chairman of the Department)

Adolf W. Lohmann, Ph.D., Professor of Applied Physics

Manuel Rotenberg, Ph.D., Professor of Applied Physics

Victor H. Rumsey, D.Eng., Professor of Applied Physics

† Peter M. Banks, Ph.D., Associate Professor of Applied Physics

Huey-Lin Luo, Ph.D., Associate Professor of Applied Physics

William A. Coles, Ph.D., Assistant Professor of Applied Physics

* George J. Lewak, Ph.D., Assistant Professor of Applied Physics

Elias Masry, Ph.D., Assistant Professor of Information

and Computer Science

Walter J. Savitch, Ph.D., Assistant Professor of Information

and Computer Science

J. Pieter Schalkwijk, Ph.D., Assistant Professor of Information and Computer Science

* * *

Hannes Alfven, Ph.D., Professor of Applied Physics in Residence
Gustaf O. S. Arrhenius, Ph.D., Professor, Scripps Institution of Oceanography

Hugh J. A. Chivers, Ph.D., Lecturer in Applied Physics
Joe R. Doupnik, Ph.D., Lecturer in Applied Physics
Seibert Q. Duntley, Sc.D., Professor, Scripps Institute of Oceanography
Ray Fitzgerald, M.S., Lecturer in Applied Physics
Timothy H. Hankins, Ph.D., Lecturer in Applied Physics
Devamitta Mendis, Ph.D., Lecturer in Applied Physics
Barnaby J. Rickett, Ph.D., Lecturer in Applied Physics
R. Viswanathan, Ph.D., Lecturer in Applied Physics

* On leave Winter, Spring 1972/73

† On leave 1972/73

* * *

Computer Science for Non-Majors

An early introduction to the structure, programming, and general use of the modern digital computer is provided in APIS 10, an elective designed primarily for freshmen in all fields. Those who wish to pursue the subject further may take APIS 11, Non-Numerical Systems, in the winter and APIS 12, Numerical Analysis Applications, in the spring.

Modern Physics for Non-Majors and Others

APIS 20A-20B-20C forms a sequence of courses intended to introduce students of the humanities and social sciences to the forms of thought and current concerns of the physical sciences. APIS 20A is a survey of an important aspect of physics ranging from the Greeks to modern times. APIS 20B is a course on the earth, the sea, and the atmosphere, acquainting the student with the physical nature of his environment. APIS 20C is a descriptive course on the nature of the universe. This sequence is suitable for fulfilling the Muir College general education requirements.

The Major Program

The major is intended to provide a basic education in physics and mathematics, combined with the opportunity to study in depth one or more of those branches of applied physics and information science in which the department is particularly strong. The program is flexible so that students may concentrate on applied physics, on information science, or on a combination of both. The applied physics major corresponds roughly to what is called engineering physics in other universities; it prepares the student to apply the principles of classical and modern physics in industrial research and development or to pursue graduate study in those fields. The information science majors are similar to programs in many modern electrical engineering departments. It provides an entry to modern electronics, communications, optics, and acoustics.

The major necessitates taking basic courses in Physics and Mathematics in the lower division. Applied Physics majors in Muir College are required to take the Science 4A-4B-4C-4D-4E sequence and Natural Science 2D. Information Science majors in Muir College are required to take Science 4A-4B-4C. Revelle College students may take Natural Science 2A-2B-2C-2D-2E. All APIS majors are required to take Mathematics 2D and Mathematics 2E. The freshman course APIS 10 is recommended for all students. All students intending to do experimental work after graduation, whether in industry or in graduate school, are advised to take the electronics sequence APIS 16A-B-C. A grade of C or higher is required in all courses included in the major program.

Laboratory Facilities

The department possesses various laboratories and shops whose facilities may be used by qualified undergraduate and graduate students. Electronics, microwave, and optical equipment is available, including apparatus for making holograms. A materials laboratory contains vacuum and cryogenic equipment for low-temperature studies, a high-vacuum furnace, thin-film preparation equipment, and a clean box with controlled atmosphere. Analytical facilities include a high-power optical microscope, mechanical and electrical polishing and etching equipment, and an x-ray diffraction unit. A departmental computer facility includes a micro-programmable computer with 32,000 words of core, a disk and disk operating system, magnetic tapes, analog-digital converters, a printer, a plotter, and two interactive graphics terminals. A digital-logic laboratory is available for designing interfaces and digital systems.

The Applied Physics Major

A student majoring in applied physics should find that the required courses listed below provide a sound education in physics, which will prove invaluable no matter what his future aims may be. The restricted electives listed involve intensive study of various specialized topics. A total of eighteen courses must be passed in order to satisfy the requirements for the major; of these, the fourteen in the table are required, and the remaining four must be chosen from the list of restricted electives. One complete sequence must be included from the restricted electives, together with at least one other course (e.g., APIS 164A-164B-164C and Physics 152). As there is no requirement for a student to take a minor subject in Muir College, Muir students may take an enriched program of courses in applied physics by choosing additional electives from the list of restricted electives. By making a careful choice of such courses,

a Muir College student may find that it is possible to satisfy many of the APIS graduate requirements in his senior year; and if his eventual aim is to take a Ph.D., he will be able to begin his research work earlier and spend a shorter time in completing the degree. It is recommended that the choice of restricted electives be discussed with the student's adviser.

	Fall	Winter	Spring
Junior Year	AMES/APIS 105A AMES 130A AMES/APIS 110 Elective	AMES/APIS 105B AMES 121A APIS 101A Elective	AMES/APIS 105C Elective APIS 101B Elective
Senior Year	PHYS 130A AMES 101A Elective Elective	PHYS 130B AMES 101B Elective Elective	AMES 111 APIS 130 Elective Elective
Restricted Electives	APIS 114A APIS 119A APIS 107 APIS 162A APIS 163A APIS 164A AMES 180A	APIS 114B APIS 119B APIS 108 APIS 162B APIS 163B APIS 164B AMES 130B AMES 180B	APIS 114C APIS 119C APIS 109 APIS 162C APIS 163C APIS 164C AMES 130C AMES 180C PHYS 152 AMES 121B AMES 101C
	AMES 120B		

The Information Science Major

The Department of Applied Physics and Information Science, recognizing the varied interests of students majoring in information science, invites each student to design his own program in accordance with his own vocational plans. As early as possible, and preferably before the beginning of the junior year, each student must discuss his curriculum with the information science faculty adviser, who has great latitude in approving major programs in information science. In general, any program with an information-science theme and an adequate educational and intellectual level will be approved.

The basic courses in information science are

APIS 105A-105B-105C Introduction to Mathematical Physics

APIS 161B-161C Introduction to Computer Science

APIS 163A-163B Linear Systems and Circuits

APIS 162A-162B Statistical Communication Theory

The first three are ordinarily taken in the junior year, the fourth in the senior year.

APIS 105 is a basic introduction to the principal techniques of applied mathematics, such as the solution of ordinary and partial differential equations, complex variables, and integral transforms. Students who are already adept at applying these techniques may wish to substitute for APIS 105 the three courses, Mathematics 120, Mathematics 110A, and Mathematics 110B, where the abstract foundations of some of these methods are stressed.

Systems Theory

In cooperation with the Department of Applied Mechanics and Engineering Sciences, the Department offers a program in systems theory, which will provide a good foundation in the modelling, analyzing, designing, and controlling of systems of all kinds. For this program students should take APIS 163A-163B-163C, APIS 162A-162B-162C, and AMES 141A-141B-141C. In addition, as technical electives the courses AMES 142A-142B-142C and AMES 146A-146B-146C are recommended.

Electronics and Communications

For electronics an introduction is provided through APIS 163A-163B-163C and APIS 164A-164B-164C, and APIS 150A should be considered as a source of additional laboratory experience. Students interested in communications should take the entire sequence, APIS 162A-162B-162C.

Acoustic Signal Processing

The study of acoustics at UCSD blends physics and information science, reflecting a strong local interest in using sound waves for oceanographic investigations. The sequence, APIS 163A-163B-163C, 162A-162B-162C, and 119A-119B-119C and AMES 101A-101B, are recommended for this program.

Optical Information Processing

Optics at UCSD is largely concerned with transmitting, storing, and processing information by optical means. Students who wish to study in this field should take APIS 114A-114B-114C (optics) in the senior year. APIS 101A-101B (electromagnetism) is an important prerequisite for optics and should be taken in the junior year. Students

whose interests are primarily in experimental optics should take APIS 164A-164B-164C; those interested mainly in the theory should take APIS 162A-162B-162C.

Computer Science

The basic information science courses may be supplemented by APIS 161A, APIS 165, APIS 167, and APIS 150A-150B. Credit for APIS 150C may be obtained by undertaking a special project in one of the laboratories in this or other departments where computers play an important role. Courses that will attract those interested in computer science are also offered in other departments such as AMES, Biology, Economics, Mathematics, Psychology, and Visual Arts. Several of these courses may, with approval, be included in the Information Science major.

The Graduate Program

There are three main divisions of study:

1. Applied Physics

This division includes the following areas of study:

- A) Radio Astronomy and Space Physics. The theoretical and experimental investigation of physical processes relating to the structure of the sun and planetary bodies. Current studies related to planetary atmospheres, ionospheres, magnetospheres, the nature of the solar wind and solar corona, comets, asteroids, interplanetary dust, and condensation of matter in space.

The Department has available the facilities of several radio astronomical observatories. In addition a large local radio observatory has been established to observe the structure of the solar wind by means of radio star scintillations.

- B) Materials Science, particularly Applied Solid State Physics. This field includes materials analysis (x-ray techniques, optical and electron microscopy, metallography), and when fully developed will also comprise materials purification, crystal growth and the study of metals, semiconductors, dielectrics, and ceramics. Areas of current research interest include the study of superconductors and the physics of metals and alloys.

2. Information Science

This division is concerned with the study of information-bearing symbols and their encoding, communication, and transformations; automata theory and the theory of computation; and acoustical, electronic, and optical signal processing.

Information processing is an area in which the department is particularly strong at the present time. Information processing involves the detection of signals and the transmission and processing of information in the acoustic, radio, and optical domains, the prediction and filtering of random processes, communication theory, and the propagation of acoustic and electromagnetic waves. Applications are made to such fields as communications, radar, sonar, oceanography, holography, image processing, and visibility in air and water. Information processing is carried out by electronic, acoustic, and optical filtering, photographically, and by digital computers. Both theoretical and practical aspects of information processing are studied.

3. Interdepartmental Curriculum in Applied Ocean Science

The Graduate Department of the Scripps Institution of Oceanography, the Department of Applied Mechanics and Engineering Sciences, and the Department of Applied Physics and Information Science offer an interdepartmental program in applied science related to the oceans. All aspects of man's purposeful and useful intervention into the sea are included. Students who enroll will receive the degree of Ph.D. upon completion of normal departmental requirements and certain others stipulated by an interdepartmental faculty committee.

Preparation

Applications will be considered from students who have taken undergraduate majors in one of the following disciplines: applied electrophysics, applied mathematics, applied physics, computer science, electrical engineering, engineering physics, engineering science, mathematics, and physics. In special circumstances alternative undergraduate preparation will be accepted, such as that of a biology major who is interested in the application of information science to biological problems. In appropriate cases provision will be made for graduate students to take, without credit, undergraduate courses required to make up deficiencies.

Department Requirements and Examinations

The requirements for the degree of Master of Science are those stated in the *Graduate Division* section of the catalog. Both Plans I and II are offered. Normally no financial support is offered to students enrolled in the M.S. program.

The department of APIS has established a set of requirements applying to the first two years of the Ph.D. program as described below.

1. **Core Courses:** Ph.D. students are required to take the following courses in their respective majors:

- Information Science: Mathematics 212A-212B-212C, APIS 260A-260B-260C, and APIS 262A-262B-262C.
- Applied Physics: AMES 294A-294B-294C, Physics 203A, APIS 208, Physics 203B, Physics 212A-212B, and APIS 206.
- Computer Science: APIS 264A-264B-264C, 265A-265B-265C, and Mathematics 212A-212B-212C, or Mathematics 200A-200B-200C.

2. **Paper Examination:** This examination is held once a year late in the Spring Quarter. All second-year Ph.D. students are required to take it. The examination consists of a presentation by the student on one of two topics before a committee of three faculty members. The topics, together with a list of references, will be given to the students about two weeks before the examination.

3. **Thesis Examination:** Ph.D. students are required to devote at least half their time to research during their second year. They are expected to present the results of their research before a committee of three faculty members. The thesis examination is held once a year late in the Spring Quarter.

4. **Criterion for a Satisfactory Performance:** Ph.D. students are expected to maintain, on an annual basis, a 3.4 grade point average for the core courses. They are expected to pass both the paper and thesis examinations. Ph.D. students entering with a Master's Degree may be exempted from the core-courses requirement.

A detailed description of the requirements for the Ph.D. program can be obtained from the department office.

Students who have satisfied these departmental graduate requirements may register for any APIS course on a Satisfactory/Unsatisfactory basis.

Dissertation

In order to be admitted to the qualifying examination a student must have satisfied the departmental graduate examination and have been accepted by a faculty member as a Ph.D. thesis candidate. A candidate for the Ph.D. will write a dissertation and defend it in a final oral examination conducted by the doctoral committee.

Financial Aids

Financial support is available to qualified graduate students in the form of fellowships, traineeships, loans, and assistantships. Stipends for half-time assistantships are about \$300 per month, with the possibility of full-time employment during the summer months. Requests for application forms for admission and financial support should be directed to the Department of Applied Physics and Information Science.

COURSES

LOWER DIVISION

The Department of Applied Physics and Information Science cooperates in the teaching and administration of the Science 4 sequence for Muir College students. (See course listings: *Science*.)

- 10. Introduction to Computer Science: The Digital Computer F-W-S** Introduction to digital computers for humanities and science freshmen. Lectures on computer organization and operation, algorithms, flow charts, ALGOL programming. Recitations review special problems and assigned ALGOL programs. (Upper-division students must have consent of instructor.)

- 11. Digital Computers: Non-Numerical Systems W** Introduction to system programming aspects. Applications: large information handling problems in the humanities; computer control. Techniques include lists, strings, disk files. Recitations and homework deal with selected projects in text editing, graphics, data storage and retrieval, simulation, programming language processors. Prerequisite: APIS 10 or consent of instructor. (Upper-division students must have consent of instructor.)

- 12. Digital Computers: Numerical Analysis Applications S** Introduction to elementary numerical analysis with emphasis upon computer applications. Solutions of non-linear equations and sets of linear equations. Matrix operations, interpolation, extrapolation, polynomial fits to data, numerical differentiation and integration, and solution of elementary differential equations. Prerequisite: APIS 10 or knowledge of ALGOL. (Upper-division students must have consent of instructor.)

- 20A. The Physics of Motion from Aristotle to Einstein F** The studies leading to the laws of motion as they emerged historically, starting from ancient times and leading through Newton to Einstein, including in the latter stages the study of light, electricity, and magnetism.

- 20B. The Nature of the Earth W** Descriptive introduction to earth science. Emergence of our present knowledge of the earth's interior, mantle, crust, oceans, and atmosphere through the study of gravity, seismology, magnetism, radioactive dating, heat flow, dynamics, and chemistry. Relation to environment and to space exploration.

- 20C. The Nature of the Universe S** Descriptive introduction to modern astronomy. Outline of our present picture of the universe. Optical, radio, x-ray and cosmic ray observations and emission processes. Stars and stellar evolution. Galaxies. Origin of the solar systems. Basic cosmology.

- 21. Space-Time Physics W** An introduction to the scientific viewpoint through study of Newton's laws of motion, gravity, orbits, inertial reference frames, the principle of relativity, conservation of energy and momentum, Galilean and Lorentz transformation, with applications to astronomy and space travel. Prerequisite: Mathematics 1A or 2A.

UPPER DIVISION

- 101A. Electromagnetism (static fields) W** Scalar and vector fields. Electrostatics, potential theory. Polarization, dielectric media. Capacitors. Steady currents, Ohm's Law, circuits. Magnetic fields: Biot-Savart law, vector and scalar potentials. Magnetic materials, hysteresis. Forces on charges and currents. Energy of electromagnetic fields. Prerequisites: Science 4E (or Natural Science 2E) and Mathematics 101.

101B. Electromagnetism (time dependent fields) S Faraday's Law, inductance; applications to motors, generators, transformers, A.C. circuits. Transmission lines. Displacement current. Maxwell's equations. Plane waves, polarization, Poynting vector. Waves in conducting and dielectric media. Reflection and refraction of waves; Snell's law, Fresnel equations. Prerequisite: APIS 101A.

105A-105B-105C. Introduction to Mathematical Physics F-W-S Differential equations, complex variables, and integral transforms with applications to problems in particle and rigid-body dynamics, vibrations, wave motion, electric circuits, heat conduction, and fluid dynamics. Prerequisites: Science 4A-4B-4C or equivalent and Mathematics 2D or equivalent.

107. Introduction to Plasma Dynamics F Cold plasmas, magnetoionic theory. Two-fluid equations; CMA diagram. Motion of a particle in electromagnetic fields, adiabatic invariants. Vlasov equation, Landau damping. Prerequisites: APIS 101B and APIS 105A.

108. Electromagnetic Waves W Waveguides, resonant cavities. Scattering and diffraction of plane waves. Antennae. Wave propagation in non-uniform and dispersive media. Geometrical optics. Prerequisites: APIS 101B and APIS 105A.

109. Magnetohydrodynamics S Equations of motion for a conducting fluid. Dimensional analysis. Maxwell stresses. Magnetohydrostatics. Frozen field theorem. Waves. Helmholtz and Rayleigh-Taylor instabilities. One dimensional flow. Shock waves. Prerequisites: APIS 101B and 105A.

110. Introductory Statistical Thermodynamics F First and second laws of thermodynamics from the microscopic and macroscopic points of view. The method of the most probable distribution. The ideal gas and equations of state. Small departures from equilibrium. Methods of cooling. The Gibbs and Helmholtz free energy. Transport coefficients Phase transitions. Prerequisites: Science 4 sequence and Mathematics 2D or consent of instructor.

114A. Optics I: Waves F Wave equation, Fresnel diffraction, Fraunhofer diffraction. Coherent image formation with lenses and holograms. Prerequisite: APIS 105C or consent of instructor.

114B. Optics II: Image Formation W Linear filter of coherent systems. Interference. Partial coherence. Holographic interferometry. Incoherent image formation as a linear filtering process. Prerequisite: APIS 114A.

114C. Optics III: Signal Processing S The space-bandwidth product. Information theory in optics. Superresolution. Spatial filtering. Optical analog computers. Hologram generation by computer. Prerequisite: APIS 114B.

119A. Acoustics I F Theory of vibrating systems: strings, bars, membranes. Prerequisites: Science 4 sequence and Mathematics 2D or consent of instructor. (Concurrent registration in APIS 119AL recommended.) Offered in alternate years only.

119B. Acoustics II W Transmission of sound waves in fluids, radiation, absorption, scattering. Prerequisite: APIS 119A or consent of instructor. (Concurrent registration in APIS 119BL recommended.) Offered in alternate years only.

119C. Acoustics III S Applications of acoustics. Architectural acoustics, speech and hearing, underwater sound. Prerequisite: APIS 119B or consent of instructor. (Concurrent registration in APIS 119CL recommended.) Offered in alternate years only.

119AL-119BL-119CL. Acoustics Laboratory F-W-S Experiments in acoustics complementing the APIS 119A-119B-119C lecture series. Prerequisite: concurrent registration in APIS 119A-119B-119C or consent of instructor. Offered in alternate odd years only.

120. Structures of Solids W Atomic structure, properties and growth of ordered and disordered solids. Laboratory work includes generation of x-ray spectra, symmetry determination by Laue technique, structure determination by single-crystal and powder techniques, electron diffraction and radial distribution analysis. Prerequisite: consent of instructor.

130. Applied Physics Laboratory S Individual and small group laboratory projects in various areas of applied physics. Projects may be chosen in electronics, radio physics, materials science, acoustics, or optics. Students will use existing apparatus and construct new apparatus. Prerequisite: consent of instructor.

150A. Digital Electronics Laboratory (2) F Design of digital hardware using integrated circuits. Special purpose hardware, analog/digital conversion, and computer interface design. The course is intended to be taken concurrently with APIS 161A. Prerequisite: consent of instructor.

150B. Computer Laboratory (2) W Direct manipulation of a small computer in a laboratory environment. Assembly language programming, design of firmware and software for real-time operation. Should be taken concurrently with APIS 161B. Prerequisite: consent of instructor.

150C. Computer Laboratory Project (2 or 4) S Computer related hardware and/or software design projects will be undertaken by individual students. Students must supply a project proposal and obtain a supervisor prior to enrolling. Prerequisites: APIS 150A-150B, and approval of instructor.

161A. Introduction to Computer Science F Boolean Algebra, combinational and sequential networks, digital machine design using MSI and LSI, microprogramming, small computer architecture. Prerequisite: APIS 10 or consent of instructor. (Concurrent registration in APIS 150A is recommended.)

161B. Introduction to Computer Science W Turing machines, machine

and assembly language, address modification, writing of assemblers, macro assemblers, input/output operations, data structures, sorting and searching. Prerequisite: APIS 10 or consent of instructor. (Concurrent registration in APIS 150B is recommended.)

161C. Introduction to Computer Science S String processing language, use of recursive functions, BN notation, ALGOL, parsing, and the writing of translators. Prerequisite: APIS 10 or consent of instructor.

162A-162B-162C. Statistical Communication Theory F-W-S Review of probability theory: combinatorial analysis, generating functions, random variables, distributions, expectations, limit theorems. Stochastic processes: correlation functions, spectral densities, the Gaussian process, orthonormal expansions, mean-square filtering. Elements of information theory: entropy, mutual information, channel capacity, coding. Prerequisite: APIS 163C.

163A-163B-163C. Linear Systems and Circuits F-W-S Network analysis, Kirchhoff's laws, topological and state-space methods, linear systems, exponential transforms, convolution integrals, sinusoidal steady-state analysis, equivalent networks, time-discrete systems, applications. Prerequisites: Mathematics 2D and 2E; APIS 105A-105B-105C or Mathematics 110A-110B, 120 taken concurrently.

164A. Semiconductor Physics F Brief review of quantum theory. Crystal lattices and Semiconductor Crystals. Band theory of solids. Electron and hole statistics. Carrier motion in semiconductors. Theory of p-n junctions. Semiconductor devices related to p-n junction diodes. Prerequisites: Science 4D, APIS 163C or Physics 101B or consent of instructor. (Concurrent registration in APIS 150A is recommended.)

164B. Electronic Circuits and Systems I W The junction diode, transistor and photocell characteristics and circuit models. Applications in common circuits such as regulated power supplies, digital logic circuits, amplitude modulators, detectors, frequency control circuits, amplifiers, oscillators and light detectors. Prerequisite: APIS 164A or consent of instructor.

164C. Electronic Circuits and Systems II S High frequency properties of junction diodes and transistors, lumped circuit models. Switching circuits, high frequency amplifiers, the parametric amplifier. Prerequisite: APIS 164B or consent of instructor.

165. Artificial Intelligence W Steps toward intelligent machine behavior: game-playing programs, heuristic and algorithmic methods, tree-searching; theorem-proving and problem-solving programs, pattern recognition, characteristic vectors and decision functions, training strategies, hierarchical structure. Appropriate programming languages. Prerequisite: APIS 10.

166. Interactive Graphics and Man-Machine Communication W Man-machine interface. Displays, generation of points, vectors, and complex structures. Interactive versus passive graphics. Pattern recognition, syntax tables, random nets. Data structures, graphics software. Mathematics of three-dimensions, projections, and the hidden-line problem. Graphical programs. Computer-aided design and instruction, animated movies. Prerequisite: APIS 161C.

167. Algorithms, Automata and Artificial Languages S Intuitive notions of algorithms, register machines, Turing machines, recursive functions, Markov algorithms, finite-state machines, minimalization and decomposition, regular expressions, context-free languages and push-down automata. Prerequisite: APIS 10 or consent of instructor.

181A-181B-181C. Topics in Technology and Modern Social Problems F-W-S The social impact of several technologies is explored. Social problem solving and the science-society interface are discussed. Emphasis is on power use in modern society; traffic control problems; social applications of remote probing methods; and automation in education. Prerequisites: Science 4A-4B-4C and APIS 10 or their equivalent and consent of instructor.

195. Teaching F-W-S Teaching and tutorial activities associated with courses and seminars. Not more than 4 units of APIS 195 may be used for satisfying graduation requirements. Prerequisite: permission of department chairman. (Pass/Not Pass grade permitted.)

199. Independent Study for Undergraduates F-W-S Independent reading or research by special arrangement with a faculty member. Prerequisite: consent of instructor.

GRADUATE

203A-203B. Optical Systems (3-3) W-S Fundamentals of optical systems which provide visual information, including photographic and electronic imagery. Geometrical, physical and physiological optics; radiometry, photometry, colorimetry, atmospheric optics, visibility; coherence, spatial frequency analysis, transfer functions, resolution, image evaluation, image reconstruction. Ultimate capabilities of optical systems. Prerequisite: consent of instructor.

204A. Advanced Acoustics I F Boundary value problems in vibrating systems, wave propagation in strings, bars and plates. Fundamentals of acoustical transducers. Prerequisites: APIS 119A-119B-119C. (Concurrent registration in 204AL recommended.) Offered in alternate years only.

204B. Advanced Acoustics II W Theory of radiation, transmission and scattering of sound with special application to ocean acoustics. Prerequisite: APIS 204A or consent of instructor. (Concurrent registration in 204BL recommended.) Offered in alternate years only.

- 204C. Advanced Acoustics III S** Signal processing in underwater acoustics. Theory and hardware embodiments. Prerequisite: 204B or consent of instructor. (Concurrent registration in 204CL recommended.) Offered in alternate years only.
- 204AL-204BL-204CL. Advanced Acoustics Laboratory (2) F-W-S** Experiments in acoustics complementing the APIS 204A-204B-204C lecture series. Prerequisites: Concurrent registration in APIS 204A-204B-204C or consent of instructor.
- 205A. Optics I: Waves (3) F** Wave equation, Fresnel diffraction, Fraunhofer diffraction. Coherent image formation with lenses and holograms. Term paper required. Prerequisite: APIS 105C or consent of instructor.
- 205B. Optics II: Image Formation (3) W** Linear filter theory of coherent systems. Interference. Partial coherence. Holographic interferometry. Incoherent image formation as a linear filtering process. Prerequisite: APIS 205A.
- 205C. Optics III: Signal Processing (3) S** The space-bandwidth product. Information theory in optics. Superresolution. Spatial filtering. Optical analog computers. Hologram generation by computer. Prerequisite: APIS 205B.
- 206. Quantum Electronics** Approximation methods for time-dependent problems. Absorption and emission of radiation. Application to masers and lasers. Prerequisite: Physics 212B or equivalent.
- 207. Introduction to Plasma Dynamics F** Cold plasmas, magnetoionic theory. Two-fluid equations; CMA diagram. Motion of a particle in electromagnetic fields, adiabatic invariants. Vlasov equation, Landau damping. Term paper required. Prerequisites: APIS 101B and 105A.
- 208. Electromagnetic Waves W** Waveguides, resonant cavities. Scattering and diffraction of plane waves. Antennae. Wave propagation in non-uniform and dispersive media. Geometrical optics. Term paper required. Prerequisites: APIS 101B and 105A.
- 209. Magnetohydrodynamics S** Equations of motion for a conducting fluid. Dimensional analysis. Maxwell stresses. Magnetohydrostatics. Frozen field theorem. Waves. Helmholtz and Rayleigh-Taylor instabilities. One dimensional flow. Shock waves. Term paper required. Prerequisites: APIS 101B and 105A.
- 212A. Advanced Plasma Physics I (3) F** The Vlasov plasma; conductivity tensor, waves, instabilities. Fluctuations in and scattering of electromagnetic waves by a plasma. Derivation of the Balescu-Lenard equation. High frequency conductivity. Quasi-linear theory. Parametric instabilities. Prerequisite: consent of instructor.
- 212B. Advanced Plasma Physics II (3) W** The Liouville equation, the BBGKY hierarchy, kinetic equations; Vlasov, Boltzmann, Fokker-Planck, Balescu-Lenard. Applications: Plasma equilibrium solutions, transport properties, instabilities. Prerequisite: consent of instructor.
- 212C. Advanced Plasma Physics III (3) S** Weakly non-linear wave-wave interaction: The decay instability, many wave interaction in the random phase approximation. Wave-particle interaction: quasi-linear theory, electron plasma oscillation turbulence. Prerequisite: consent of instructor.
- 224. Introduction to Radio Astronomy (3) F** Radio telescopes. Antennas for measurement of celestial brightness distribution. Receivers for detection of stochastic signals. Effects of aperture size, bandwidth and integration time. Radio continuum and line spectra. Partial coherence and Stokes' polarization parameters. Interferometric methods and synthesis of sky maps. Prerequisite: consent of instructor.
- 225. Signal Processing in Observational Physics (3) W** Spectral analysis and applications of Fourier transforms. Digital filtering. Mean-square filtering and signal detection. Antenna aperture and radar pulse synthesis. Applications to radio astronomy. Prerequisite: consent of instructor (APIS 162 and 224 desirable).
- 226. Wave Propagation through Random Media (3) F** Scattering of waves by a randomly varying medium. Applications to analysis of ground based measurements of radio wave scintillations to determine source size and structure, solar wind characteristics, ionospheric drift, and to probe the interplanetary and interstellar media. Prerequisite: consent of instructor.
- 227. Instrumentation in Applied Physics (3) W** Design, calibration, and testing of modern measurement systems. Electronic amplifiers, filters and detectors. Receivers. Microwave systems. Digital systems. Special devices; hybrid systems, noise generators, phaselock loops, etc. Prerequisite: consent of instructor.
- 228. Structure and Evolutionary History of the Solar System (3) W** The orbits of planets and satellites, the small bodies, the resonance structure, spin and tides, post-accretion changes in the solar system, formation of celestial bodies, spin and accretion, on the accretion of planets and satellites. Prerequisite: consent of instructor.
- 230. Structures of Solids (3) W** Atomic structure, properties and growth of ordered and disordered solids. Laboratory work includes generation of x-ray spectra, symmetry determination by Laue-technique, structure determination by single crystal and powder techniques, electron diffraction and radial distribution analysis. Term paper required. Prerequisite: consent of instructor.
- 260A-260B-260C. Advanced Communication Theory (3-3-3) F-W-S** Probability theory and its application to signal processing — an advanced treatment. Random variables, limit theorems. Random processes, correlation functions and power spectra, series representation, mean-square linear and nonlinear filtering and prediction, adaptive filtering, sampling and quantization, Markov processes. Prerequisites: APIS 162C and Mathematics 212C.
- 262A-262B-262C. Detection Theory (3-3-3) F-W-S** Hypothesis testing; detection of signals in white and colored Gaussian noise; Karhunen-Loeve expansion; estimation of signal parameters; maximum-likelihood detection; resolution of signals; detection and estimation of stochastic signals; applications to radar, communications, and optics. Prerequisite: APIS 162C.
- 263A-263B-263C. Information Theory (3-3-3) F-W-S** Principles of optimum communication: analog and digital modulation, mutual information and entropy, channel capacity, error exponents and the coding theorem, algebraic and sequential coding and decoding, use of feedback, multipath and diversity channels, source coding with a fidelity criterion. Prerequisites: APIS 162C and APIS 163C.
- 264A-264B-264C. Information Systems (3-3-3) F-W-S** Organization of computers and information-handling systems; resource allocation; aspects of switching and automata theory; computational models, algorithms, data structures; algebraic and symbolic programming languages; assemblers, macros, compilers translator writing systems. Prerequisite: APIS 161C or consent of instructor.
- 265A-265B-265C. Automata, Formal Languages, and Computational Complexity (3-3-3) F-W-S** Regular sets and finite state machines; context free languages and pushdown automata, ambiguous languages, deterministic languages, normal form theorems; Turing and register type machines, the halting problem, time and storage requirements; Blum axioms for computational complexity. Prerequisite: consent of instructor.
- 266. Applications of Graph Theory (3) S** Applications of the theory of graphs to information theory, game theory, and computers. Also source encoding, graph theoretic error correcting codes, communication networks, two-person zero-sum games, information retrieval and other topics. Prerequisite: consent of instructor.
- 267. Game Theory (3) W** Two-person zero-sum games, linear programming, utility theory, two-person general-sum games, n-person games, and applications to information theory and coding. Prerequisites: APIS 162 and APIS 266.
- 287A-287B-287C. Special Studies in Information Science (1-3, 1-3, 1-3) F-W-S** Topics of special interest in information science to be presented by staff members and graduate students under faculty direction. Subject matter to be announced before each quarter. Prerequisite: consent of instructor.
- 288. Special Topics in Applied Physics (1-6, 1-6, 1-6) F-W-S** A course to be given at the discretion of the faculty at which topics of current interest in applied physics will be presented by visiting or resident faculty members. Prerequisite: consent of instructor.
- 289. Special Topics in Information Science (1-6, 1-6, 1-6) F-W-S** A course to be given at the discretion of the faculty at which topics of current interest in information theory, computer science, or signal processing will be presented by visiting or resident faculty members. Prerequisite: consent of instructor.
- 290. Observatory Field Course (1-12, 1-12, 1-12, 1-12) F-W-S-Su** Methods of measurement, observation, and data processing used at radio, radar and optical observatories in astronomy and solar system physics; establishment and use of equipment for a current research investigation at an observatory; analysis and interpretation of results with a report. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)
- 291. Graduate Seminar in Applied Physics (1-1-1) F-W-S** Weekly discussion of current research literature. (Satisfactory/Unsatisfactory grades only.)
- 292. Graduate Seminar in Solar System and Space Physics (1-1-1) F-W-S** Research topics in radio astronomy and solar system physics. (Satisfactory/Unsatisfactory grades only.)
- 293. Graduate Seminar in Information and Computer Science (1-1-1) F-W-S** Research topics in information and computer science. (Satisfactory/Unsatisfactory grades only.)
- 294. Graduate Seminar in Applied Solid State Physics F-W-S** Research topics in applied solid state physics and quantum electronics. (Satisfactory/Unsatisfactory grades only.)
- 295. Graduate Seminar on the Evolution of the Solar System (1) F** Survey of different theories. Importance of plasma physics and celestial mechanics. Changes in the solar system since the time it originated. Tidal effects, resonances. Interaction between a rotating body and a surrounding plasma. Formation of planets, asteroids, and satellites. (Satisfactory/Unsatisfactory grades only.)
- 296. Graduate Seminar in Optical Signal Processing F-W** Research topics of interest in holography. (Satisfactory/Unsatisfactory grades only.)
- 297. Seminar in Applied Ocean Science (1-1-1) F-W-S** Topics in applied ocean science. (Satisfactory/Unsatisfactory grades only.)
- 298. Independent Study (1-12, 1-12, 1-12, 1-12) F-W-S-Su** Open to properly qualified graduate students who wish to pursue a problem through advanced study under the direction of a member of the staff. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)
- 299. Research (1-12, 1-12, 1-12, 1-12) F-W-S-Su** (Satisfactory/Unsatisfactory grades permitted.)
- 501. Teaching (1-4, 1-4, 1-4) F-W-S** Teaching and tutorial activities associated with courses and seminars. Not required for candidates for the Ph.D. degree. Number of units for credit depends on number of hours devoted to class or section assistance. Prerequisite: consent of department chairman. (Satisfactory/Unsatisfactory grades only.)

BIOCHEMISTRY

THE UNDERGRADUATE PROGRAM

The undergraduate program in biochemistry is an integrated program of course offerings by the Departments of Biology and Chemistry which leads to a bachelor's degree in either Biology or Chemistry. A student must meet the degree requirements of either the Department of Biology or Chemistry as outlined under the respective departments; this would include one of the following introductory courses normally taken during the junior year:

Muir Biology Majors: Biology 110A

Revelle Biology Majors: Biology 101C

Revelle Chemistry Majors: Chemistry 101C

During the senior year, students may take electives within the department of their major. These include the integrated Biology/Chemistry courses listed in this section.

THE GRADUATE PROGRAM

The Departments of Biology and Chemistry offer an integrated program of research training, courses and seminars leading to the Ph.D. degree in either biology or chemistry with emphasis on biochemistry. Each student selects a graduate research problem in the field of interest of a member of the faculty which are listed below.

Scripps Institution of Oceanography and the School of Medicine are an integral part of the University, and several of their faculty are active participants in the Biochemistry program. In addition, the University is close to the Salk Institute for Biological Studies and the Scripps Clinic and Research Foundation; several members of these institutions are adjunct professors at the University and are involved in the teaching aspects of the graduate program as well as serving as research advisers. Fully equipped, modern research facilities and libraries permit study in all major fields in biochemistry.

A student must meet the degree requirements of the Department to which he is admitted; these are discussed separately by the Biology and Chemistry Departments. A program of integrated Biology/Chemistry course offerings is described herein; other courses in biochemistry and related fields are listed in the course offerings of the Biology and Chemistry Departments.

Interested students may obtain application forms and further information from the Interdepartmental Committee on Biochemistry (Departments of Biology or Chemistry) University of California, San Diego, La Jolla, California, 92037. If possible, the students should indicate a preference for either the department of Biology or of Chemistry in applying for this program.

The participating faculty are:

John Abelson, Assistant Professor of Chemistry
 William Allison, Assistant Professor of Chemistry
 Andrew A. Benson, Professor of Marine Biology; Associate Director of Scripps Institution of Oceanography
 Stuart Brody, Assistant Professor of Biology
 Willie C. Brown, Assistant Professor of Biology
 Warren L. Butler, Professor of Biology
 Maarten J. Chrispeels, Assistant Professor of Biology
 Melvin Cohn, Adjunct Professor of Biology; Fellow, Salk Institute for Biological Studies
 Edward A. Dennis, Assistant Professor of Chemistry
 Russell F. Doolittle, Associate Professor of Chemistry
 Richard W. Dutton, Professor of Biology
 Walter Eckhart, Associate Adjunct Professor
 John Elovson, Assistant Professor of Biology
 David J. Faulkner, Assistant Professor of Marine Chemistry, Scripps Institution of Oceanography
 Morris E. Friedkin, Professor of Biology
 Peter Geiduschek, Professor of Biology
 Murray Goodman, Professor of Chemistry
 Mehran Goulian, Professor of Medicine
 Melvin H. Green, Associate Professor of Biology
 Francis T. Haxo, Professor of Marine Biology, Scripps Institution of Oceanography
 Masaki Hayashi, Associate Professor of Biology
 Donald R. Helinski, Professor of Biology
 John J. Holland, Professor of Biology
 Robert Holley, Adjunct Professor of Chemistry; Fellow, Salk Institute for Biological Studies
 Yasuo Hotta, Associate Research Biologist
 Stephen H. Howell, Assistant Professor of Biology
 Frank M. Huenneke, Adjunct Professor of Biology; Chairman, Department of Biochemistry, Scripps Clinic and Research Foundation
 Harvey Itano, Professor of Pathology
 Oliver W. Jones, Associate Professor of Medicine and Pediatrics
 Martin D. Kamen, Professor of Chemistry
 Nathan O. Kaplan, Professor of Chemistry
 Joseph Kraut, Professor of Chemistry
 William F. Loomis, Jr., Assistant Professor of Biology
 Steven E. Mayer, Professor of Medicine
 William D. McElroy, Professor of Biology (Chancellor)

Jerrold Meinwald, Professor of Chemistry
 Stanley L. Miller, Professor of Chemistry
 Stanley E. Mills, Professor of Biology
 William L. Nyhan, Professor of Pediatrics
 John O'Brien, Professor of Neurosciences
 Leslie E. Orgel, Adjunct Professor of Chemistry; Fellow, Salk Institute for Biological Studies
 Ramon Pinon, Assistant Professor of Biology
 Paul A. Price, Assistant Professor of Biology
 Arthur E. Robinson, Assistant Professor of Biology
 Percy J. Russell, Associate Professor of Biology
 Paul D. Saltman, Professor of Biology (Vice Chancellor-Academic Affairs)
 Gordon Sato, Professor of Biology
 Immo Scheffler, Assistant Professor of Biology
 Gerhard N. Schrauzer, Professor of Chemistry
 J. Edwin Seegmiller, Professor of Medicine
 Melvin I. Simon, Associate Professor of Biology
 S. Jonathan Singer, Professor of Biology
 Douglas W. Smith, Assistant Professor of Biology
 John Spizizen, Adjunct Professor of Biology; Chairman, Department of Microbiology, Scripps Clinic and Research Foundation
 Daniel Steinberg, Professor of Medicine
 Herbert Stern, Chairman of the Department and Professor of Biology
 Teddy G. Traylor, Professor of Chemistry
 Silvio S. Varon, Professor of Biology
 Benjamin Volcani, Professor of Marine Microbiology, Scripps Institution of Oceanography
 Nguyen-Huu Xuong, Associate Professor of Biology
 Bruno H. Zimm, Professor of Chemistry

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COURSES

Other courses in biochemistry and related fields are listed in the course offerings of the Biology and Chemistry Departments.

UNDERGRADUATE

101C. Metabolism and Biochemistry S The metabolism of organisms with respect to energetics, biosynthesis and nutrition. Prerequisites: Chemistry 141A-141B or 144A-144B.

110A. Biochemistry F General biochemistry. Required core course for Muir biology majors. Prerequisite: organic chemistry (Science 3D, 3E or equivalent).

110D. Physical Biochemistry F Physical chemical properties of biological molecules and their reactions. Equilibrium and irreversible thermodynamics, reaction kinetics, characterization of biopolymers. Required core course for Muir biology majors. Three hours lecture. Prerequisite: organic chemistry.

113. Chemistry of Biological Macromolecules S A quantitative discussion of the structure of biologically important macromolecules and the techniques used in their study. Prerequisites: elementary physical chemistry, organic chemistry and biochemistry.

114. Biochemical Structure and Function W Introduction to biochemistry from a structural and functional viewpoint. Prerequisites: elementary organic and physical chemistry (which may be taken concurrently).

116. Chemistry of Enzyme Catalyzed Reactions W A discussion of the chemistry of representative enzyme catalyzed reactions is presented. Enzyme reaction mechanisms and coenzyme chemistry are emphasized. Prerequisites: elementary physical chemistry, organic chemistry and biochemistry.

117. Human Biochemistry F An advanced course in biochemistry which will primarily deal with the molecular basis of human disorders. Prerequisite: elementary biochemistry.

118. Advanced Biochemistry F Advanced topics and recent advances in biochemistry for students already familiar with the subject matter of elementary courses. Prerequisites: elementary physical chemistry, organic chemistry and biochemistry.

199. Independent Study in Biochemistry F-W-S Independent literature or laboratory research by arrangement with, and under the direction of, a member of the Biology or Chemistry faculty. Prerequisites: permission of instructor and department.

GRADUATE

210. Seminar in Biochemistry (1,1,1) F Seminars presented by advanced graduate students which will explore topics in specialized areas of biochemistry and provide opportunities for students to gain experience on the organization, critical evaluation, and oral presentation of information from the literature. Each quarter a different topic is discussed; recent topics have included: Lipids, Membranes, Oxidative Phosphorylation, Nucleic Acid Structure, Function, and Synthesis, Protein Structure and Function, History of Biochemistry. Prerequisites: one year of graduate study.

211. Introductory Biochemistry (3) F A comprehensive course in introductory biochemistry. The course is intended for entering graduate students, including those who have not previously had a formal course in biochemistry. Prerequisites: physical and organic chemistry.

213. Chemistry of Biological Macromolecules (3) S A quantitative discussion of the structure of biologically important macromolecules and the techniques used in their study. Prerequisite: elementary physical chemistry.

215. Metabolic Control Mechanisms (2) A discussion of control mechanisms at different levels of cell function, which influence the activity of representative enzymes and metabolic pathways. Prerequisite: Chemistry 211 or equivalent.

216. Chemistry of Enzyme Catalyzed Reactions (3) W the chemistry of representative enzyme catalyzed reactions is presented. Enzyme reaction mechanisms and coenzyme chemistry are emphasized. Prerequisite: organic chemistry.

217. Human Biochemistry (2) F An advanced course in biochemistry which will primarily deal with the molecular basis of human disorders. Prerequisite: Chemistry 211 or equivalent.

218. Advanced Biochemistry (3) F Advanced topics and recent advances in biochemistry for students already familiar with the subject matter of elementary courses. Prerequisites: physical and organic chemistry and Chemistry 211 or equivalent.

219. Special Topics in Biochemistry (3,3,3) Recent topics have included: Techniques in Experimental Biochemical Dynamics, Topics in Biophysics.

299. Research in Biochemistry (1-12, 1-12, 1-12) F-W-S

BIOLOGY

Office: 2130 Bonner Hall

Warren L. Butler, Ph.D., Professor of Biology

Richard W. Dutton, Ph.D., Professor of Biology

Morris E. Friedkin, Ph.D., Professor of Biology

E. Peter Geiduschek, Ph.D., Professor of Biology

Clifford Grobstein, Ph.D., Professor of Biology

(Dean, School of Medicine)

Donald R. Helinski, Ph.D., Professor of Biology

John J. Holland, Ph.D., Professor of Biology

Harvey Itano, Ph.D., Professor of Pathology

Dan L. Lindsley, Ph.D., Professor of Biology

William D. McElroy, Ph.D., Professor of Biology (Chancellor)

Stanley E. Mills, Ph.D., Professor of Biology

Paul D. Saltman, Ph.D., Professor of Biology

(Vice Chancellor — Academic Affairs)

Gordon H. Sato, Ph.D., Professor of Biology

S. Jonathan Singer, Ph.D., Professor of Biology

Herbert Stern, Ph.D., Professor of Biology

(Chairman of the Department)

Silvio S. Varon, M.D., Professor of Biology

Melvin H. Green, Ph.D., Associate Professor of Biology

Masaki Hayashi, Ph.D., Associate Professor of Biology

Percy J. Russell, Ph.D., Associate Professor of Biology

Melvin I. Simon, Ph.D., Associate Professor of Biology

Nguyen-Huu Xuong, Ph.D., Associate Professor of Biology

Stuart Brody, Ph.D., Assistant Professor of Biology

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Maarten J. Chrispeels, Ph.D., Assistant Professor of Biology

John Elovson, Ph.D., Assistant Professor of Biology

Gary L. Freeman, Ph.D., Assistant Professor of Biology

Daniel K. Hartline, Ph.D., Assistant Professor of Biology

Stephen H. Howell, Ph.D., Assistant Professor of Biology

William F. Loomis, Jr., Ph.D., Assistant Professor of Biology

Muriel Nesbitt, Ph.D., Assistant Professor of Biology

Ramon Pinon, Ph.D., Assistant Professor of Biology

Immo E. Scheffler, Ph.D., Assistant Professor of Biology

Allen I. Selverston, Ph.D., Assistant Professor of Biology

Douglas W. Smith, Ph.D., Assistant Professor of Biology

Michael Soule, Ph.D., Assistant Professor of Biology

* * *

Yasuo Hotta, Ph.D., Associate Research Biologist

Kiyoteru Tokuyasu, Ph.D., Associate Research Biologist

Deborah J. Delmer, Ph.D., Assistant Research Biologist

Ruth Grobstein, Ph.D., Lecturer

Meredith G. Somero, Ph.D., Assistant Research Biologist

Doris B. Wilson, Ph.D., Assistant Research Anatomist

(Lecturer)

Melvin Cohn, Ph.D., Adjunct Professor

Walter Eckhart, Ph.D., Associate Adjunct Professor

Frank M. Huennekens, Ph.D., Adjunct Professor

Edwin Lennox, Ph.D., Adjunct Professor

John Spizzen, Ph.D., Adjunct Professor

William O. Weigle, Ph.D., Adjunct Professor

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MAJOR PROGRAMS

The undergraduate programs leading to a Bachelor of Arts in biology are aimed toward understanding the whole of the biological world in terms of the common principles which control living things. They are so designed to provide for the development of professional careers in the fields of biology and medicine. Although all the major programs reflect the striking advances made in biology in recent years and therefore require a substantial preparation in mathematics and the physical sciences, each of the programs is structured to meet the distinctive aims of its host college.

The Revelle Major in biology is intended for those who have a very strong interest in cellular and molecular biology. In order to fulfill this objective biology majors are required to take a substantial part of the course work which is required for chemistry majors. In general, the program is tightly knit and intended for those students who wish to train for this area of biology. The program is suitable for pre-medical students and with few exceptions is highly desirable for a variety of careers in biology.

The Muir biology major has a somewhat different structure from that of Revelle. Students selecting the Muir biology major get their basic chemistry preparation including organic chemistry during the lower-division years. In the upper-division years, the core program involves four subjects: biochemistry, genetics, molecular biology and cell biology. These include two laboratory courses. Beyond these courses the student is free to arrange for a selection of biology subjects in accordance with his special interest.

The Third College Health Science Major program is primarily designed for students intending to enter medical or dental schools or careers in the allied health professions. Students will receive most of their basic chemistry, physics and math preparation during the lower-division years. The upper-division courses will involve a seven-quarter sequence of courses in human biology and two additional courses in chemistry of biological compounds and in physical chemistry and applied math. The remainder of the Health Science Major program requirements consists of four supplementary courses to be chosen from the areas of environmental biology, molecular biology and biochemistry, public health and biotechnology. An official listing and details of the new courses for the Health Science Major will be provided in subsequent publications.

REVELLE COLLEGE

Major Program in Biology (Recommended Schedule)

	FALL	WINTER	SPRING
Junior Year	Genetics 101A Genetics 103 (1/2 course) Organic Chemistry 140A Organic Chemistry Lab. 143A (1/2 course)	Dev. Phys. 101B Organic Chem. 140B Phys. Chem. 131	Biochemistry 101C Phys. Chem. 132 Phys. Chem. Lab. 105A (1/2 course)
Senior Year	Molecular Bio. 111A Biochem. Lab. 102	Cell Bio. 111B Cell Biology Laboratory 112	Pop. Biology and Ecology 111C

Students who have completed either the Natural Sciences 1 or 2 sequence are qualified for the major program. In addition, biology majors are strongly advised to take Natural Sciences 2FL as an elective and Natural Science 2DL in place of Natural Science 2D. Mathematics 2D should be taken as an elective by students who have completed Mathematics 2C.

Biology majors are required to take the courses listed in the recommended schedule for the upper-division years. Chemistry 131, 132, and 105A can be taken in either the junior or senior year. In addition to the courses listed, a student is encouraged to elect other courses offered by the Biology and Chemistry Departments to broaden his knowledge in the natural sciences or pursue an area of special interest.

Noncontiguous Minor in Biology

Students majoring in a field outside the natural sciences may complete a noncontiguous minor in biology by taking some such combination as: Natural Sciences 2F or 2FL, Biology 101A-101B, 111C, 121 and 129. Additional upper-division biology courses will be available, and any six biology courses will complete the minor.

MUIR COLLEGE

Major Program in Biology (Recommended Schedule)*

	FALL	WINTER	SPRING
Junior Year	Biology 110A Biology 110X	Biology 110B Biology 115A (Laboratory)	Biology 110C Biology 115B (Laboratory)
Senior Year	Biology 110D		

* Prerequisites for the junior year biology course in Muir College are Science 3C, 140A-140B, Mathematics 2A-2B-2C or Mathematics 1A-1B-1C. All of these prerequisites should be taken in the first two years. (Science 4A-4B-4C are required but can be

taken at any time before graduation.) In the senior year, Muir biology majors may choose any combination of upper-division courses appropriate to their educational and career goals.

THIRD COLLEGE

Major Program in Health Sciences

(Recommended Schedule)*

	FALL	WINTER	SPRING
Junior Year	Organic Chemistry (biological compounds) Phys-Chem. of Biological Systems Cytology	— — Biophysical Physiology Human Development	— — Biochemical Physiology Pathology
Senior Year	Supplementary Course 1 Supplementary Course 2 Supplementary Course 3 Supplementary Course 4	Sensory-Motor Physiology	Behavioral Physiology

*Prerequisites: Science and Technology 1A-1B-1C, 2A; one additional quarter each of general and organic chemistry, and two additional quarters of physics. Three quarters of mathematics (including calculus) and one quarter of human genetics.

THE GRADUATE PROGRAM

Graduate studies for a Ph.D. degree in the Department of Biology are oriented mainly toward the development of the capacity for independent, imaginative and self-critical research and for teaching in the Biological Sciences.

There are no inflexible requirements for entrance to graduate study in the Department of Biology, but it is recommended that the student's undergraduate preparation include courses in calculus, organic chemistry, physical chemistry and biochemistry.

Formal course work and opportunities for dissertation research include most basic areas of biology with major emphasis in the general areas of biochemistry, genetics and developmental biology.

Doctor's Degree Program

A program of study, including seminars and courses that are appropriate to a student's background and interests, will be arranged, through consultation between the student and the faculty. During the first year of graduate study, each student undertakes a small research project in the laboratories of each of five different faculty members; he is expected to spend a major portion of his academic time on this project. The selection of laboratories is designed by the Graduate Committee in consultation with the student to give him a broad view of the research interests of the department. The only other course requirement is four units of Biology 500 (Apprentice Teaching in Biology) for every year of graduate study after completion of the rotation program. Much reliance is placed on informal instruction through early and close association of the student with the faculty and research staff, and through regular seminars. After becoming familiar with the research activities of the faculty through the laboratory rotation program, the student will begin work on a thesis research problem of his choice, no later than the end of the first year. By the end of the second year, the student will be required to take a two-part oral examination in order to be admitted to candidacy for the Ph.D. degree. The purpose of these examinations is to have the student demonstrate competence in the field of his major interest and in related fields of biology. The major remaining requirement for the Ph.D. degree will be the satisfactory completion of a dissertation consisting of original research carried out under the guidance of a faculty member. (See *Graduate Announcement: The Ph.D.*)

Close collaboration with members of the Departments of Chemistry, Physics and the School of Medicine is a vital and stimulating aspect of the biology program. Additional strength and breadth in biology is gained by collaboration with the Department of Marine Biology of the Scripps Institution of Oceanography, with the Scripps Clinic and Research Foundation and with the Salk Institute for Biological Studies. Students may carry out their dissertation research in collaboration with members of these groups.

INSTITUTE FOR STUDIES IN DEVELOPMENTAL BIOLOGY

The object of this Institute is to promote teaching and research in the field of developmental biology. Various disciplinary groups within the biomedical sciences are associated with the Institute. The common aim of these groups is to study developmental problems in different types of organisms, with approaches ranging from the molecular to the behavioral. Current research and instructional programs are in the field of developmental genetics, photobiology, reproductive biology, cytodifferentiation, biochemical embryology, tissue-tissue interactions, and morphogenesis of subcellular components.

Graduate Program in Biochemistry

Please refer to the entry in the course listings.

COURSES

LOWER DIVISION

The Department of Biology cooperates in the teaching and administration of the Natural Sciences sequences for Revelle College students and the Science Sequence for Muir College students. (See *course listings: Natural Sciences or Science.*)

6. Principles of Modern Biology F The essentials of cell biology, elementary cell chemistry, genetics, and the biological basis of certain disease states will be emphasized. Not open to biology majors.

7. Man and His Environment Human evolution, the human body, the human population, the effect of modern society on the human body, human diseases, nutrition. Not open to biology majors.

8. General Microbiology General principles of microbiology for non-scientists, with emphasis on the cell biology of microorganisms, and of the cells with which they interact in causing diseases of man and animals. The microbiology of infection by bacteria, fungi and viruses, and host responses to infection.

10. Introductory Plant Biology Principles of plant anatomy, morphology, physiology, growth and development. Prerequisite: freshman chemistry.

11. Introduction to Animal Biology W Diversity in form and function in animals and the fundamentals of genetics, development, and evolution. Three hours lecture, three hours laboratory. Prerequisites: Natural Science 1A, Science 3A, or equivalent.

21. Introduction to Human Genetics Introduction to the principles of genetics with special emphasis on genetic systems in higher organisms, especially man. Prerequisites: Science and Technology 1A-1B-1C or equivalent.

UPPER DIVISION

101A. Genetics F An introduction to the principles of heredity, primarily in diploid organisms, including chromosome behavior in cell division, Mendelian inheritance, population genetics, linkage, sex determination, and behavior of chromosome aberrations. Three hours lecture and one hour recitation. Prerequisite: Natural Science 1C.

101B. Developmental Physiology W The development of organisms in relation to their functions and behavior, including the origins of multicellularity, cell-cell interactions, tissue interactions, fields and gradients, hormonal integration, neural integration and regeneration. Three hours lecture and four hours laboratory-recitation. Prerequisite: Biology 101A.

101C. Metabolism and Biochemistry S The metabolism of organisms with respect to energetics, biosynthesis and nutrition. Three hours lecture and two hours recitation. Prerequisites: Chemistry 141A-141B, Chemistry 143A.

102. Biochemical Techniques S A laboratory-lecture course in the application of biochemical methods to biological problems. Ten hours laboratory, one hour lecture and one hour recitation. Prerequisite: Biology 101C (may be taken concurrently).

103. Genetics Laboratory (2) F This course will emphasize the principals of Mendelian inheritance and will require the student to learn to apply the principals of cytology and genetics to problems of transmission genetics. Prerequisites: Natural Science 1C or equivalent; 101A (may be taken concurrently).

110A. Biochemistry F General biochemistry. Required core course for Muir biology majors. Prerequisite: organic chemistry. Three hours lecture.

110B. Molecular Biology Study of biological macromolecules, their synthesis and function. Special emphasis on nucleic acids, proteins and regulatory phenomena. Required core course for biology majors. Prerequisites: Biology 110A and 110X.

110C. Cell Biology The structure and function of cells. Cellular control mechanisms, cell division, cell differentiation and specialization. Required core course for all Muir biology majors. Prerequisite: Biology 110B.

110D. Physical Biochemistry F Physical chemical properties of biological molecules and their reactions. Equilibrium and irreversible thermodynamics, reaction kinetics, characterization of biopolymers. Required core course for Muir biology majors. Three hours lecture. Prerequisite: Organic Chemistry.

110X. Genetics F Introduction to genetics, covering transmission genetics, linkage and mapping, sex determination, haploid and microbial genetics and chromosome aberrations. Emphasis on certain aspects of human genetics, and on the role of genetics in biology. Prerequisites: Biology 10, 11 or equivalent.

111A. Molecular Biology F Molecular analyses of biological phenomena with special emphasis on genetics and metabolic regulation. Three hours lecture, two hours recitation. Prerequisites: Biology 101C, Chemistry 100A-100B.

111B. Cell Biology W The relation between the structure and function of cells, with particular emphasis on the role of the membrane and transport phenomena in cell and organelle physiology in selected cell type. Three hours lecture, two hours recitation. Prerequisite: Biology 111A.

111C. Population Biology and Evolution The behavior and flux within groups of organisms, particularly in relation to ecology and evolution. Three hours lecture, four hours laboratory-recitation. Prerequisite: Biology 101A-101B.

- 112. Techniques in Cell Biology W** A laboratory-lecture course in methods of studying cell organization and behavior. Ten hours laboratory, one hour lecture, one hour recitation. Prerequisite: Biology 111B (may be taken concurrently).
- 113. Chemistry of Biological Macromolecules** A quantitative discussion of the structure of biologically important macromolecules and the techniques used in their study. Prerequisites: elementary physical chemistry, organic chemistry, and biochemistry.
- 115A. Biochemistry Laboratory (4) W** Required core course for Muir Biology majors to be taken concurrently with Biology 110B. Six hours laboratory. Prerequisite: Biology 110A.
- 115B. Molecular and Cell Biology Laboratory (4) S** Required core course for Muir Biology majors to be taken concurrently with Biology 110C. Six hours laboratory. Prerequisite: Biology 110B.
- 116. The Chemistry of Enzyme Catalyzed Reactions** A discussion of the chemistry of representative enzyme catalyzed reactions is presented. Enzyme reaction mechanisms and coenzyme chemistry are emphasized. Prerequisites: elementary physical chemistry, organic chemistry, and biochemistry.
- 118. Advanced Biochemistry** Advanced topics and recent advances in biochemistry for students already familiar with the subject matter of elementary courses. Prerequisites: elementary physical chemistry, organic chemistry, and biochemistry.
- 121. Neurobiology I W** Survey of anatomy and physiology of invertebrate and vertebrate nervous integration; methods of study and modern developments in the system aspects of neural function. Three hours lecture. Prerequisite: general biology or general psychology.
- 123. Analysis of Development S** A study of the fundamental problems in developmental biology. Three hours lecture. Prerequisite: Biology 111B.
- 125. Cytogenetics** A review of the principals of chromosome structure and behavior. The topics covered change yearly over a three-year cycle. (a) chromosome structure and function, (b) chromosome pairing and segregation, and (c) chromosome recombination. Prerequisite: Biology 101A or equivalent.
- 127. Virology S** Molecular aspects of viral structure and development. Three hours lecture. Prerequisite: Biology 111A.
- 129. Structure and Function of Tissues F** This course corresponds exactly to AMES271. For description, see *Departments of Instruction: AMES*.
- 131. Marine Biology W** An introduction to life in the sea with emphasis on ecology and phylogenetic relationships. Prerequisite: Biology 11 or permission of instructor.
- 132. Cytology** A brief overview of gross anatomy and histology and introduction to cell biology. Prerequisites: Science and Technology 1A-1B-1C; Introduction to Human Genetics, Biology 21; Chemistry 2A-2B.
- 133. Computer Programming in Biology S** Limited enrollment for senior students, majoring in biology. Students will be instructed in the use of computer programming the collection and analysis of data from biological systems. Each student will be assigned an independent project. Prerequisite: knowledge of Fortran or Ditrans programming.
- 134. Physical Chemistry of Biological Systems** Elementary principles of equilibria and kinetics of chemical reactions in solution and their application to biochemical processes. Prerequisite: organic chemistry (may be taken concurrently).
- 135. Special Topics in Biology S** A lecture-discussion course designed by the graduate students under faculty supervision on ten biological topics covering issues of social importance. The student will select five of these for his particular program. Each topic will be developed under the guidance of a graduate student. Since the topics will vary from year to year, interested students are advised to contact the Biology office for the list of topics currently offered. Prerequisite: open to any upper-division student. Course limited to 50.
- 137. Human Genetics S** Human cytogenetics including normal chromosome behavior, abnormal chromosomal complements and chromosome breakage; human physiological genetics including consideration of hemoglobins, immunoglobulins, tissue antigens, and inborn errors in metabolism; human population genetics including consideration of sex ratio, linkage, inbreeding, and genetic load. Prerequisites: Biology 101A and Biology 101C or consent of instructor.
- 139. Comparative Physiology W** Structure and function of invertebrate and vertebrate physiological systems. Does not include nervous system. Three hours lecture. Prerequisite: general biology or consent of instructor.
- 142. Regulation in Higher Organisms** A discussion of the molecular basis or control mechanisms in the development and function of higher organisms.
- 143. Neurobiology II S** Biophysical basis of resting and action potential; synaptic transmission and properties of junctions. Neural coding; integration in sensory and motor systems. Three hours lecture. Prerequisites: Chemistry 100A-100B or consent of instructor.
- 143L. Laboratory in Neurobiology** Current electrophysiological techniques used to study nervous systems will be taught through exercises and individual projects. One hour lecture, six hours laboratory. Students must be interviewed by instructors before registering in this course. Prerequisite: Chemistry 100A-100B.
- 145. Endocrinology F** This course will cover the endocrine physiology of mammals with emphasis on human endocrinology. Topics covered will be neuro-endocrinology, reproductive physiology and mechanism of hormone action. Three hours lecture. Prerequisite: approval of instructor.
- 147. Immunology F** The course will deal with antibody structures, antigens, antigen-antibody interactions, immune response, immunological unresponsiveness, *in vivo* and *in vitro* consequences of antigen-antibody interactions, delayed hypersensitivity, control of the immune response and transplantation immunities. Prerequisite: Biology 101C.
- 151. Advanced Plant Biology** An analysis of those aspects of development in lower and higher plants which can be understood in molecular or cellular terms. Prerequisites: biochemistry, molecular and cell biology; senior standing.
- 157. General Microbiology** A discussion of the structure, growth and physiology of microorganisms with emphasis on their diverse activities and on their interaction with their environment. Prerequisite: junior core sequence in Muir or Revelle.
- 165. Immunochemistry S** Discussion of antibodies, antigens complement and their interactions. Three hours lecture. Prerequisite: Biology 110A.
- 171. Human and Animal Virology W** This course will cover all aspects of human and animal viruses and their activities. The biochemistry, cell biology, genetics and immunology of virus infection will be examined in lectures and in seminar-discussion format with student presentations. Two hours lecture, one hour seminar. Prerequisite: senior standing as biology major.
- 172. Evolution** Evolutionary processes are discussed in the genetic and ecological contexts. Emphasis on recent literature. Modern field and museum techniques are practiced. Prerequisite: Biology 101A or 110X.
- 174. Physiological Basis of Behavior S** The physiological basis of animal behavior, invertebrate, vertebrate and including man. Principles of ethology and their relation to neurophysiology and behavioral physiology. Stimulus filtering, releasers, motivation, development, feeding, communication, aggression, territoriality, reproductive behavior. Three hours lecture. Optional field work. Prerequisites: lower-division biology, physics, and chemistry; Biology 121 desirable.
- 190. Current Issues in Biology F** A special course of invited lectures by prominent biologists to familiarize students with some of the contemporary problems in biology. Two hours lecture. Prerequisites: senior standing in the major program and consent of instructor.
- 195. Introduction to Teaching in Biology S** Introduction to the teaching of the basic course in biology. A student under the direction of the instructor of the course will be assigned one class section and will meet one time per week with the section. A student will also be required to attend the lecture in the course and to meet at least one time per week with the instructor of the course. Limited to senior students who have a B average or better in their upper-division biology courses. Three hours lecture. Prerequisites: Biology 101A-101B-101C; 102; 111A-111B and 112.
- 199. Independent Study for Undergraduates F-W-S** Independent reading or research on a problem by special arrangement with a faculty member. Prerequisite: consent of instructor.

GRADUATE

203A-203B-203C. Laboratory Projects in Biology (3-12,3-12,3-12) An introduction to contemporary laboratory techniques and research interests through independent, original projects under the direction of individual faculty members. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

210. Seminar in Biochemistry (1) Seminars presented by advanced graduate students which will explore topics in specialized areas of biochemistry and provide opportunities for students to gain experience on the organization, critical evaluation and oral presentation of information for the literature. Each quarter a different topic is discussed; recent topics have included: lipids, membranes, oxidative phosphorylation, nucleic acid structure, function, and synthesis, protein structure and function, history of biochemistry. Prerequisite: one year of graduate study. (Satisfactory/Unsatisfactory grades permitted.)

211. Introductory Biochemistry (5) A comprehensive course in introductory biochemistry taught by members of the departments of chemistry, biology and medicine. The course is intended for entering graduate students, including those who have not previously had a formal course in biochemistry. Same as Chemistry 211. Prerequisites: physical and organic chemistry.

213. The Chemistry of Macromolecules (3) A quantitative discussion of the structure of biologically important macromolecules and the techniques used in their study. Same as Chemistry 213. Prerequisite: elementary physical chemistry.

215. Metabolic Control Mechanisms (2) S A discussion of control mechanisms at different levels of cell function, which influence the activity of representative enzymes and metabolic pathways. Prerequisite: Chemistry 211 or its equivalent.

216. Chemistry of Enzyme Catalyzed Reactions (3) A discussion of the chemistry of representative enzyme catalyzed reactions is presented. Enzyme reaction mechanisms and coenzyme chemistry are emphasized. Prerequisite: organic chemistry.

217. Human Biochemistry (2) An advanced course in biochemistry which will primarily deal with the molecular basis of human disorders. Prerequisite: Chemistry 211 or its equivalent.

218. Advanced Biochemistry (3) Advanced topics and recent advances in biochemistry for students already familiar with the subject matter of elementary

courses. Prerequisites: physical and organic chemistry and Chemistry 211 or equivalent.

219. Special Topics in Biochemistry (3) Recent topics have included: Techniques in Experimental Biochemical Dynamics, Topics in Biophysics.

220. Seminar in Genetics (1) Seminars presented by graduate students which will explore topics in specialized areas of genetics and provide opportunities for students to gain experience on the organization, critical evaluation and oral presentation of information for the literature. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

221. Cytogenetics (3) A review of the principles of transmission genetics, cytogenetics and chromosome structure. Discussion of current problems in these areas. Prerequisites: Biology 101A; 111B or equivalent.

222. Microbial Genetics (3) Description of bacterial and viral genetic systems, including the nature of the process involved in gene duplication, recombination and lysogeny. Prerequisites: Biology 101A; 111A or equivalent.

223. Molecular Genetics (3) Discussion of the molecular mechanisms involved in the transcription, translation and integration of genetic information. Prerequisites: Biology 101A; 111A or equivalent. (Satisfactory/unsatisfactory grades only.)

228. Virology (3) Molecular aspects of viral structure and development. Three hours lecture. Prerequisite: Biology 111A.

230. Seminar in Developmental Biology (1) Seminars presented by graduate students which will explore topics in specialized areas of developmental biology and provide opportunities for students to gain experience on the organization, critical evaluation and oral presentation of information for the literature. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

231. Regulation in Higher Organisms (3) A discussion of the molecular basis of control mechanisms in the function of specialized tissues of higher organisms. Prerequisite: Biology 123 or equivalent.

232. Cellular Aspects of Development (3) The behavior of cells in developing systems with special emphasis on mechanisms of regulation at the subcellular and molecular level. Prerequisite: Biology 123 or equivalent. (Satisfactory/Unsatisfactory grades permitted.)

233. Morphogenesis and Tissue Interactions (3) Nature and significance of formative processes in relation to cytodifferentiation, with particular emphasis on cell-cell and tissue-tissue interactions and their mechanisms. Prerequisites: Biology 101A-101B or equivalent.

240. Seminar in Population Biology (1) Graduate students will report on controversial and pivotal issues in contemporary ecological and evolutionary biology. Critical analysis and synthesis of the literature will be emphasized. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades only.)

242. Immunology (3) The course will deal with antibody structures, antigens, antigen-antibody interactions, immune response, immunological unresponsiveness, *in vivo* and *in vitro* consequences of antigen-antibody interactions, delayed hypersensitivity, control of the immune response and transplantation immunities. Prerequisite: Biology 101C.

243. Neurobiology (3) Biophysical basis of resting and action potential; synaptic transmission and properties of junctions. Neural coding; integration in sensory and motor systems. Prerequisites: Chemistry 100A-100B or consent of instructor.

243L. Laboratory in Neurobiology (2) Current electrophysiological techniques used to study nervous systems will be taught through exercises and individual projects. One hour lecture, six hours laboratory. Prerequisites: Chemistry 100A-100B and consent of instructor. (Limited to 15 students.)

244. Physiological Basis of Behavior The physiological basis of animal behavior, invertebrate, vertebrate, and including man. Principles of ethology and their relation to neurophysiology and behavioral physiology. Stimulus filtering, releasers, motivation, development, feeding, communication, aggression, territoriality, reproductive behavior. Three hours lecture, three hours lab or field work. Prerequisites: lower-division biology, physics, and chemistry; Biology 121 desirable.

250. Seminar in Immunology (1) The course involves weekly seminars given by faculty, postdoctoral research fellows, advanced graduate students, concerning current research in immunology and immunochemistry. One hour lecture. Prerequisite: approval of instructor. (Satisfactory/Unsatisfactory grades permitted.)

251. Combined Human Immunology A multiple discipline course in human immunology is planned with review of basic immunologic principles and immunopathologic mechanisms correlated to human disease. Lectures, demonstrations and case presentations will be used. Faculty will consist of basic scientists and clinicians from five departments who will relate their speciality to the problems of human immunobiology and disease.

252. Development in Lower and Higher Plants An analysis of those aspects of development in lower and higher plants which can be understood in molecular or cellular terms. Prerequisites: biochemistry, molecular and cell biology.

290. Special Topics in Biology (3) A course to be given at the discretion of the faculty in which integrative or interdisciplinary topics of biological interest will be presented by visiting or resident faculty members.

299. Research in Biology (1-12)

500. Apprentice Teaching (1-4) The course, designed to meet the needs of graduate students who serve as TA's, includes analyses of texts and materials,

discussion of teaching techniques, conducting discussion and/or laboratory sections, formulation of topics and questions for papers and examinations, and grading papers and examinations under the supervision of the instructor assigned to the course. Participation in the undergraduate teaching program is required for the Ph.D. degree. A total of 12 units is required for graduation. Normally, a student would take 4 units of this course (equivalent of 0.5 of an assistantship per quarter) in each of three successive years, beginning with his second year of graduate study. (Satisfactory/Unsatisfactory grades only.)

BIOPHYSICS

Office: 3426 Physics-Chemistry Building

This is an undergraduate program within the Department of Physics which prepares the student for a career in biophysics.

No graduate degrees in biophysics are awarded at present. Research in biophysics is being actively pursued in several departments (e.g. Physics, Chemistry, Biology) which also offer courses in or relevant to biophysics. A student interested in working toward a graduate degree in one of the areas of biophysics receives at present his degree from the department to which his thesis supervisor belongs.

It is contemplated to provide an interdisciplinary graduate degree in biophysics in the near future.

CHEMISTRY

Office: 2112 Urey Hall

Student Information: 4426 Physics-Chemistry Building

James R. Arnold, Ph.D., Professor of Chemistry

Murray Goodman, Ph.D., Professor of Chemistry

(Acting Provost, Revelle College)

Martin D. Kamen, Ph.D., Professor of Chemistry

Nathan O. Kaplan, Ph.D., Professor of Chemistry

Joseph Kraut, Ph.D., Professor of Chemistry

(Acting Chairman of the Department 1972-73)

Joseph E. Mayer, Ph.D., Professor, Emeritus

Jerrold Meinwald, Ph.D., Professor of Chemistry

Stanley L. Miller, Ph.D., Professor of Chemistry

G. N. Schrauzer, Ph.D., Professor of Chemistry

Kurt E. Shuler, Ph.D., Professor of Chemistry

Hans E. Suess, Ph.D., Professor of Chemistry

Teddy G. Traylor, Ph.D., Professor of Chemistry

Harold C. Urey, Ph.D., University Professor, Emeritus

Bruno H. Zimm, Ph.D., Professor of Chemistry

F. Thomas Bond, Ph.D., Associate Professor of Chemistry

Leigh B. Clark, Ph.D., Associate Professor of Chemistry

Russell F. Doolittle, Ph.D., Associate Professor of Chemistry

Robert C. Fahey, Ph.D., Associate Professor of Chemistry

Charles L. Perrin, Ph.D., Associate Professor of Chemistry

Joseph W. Watson, Ph.D., Associate Professor of Chemistry

(Provost of Third College)

Kent R. Wilson, Ph.D., Associate Professor of Chemistry

Nguyen Huu Xuong, Ph.D., Associate Professor of Chemistry

John Abelson, Ph.D., Assistant Professor of Chemistry

Edward C. Alexander, Ph.D., Assistant Professor of Chemistry

William S. Allison, Ph.D., Assistant Professor of Chemistry

Edward A. Dennis, Ph.D., Assistant Professor of Chemistry

Arthur F. Diaz, Ph.D., Assistant Professor of Chemistry

Robert G. Linck, Ph.D., Assistant Professor of Chemistry

Katja Lindenberg, Ph.D., Assistant Professor of Chemistry

in Residence

Kurt Marti, Ph.D., Assistant Professor of Chemistry

Robert L. Vold, Ph.D., Assistant Professor of Chemistry

John H. Weare, Ph.D., Assistant Professor of Chemistry

John C. Wheeler, Ph.D., Assistant Professor of Chemistry

* * *

Robert W. Holley, Ph.D., Adjunct Professor

Leslie E. Orgel, Ph.D., Adjunct Professor

Robert G. Bartsch, Ph.D., Associate Research Chemist

* * *

The Undergraduate Program

The undergraduate major in chemistry is intended to enable a student to pursue further studies in chemistry or in related fields of science, engineering, or medicine. The program combines a thorough preparation in the fundamentals of chemistry and related fields with an opportunity for more advanced work in particular areas of chemistry.

The student who is considering a chemistry major is advised to take the Natural Science 2 sequence. In any case Natural Science 20A, 20L, 2F and 2FL are essential.

The department strongly recommends that all chemistry majors take Mathematics 2D.

Transfer students should note that in the first two years of the Revelle College curriculum students take calculus and physics, and that the sophomore chemistry course is concerned with thermodynamics and quantum theory; organic chemistry is deferred until the junior year. Transfer students should have had a laboratory course equivalent to Natural Science 2DL and 2FL, usually approximated by quantitative analysis.

The departmental course requirements for the Bachelor of Arts degree in Chemistry are: Chemistry 130, 131, 132; 120A, 120B; 141A, B, C; at least four of the following five laboratory half courses, Chemistry 105A, 105B, 143A, 143B, 143C; five additional upper division or graduate courses in chemistry or related fields, including at least a half course of upper-division laboratory. The minimum passing grade in these courses is D and a minimum of a C average in the major is required for the degree. Opportunities for independent work and for research are available to qualified students through enrollment in Chemistry 199. Students should arrange a schedule for completing required courses in consultation with their faculty advisers at the start of the junior year.

Exceptions to these requirements may be made for students who wish to pursue more specialized programs such as biochemistry, geochemistry or chemical physics.

BIOCHEMISTRY: The following program is designed for those wishing to major in chemistry, but with an emphasis on biochemistry and, with the options indicated, is suitable for pre-medical students:

REVELLE COLLEGE

Major Program in Chemistry

for Premedical and Biochemistry Concentrators (Recommended Schedule)

	FALL	WINTER	SPRING
Junior Year	(Org) Chem 141A (Phy) Chem 130 -- -- (Org Lab) Chem. 143A	(Org) Chem 141B (Phy) Chem 131 (Biochemistry) Chem. 114 (Phy Lab) Chem. 105A (Org Lab) Chem. 143B**	(Org) Chem 141C -- (Biochemistry) Bio. 101C -- (Org Lab) Chem. 143C**
Senior Year	(Adv) Chem 118 (Inorg) Chem 120A (Human) Chem 117* (Mol Bio) Bio 111A*	(Enz) Chem 116 -- -- --	(Macro) Chem 113 -- -- --

* May be substituted by appropriate upper division courses in chemistry or biology with approval of adviser including (Research) Chemistry 199 and not more than one laboratory course (Molecular Biology) Biology 110B may be taken instead of (Molecular Biology) Biology 111A. Premedical students are advised to take two of the following three courses: (Genetics) Biology 101A, (Developmental Physiology) Biology 101B, or (Cell Biology) Biology 111B.

** (Biochem Lab) Biology 115A (4 units) or (Biochem Lab) Biology 102 (4 units) may be taken instead of (Organic Chemistry Lab) Chemistry 143B and (Organic Chemistry Lab) Chemistry 143C.

CHEMICAL PHYSICS: Prerequisites for this curriculum include Natural Science 2D and Mathematics 2E (may be taken in the junior year). Chemistry 141C and 143C are not required, instead the upper-division electives include Chemistry 133, Physics 110A, 110B and Mathematics 110A, plus any two of the following courses: Chemistry 102A, 102B, 190, 199, any graduate course in physical chemistry; Physics 100A, 100B, 100C, 130A, 130B, 130C, 131A; Mathematics 102A, 102B, 110B, 120.

CHEMISTRY MAJOR WITH SPECIALIZATION IN EARTH SCIENCES is also available for undergraduates. See *Earth Sciences* for description of this program, which may be arranged by consultation with advisers in the Department of Chemistry and Scripps Institution of Oceanography.

The Graduate Program

The Department accepts students for study toward the M.S. or the Ph.D. The Department usually recommends financial support only for students who are seeking the Ph.D. The doctoral program is designed to encourage initiative on the part of the student and to develop habits of independent study. Students with normal preparation start research early.

In order that he may participate effectively in this program, the entering graduate student will be required to have a mastery of the subjects usually presented in an undergraduate chemistry curriculum; physical, organic, and descriptive inorganic chemistry. So that the student may be properly advised, his mastery of these undergraduate subjects will be tested by written examination on his arrival. Deficiencies in undergraduate preparation must be remedied during the first year of graduate study. Physical chemists will be expected to present the equivalent of two years of physics, and mathematics at least through integral calculus. The appropriate background courses in biology or geology are highly desirable for students interested in biochemistry and geochemistry, respectively, but will sometimes be taken after arrival.

In the first year the student will usually take several of the graduate courses listed below. He may also take upper-division undergraduate courses and be assigned 3 units

of credit per course. Depending on his special interests, he may also take courses in other departments. The student will normally select his thesis adviser by the end of the first year of study and begin his thesis research. In the second year he will usually carry a lighter load of formal courses, but will continue to participate in seminars and informal study groups.

A reading knowledge of one foreign language (either German or Russian) is required for the Ph.D. This knowledge must be demonstrated by passing the Educational Testing Service examination with a score of 500 (see *Graduate Division: Foreign Language Requirement*). Another foreign language may be substituted for Russian or German through petition to the Chairman. Students whose native language is not English must demonstrate the ability to read, write, speak and understand scientific English. Normally this requirement is met by satisfactory performance in the usual graduate-level courses in chemistry and in the oral qualifying examination. The language requirement must be fulfilled before the qualifying examination is taken, usually in the second year of study.

The qualifying examination for admission to candidacy must be taken before the end of the fifth quarter of graduate study and will be conducted as follows:

The candidate will present a major and a minor proposition, the former consisting of a statement summarizing an original research problem or scientific idea not closely connected to his thesis. He should be prepared to discuss both the theory and the experimental techniques involved, as well as the significance of the proposition and its relation to previous knowledge.

The minor proposition may be similar to the major one, or it may consist of a critical survey of literature in some field of chemistry outside the student's main interest. This is intended to reveal the ability of the candidate to make a critical survey and adequate presentation and to provide him with the incentive to broaden his understanding of chemistry.

In special circumstances the doctoral committee may modify the examination at its discretion. For University requirements, see *Graduate Division*.

Successful passing of the qualifying examination advances the student to candidacy for the Ph.D. He then devotes most of his time to his thesis research and study. A final examination, conducted by the student's doctoral committee, is given upon completion of the dissertation. The examination is oral and deals with the dissertation and its relation to the general field of study.

Teaching experience is required of all chemistry graduate students. Every graduate student is required to perform half-time teaching for one quarter for every three quarters of residence. Course credit may be obtained for this teaching by registration in Chemistry 500.

The interdisciplinary tradition is strong on the San Diego campus. The chemistry faculty has close ties with the Departments of Aerospace and Mechanical Engineering Sciences, Biology, and Physics, as well as with the Scripps Institution of Oceanography and the Institute for Pure and Applied Physical Sciences. Opportunities and facilities are thus available to the graduate student for study and research in a wide variety of interdisciplinary fields. A high-speed computer is available for use by graduate students.

Graduate Program in Biochemistry

Please refer to *Biochemistry* section.

Graduate Program in Chemical Physics

The Department of Chemistry, in collaboration with the Departments of Physics and AMES (Applied Mechanics and Engineering Sciences), offers a strong and broad program in Chemical Physics. The entering graduate student has the opportunity to study and work with outstanding faculty in various fields of theoretical and experimental Chemical Physics. Fully equipped modern research facilities permit studies in most major fields of Chemical Physics. Faculty members involved in this program include: Mr. Clark, Mr. Mayer, Mr. Shuler, Mr. Vold, Mr. Weare, Mr. Wheeler, Mr. Wilson, Mr. Brueckner (Physics), Mr. Chen (Physics), Mr. Lin (AMES), Mr. Penner (AMES), Mr. Rand (AMES).

Joint Doctoral Program with San Diego State

The Department of Chemistry at UCSD cooperates with the Department of Chemistry in the Division of the Physical Sciences, San Diego State University, in offering a joint program of graduate study leading to the Ph.D. degree in chemistry.

An applicant for admission to the joint doctoral program must first be admitted to regular graduate standing in the Graduate Division of the University of California, San Diego, and to classified graduate standing in the Graduate Division of San Diego State College. In seeking admission to the two Graduate Divisions, the applicant must pay all fees required by each institution and comply with the admission procedures stated in this catalog and in the current edition of the Bulletin of the Graduate Division of San Diego State College, where the program is more fully described.

COURSES

LOWER DIVISION

The Department of Chemistry cooperates in the teaching and administration of the Natural Sciences sequences for Revelle College students. (See course listings: *Natural Sciences*.)

UPPER DIVISION

101C. Metabolism and Biochemistry S The metabolism of organisms with respect to energetics, biosynthesis and nutrition. Prerequisites: Chemistry 141A-141B or 144A-144B.

102A. Thermodynamics F Thermodynamics of Chemical Systems; the three laws with emphasis on the formal structure of thermodynamics. Chemical equilibrium, stability theory, heterogeneous equilibrium. Solutions. Intended as a preparation for Chemistry 204A.

103. Molecular Spectroscopy The interaction of electromagnetic radiation with molecules will be treated both theoretically and experimentally. Topics to be covered include rotational, vibrational and electronic spectroscopy, electron spin resonance, nuclear magnetic resonance, and structural determination by x-ray diffraction. Prerequisites: Chemistry 130, 131, 132.

105A. Physical Chemistry Laboratory (2) F-W-S Laboratory course in experimental physical chemistry. Prerequisites: Chemistry 100A; 100B (may be taken concurrently).

105B. Physical Chemistry Laboratory (2) S Laboratory course in experimental physical chemistry. Students who have taken Chemistry 105A will do more advanced projects. Prerequisites: Chemistry 100B, 100C (may be taken concurrently).

106. The Chemical Bond S An introduction to theoretical chemistry for beginning graduate students and senior undergraduate students in chemistry and biochemistry, comprising the application of quantum mechanical principles in the description of the chemical bond. Three lectures. Prerequisites: Chemistry 100A-100B; 141A-141B.

107. Natural and Synthetic Macromolecules S The physical chemistry of high polymers, proteins, and nucleic acids with emphasis on structure, characterization and properties. Prerequisites: Chemistry 100B, 141B.

110A. Biochemistry F Introduction to biochemistry including the metabolism of organisms with respect to energetics and biosynthesis. Prerequisites: organic chemistry and physical chemistry.

113. Chemistry of Biological Macromolecules S A quantitative discussion of the structure of biologically important macromolecules and the techniques used in their study. Prerequisites: elementary physical chemistry, organic chemistry and biochemistry.

116. Chemistry of Enzyme Catalyzed Reactions W A discussion of the chemistry of representative enzyme catalyzed reactions is presented. Enzyme reaction mechanisms and coenzyme chemistry are emphasized. Prerequisites: elementary physical chemistry, organic chemistry and biochemistry.

117. Human Biochemistry F An advanced course in biochemistry which will primarily deal with the molecular basis of human disorders. Prerequisite: elementary biochemistry.

118. Advanced Biochemistry F Advanced topics and recent advances in biochemistry for students already familiar with the subject matter of elementary courses. Prerequisites: elementary physical chemistry, organic chemistry and biochemistry.

120A-120B. Inorganic Chemistry F-W The chemistry of the elements of the periodic table is presented in terms of unifying concepts. The structure of atoms, the influence of atomic properties on the structure of compounds, synthesis of compounds, and the kinetics and mechanisms of chemical reactions are discussed. Thermodynamic aspects of inorganic chemistry and spectral and magnetic properties of compounds are treated. Other topics include: solids, ions in solution, complex ions, solution structure, organometallic compounds. Three lectures, one recitation. Prerequisites: Chemistry 100A and 141A, or consent of instructor.

130. Physical Chemistry F-W Quantum mechanics, atomic and molecular spectroscopy, molecular structure. Prerequisites: Natural Science 2D, Mathematics 2C, or consent of instructor.

131. Physical Chemistry W-S Thermodynamics, Chemical equilibrium, phase equilibrium, chemistry of solutions. Prerequisites: Natural Science 2D, Mathematics 2C, or consent of instructor.

132. Physical Chemistry S Chemical statistics, kinetic theory, reaction kinetics. Prerequisites: Natural Science 2D, Mathematics 2C, or consent of instructor.

133. Elementary Statistical Thermodynamics F Equilibrium distribution functions; development of partition functions; derivation of thermodynamic properties of simple systems from partition functions. Prerequisites: Chemistry 130, 131, 132, Mathematics 2D.

140A-140B. Organic Chemistry F-W A two-quarter sequence in organic chemistry with emphasis on material fundamental to biochemistry. Topics include: bonding theory, structure, isomerism, conformation, chemical and physical properties; reaction mechanisms; substitution, elimination, and addition reactions; special topics related to biology. Prerequisite: two quarters of lower-division chemistry or consent of instructor.

141A-141B-141C. Organic Chemistry F-W-S Lectures in organic chemistry for students majoring in chemistry. The lectures will be concerned with (1) structure and properties of covalent molecules, (2) classification of reactions of first-row elements, and (3) reactions of organic compounds, with an introduction to biochemistry. Prerequisite: Natural Science 2FL.

143A. Organic Chemistry Laboratory (2) F Introduction to laboratory techniques needed in Organic Chemistry. Stresses physical methods including separation and purification, spectroscopy, product analysis and effects of reaction conditions. Prerequisite: Chemistry 141A (may be taken concurrently).

143B. Organic Chemistry Laboratory (2) W Continuation of 143A, emphasizing synthetic methods of organic Chemistry. Prerequisites: Chemistry 143A; 141B (may be taken concurrently).

143C. Organic Chemistry Laboratory (2) S Identification of unknown organic compounds by a combination of chemical and physical techniques. Prerequisites: Chemistry 143A; 141C (may be taken concurrently).

145. Structure and Properties of Organic Molecules F Introduction to the measurement and theoretical correlation of the physical properties of organic molecules. Topics to be covered include simple molecular orbital theory, bond lengths, bond energies, dipole moments, ionization potentials, infrared and ultraviolet spectra, nuclear magnetic resonance and electron spin resonance. Three lectures. Prerequisites: Chemistry 100B, 141B.

146. Kinetics and Mechanism of Organic Reactions W Methodology of mechanistic organic chemistry: integration of rate expressions, determination of rate constants, transition state theory; catalysis, kinetic orders; isotope effects, substituent effects, solvent effects; linear free energy relationships; product studies; stereochemistry; reactive intermediates; rapid reactions. Three lectures. Prerequisite: Chemistry 141C.

147. Mechanisms of Organic Reactions S A detailed study of the mechanisms of various organic reactions; carbonium ion reactions (substitutions, displacements, eliminations, additions, hydrolyses); carbanion reactions (eliminations, substitutions, hydrolyses, condensations); carbene reactions; rearrangements; multicenter reactions; free radical processes. The topics emphasized will vary from year to year. Three lectures. Prerequisite: Chemistry 141C.

149A. Chemistry of the Environment S Sources, components, chemistry, dynamics, and medical effects of air pollution. The role of energy. The decision making process — the role of the citizen, government, industry. Prerequisites: Three quarters of Mathematics; five courses in physical and biological sciences.

150A-150B-150C. Advanced Projects Laboratory F-W-S This course is designed to provide the chemistry major with an introduction to chemical research. Various original projects dealing with synthetic, structural, and mechanistic aspects of chemistry and biochemistry will be available to the student. The student will be allowed flexibility to choose and pursue those projects of most interest to him. Need not be taken in sequence. One lecture, three three-hour laboratories. Prerequisites: Chemistry 100C, 120B, 141C or consent of instructor.

170. Cosmochemistry W Composition of stars, of planets, of meteorites and the earth. Nuclear stability rules and isotopic composition of the elements. Chemical properties of solar matter. Origin of the elements and of the solar system. Three lectures. Prerequisite: Natural Science Sequence or equivalent, physical chemistry desirable.

171. Radiochemistry S Nuclear chemistry, radioactive decay, stability systematics, neutron activation, radiochemistry, Scillard-Chalmers reactions, hot atom chemistry, radiation chemistry, effects from ionizing radiation. Three lectures. Prerequisite: Natural Science 2 Sequence.

190. Mathematical Methods of Chemistry F Calculus, special functions, differential equations; probability and statistics; vectors, matrices and determinants; applications of computers; linear algebra. Three lectures. Prerequisites: Chemistry 100C, Mathematics 2D.

195. Chemistry Instruction F-W-S Introduction to the teaching of elementary college chemistry. Each student will be responsible for and teach a class section of one of the lower-division chemistry courses. Limited to senior chemistry majors who have maintained a B average or better in their major course work. One meeting per week with instructor, one meeting per week with assigned class section, and attendance at lecture of the lower-division course in which the student is participating. Prerequisites: Chemistry 100C, 141C; advanced standing, consent of instructor.

199. Senior Reading and Research F-W-S Independent literature or laboratory research by arrangement with, and under the direction of, a member of the Chemistry faculty. Prerequisite: permission of instructor and department.

GRADUATE

200A-200B. Molecular Quantum Mechanics (4-4) W-S The fundamental concepts and techniques of quantum mechanics which are necessary for the treatment of problems of chemical interest are developed and applied. Prerequisites: Chemistry 100C and 190 or equivalent.

200D. Elementary Statistical Thermodynamics Equilibrium distribution functions; development of partition functions; derivation of thermodynamic properties of simple systems from partition functions.

202A. Thermodynamics (3) F Thermodynamics of chemical systems; the

three laws with emphasis on the formal structure of thermodynamics. Chemical equilibrium stability theory, heterogeneous equilibrium, solutions. Intended as a preparation for Chemistry 204A, as well as prerequisite to Chemistry 202B. Prerequisite: Chemistry 100C or equivalent.

203. Molecular Spectroscopy (4) S The interaction of electromagnetic radiation with molecules will be treated both theoretically and experimentally. Topics to be covered include rotational, vibrational and electronic spectroscopy, electron spin resonance, nuclear magnetic resonance, and structural determination by x-ray diffraction. Prerequisites: Chemistry 130, 131, 132.

204A. Statistical Mechanics of Chemical Systems (4) W Equilibrium Statistical Mechanics, derivation of the formal ensemble equations and the laws of thermodynamics from the principles of classical and quantum mechanics, the relations between the different ensembles, the use of the equations for various chemical systems, gases, crystals and liquids. Prerequisite: physical chemistry or thermodynamics, or consent of instructor.

206. Topics in Biophysics and Physical Biochemistry (3) Application of physical methods to biochemistry, e.g., x-ray diffraction, optical rotatory dispersion and circular dichroism, magnetic resonance. Same as Physics 206. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

207. Synthetic Macromolecules S The organic and physical chemistry of high polymers with emphasis on synthesis, structure, characterization and properties. Polymers as materials are important as films, fibers and elastomers. They play an ever increasing role in science, technology and medicine. Same as Chemistry 107. Prerequisites: Chemistry 100B and 141B or equivalent.

209. Special Topics in Chemical Physics F-W-S Topics of special interest will be presented. Examples include NMR, solid state chemistry, phase transitions, stochastic processes, scattering theory, non-equilibrium processes, and advanced topics in statistical mechanics, thermodynamics and chemical kinetics.

210. Seminar in Biochemistry (1) F-W-S Seminars presented by advanced graduate students which will explore topics in specialized areas of biochemistry and provide opportunities for students to gain experience on the organization, critical evaluation, and oral presentation of information from the literature. Each quarter a different topic is discussed; recent topics have included: Lipids, Membranes, Oxidative Phosphorylation, Nucleic Acid Structure, Function, and Synthesis, Protein Structure and Function, History of Biochemistry. Prerequisite: one year of graduate study.

211. Introductory Biochemistry (3) F A comprehensive course in introductory biochemistry. The course is intended for entering graduate students, including those who have not previously had a formal course in biochemistry. Prerequisites: physical and organic chemistry.

213. Chemistry of Macromolecules (3) S A quantitative discussion of the structure of biologically important macromolecules and the techniques used in their study. Prerequisite: elementary physical chemistry.

215. Metabolic Control Mechanisms (2) A discussion of control mechanisms at different levels of cell function, which influence the activity of representative enzymes and metabolic pathways. Prerequisite: Chemistry 211 or equivalent.

216. Chemistry of Enzyme Catalyzed Reactions (3) W A discussion of the chemistry of representative enzyme catalyzed reactions is presented. Enzyme reaction mechanisms and coenzyme chemistry are emphasized. Prerequisite: organic chemistry.

217. Human Biochemistry (2) F An advanced course in biochemistry primarily dealing with the molecular basis of human disorders. Prerequisite: Chemistry 211 or equivalent.

218. Advanced Biochemistry (3) F Advanced topics and recent advances in biochemistry for students already familiar with the subject matter of elementary courses. Prerequisites: physical and organic chemistry and Chemistry 211 or equivalent.

219. Special Topics in Biochemistry (3) Recent topics have included: techniques in experimental biochemical dynamics, topics in biophysics.

220. Advanced Inorganic Chemistry S Introduction to theoretical inorganic chemistry. Chemistry of typical main group and transition elements; coordination compounds; organometallic chemistry, catalysis, experimental techniques. Prerequisites: Chemistry 120B, 141C, and 100B.

229. Special Topics in Inorganic Chemistry (1-3)

233. Elementary Statistical Thermodynamics F Equilibrium distribution functions; development of partition functions; derivation of thermodynamic properties of simple systems from partition functions. Prerequisites: Chemistry 130, 131, 132, Mathematics 2D.

245. Structure and Properties of Organic Molecules (3) F Introduction to the measurement and theoretical correlation of the physical properties of organic molecules. Topics to be covered include simple molecular orbital theory, bond lengths, bond energies, dipole moments, ionization potentials, infrared and ultraviolet spectra, nuclear magnetic resonance and electron spin resonance.

246. Kinetics and Mechanism (3) W Methodology of mechanistic organic chemistry: integration of rate expressions, determination of rate constants, transition state theory; catalysis, kinetic orders; isotope effects, substituent effects, solvent effects, linear free energy relationships; product studies, stereochemistry; reactive intermediates; rapid reactions.

247. Mechanisms of Organic Reactions (3) S A detailed study of the mechanisms of various organic reactions; carbonium ion reactions (substitutions, displacements, eliminations, additions, hydrolyses); carbanion reactions (eliminations, substitutions, hydrolyses, condensations); carbene reactions; rearrangements, multi-center reactions; free radical processes.

249. Special Topics in Organic Chemistry (1-3)

250. Seminar in Chemistry (1) F Regularly scheduled seminars by first-year graduate students provide opportunities for practice in seminar delivery and for the exploration of topics of general interest.

251. Research Conference (1) F-W-S Group discussion of research activities and progress of the group members. (Satisfactory/Unsatisfactory grades permitted.)

252. Advanced Seminar in Chemistry (1) Regularly scheduled seminars by advanced graduate students provide opportunities for practice in seminar delivery and for the exploration of topics of general interest. Prerequisite: two years of graduate study.

272. Nuclear and Cosmochemistry (3) Structure and properties of nuclei. Theory of alpha and beta decay. Interaction of radiation with matter. Nuclear reactions. Nuclear processes in chemistry. Abundance and synthesis of the elements. Radioactive methods of age determination. Prerequisite: Chemistry 200A or consent of instructor.

294. Organic Chemistry Seminar (2) F-W-S Formal seminars or informal puzzle sessions on topics of current interest in organic chemistry, as presented by visiting lecturers, local researchers, or students. Prerequisite: graduate student standing. (Satisfactory/Unsatisfactory grades only.)

298. Special Study in Chemistry (1-12) F-W-S Reading and laboratory study of special topics under the direction of a faculty member. Exact subject matter to be arranged in individual cases. (Satisfactory/Unsatisfactory grades permitted.)

299. Research in Chemistry (1-12) F-W-S (Satisfactory/Unsatisfactory grades permitted.)

500. Teaching in Chemistry (4) F-W-S A doctoral student in Chemistry is required to teach a four-unit course (50% teaching assistantship) one quarter out of every three in residence. This is an introduction to teaching elementary college chemistry. Each student will be responsible for, and teach a class section from, one of the undergraduate chemistry courses. One meeting per week with instructor, one or two meetings per week with assigned class section, and lecture of the undergraduate course in which he is participating. Prerequisites: graduate standing and consent of instructor. (Satisfactory/Unsatisfactory grades only.)

CHINESE STUDIES

Office: Building 410, Matthews Campus
 Matthew Y.-Ch. Chen, Ph.D., Assistant Professor of Linguistics
 David K. Jordan, Ph.D., Assistant Professor of Anthropology
 Thomas A. Metzger, Ph.D., Assistant Professor of History
 Benjamin K. T'sou, Ph.D., Assistant Professor of Linguistics
 (Chairman of the Program)
 Wai-Lim Yip, Ph.D., Assistant Professor of Chinese and Comparative Literature

* * *

Chinese Studies is an interdisciplinary program. Four features of this program are particularly important: first, study of some aspect of Chinese civilization in terms of a particular discipline; second, a broader approach to Chinese civilization based on a small number of courses drawn from a variety of disciplines; third, a basic knowledge of the Chinese language in terms of one of two major dialects or both of them; and fourth, a senior project of study integrating the main features of his training.

This program is unusual in that it allows for training in a variety of Chinese dialects and stresses a creative approach to Chinese civilization through the use of Chinese language in combination with a disciplinary perspective. It readily allows the student to pursue a double major.

The Major Program

The major in Chinese Studies is intended to prepare a student for graduate work in some aspect of Chinese civilization. The student choosing the major in Chinese Studies must decide on a disciplinary focus, and depending on the discipline focus, the course requirement may vary from 14 to 17 courses. These courses are divided among the following requirements:

(1) Language A minimum of two years of Mandarin or Cantonese. In certain disciplines an additional year of classical Chinese will be required.

(2) Chinese Focus Two to four courses dealing with China in the chosen discipline focus.

(3) Chinese Spectrum Two to four courses dealing with China but not in the chosen discipline focus.

(4) Discipline Focus Three to four courses in the chosen discipline focus. These courses should be concerned with theory and methodology in the discipline and not with China.

(5) **Seminar or Independent Study** Two courses of seminar, 198 or 199 on any aspect of Chinese studies. Except for (4) all courses may be chosen from those listed under Courses. At present seven disciplines/ areas are available to the student.

Major Programs Course Requirements

		Major Program in Chinese Studies Course Requirement						Third World Studies
No. of courses	Discipline focus	Anthro.	History (Modern)	History (pre-mod)	Ling.	Lit.	Socio.	
Chinese Studies Requirements								
Language		3	3	3	3	3	3	3
Modern Classical		0	0	3	0	3	0	0
Chinese Focus		3	4	4	2	3	3	2
Chinese Spectrum		3	2	2	4	2	3	4
Non-Chinese discipline		3	3	3	4	3	3	3
Seminar/199		2	2	2	2	2	2	2
Total number of upper-division courses		14	14	17	15	16	14	14
Lower-division Chinese language prerequisite		3	3	3	3	3	3	3

The Minor Program

The Chinese Studies minor consists of six courses beyond one year of language. These courses may be chosen from any of the upper-division courses listed below. They will be selected in consultation with the undergraduate adviser of the program. The context of these courses will determine whether the Chinese Studies minor is classified as humanities or social science.

COURSES

Language-Lower Division

- Lang/Ch 51 — Elementary Cantonese
- Lang/Ch 52 — Elementary Cantonese
- Lang/Ch 53 — Elementary Cantonese
- Lang/Ch 61 — Elementary Mandarin
- Lang/Ch 62 — Elementary Mandarin
- Lang/Ch 63 — Elementary Mandarin

Language — Upper Division

- Lang/Ch 154 — Intermediate Cantonese
- Lang/Ch 159 — Mandarin for Cantonese Speakers
- Lang/Ch 164 — Intermediate Mandarin
- Chinese Studies 175 — Readings in Contemporary Chinese I
- Chinese Studies 176 — Readings in Contemporary Chinese II

Chinese Focus/Chinese Spectrum

- Anthropology 12 — Chinese Society and Culture
- Anthropology 138 — Contemporary Chinese Society
- Literature 151 — Masterpieces of Chinese Literature in Translation
- Linguistics 164 — Language Structures
- History 180A-180B-180C — The History of Imperial China
- History 183A-183B — Modern Chinese History
- Sociology 190 — Senior Seminar
- Chinese Studies 198 — Directed Group Study in Chinese Studies
- Chinese Studies 199 — Independent Study in Chinese Studies

COURSES

UPPER DIVISION

- 175. Readings in Contemporary Chinese I** Reading and translation in contemporary Chinese literature. The emphasis will be on the further development of reading, writing, and comprehension ability. The course includes grammar reviews, lectures, and class discussions. Prerequisite: Lang/Ch 164 or 159; Lang/Ch 159 may be taken concurrently.
- 176. Readings in Contemporary Chinese II** Continuation of Chinese Studies 175. Introduction to simplified characters used in the Republic of China. Half of the selections to be used in class will be drawn from literature written in simplified characters. Prerequisite: Chinese Studies 175.
- 181. Introduction to Classical Chinese** Introduction to the classical language through Confucius, Mencius and the other Great Books. The emphasis will be on comprehension and reading ability. Prerequisite: Lang/Ch 154 or 164, or equivalent.
- 182. Introduction to Classical Chinese** Continuation of Chinese 181. Prerequisite: Chinese Studies 181 or equivalent.
- 183. Readings in Classical Chinese** Introduction to major works written in Classical Chinese, including poetry and historical documents. Prerequisite: Chinese Studies 182 or equivalent.
- 198. Directed Group Study in Chinese Studies (2 or 4)** Study of specific topics in Chinese Studies not covered in regular course work. Under the direction of a faculty member in Chinese Studies. Prerequisite: consent of instructor.
- 199. Independent Study in Chinese Studies (2 or 4)** The student will undertake a program of research or advanced reading in selected areas in Chinese Study under the supervision of a faculty member in Chinese Studies. Prerequisite: consent of instructor.

CLASSICAL STUDIES

Office: Humanities and Social Sciences Building, Muir College
(Provost, Muir College)

Edward N. Lee, Ph.D., Associate Professor of Philosophy
(Chairman)

David K. Crowne, Ph.D., Associate Professor of English and
Comparative Literature

Georgios H. Anagnostopoulos, Ph.D., Assistant Professor of Philosophy

Edwin F. Dolin, Ph.D., Assistant Professor of Classical and
Comparative Literature

Lawrence Waddy, M.A., Lecturer in Classical Languages and Literature

* * *

This program offers undergraduates an opportunity to study the cultures of Greece and Rome through the coordinated resources of the History, Literature, and Philosophy Departments. Included besides training in the Greek and Latin languages, are courses in the history, literature, and philosophy of Greece and Rome, utilizing materials in the original languages and in translation.

The Major Program

A major in Classical Studies consists of a choice of twelve upper-division courses approved for the Program and listed below. Six of the twelve courses must involve the use of materials in the original language, either Greek or Latin. The particular courses making up each student's major will be selected with advice from the Program staff. The major will normally include at least two courses from each of the participating departments.

The Minor Program

A minor in Classical Studies consists of six courses from those approved for the Program and listed below. A knowledge of Greek or Latin is not required. The minor will include Classical Studies 109: Intellectual History of the Greco-Roman World, and three other courses, one from each of the participating departments.

Graduate courses may be taken by undergraduates with the consent of the instructor. The faculty of the Program welcomes qualified undergraduates in graduate courses.

Additional courses counting toward a major in Classical Studies are offered on a year-to-year basis, both at the undergraduate and graduate levels. As these often cannot be listed in advance, interested students should consult the Program faculty for an up-to-date list.

COURSES

UNDERGRADUATE

Humanities 2. Jews and Greeks

Classical Studies 109A-109B-109C. The Greco-Roman World An intensive study of the intellectual life of the Greco-Roman literature, philosophy, historiography, and art. A primary purpose will be to understand the relationships between the intellectual activity and the social and political environment in which it took place. Prerequisite: upper-division standing.

History 104A-104B. Greece in the Classical Age

History 105A-105B. The Roman Republic and Empire

History 107. The Ancient Near East

History 199. Independent Study in Greek and Roman History

Lit/Gr 1. Elementary Greek

Lit/Gr 2. Intermediate Greek Prerequisite: Lit/Gr 1 or equivalent.

Lit/La 1. Elementary Latin

Lit/La 2. Intermediate Latin Prerequisite: Lit/La 1 or equivalent.

Lit/Gr 100. Introduction to Greek Literature Prerequisite: Lit/Gr 2 or equivalent.

Lit/La 100. Introduction to Latin Literature Prerequisite: Lit/La 2 or equivalent.

Lit 120. The Classical Tradition Greek and Roman literature in translation.

Lit 199. Special Studies in Greek and Roman Literature

Philosophy 101. History of Philosophy Greek philosophy to Aristotle.

Philosophy 102. History of Philosophy Greek and Roman philosophy after Aristotle.

Philosophy 199. Independent Study

GRADUATE

History 201A. The Literature of Greek History

History 201B. The Literature of Roman History

History 202A. Research in Greek History

History 202B. Research in Roman History

History 298. Directed Readings in Greek and Roman History

Lit/Ci 210. Classical Studies Prerequisite: working knowledge of either Greek or Latin

Lit/CI 297. Directed Studies in Greek or Latin Literature

Lit/CI 298. Special Projects in Greek or Roman Literature

Philosophy 201. Topics in the History of Philosophy: Greek Philosophy

Philosophy 202. Topics in the History of Philosophy: Hellenistic and Roman Philosophy

Philosophy 290. Directed Independent Study

Philosophy 295. Research Topics

COMMUNICATIONS

Office: Building 411, Matthews Campus

Herbert I. Schiller, Ph.D., Professor of Communications

Michael R. Real, Ph.D., Assistant Professor of Communications

(Coordinator of Communications)

Oscar H. Gandy, Jr., M.A., Lecturer in Communications

Will H. Wright, M.A., Acting Assistant Professor in Communications and Sociology

* * *

Jeffrey F. Raskin, M.A., Assistant Professor of Visual Arts

Benjamin K. Tsou, Ph.D., Assistant Professor of Linguistics

* * *

The Communications Program, which will soon broaden into a campus-wide department, is concerned simply with the study of human behavior from a communications perspective. The academic instruction extends from the genetic code to television, from non-verbal signals to linguistics, from training in the syntax and grammar of mass media to critical analysis of all forms of communications.

The Communications requirement for all Third College students consists of a two-quarter sequence (Communications 1A-1B) which is offered in the winter and spring quarters. The basic sequence is designed to create an awareness of the social institutions and processes that shape individual and group consciousness. It will familiarize the student with the process of communications in its social context. Message transmission in its many forms will be analysed, always relating communications to the social environment.

The Major Program

Declaring a major in communications, which is available to all students at UCSD, will entail six upper-division courses in communications, of which one has to be in Theory and Behavior, one in Institutions, and one in Media. Nine additional upper-division courses in communications or related areas (disciplines) will be required and these will be approved by a faculty adviser in communications. All faculty in communications will serve as advisers.

Theory Courses: Symbols and Systems, Language and Society, Pragmatics of Communications, Research and Design.

Institutions Courses: Mass Culture, Film and Society, Mass Communications, Political Economy of International Communications, Communications and National Development.

Media Courses: TV Practicum and Photography Sequence (along with Visual Arts). Also, Computer Sciences, Visual Arts, Drama and Composition courses, with approval of the respective department.

COURSES

LOWER DIVISION

1A-1B. Communications W-S Course will provide the student with an opportunity to explore diverse aspects of the communications process and to develop their basic communications skills, including speaking, reading, and writing.

10. Composition Course attempts to zero in on the basic language problems particular to minority students and to deal with them on an independent basis. The curriculum will aim at four primary problematic areas in composition — differences between oral and written presentation, spelling, and punctuation; grammatical differences; analysis and synthesis; and exposition. May be repeated for credit.

11. Composition Intensive course in reading and rhetoric limited to students recommended by the Provost.

UPPER DIVISION

100A-100B-100C. Basic Communications Sequence Course will provide the student with an opportunity to explore diverse aspects of the communications process and to develop basic communications skills, including speaking, reading, and writing.

101A. Television Production and Analysis F An introductory course covering the techniques and conventions common to the production of news, discussion and variety format television programs. Particular emphasis will be placed on the choice of camera "point of view," and its influence on program content. Prerequisites: basic communications sequence and consent of instructor.

101AL. Television Production and Analysis Laboratory (2) F Two laboratory sessions weekly will provide students with an opportunity to experiment with

production elements influencing the interpretation of program content. Concentration on lighting, camera movement, composition and audio support will closely parallel program formats discussed in the lecture series. Prerequisite: concurrent enrollment in Communications 101A.

101B. Television Documentary W S Advanced television course which will examine the history, form, and function of the television documentary in American society. Experimentation with documentary technique and style will require prior knowledge of television or film production. The class will meet twice weekly, with individual arrangements for laboratory access. Prerequisites: Communications 101A and 101AL.

101C. Television as a Social Force S Primarily a research and production course. Students will undertake the research, design, and production of a series of videotaped programs that serve some pressing social need. (For example, students may choose to produce a weekly news feature for cable distribution, or a series of educational programs for community centers.) Prerequisite: completion of either 101A or 101B.

113. The Writing of Dramatic Materials for Television Production Course will consist of the writing of scripts and scenarios with an eye to their use in television production. The first four weeks of the course will deal with dramatic fabulation, the second four weeks with documentary narration. The last two weeks will involve the preparation and presentation, on videotape, of each student's project in either dramatic or documentary form — or a combination thereof. Prerequisite: consent of instructor.

114. 16 mm Film Workshop An introduction to the practical and social aspects of 16 mm film production. Basic camera, exposure, editing, and sound techniques will be presented. Each student will produce one or two short films during the course. A brief review of film literature will be undertaken.

152. Myths and Symbols in Society A study of the contributions of mythical symbols and narratives to the establishment of social meanings and behavior in primitive and modern societies. Included will be a review of different theories of myth and narrative such as those of Levi-Strauss, Cassirer, and Propp.

170. Computer Media I Requiring no mathematical or scientific training, this is an introduction to programming in a higher level language. Exercises dealing with specific problems of the arts are emphasized.

180. The Political Economy of Mass Communications F The social, legal and economic forces affecting the evolution of mass communications institutions and structures in the industrialized world. The character and the dynamics of mass communications in the United States today.

181. The Political Economy of International Communications W The character and forms of international communications. Emerging structures of international communications. The United States as the foremost international communicator. Differential impacts of the free flow of information and the unequal roles and needs of developed and developing economies in international communications. Prerequisite: consent of instructor.

182. Pragmatics of Human Communications F This course analyzes human, social and psychological behavior with a view to providing the student with the tools to analyze and comprehend his own status in the world of communication. It is preferred that the student take both quarters for credit and continuity. Prerequisites: Communications 1A-1B, advanced standing, or consent of instructor.

183. Syntactics of Communication S Deals with the formal and theoretical aspects of human and biological communication systems. Reviews the literature of semiotics, communication theory, structuralism, and linguistics in respect to the syntactics (the articulation of codes and messages) of goal-seeking open systems. Prerequisites: Communications 1A-1B, or Third College advanced standing, or permission of instructor.

184. Semantics of Human Communication Deals with the environmental relationships and intentions characteristic of human and biological communication systems. Reviews the literature of semiotics, communication theory, structuralism, and linguistics in respect to the semantics ("goals", "purposes") or the relation between "organism" and "environment". Prerequisites: Communications 1A-1B, Third College advanced standing, or permission of instructor.

185. Mass Communications and Public Opinion F Considers the concept of public opinion, its measurement and impact, the possibilities of manipulation and control, polling and the differing role of public opinion in differing social systems.

186. The Film Industry A study of the social organization of the film industry throughout its history addressing such questions as who makes films, by what criteria and for what audience. The changing relationships between studios, producers, directors, writers, actors, editors, censors, distributors, audience and subject matter of the films will be explored.

187. Cinema of Dissent A study of the cinema as a method of dissent and as a medium for the analysis of race and class relationships. Included will be films which reveal and challenge accepted attitudes toward minority groups and social classes and describe lives and social relationships in Third World communities. Films will be shown, with discussion, and readings will be required.

188. Popular Communications W An investigation of the relationship between mass communications and popular culture. Historical, esthetic, and political consideration of the evolution of popular expressions of culture, of the interaction between media and society, of the characteristic products of mass culture in America

and among minorities and non-western peoples, and of the possibilities of a radically humanistic popular culture.

189. The Sociology of Culture W The study of the concept of culture, its origins, and its application to modern societies. Included will be discussions of the role in society of various symbolic systems such as art, science, myths, history, and language.

190. Communications Analysis and Research S Introduction to finding and analyzing information about the communications functions of private, public, and mixed structures and institutions on the local, national, and international levels. Techniques for observing, collecting, processing, and implementing data.

191. Communications and National Development S Course deals with the role of communications in the developmental process, the specific contributions of mass communications to national integration in newly-formed states, and varieties of interpersonal and group communications in developing societies. The role of consciousness as a vital factor in development is analysed and reviewed. Prerequisites: Communications 1A-1B, advanced standing, or permission of instructor.

198. Independent Group Study W Directed group study on regional/local mass communications projects involving research and analysis of media activities and services.

199. Independent Study F-W-S The communications program will include: the study of communicators' behavior, the analysis of the character of messages, and the examination of the social institutions involved in the communications process. Also, an overview of the structures of mass communication, the role the media have and continue to perform in shaping individual and societal values and objectives, and the possibilities for utilizing the media for social change. The efforts of the visual, literary, auditory, and plastic arts along with the analytic and empirical social sciences will be utilized. Prerequisite: consent of instructor.

CONTEMPORARY ISSUES

Office: 2105 Humanities and Social Sciences Building
Lola R. Schwartz, Ph.D., Director

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COURSES

LOWER DIVISION

1. Contemporary Issues S Designed as a directed "peer-group-leading" situation in which a discussion leader (who will have had a seminar workshop with the director and consulted with a faculty adviser) will work with a group of students on an issue of contemporary concern with the purpose of learning how to analyze, research, discuss, and prepare a presentation. Lectures by the director and guests to the group.

2. Freshman Seminars on Contemporary Issues F-W-S Seminars for students of John Muir College directed by members of UCSD faculty and visiting professors, and treating in depth one contemporary issue or small group of related issues. (Consult the *Schedule of Classes* for possible offerings.)

3. Women: The Longest Revolution S An examination of woman's role in history and today, with attention both to psychological and to political aspects of her situation.

UPPER DIVISION

190. Culture / Personality and the Education Process W Theories and societal assumptions about the teaching-learning process will be examined both from an interdisciplinary and cross-cultural perspective. Field observation techniques will be an adjunct to the lectures.

195. Discussion Leading F-W-S Students (after preparation and training in Contemporary Issues Workshop 196) will lead groups of 10-20 students in discussion of contemporary concern. Students will meet with the director to plan and prepare for their discussions to be held weekly. Students will also consult with another faculty member specializing in his topic for further check on reading materials and course of discussion. Prerequisite: Contemporary Issues 196, and consent of Director of Interdisciplinary Sequences.

196. Contemporary Issues Workshop F A workshop for potential discussion leaders in the Contemporary Issues Program. Students will investigate both possible topics for discussion and methods of presentation and instruction. Participation in the workshop does not guarantee that a student will be selected as a discussion leader. Prerequisite: consent of the director of Contemporary Issues Program.

198. Directed Group Studies in Contemporary Issues Group studies, readings, projects, and discussions in areas of contemporary concern. Course is set up so that students may work together as a group with a professor in an area of contemporary concern whereby group emphasis would be more beneficial and constructive than individual special studies.

199. Special Studies in Contemporary Issues (2-4) F-W-S Individual reading and projects in the areas of contemporary concern. Term paper and/or completed project is required. This class is given under special circumstances, e.g., student abroad. Prerequisites: permission of Muir Provost and Director of Interdisciplinary Sequences.

CULTURAL TRADITIONS

Office: 2105 Humanities and Social Sciences Building
Lola R. Schwartz, Ph.D., Director

* * *

Each year several different three-course sequences are offered. The sequences are developed by a special committee of faculty and students in consultation with those who will teach them. The particular cultures to be studied vary from year to year, though some, such as the Afro-American, have attracted such widespread interest that they may be carried over from one year to the next. Other sequences have recently been offered in or are planned for such cultures as Asian Indian, Latin American, Chinese, Graeco-Roman, West African, New World, and Caribbean.

While no regulation prohibits freshmen from enrolling in these courses, they are conceived in the expectation that most students taking them will be in their second or later years in the college. A descriptive list of the sequences offered for the coming academic year is available in time for the Fall enrollment. Inquiries about the program or projected sequences should be addressed to the department.

COURSES

1A-1B-1C. Cultural Traditions F-W-S A 3-quarter sequence involving the study of the deep and surface structures of the life styles of one specific culture. The approach from several disciplines addresses itself to analyses of the social, political, and economic institutions, the aesthetic structuring through formal artistic expression, and the cultural forms of everyday living.

199. Special Studies in Cultural Traditions (2-4) F-W-S Individual reading and projects in the areas of cultural studies in which a particular culture will be viewed in reference to its history, arts, events, literature, music, societal structure. This course given under very special circumstances; e.g., a student is abroad at a time which interrupts his CT sequence but provides him a special opportunity in another culture or an upper-division student desiring to do such a study under the personal direction of the director. Prerequisite: consent of director.

DRAMA

Office: UCSD Theatre, Building 203, Matthews Campus
Arthur Wagner, Ph.D., Professor of Drama

(Chairman of the Department)

Michael Langham, Adjunct Professor of Drama

Eric Christmas, Acting Professor of Drama

Director of the UCSD Theatre

Floyd Gaffney, Ph.D., Acting Associate Professor of Drama

* * *

The Drama Department offers a major having as its core theatre courses taught by members of the Drama Department. As the Department is too small to provide all the courses needed for a major, others in dramatic literature, taught by members of the Literature Department, will supplement the theatre courses. Students may also choose for the major certain approved courses in Anthropology, Communications, Music and Visual Arts. A broad and well-balanced course of study can thereby be achieved.

Students thinking of majoring in Drama should understand that they would receive thereby an excellent liberal arts education, but not in any sense a vocational one. It is not the intention of the Department to prepare students for careers in theatre. While the Drama major might be regarded as a good base for later study, technical training directed exclusively toward a career in professional theatre would have to be obtained elsewhere.

Further information on the major can be obtained from the Drama Department.

COURSES

LOWER DIVISION

11. Introduction to the Theatre F-W-S A study of plays in terms of their realization in the theatre, including terminology and technical aspects viewed against historical backgrounds.

12. Introduction to Performance Beginning experiences in the process of acting; observation, concentration, use of objects, use of self, actions and objectives, improvisation, theatre games, preparation of scenes. Selected readings from the history of acting. (May be used to fulfill the Muir College fine arts requirement.)

13. Introduction to Production Lectures and laboratories dealing with the technical aspects of theatre production: scenery, lights, costumes, the designer, the director, the stage manager, etc. Portion of labs will be work on productions in the UCSD Theatre in construction and running crews. (May be used to fulfill the Muir College fine arts requirement.)

20. Modern Dance (2) Introduction to movement as an expressive medium, offering the student an opportunity to explore an area of emphasis which is structured to include the theoretical and technical aspects of modern dance within a liberal arts education.

UPPER DIVISION

101A-101B-101C. Studies in Performance F-W-S A course concerning living drama from reading to performance intended to familiarize students with both selected works and the problems of production and performance related to their stage presentation. Prerequisite: consent of instructor. May be repeated for credit.

122A-122B-122C. Studies in Dance (Intermediate) (2) Critical analysis of the principles of dance as utilized in theatrical and musical productions. A study of ethnic forms and an exploration of the historical development of ethnic dance, particularly in America.

132. Oral Interpretation of Dramatic Literature The development of stage speech and vocal expression through the interpretation of dramatic literature from black and white American writers. Prerequisite: consent of instructor.

198. Directed Group Studies in Drama Group studies, readings, projects, and discussions in drama history, problems of production and performance, and similarly appropriate topics. Prerequisite: consent of instructor. May be repeated for credit.

199. Special Projects in Drama (2 or 4) F-W-S Qualified students will pursue projects in reading drama, studying drama history, or doing research for a production. Prerequisite: consent of instructor.

EARTH SCIENCES

Office: Provost, Revelle College

* * *

Developments in the discipline of the Earth Sciences suggest that the most effective means for undergraduates to enter this fascinating field is for the University to enrich its course work for majors in the Departments of Chemistry, Mathematics, and Physics with contemporary and exciting courses in the Earth Sciences. These enrichment courses are taught by faculty members of the Scripps Institution of Oceanography.

The program in Revelle College is one which is based on the premise that a thorough grounding in one of the above disciplines is necessary. Thus an entering student will elect to enter the Department of Chemistry, Mathematics, or Physics and for the first two years will take the Revelle core curriculum. At the beginning of his junior year, a student will select his courses in consultation with the Earth Sciences advisers in the Geological Sciences Group in the Scripps Institution of Oceanography and his own department. In most instances he may be able to substitute Earth Sciences courses for major requirements or restricted electives.

The degree will be granted by the major department and will indicate that the student's education has been enriched in the Earth Sciences (B.A. in Chemistry with specialization in Earth Sciences).

A student who plans to graduate with a specialization in Earth Sciences must complete ES 101, 102, 103, 120, and SIO 256A as a minimum course requirement. Additional courses for the earth Sciences specialization may be selected with the aid of the Earth Sciences advisers. Because of course scheduling and prerequisites the normal sequence of courses begins with the series ES 101, 102, 103, 120.

This interdisciplinary program will provide the student with the information to make the choice of a graduate major with the freedom that an undergraduate major in a basic science provides. This program will not impede the progress in such a basic science and will provide a concrete example of such sciences applied to Earth problems.

COURSES

Prerequisite for all Earth Science courses: one year each of college-level physics, chemistry and mathematics.

101. Introductory Geology F The origin and evolution of the Earth, especially its crust, and the evolution of life as indicated by the fossil record. Emphasis is on the nature of rocks and minerals, their origin, reconstitution, and decay; the evolution of continents, ocean basins, and mountain belts; processes of vulcanism; and the work of wind, water, and glaciers in modifying the Earth's surface, with the aim of creating an awareness in the student of the geological environment in which we live. Three lectures, occasional field trips.

102. Introductory Geochemistry S The chemistry of the Earth and the solar system, and the applications of physical chemistry and nuclear physics to the study of the origin and geological history of the Earth. Cosmic and terrestrial abundances of elements; nucleosynthesis; origin of the Earth; mineralogy and chemistry of the Earth's crust, mantle, and core; geochronology and the geological time scale; chemistry of the atmosphere and the oceans. Three lectures, one discussion period.

103. Introductory Geophysics W Selected geophysical subjects are treated in some depth. The emphasis is on topics that involve the entire planet Earth, the propagation of elastic waves through the Earth, oceans and atmosphere; gravity, isostasy and the shape of the Earth; oceanic, atmospheric and bodily tides; mountains, earthquakes, and the movements of continents. Three lectures.

120. Mineralogy F-S Lectures and laboratory work on symmetry, morphology, goniometry, crystal structure, elementary X-ray crystallography, physical and chemical properties of minerals and recognition of common rock-forming minerals. Use of the petrographic microscope in the study of rock-forming minerals. Two three-hour

periods of laboratory and lecture. Prerequisites: Earth Sciences 102 or concurrent registration.

199. Independent Study for Undergraduates F-W-S Independent reading or research on a problem by special arrangement with a faculty member.

Note: Also see course listings: SIO

ECONOMICS

Office: 3412 Humanities-Library Building

John W. Hooper, Ph.D., Professor of Economics

Daniel Orr, Ph.D., Professor of Economics

(Chairman of the Department)

Richard E. Attiyeh, Ph.D., Associate Professor of Economics

Donald V. T. Bear, Ph.D., Associate Professor of Economics

John Conlisk, Ph.D., Associate Professor of Economics

(Director of Graduate Studies in Economics)

William P. Travis, Ph.D., Associate Professor of Economics

Richard Emmerson, Ph.D., Assistant Professor of Economics

Ramachandra Ramanathan, Ph.D., Assistant Professor of Economics

Wolfhard Ramm, Ph.D., Assistant Professor of Economics

Richard Schmalensee, Ph.D., Assistant Professor of Economics

(Director of Undergraduate Studies in Economics)

Dennis Smallwood, Ph.D., Assistant Professor of Economics

* * *

The Major Program

The undergraduate major in economics is designed to provide a broad understanding of resource allocation and income determination mechanisms. Both the development of the tools of economic analysis and their application to contemporary problems are stressed. This program serves to prepare students for graduate work in economics, and in such related areas as business, law, and public administration, and also to provide a useful background for students who plan to enter careers in which decision-making plays an important role.

Each student majoring in economics will be required to take either Economics 1A-1B-1C, or 2A-2B-2C. At least twelve upper-division courses in economics must be taken, including Economics 100A, 100B, 110A, and 110B. A 2.0 (C) grade point average in upper-division economics courses is a degree requirement for students majoring in economics.

It is recommended that majors take Mathematics 1A-1B-1C or the equivalent before beginning upper-division course work in economics. Those without this background may take Economics 3 in place of or in addition to 1C to prepare themselves for upper-division work.

A Revelle College student majoring in economics can meet the requirements for a noncontiguous minor by taking courses in the humanities, in mathematics or in the sciences. A noncontiguous minor must be approved by the minor adviser in the department in which the noncontiguous minor is concentrated.

The economics major is encouraged to discuss his elective courses and choice of minor with the Director of Undergraduate Studies. Depending on individual interests and career plans, courses in related fields such as political science, history, and mathematics may be appropriate. Graduate work in economics requires a strong mathematics background, which should include Mathematics 2D and 2E and, depending on the student's interests, might include certain upper-division mathematics courses.

In planning his upper-division program, the prospective economics major should consult with the Director of Undergraduate Studies during the year in which he or she takes the Economics 1 or 2 sequence. It is often convenient to commence with the 100 or 110 sequences or both.

The Noncontiguous Minor (Revelle College)

Students majoring in mathematics, humanities, or the sciences who elect economics as a noncontiguous minor field have two options, depending on the use to which they put Economics 1A, 1B, 1C or 2A, 2B, 2C;

1. If either sequence is used to satisfy the Revelle College social science requirement, the economics minor must include six upper-division courses.

2. Otherwise, the minor must include either elementary sequence plus any three upper-division courses.

The Department of Economics is also willing to cooperate with other departments in the formulation of an integrated project minor for which the work is done in two or more related disciplines. (See *Revelle College: Noncontiguous Minor.*)

Students who wish to pursue a noncontiguous minor involving the Department of Economics should consult with the Director of Undergraduate Studies (minor adviser) as early as possible.

The Graduate Program

The program of study for the Ph.D. degree normally entails 18 to 24 courses during the first two years. A typical 18-course program for a student starting in fall 1972 is the following:

	FALL	WINTER	SPRING
Year I	Economics 200A (microeconomics)	Economics 200B (microeconomics)	Economics 200C (microeconomics)
	Economics 210A (macroeconomics)	Economics 210B (macroeconomics)	Economics 210C (macroeconomics)
	Economics 220A (econometrics)	Economics 220B (econometrics)	Economics 220C (econometrics)
Year II	Economics 220D (econometrics)	Economics 209 (applied micro)	Economics 269 (seminar)
	Elective	Economics 219 (applied macro)	Elective
	Elective	Elective	Elective

Students must pass written and oral doctoral qualifying examinations. The written examination has four parts (i) microeconomics, (ii) macroeconomics, (iii) econometrics, and (iv) an elective field. Parts (i) and (ii) are usually taken by a student at the end of his first year; the course sequences 200 and 210 are preparatory. Parts (iii) and (iv) are usually taken at the end of the second year. The 220 sequence and 209 and 219 are preparatory to part (iii) and elective courses are preparatory to part (iv). The oral qualifying examination is taken after the written examinations.

The elective field examination, elective courses, and the dissertation seminar (269) form the developing ground for a student's research specialty. Ideally, a student will have a well developed dissertation topic by the end of his second year and a nearly completed dissertation by the end of his third year. In practice, it usually takes longer, though students are discouraged from remaining in residence more than four years.

A Candidate in Philosophy degree is awarded to a student after he passes his written and oral qualifying examinations. This is not viewed as a terminal degree, but rather as an aid to a student in getting a teaching or other job while completing his dissertation. No Master's degrees are awarded.

Foreign language proficiency is required only when it is crucial to a student's research specialty. There are no course "breadth" requirements. Residence and other university-wide requirements are described in the Graduate Division section of this catalog.

COURSES

LOWER DIVISION

1A-1B-1C. Elements of Economics The objectives of this survey course are to prepare students for a major or minor in economics, and to give those who will not specialize in economics an understanding of how the economy functions. Elementary theories of resource allocation and income determination are used to analyze policy issues of major significance. (May be used in fulfilling the Revelle College Social Science requirement.)

2A-2B-2C. Introduction to Economics Analysis The content of this course approximates that of the 1 sequence, but analytical methods are stressed. Open only to students with Mathematics 1A-1B-1C or the equivalent, and intended principally for mathematics, engineering, physics or economics majors. Either 1A-1B-1C or 2A-2B-2C or the equivalent is required of all majors and minors in economics.

3. Mathematical Methods for Economists Elementary mathematical methods useful in economics. Recommended for students without Mathematics 1A-1B-1C or the equivalent desiring to do upper-division work in economics. Prerequisite: consent of instructor.

UPPER DIVISION

100A-100B. Microeconomics The theory of consumer behavior and the theory of the firm as foundations of demand and supply. Market structure, distribution theory, and welfare economics. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

101. International Trade Analysis of the causes and patterns of international trade and investment, of the scope for increasing national welfare through foreign trade and investment, and of the policies for realizing those gains and for distributing them internationally. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

103. International Monetary Relations Balance of payments, international capital movements, and foreign exchange examined in light of current theories, policies, and problems. Prerequisite: Economics 101.

105. Industry Organization and Public Policy Study of the structure and performance of American industry. Dimensions and determinants of market structure and performance, empirical evidence. Anti-trust laws, regulation of industry, and other aspects of public policy toward industry. Prerequisites: Economics 100A-100B.

107. Invention, Innovation and Technical Change Research and development activity; market structure and technical change; the role of technical change in economic development; appropriate government policies to foster technical change in the private sector. Prerequisites: Economics 100A-100B.

109A-109B. Introduction to Business Management Decision-making in the firm; application of microeconomic tools and concepts to business problems; elements of accounting, marketing, finance, and production. Prerequisite: Economics 100A.

110A-110B. Macroeconomics The theory of national income determination as the basis for explaining fluctuations in income, employment, and the price level. Analysis of monetary and fiscal policy as a means of stabilizing the economy. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

111A-111B. Financial Institutions and Monetary Policy A study of the financial structure of the United States economy including analysis of bank behavior and the techniques of central bank monetary control. Prerequisites: Economics 110A-110B.

113. Mathematical Economics Mathematical concepts and techniques used in advanced economic analysis; applications to selected aspects of economic theory. Prerequisites: Economics 100A-100B, and Mathematics 2A-2B-2C or their equivalents.

115A-115B. The Evolution of Economic Theory and Policy An examination of the evolution of economic theory and policy in western Europe and Great Britain during the eighteenth and nineteenth centuries. While attention is given to the works of such individuals as A. Smith, D. Ricardo, T. R. Malthus, J. S. Mill, K. Marx, J. E. Cairnes, and others, the primary emphasis is on the development of economic analysis as a response to the economic problems of the times. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

116. Economic Development Analysis of current economic problems of "underdeveloped" areas and conditions for increasing income and employment. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

118A-118B. Law and Economics Economic analysis of the rationale for and actual effects of the legal system as it relates to economic activity. Legal foundations of the U.S. economy, attempts to control business practices through legislation, and direct regulation of particular industries will be studied. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

120A-120B-120C. Statistical Methods in Economics Statistical methods of special application to economic problems, and statistical problems commonly encountered in confronting economic models with non-experimental data. Correlation and regression analysis with applications to time-series and cross-section data; estimation of simultaneous equations models. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C and Mathematics 1A-1B-1C.

121. Games, Decisions and Programming An introduction to activity analysis, the theory of games, statistical decision theory, and linear programming. Utility theory, expected utility maximization, and other decision criteria. The Duality and min-max theorems. The simplex method. Leontief systems. Prerequisites: Economics 100A-100B.

122. Management Science Application of formal modeling techniques to allocation problems in business and government. Prerequisite: Economics 121.

130A-130B-130C. Public Policy The application of macroeconomic and microeconomic theory to issues of public policy and the contributions of related disciplines, e.g. political science, sociology, education, history to the solution of these problems. (The student will be required to study one problem intensively.) Prerequisites: 1A-1B-1C or 2A-2B-2C.

135. Urban and Regional Economics The economics of location: transport demand in relation to the layout of the city; the determinants of interregional economic specialization; central-place theory; industrial complex analysis. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

136. Human Resources Theoretical and empirical analysis of public and private investment in people, emphasizing the contribution to productivity of education. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

137. Inequality and Poverty Analysis of inequality in the distribution of income, education, and wealth; causes of poverty and public policies to combat it. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

138. Economics of Health The application of economic analysis to the health field; the role of health in income, production, and poverty; supply, demand and price determination in the public and private health sectors. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

139. Labor Economics A study of labor markets including such topics as collective bargaining, evolution and impact of unions, labor force participation, labor mobility, the effects of technological change on unemployment. The implications for public policy will be given extended consideration. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

140A. Economic History Surveys the economic history of Europe from the fall of the Roman empire to the onset of the Industrial Revolution, with emphasis on the critical analysis of the relationships among the main social institutions, land settlement, and economic growth. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

140B. Economic History Concentrates on American Economic history from 1790, with emphasis on the role of economic policy and on the quantification of economic change. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

150. Public Finance An analysis of the effects of government tax and expenditure policies on resource allocation and the distribution of income; the public debt; economic and political determinants of optimal public expenditure policies.

160. Economic Planning A development and evaluation of techniques for indicative planning (France) and central direction of the economy (Eastern Europe). Prerequisite: Economics 121.

161. Comparative Economics Systems Capitalism and socialism, studied as

ideal models and in actual performance. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

165. Economic Methodology and Ideology The individualistic basis of modern Western welfare economics. Alternative tenets (Marxist, radical, Maoist, Fabian, technocratic) and their implications. The roles of scientific method and ethical judgments in economic analysis. Current research and thinking in political economy. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

166. Marxist and Radical Economics Theories and ideologies in relation to practice in various economies; analysis of the views of economic thinkers in the Marxist and radical traditions. Prerequisites: Economics 1A-1B-1C or 2A-2B-2C.

190A-190B-190C. Seminars and Independent Work Seminars which will encourage the student to work on a particular problem intensively, culminating in at least one major paper. Prerequisite: consent of instructor.

195. Introduction to Teaching Economics Introduction to teaching economics. Each student will be responsible for a class section in one of the lower-division economics courses. Limited to advanced economics majors with distinguished records. May be repeated for credit once, but not for teaching the same course. Prerequisites: consent of department chairman and course instructor.

199. Independent Study Independent reading or research under the direction of and by special arrangement with an Economics Department faculty member. Prerequisites: consent of instructor and departmental approval.

GRADUATE

200A-200B-200C. Price and Allocation Theory (3-3-3) The role of theory in economics; demand analysis; the traditional theory of the firm; market structure and welfare; activity analysis and linear programming; dynamic models of the firm; market stability under uncertainty; capital theory and asset management.

201A-201B. International Trade (3-3) Theory of international trade, finance, and monetary relations. Growth, disturbances, and balance of payments adjustment. International economic policy and welfare.

205. Industrial Structure and Performance (3) Problems of monopoly and their effect on resource allocation. Measurement of monopoly power. The extent of and changes in monopoly behavior over time. Prerequisites: Economics 200A-200B.

209. Applied Microeconomics Intensive examination of selected empirical studies in microeconomics. An empirical research project is usually required of each student. Prerequisites: Economics 200A-200B-200C, 220A-220B-220C-220D.

210A-210B-210C. Aggregate Economic Analysis (3-3-3) The theory of income determination; consumption and investment; money, the general price level and the rate of interest; fluctuations in income and employment.

211. Monetary Theory and Policy The theory of money and economic activity. Factors determining money supply and demand. Monetary institutions, monetary reform, and the efficiency and rationality of monetary policy.

212. Optimal Economic Growth (3) The concepts of efficiency and optimality in dynamic models; interpretation and application of dynamic programming, calculus of variations, and control theory in problems of economic growth; the performance of markets in intertemporal resource allocation. Prerequisites: Economics 200A-200B, 210A-210B-210C or equivalent.

213A-213B. Topics in Economic Theory (3-3) An intensive examination of the literature on selected topics of current importance in economic theory. Prerequisites: 200 and 210 or consent of instructor.

214. Monetary Theory (3) Macroeconomic theory related to supply and demand for money. Relationship of money to prices, interest rates and output. Models of monetary and financial structure. Monetary dynamics of inflation, business fluctuation, and economic growth. Prerequisite: Economics 210A or consent of instructor.

216A-216B. Economic Development and National Planning (3-3) Analysis of conditions necessary for increasing income, employment, and capital formation in "underdeveloped" areas. Techniques useful in planning, e.g., input-output analysis and programming. Prerequisites: Economics 200C and 210C, or consent of instructor.

219. Applied Macroeconomics Intensive examination of selected empirical studies in macroeconomics. An empirical research project is usually required of each student. Prerequisites: Economics 210A-210B-210C, 220A-220B-220C-220D.

220A-220B-220C-220D. Econometrics The construction and application of stochastic models in economics. This includes both single and simultaneous equations models. Matrix algebra and basic statistics are covered.

221. Special Topics in Econometrics (3) Advanced exploration in econometric theory, with emphasis on thorough coverage of an important research technique. Prerequisite: Economics 220C.

250A-250B. Public Finance (3-3) Analysis of the impact of the government budget upon resource allocation and income distribution; social choice and political processes; tax and transfer policies and inter-temporal income distribution; the problem of public goods in a private market economy.

269. Seminar in Economics (3) A program of regular reports by graduate students on their own research, usually dissertation research. Faculty and visitors are encouraged to participate, both to act as critics and to report on their research. May be repeated for credit. (Satisfactory/Unsatisfactory grades permitted.)

290A-290B-290C. Teaching Methods in Economics (3-3-3) The study and development of effective pedagogical materials and techniques in economics.

Students who hold appointments as teaching assistants must enroll in this course, but it is open to other students as well. (Satisfactory/Unsatisfactory grades only.)

297. Independent Study (1-6, 1-6, 1-6) (Satisfactory/Unsatisfactory grades permitted.)

299. Research in Economics for Dissertation (1-12, 1-12, 1-12) (Satisfactory/Unsatisfactory grades permitted.)

FRONTIERS OF SCIENCE

Office: Provost, Revelle College

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This sequence of courses is designed to be used as a noncontiguous minor by Revelle College students who are not majoring in the sciences. However, inasmuch as the sequence will be given at the upper-division level, a knowledge of the material covered in a Revelle College lower-division sequence in the natural sciences will be presupposed. (See *Natural Sciences*, this section.) For the 1972-73 academic year, courses in Frontiers of Modern Medicine, Frontiers in Modern Physics, Quantitative Aspects of Social and Environmental problems, and Technology, Ecology, Morality are planned along with new offerings of current interest. However, others in the sequence may be scheduled if faculty are available and there appears to be sufficient demand for a particular course.

Prerequisite for all "Frontiers of Science" courses: Junior standing, completion of Revelle's Natural Science Sequence (or the equivalent), or consent of instructor.

COURSES

108. Biochemical Anthropology and Individuality S Reconstruction of migrations of different ethnic groups will be discussed with respect to various biochemical tests. Biochemical variations due to genetic differences in human populations will also be discussed from the point of view of both disease and a changing environment. The evolutionary factors which influence biochemical changes in man will be compared to that of other species. A summary will be made of the concepts of biochemical individuality as related to our society as well as its impact on the practice of medicine.

112. Quantitative Aspects of Social and Environmental Problems W Scientific and technical aspects of the following topics will be discussed: elements of probability theory and statistics, vital statistics and population growth, mathematical theory of the arms race, mathematical theory of the occurrence of wars, spreading of information (news and rumors), why some people will always be smarter or richer or more productive than others, occurrence of extreme events (how to predict floods and earthquakes), population density in cities, cities as organisms. To find solutions to social and environmental problems it is first necessary to analyze these problems.

113. Frontiers of Modern Medicine F An integrated series of lectures and readings covering the modern frontiers of medical research. Lectures to be given by members of the faculty of the School of Medicine to acquaint the student with ongoing problems in modern health research. Prerequisite: Revelle lower-division science sequence or equivalent.

114. Frontiers and Fringes of Modern Physics F Modern physics has developed in many different ways. The spectrum covers many aspects from pure propaganda to every day life. Subjects relevant to our existence reach all the way to profound questions concerning the origins of the universe. The aspects will be covered involving student participation. Prerequisite: Revelle lower-division science sequence or equivalent.

HISTORY

Office: Room 5024, Humanities and Social Sciences Building

Guillermo Cespedes, Ph.D., Professor of History

Gabriel Jackson, Ph.D., Professor of History

† Armin Rappaport, Ph.D., Professor of History

Ramon E. Ruiz, Ph.D., Professor of History

(Chairman of the Department)

Harry N. Scheiber, Ph.D., Professor of History

Curtis A. Wilson, Ph.D., Professor of History

† Stanley A. Chodorow, Ph.D., Assistant Professor of History

John G. Leonard, Ph.D., Assistant Professor of History

Thomas A. Metzger, Ph.D., Assistant Professor of History

* Franz G. Nauen, Ph.D., Assistant Professor of History

Michael E. Parrish, Ph.D., Assistant Professor of History

Edward Reynolds, Ph.D., Assistant Professor of History

Robert C. Ritchie, Ph.D., Assistant Professor of History

Susan J. Kleinberg, M.A., Acting Assistant Professor of History

* Leave of absence, fall quarter, 1972/73.

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THE MAJOR PROGRAM

Students majoring in the Department of History are required to take a minimum of twelve upper-division courses in history. These courses must be selected from four groups:

1. Lecture and discussion courses in European history
2. Lecture-discussion courses in western-hemisphere history
3. Lecture and discussion courses in non-western history
4. A one-quarter senior seminar

Students will be expected to fulfill a distribution requirement as follows: five quarter courses from one of the first three groups (to be designated the student's primary field); three quarter courses from a group other than the primary field; two quarter courses from a third group; and the senior seminar. With the consent of the student's advisor, a student may substitute additional senior seminars for lecture-discussion courses in Groups I, II and III, not to exceed one substitution in each group. With the consent of the student's advisor, a student may substitute two lecture-discussion courses for the senior seminar providing the two substitute courses are from different groups.

History majors are urged to take courses in related disciplines to enhance their understanding of the historical process and to strengthen their preparation in the major. Such courses should be selected in consultation with the advisor. A "C" average is required to graduate with a major in history.

The Graduate Program

The Department currently offers graduate work leading to the Ph.D. degree. Admission is based upon the student's performance as an undergraduate, upon any previous graduate record, and upon letters of recommendation from his professors. Graduate Study Applicants are required to submit Graduate Record Examination scores, as well as proof that they have passed an Educational Testing Service examination in French, German, Spanish or Russian. They are also asked to submit one or two papers written for history courses in which they have been enrolled. The minimum grade-point average for admission is 3.0 but students will be expected to have made a somewhat better average in their undergraduate history courses and in courses in the humanities and the social sciences. Applicants who show exceptional promise as evidenced by their overall grade-point average and by the testimonials of their professors may be admitted to the program without having had an undergraduate major in history. In special cases it may be possible for applicants with deficiencies in undergraduate courses to be admitted as limited students pending admission to the regular program. The deadline for filing applications for the academic year 1972/73 is February 1, 1973.

All students admitted to the program will be expected to be full-time students. A full-time program consists of twelve units per quarter; students holding a teaching appointment will take fewer, but not less than eight. The units will be distributed among three types of courses, as follows: research seminars (4 units per quarter), readings in the literature of the several fields (4 units per quarter), directed reading courses. Students will normally take two research seminars (each is a two-quarter sequence); at least three reading courses in the literature of the several fields (each is a one-quarter course); and the remaining units in directed reading. The research seminars must be taken under two different instructors. At present, students may choose among the following fields:

- Expansion of Europe
- Greece
- Rome
- Western Europe, 325-1250
- (Western Europe, 1250-1648, when available)
- Western Europe, 1750-1870
- Western Europe, 1870-Present
- Russia and Eastern Europe since 1613
- United States, 1607-1789
- (United States, 1789-1877, when available)
- United States, 1877-Present
- United States, Economic
- Latin America, Colonial
- Latin America, National
- History of Science
- Africa
- China
- India

Each candidate will be expected to pass a departmental written examination in each of his two chosen minor fields and an oral qualifying examination in his major field before beginning work on the doctoral dissertation. The examinations in the minor fields will be taken normally during the spring quarter of the second year and the oral exam in the major field normally will be taken during the fall quarter of the third year. The dissertation must be completed not later than six years from the time of admission to the program, preferably sooner. It normally will not exceed two hundred fifty pages, notes included. A final oral examination on the dissertation will be conducted by the student's doctoral committee.

The various requirements noted above apply to students who have done no previous graduate work in history. If a candidate has completed some graduate work before entering UCSD, there may be appropriate adjustments in the course work. Nevertheless, all candidates will be required to demonstrate reading knowledge of one or two foreign languages, depending on the major field, to pass the departmental and qualifying examinations, to write a dissertation, and to pass the final oral examination.

COURSES

LOWER DIVISION

The Department of History cooperates in the teaching and administration of the Humanities sequence for Revelle College students. (See *Interdisciplinary Courses*.) Completion of this sequence or the Muir College lower-division requirements is normally prerequisite to enrolling in upper-division courses in the Department of History. (Transfer students with credit for a two-semester, lower-division history sequence may be admitted to the upper-division courses.)

1A-1B-1C. Comparative History of the Americas A lecture-discussion course on the comparative history of Spanish America and the United States from the pre-Columbian period to the present. Through lectures, panel discussions, and readings, students will compare and contrast selected aspects of the political systems, economic developments, and cultural currents in the Americas. Among the topics to be covered are: patterns of conquest, slavery and race relations, the impact of technology, war, and imperialism.

5A-5B-5C. Tradition and Modernity in Europe and China Dealing comparatively with Europe and China from late medieval times to the present, this course focuses on the traditional patterns of intellectual, economic, and political life in these two civilizations and on the transformation of these patterns in modern times.

30A-30B-30C. United States History F-W-S Examines intensively a series of nine topics over the year drawn from American history, chosen to show the diversity of materials and techniques which historians use. Topics are introduced by a series of lectures designed to establish the necessary context, but the emphasis is on the problems themselves. Each of these is studied in small class groups, with special attention given to written work. Satisfies the American History and Institutions requirement.

UPPER DIVISION

104A-104B. Greece in the Classical Age W-S The political, economic and intellectual history of Greece from the birth of the city-states to the death of Alexander the Great. Three hours lecture and discussion.

105A-105B. The Roman Republic and Empire F-W The political, economic and intellectual history of the Roman world from the foundation of Rome to the death of Constantine. Three hours lecture and discussion.

107. The Ancient Near East S The development of Egyptian, Mesopotamian and Anatolian civilization to the time of Alexander the Great. Prerequisite: upper-division standing or permission of instructor.

108. Special Topics in Ancient History S A study in depth of selected problems and periods in ancient history. Topics will vary from year to year and students may repeat the course for credit with permission of instructor. Prerequisite: one upper-division course in ancient history.

109A-109B-109C. Intellectual History of the Greco-Roman World F-W-S An intensive study of the intellectual life of the Greco-Roman World with special emphasis on the development of the unique features of Greco-Roman literature, philosophy, historiography, and art. A primary purpose will be to understand the relationships between intellectual activity and the social and political environment in which it took place. Prerequisite: upper-division standing. (NOTE: Cross listed as Literature 109A-109B-109C and Philosophy 109A-109B-109C.)

110. Medieval Legal History Study of the legal system of early Germanic communities and the medieval kingdoms. Focus will be on the confluence of Roman, canon, and customary law in the formation of the modern legal system. Prerequisites: upper-division standing, History 111A-111B, or permission of instructor.

111A-111B. The Rise of Europe F-W The development of European society from the decline of the Roman Empire to 1250. Three hours lecture. Prerequisite: humanities sequence or its equivalent.

112. Church and State in the Middle Ages S Course will cover the progress of disputes between secular and ecclesiastical authority during the Middle Ages. The political literature produced by these disputes and their effects of governmental practice and theory will be of central concern. Prerequisites: 111A-111B or consent of instructor.

113. Renaissance Europe, 1348-1517 F The intellectual, political and economic transformation of late-medieval Europe from the crisis of the Italian civic spirit to the flowering of the Renaissance monarchies. The concurrent evolution of diplomacy, warfare, and political behavior. Prerequisite: completion of the humanities sequence or its equivalent.

121A-121B. European Social Thought, 1830-1890 Course will focus on the revolutions of 1848, the formation of the bourgeois synthesis and the anticipation of its disintegration. Discussions will be based on readings in European social criticism and literature including Marx, DeTocqueville, Mill, Comte, and Nietzsche.

122. The Expansion of Europe, 15th-17th Centuries The techniques, economic organization and institutional evolution of European colonizations in Africa, the

Far East and the Americas. The great geographical discoveries and the beginnings of world trade. With emphasis in comparative aspects.

123A-123B. Europe, 1750-1870 The impact of industrialization and the entry of new classes into politics. Effects of political, social, and economic change on both the domestic and the international order of the European states. (123A covers 1750-1814; 123B covers 1815-1870.) Prerequisite: humanities sequence or equivalent.

125. European Revolutions A lecture-discussion course on the causes and consequences of social and political revolutions in European society from the French Revolution of 1789 to the Bolshevik Revolution with emphasis upon their comparative aspects.

127. Modern German History A lecture-discussion course on the political and social history of Germany during the 19th and 20th centuries. Prerequisite: upper-division standing.

130A-130B. Russia since 1800 A two-quarter lecture-discussion course on modern Russian history with an emphasis upon political and institutional changes in the 19th and 20th centuries, including the growth of revolutionary movements, the collapse of the Imperial regime, the rise of Bolshevism, and the impact of communism upon Russian society. Prerequisite: upper-division standing.

133. The Soviet Union in the 1920s A lecture-discussion course on the social, economic, and political history of the Soviet Union after the Bolshevik Revolution with emphasis upon social and political structure, the New Economic Policy, and the rise of Stalinism. Prerequisite: upper-division standing.

135. The Era of the French Revolution France and Europe from the late Old Regime to the advent of Bonaparte. Emphasis falls upon intellectual and social forces. Prerequisite: upper-division standing or permission of instructor.

137. Modern French History A lecture-discussion course on the political and social history of France during the 19th and 20th centuries. Prerequisites: upper-division standing; permission of instructor.

140A-140B-140C. History of Latin America a Survey on the evolution of Latin America, covering aboriginal civilizations, Iberian colonizations and development of the modern nations, from prehistory to the present. With emphasis on demographic, economic and social problems. Prerequisite: completion of humanities sequence or its equivalent.

143A-143B. A History of Mexico From the Conquest through the Reforma, with special emphasis on social and cultural events. The second quarter will cover the period since 1876. Prerequisite: upper-division standing or permission of instructor.

145. Medieval and Golden Age Spain Interaction of the Muslim, Christian and Jewish communities, c. 700-1100. The Reconquest, economic and social development of Castile and Aragon. Inquisition, Renaissance, and Counter-Reformation. Political and cultural role in Europe and America, 1500-1650. Prerequisite: upper-division standing or permission of instructor.

148. Spain Since 1808 Resistance to Napoleon, Liberal revolution, Carlist wars and the era of pronunciamientos. Industrialization, urbanization, Krausism, socialism, anarchism. The Primo dictatorship, the Republic, the Civil War, and the Franco regime, 1923-present. Prerequisite: upper-division standing or permission of instructor.

152A-152B. Modern European History Lecture-discussion course on the political, social, economic and intellectual history of Europe from the late 10th century to the present, with emphasis upon national economies, the two great wars, Fascism and Communism. The first quarter covers 1870-1914. The second quarter covers 1914-present.

157A-157B. American Legal and Constitutional History A lecture-discussion course on the growth of constitutionalism in the United States from 1787 to the present with particular emphasis upon the judicial process, the role of the Supreme Court, and legal institutions. Prerequisite: upper-division standing or permission of instructor.

158A-158B. Economic History of the United States F-W A two-quarter course providing analysis of the American economy's development from the colonial period to the present. Readings and lectures will emphasize institutional aspects of economic change, including such topics as federal and state resource-use policies, the nature and impact of southern slavery, business entrepreneurship and management, and agricultural reform movements. Prerequisite: upper-division standing or permission of instructor.

160. United States: Colonial Period to 1763 F Political and social history of the thirteen colonies; European background, settlement and expansion, beginnings of culture and the Imperial context. Prerequisite: upper-division standing.

161. United States: The New Nation, 1763-1800 W Political and social history of the American nation, with emphasis on the Revolution, Confederation, and Union, the rise of the west. Prerequisite: upper-division standing.

164. American Intellectual History to 1860 W From colonial times through the pre-Civil War period; European origins and the development of political, social, economic, and religious thought in the American context. Emphasis on principal thinkers and ideas, with some reference to the general historical and background and values. Three hours discussion. Prerequisite: humanities sequence or its equivalent. Satisfies American History and Institutions requirement.

165. American Intellectual History from 1860 S American thought in the post-Civil War period, and some major trends in social, economic, political, and religious thought in the twentieth century. Developments in American philosophy, the

social sciences, and literature. Three hours discussion. Prerequisite: humanities sequence or its equivalent. Satisfies American History and Institutions requirement.

167A-167B. United States in the Twentieth Century W-S A lecture-discussion course on American society from 1890 to the present. Emphasis will be placed upon the domestic sources of public policy: including haphazard industrial growth, urbanization, and demographic change upon the social structure and politics of a rural, democratic, entrepreneurial culture. Close attention will be given to the origins and strategies of local, state, and national reform movements, the role of private interest groups, the effects of war, and the Negro revolution. Prerequisite: upper-division standing. Satisfies American History and Institutions requirement.

169A-169B. History of American Foreign Policy and Diplomacy F-W A two quarter course in the history of American Foreign Policy and diplomacy covering the period from the establishment of the colonies to the present. The course deals with the policy of the United States and the forces, intellectual, economic, cultural, and social which shaped that policy. Prerequisite: upper-division standing or permission of instructor. Satisfies American History and Institutions requirement.

170. Spanish Civil War W The cultural renaissance of twentieth-century Spain, the political and economic background, the Spanish Republic of 1931-36, the Civil War seen as both a domestic and an international crisis. Three hours discussion. Prerequisite: humanities sequence or its equivalent.

177. History of Africa to 1880 W A survey of pre-Colonial Africa, concentrating on the role of Islam in African history and the organization of early trade between Africans and Europeans (including the slave trade). Prerequisite: upper-division standing.

178. Modern African History S A survey of sub-Saharan Africa dealing with the European "scramble for Africa" in the 1880's, primary resistance movements, economic development, and modern nationalist movements. Prerequisite: upper-division standing.

179A. History of Africa (Ancient Africa to 1807) F This course deals with Ancient Africa, the Medieval States of the West African Sudan, East Africa and Medieval times, the forest kingdoms of West Africa, the great migrations and the impact of the Atlantic trade. Prerequisite: upper-division standing or permission of instructor.

179B. History of Africa (19th Century Africa) W This course deals with European penetration and African resistance in the 19th Century, the Islamic Revolution and its impact, African states in the 19th century, partition and African response thereto. Prerequisite: upper-division standing or permission of instructor.

179C. History of Africa (20th Century Africa) S This course deals with Africa in the 20th century; African development, the rise of nationalism and the response of metropolitan powers, the transfer of power, self-rule and military coups and the quest for identity and unity. Prerequisite: upper-division standing or permission of instructor.

180A. History of Ancient China (5000-206 B.C.) Course covers Chinese history from earliest times through the Chou period and focuses on Chou thought. Prerequisite: upper-division standing or permission of instructor.

180B. History of Imperial China from the Han through the Sung Periods (206 B.C.-1279 A.D.) Course focuses on Han thought and political structure, the rise of Buddhism, and societal changes during T'ang and Sung times. Prerequisite: upper-division standing or permission of instructor.

180 C. History of Imperial China in Ming and Ch'ing Times Course focuses on developments in the local society, the problem of capitalism, social mobility, the political structure, intellectual history, and foreign relations. Prerequisite: upper-division standing or permission of instructor.

183A. History of Modern China (1800-1937) Course deals with the advent of Western imperialism, the breakdown of the traditional order, the coming of revolution, and problems of modernization. Prerequisite: upper-division standing or permission of instructor.

183B. History of China in Recent Decades Course deals with the rise of Chinese Communism, the political structure of the Chinese People's Republic, the CPR's reorganization of both urban and rural life and the CPR's foreign relations, as well as developments on Taiwan. Prerequisite: upper-division standing or permission of instructor.

186. Social and Cultural History of India Mahatma Gandhi: Six Faces. The role of the charismatic individual has been a central concern of historical study. This course will investigate how scholars of six different disciplines have focused on the life of Mahatma Gandhi and reached conclusions regarding the meaning of his life and times. Of particular interest will be the importance of these different studies — history, philosophy, psychology, religion, political science, and sociology — for understanding the changes in Indian society during the early 20th century.

187A. History of India: 1500-1765 The political, economic, and cultural history of the Moghul Empire, the challenge of European traders, and the collapse of central authority in the 18th century. Prerequisite: upper-division standing or permission of instructor.

187B. History of India: 1765-1905 The establishment of British hegemony, the transformation of Indian society and culture, and the rise of resistance movements to colonial rule. Prerequisite: upper-division standing or permission of instructor.

187C. History of India: 1905-Present An introductory course emphasizing the historical roots and social bases of contemporary politics in India, Pakistan, and Bangla Desh. (Cross-listed as Political Science 187.) Prerequisite: upper-division standing or permission of instructor.

190A-190B-190C. History of Science The first quarter concerns the history of physical science from megalithic astronomy to Copernicus and from pre-Socratic thought to the late medieval attack on Aristotelian physics. The second quarter deals with the history of the scientific revolution in the 17th century, from Kepler and Galileo to the Newtonian synthesis. The third quarter will focus chiefly on three topics: the emergence of modern chemistry from Lavoisier to van't Hoff; the coming of Darwinism; and the roots of Einstein's special theory of relativity. Prerequisite: upper-division standing or permission of instructor.

191. Early Technics and Society, East and West A survey of the history of technics down to the 17th century, with attention to the interplay between the social milieu and the more specific achievements of the inventor and the engineer. Prerequisite: upper-division standing or permission of instructor.

192. History and Historians The nature and uses of history will be explored through the study of the historian's craft, and the critical analysis of historical sources and historical literature relating to selected topics in European, American, and non-Western history.

193. Tudor-Stuart England, 1485-1688 Social and political history from Henry VII to the Glorious Revolution with emphasis on social and economic problems, the expansion of central authority, the Puritan Revolution and Restoration. Prerequisite: upper-division standing or permission of instructor.

194. Senior Seminar A critical analysis of historical literature in a field of restricted scope. Several sections, focusing upon European, Western Hemisphere, and non-Western history, are offered each year. Students should consult their advisers each quarter about the seminars to be offered. Prerequisites: senior and history major; permission of instructor.

196. Special Topics in the Various Fields of History Readings and discussions on a particular topic in any field of history of special interest to a member of the faculty. Offered occasionally. Prerequisites: upper-division standing and permission of instructor.

199. Independent Study F,W,S Program to be arranged between student and instructor, depending on the student's needs and the instructor's advice in terms of these needs. Prerequisites: upper-division standing and approval of instructor.

GRADUATE

204. Literature of Greece

205. Topics in Roman History

206A-206B. Greece The course is designed to train students in research and writing historical papers. The first quarter is devoted to developing research techniques and to gathering material; the second quarter to composing the paper.

207A-207B. Rome The course is designed to train students in research and writing historical papers. The first quarter is devoted to developing research techniques and to gathering material; the second quarter to composing the paper.

210. Topics in Medieval History Class will study the Investiture Contest concentrating on the personalities involved in the ideas developed on both sides of the dispute.

220A-220B. The European Left After the Paris Commune A study of the theory and practice of socialism in the latter half of the 19th century. Reading and discussion will center on the Marxist tradition, revisionism, and anarchism, the possibilities of revolution. Research will focus on the social and political setting of leftist movements.

221. Aspects of European Thought, 1660-1715 Topics dealt with will include political and theological thought and the new natural philosophies of Descartes and Newton as they relate to political and theological questions.

222. The Historical Literature of Western Europe Since 1870 Readings in the historical literature of Western Europe since 1870.

232. Jewish Intellectual History of the 18th Century Isaac DePinto and Moses Mendelsson. (Cross-listed as Philosophy 270.)

234. European Intellectual History, 1890-1933 Discussion of the transformation in modern social theory, the crisis of bourgeois culture and the redefinition of Marxist ideology. Readings will include Weber, Freud, Bergson, Sorel, Lenin, and Gramsci.

240. The Literature of Latin America: Pre-Colonial Readings and discussion in the monographic literature and in the sources of selected topics. Emphasis on analysis of the historiography of the periods. Several papers will be required.

241A-241B. Latin America: Pre-Colonial

243A-243B. Topics in Latin American History

245. Spain Since 1808 Study of major Spanish historians of the 19th and 20th centuries.

246. Spanish Civil War: Issues in Contemporary History Analysis of domestic and international issues raised by the Spanish Civil War and of their interpretation, 1930's to the present. Extensive use of materials in the Southworth Collection.

247. Literature of the Spanish Civil War The Southworth Collection will be used extensively.

248A-248B. History of Mexico A research and study seminar of two quarters on the Mexican Revolution, 1910 to 1923, with primary emphasis on the socio-economic roots of revolution and social change. The first quarter deals with primary sources, bibliography, and the selection of a research project; in the second quarter, the student will complete the project and submit the study to the scrutiny of the seminar.

250A-250B-250C. The Literature of American History A three-quarter sequence of readings and discussion on the bibliographical and monographic literature of American history from the colonial period to the present. Taught by different members of the staff each quarter. The course is required of all beginning graduate students in American history.

251. Readings in American History Reading and discussion in selected areas of American history for advanced graduate students.

252A-252B. America in the 20th Century A two-quarter research seminar focusing upon the political, constitutional, and social history of the United States in the 20th century. Students will receive training in the archival sources and research techniques relevant to the study of selected aspects of the progressive movement and the New Deal. The second quarter will be devoted to the writing of individual research papers.

258A-258B. American Economic History Examination of some of the major interpreter problems in American economic history. Case studies of public economic policies and their impact, and individual research papers.

261A-261B. Untied States: Colonial Period

269A-269B. Topics in U.S. Diplomatic History Critical analysis of major works in U.S. diplomatic history; designed to acquaint the student with the historiographic developments in the field. Readings, discussions, and papers will form the basis of the course.

270. History of Africa Readings in principal themes of African history during the 19th and 20th centuries.

271A-271B. Topics in West African History A two-quarter seminar on selected topics in West African history. One quarter will be devoted to readings and discussions, and the second quarter will be devoted to the writing of individual research papers.

276. Readings in the Expansion of Europe The expansion of European culture into the non-Western world analyzed through a series of case studies. Emphasis will be on cross-cultural analysis of the colonial experience in Asia and Africa.

287. Readings in Indian Political History This seminar will examine some major themes of Indian politics in the 19th and 20th centuries. Aspects of political modernization will generally deal with the role of government and the political processes associated with governing. In addition to surveying historiographic trends, a basic approach will be to apply the insights of social science to historical phenomena by analyzing methodologies. Readings will include studies from other social sciences as well as standard historical works.

290. Readings in the History of Technology to 1830 A survey of the growing literature in this field, with selected readings that focus on the relation between technics, social organization, and social change.

298. Directed Reading (1-12) Guided and supervised reading in the literature of the several fields of history. Prerequisite: graduate standing. (Satisfactory/Unsatisfactory grades permitted.)

299. Thesis Direction (1-12) Independent work by graduate students engaged in research and writing of doctoral thesis. Prerequisite: graduate standing. (Satisfactory/Unsatisfactory grades permitted.)

500. Apprentice Teaching (1-4) A course in which teaching assistants are aided in learning proper teaching methods by means of supervision of their work by the faculty; handling of discussions, preparation and grading of exams and other written exercises, and student relations. Prerequisite: graduate standing. (Satisfactory/Unsatisfactory grades permitted.)

501. Teaching in the Humanities (1-4) Consideration of pedagogical methods appropriate to the teaching of literary, historical, and philosophical texts at the undergraduate level. Pedagogical aids for the teaching of composition. Supervised teaching in sections of the undergraduate Humanities Sequence. Student must be a Teaching Assistant or Fellow-Teaching Assistant in Revelle College. (Satisfactory/Unsatisfactory grades only.)

503. Teaching in Third World Studies (1-4) A course in which teaching assistants are aided in learning proper teaching methods by means of supervision of their work by the faculty; handling of discussions, preparation and grading of exams and other written exercises, and student relations.

HUMANITIES

Office: 1512 Humanities-Library Building

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This sequence of courses is to be used by Revelle College students in fulfilling the humanities requirement of the college. It is offered jointly by the Departments of Literature, Philosophy and History, and has the purpose of introducing the student to the Western cultural tradition. He will learn to interpret major literary, historical and

philosophical documents through lectures and discussions, as well as through the writing of themes.

one aim of the course is to develop the student's ability to write clear and well-ordered expository prose. In each quarter, students read approximately 1,500 to 2,000 pages and write three themes of approximately 1,000 words each plus a final examination. The reading assignments are equally divided among the fields of literature, philosophy and history. No less than five or more than ten different authors are read per quarter.

A student may not graduate from Revelle College with a major in humanities. Students interested in the area of humanities must choose a specific major within the humanities, i.e., literature, philosophy, etc. See *Subject A* for explanation of the *Subject A* course in Revelle College.

COURSES

- 1. The Present Age S** Analysis of some major twentieth-century books and cultural trends. Two lectures, one discussion, regular assignments in expository writing.
- 2. Jews and Greeks F** Readings from the Bible, Homer and the Greek dramatists, historians and philosophers. Two lectures, one discussion, regular assignments in expository writing.
- 3. Rome and the Middle Ages W** Documents in the literature, philosophy and history of Rome and Medieval Europe. Two lectures, one discussion, regular assignments in expository writing.
- 4. The Renaissance S** Documents in the literature, philosophy and history of the Renaissance. Two lectures, one discussion, regular assignments in expository writing.
- 5. Classicism and Enlightenment F** Documents in literature, philosophy and history of the seventeenth and eighteenth centuries. Two lectures, one discussion, regular assignments in expository writing.
- 6. The West after the French Revolution W** Documents in the literature, philosophy and history of the nineteenth century. Two lectures, one discussion, regular assignments in expository writing.

INTERDISCIPLINARY

Office: Provost, Revelle College

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COURSES

- 1. The Oceans F** Presents modern ideas and descriptions in the physical, chemical, biological and geological aspects of oceanography, and considers the interactions between these aspects. Intended for students interested in the oceans, but who do not necessarily wish to become professional scientists.
- 10. Interpersonal Behavior, Group Development and Leadership Styles F-S** As a means of exploring the dynamics of human interaction, each student will become a member of a small unstructured group. Readings will focus on contemporary theories of human development and concepts of humanistic education. The student will be asked to relate readings to his class experience. (Formerly Social Science 10 or 100.)
- 11. The Clinical Perspective F-W** A comprehensive view of the relationship between personality theory, therapeutic intervention, and expected outcomes. Three approaches to personal change will be presented and related to the basic assumptions of personal/human development embedded in the underlying theory. Readings will be drawn from both the experimental personality and applied therapeutic areas. Extensive use will be made of audio-visual techniques and of demonstrations to fully illustrate the methodology under discussion.
- 25. Law and Society S** This course will examine aspects of the legal process, including how and when the process is invoked, judicial decision-making, the role of the lawyer. Illustrative cases will be drawn from diverse areas, for example, commitment of the mentally ill, conscientious objection to the draft, economic equalization under the Constitution.
- 30. Workshop in Student Media (2) F-W-S** A half course open to members of the staffs of the student papers. Laboratory work covering the reporting, editing, layout and production of a regularly scheduled newspaper. Students will produce a weekly paper and be given other writing assignments.
- 44. Society and Human Values S** Course will consider historical and contemporary approaches to human values; criteria for determining values appropriate to human persons in community; contemporary and impending critical issues, social and individual, requiring value choice.
- 45. Introduction to Religious Studies F-W** Course is designed to introduce the student to the scholarly study of religion in a variety of contexts: historical, social, scientific, philosophical, literary, and artistic.
- 105A-105B-105C. Practicum in Student Counseling (2-2-2) F-W-S** A program to acquaint students with fields of study and areas of professional experience

in counseling, leadership and residence hall staffing. Prerequisite: appointment as a Resident Assistant for UCSD residence hall.

195. Discussion Leading F-S Discussion and tutorial activities associated with interdisciplinary courses. In addition to his assignment to an individual class or section, a student participating in this program will be required to meet for one three hour seminar per week with the course instructor. Prerequisites: senior standing, permission of and instructor.

196. Tutoring, Teaching and Academic Learning F-W-S The intellectual and relational aspects of teaching will be surveyed. Emphasis will be placed on learning theory and information organization. The theoretical material from the course will be applied to tutor-student relationships. Participation in the tutorial program is required for class membership. (Course may be repeated but not for credit.)

199. Independent Studies F-W-S Individual readings and projects in areas covered by the interdisciplinary courses. Prerequisite: permission of Provost of Revelle College.

LANGUAGE

Office: Language Center, 2125 Psychology and Linguistics Building

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Language proficiency requirements are established for undergraduate students by the Colleges and for graduate students by the department. John Muir College students: see college and major department requirements.

Revelle College students demonstrate their proficiency in a foreign language by satisfactory performance in a language proficiency examination (which tests both conversational and reading abilities). There is no formal language course requirement, but students who are not proficient upon entrance will normally gain the requisite proficiency after taking from one to four courses in the Language Sequence (Language 1-2-3-4-5-6). A student who is not yet proficient after completing those courses will gain the requisite proficiency by taking one of the Literature 10 courses.

Courses numbered Language 1-2-3-4-5-6 consist of a combination of small tutorial meetings with a native speaker, weekly group conferences led by a linguist, assigned laboratory work, and outside reading.

Students who begin their study of a language at UCSD should enroll in Language 1. A student who has studied a language previously must take a placement test given by the UCSD Testing Office if he wishes to continue his study of that language at UCSD. His placement within the Language course sequence or in Literature 10 or 11 will be determined by the results of that examination.

Placement into language or literature courses will be as follows:

COURSE	PREREQUISITES	PLACEMENT SCORE PREVIOUS COURSE	
Lang 1 (formerly 1A)	none		none
Lang 2 (formerly 1B)	0-424		Lang 1 (1A)
Lang 3 (formerly 1C)	425-474		Lang 2 (1B)
Lang 4 (formerly 1D,2A)	475-549		Lang 3 (1C)
Lang 5 (formerly 2B)			Lang 4 (2A)
Lang 6 (formerly 2C)			Lang 5 (2B)
Lit. 10	550-649		See below
Lit. 11	650 plus		

Admission to Literature 10 and to sections of Cultural Traditions courses conducted in a foreign language is gained either through examination or by course work. The alternatives are:

1. A score of 500 or higher in the Language Placement Examination administered by the UCSD Testing Office. (A score of 550 or higher is required for French or Spanish.)
2. Satisfactory performance in a language proficiency test conducted by the Department of Linguistics.

Courses numbered Language 11 or 12 are intended for students whose primary concern is to learn to read a language, and graduate students preparing to fulfill their graduate reading examination requirements. Courses numbered 12A, 12B, 12C need not be taken in sequence.

The language laboratory and language library at UCSD offer a rich collection of materials that can be used for self-instruction in a variety of languages. To encourage students to take advantage of these materials, credit will be granted to undergraduate students who have passed their proficiency requirements in one language and wish to study another on a self-instructional basis. Such students should enroll in Language 19. Prior to registration, students must consult the instructor of Language 19, who will establish a program of study and arrange for a final examination. Subject to the availability of materials at a suitable level of advancement, Language 19 may be taken for full or half credit and may be repeated for credit.

The facilities and materials in the language laboratory and language library are available to all students and faculty of the University, whether or not they are formally enrolled in one of the formal language programs.

COURSES

LOWER DIVISION

- Lang/Fr 1-2-3-4-5-6. French** See general description above.
Lang/Ge 1-2-3-4-5-6 German See general description above.
Lang/Ru 1-2-3-4-5-6. Russian See general description above.
Lang/Sp 1-2-3-4-5-6. Spanish See general description above.

Lang/En 2A-2B-2C. Intermediate English as a Foreign Language F-W-S Need not be taken in sequence. Open to undergraduate and graduate students whose native language is not English.

Literature 10. French See *Departments of Instruction: Literature.*

Literature 10. German See *Departments of Instruction: Literature.*

Literature 10. Italian See *Departments of Instruction: Literature.*

Literature 10. Russian See *Departments of Instruction: Literature.*

Literature 10. Spanish See *Departments of Instruction: Literature.*

Lang/Fr 11. Elementary French Reading* F-W-S A course designed to prepare students for graduate reading examination.

Lang/Ge 11. Elementary German Reading* F-W-S A course designed to prepare students for graduate reading examinations.

Lang/Ru 11. Elementary Russian Reading* F-W-S A course designed to prepare students for graduate reading examination.

Lang/Fr 12A-12B-12C. Intermediate French Reading* F-W-S Need not be taken in sequence. A course designed to prepare students for graduate reading examination.

Lang/Ge 12A-12B-12C. Intermediate German Reading* F-W-S Need not be taken in sequence. A course designed to prepare students for graduate reading examination.

Lang/Ja 12A-12B-12C. Intermediate Japanese Reading Intended to give an opportunity for those who already have basic knowledge of spoken Japanese to acquire reading knowledge of the language. Prerequisites: basic knowledge of spoken Japanese; consent of instructor.

Lang/Ru 12A-12B-12C. Intermediate Russian Reading* F-W-S Need not be taken in sequence. A course designed to prepare students for graduate reading examination.

Lang/Es 16. Introduction to Esperanto An introduction to the construction of Esperanto, its origins and its literature, and general problems of man-made language projects. Students should be able to speak, write, read and understand Esperanto by the end of the quarter. (Esperanto may not be submitted to fulfill UCSD language requirements.)

Language 19. Directed Study-Language* (2-4) Self-instructional materials are available at present in Afrikaans, American Sign Language, Arabic (Iraqi), Basque, Burmese, Chinese (Mandarin), Czech, Danish, Dutch, Finnish, French, German, Modern Greek, Haitian Creole, Modern Hebrew, Hindustani, Hungarian, Icelandic, Igbo, Italian, Japanese, Korean, Luganda, Malay, Norwegian, Persian, Polish, Portuguese, Russian, Serbo-Croatian, Spanish, Swahili, Swedish, Tai, Twi, Turkish, Vietnamese, Yiddish, and Yoruba. Prerequisite: must have passed college language proficiency requirement in another language.

*Credit earned in language courses which duplicates credit gained in previous courses will not be counted towards graduation.

Lang/Ch 51. Elementary Cantonese Basic grammar and usage with initial emphasis on the spoken language. The written language will be progressively incorporated.

Lang/Ch 52. Elementary Cantonese Continuation of Lang/Ch 51. Prerequisite: Lang/Ch 51 or equivalent.

Lang/Ch 53. Elementary Cantonese Continuation of Lang/Ch 52. Prerequisite: Lang/Ch 52 or equivalent.

Lang/Ch 61. Elementary Mandarin Basic grammar and usage with initial emphasis on the spoken language. The written language will be progressively incorporated.

Lang/Ch 62. Elementary Mandarin Continuation of Lang/Ch 61. Prerequisite: Lang/Ch 61 or equivalent.

Lang/Ch 63. Elementary Mandarin Continuation of Lang/Ch 62. Prerequisite: Lang/Ch 62 or equivalent.

Lang/Ch 71. Intermediate Cantonese Usage and grammar with equal emphasis on the written language and spoken language. Prerequisite: Lang/Ch 53 or equivalent.

UPPER DIVISION

Lang/Sp 101A-101B-101C. Conversational Spanish for Medical Students A course designed to teach basic Spanish conversation and reading to meet the special needs of students in clinical settings. Prerequisite: medical student status or permission of instructor.

Lang/Sp 102A-102B-102C. Intermediate Conversational Spanish for Medical Students A course designed to teach basic Spanish conversation and reading at the intermediate level to meet the special needs of students in clinical settings.

Prerequisite: medical student status or permission of instructor, or Lang/Sp 101A-101B-101C.

Lang/Ru 130. Advanced Russian Composition A practical application of Russian morphology, syntax, and stylistics to oral and written composition. It includes the study of structure in the context of reading, interpretation and discussion of a wide range of contemporary Russian expository and journalistic prose. Prerequisite: proficiency or equivalent. May be taken concurrently with Literature 10: Russian.

Lang/Ch 154. Intermediate Cantonese Grammar, conversation in Cantonese, and reading and writing in Cantonese and in Modern Standard Chinese. Continuation of Lang/Ch 53. (This course or equivalent will fulfill the language requirement.) Prerequisite: Lang/Ch 53 or equivalent.

Lang/Ch 159. Mandarin for Cantonese Speakers Introduction to Mandarin Chinese for Cantonese speakers. Systematic approach to differences between Mandarin and Cantonese (sound, vocabulary, grammar and writing) through lectures, recitation sessions and laboratory. Specially designed to facilitate the transition from Cantonese to Mandarin. Prerequisite: Lang/Ch 154 or equivalent.

Lang/Ch 164. Intermediate Mandarin Grammar, conversation, reading and writing in Mandarin. Continuation of Lang/Ch 63. (This course or equivalent will fulfill the language requirement.) Prerequisite: Lang/Ch 63 or equivalent.

Lang/Ch 175. Readings in Contemporary Chinese I Reading and translation in contemporary Chinese literature. The emphasis will be on the further development of reading, writing and comprehension ability. The course includes grammar reviews, lectures and class discussions. Prerequisite: Lang/Ch 164 or 159; Lang/Ch 159 may be taken concurrently.

Lang/Ch 181. Introduction to Classical Chinese Introduction to the classical language through Confucius, Mencius and the other Great Books. The emphasis will be on comprehension and reading ability. Prerequisite: Lang/Ch 154 or 164 or equivalent.

Lang/Ch 182. Introduction to Classical Chinese Continuation of Lang/Ch 181. Prerequisite: Lang/Ch 181 or equivalent.

Lang/Ch 183. Readings in Classical Chinese Introduction to major works written in Classical Chinese, including poetry and historical documents. Prerequisite: Lang/Ch 182 or equivalent.

LINGUISTICS

Office: 5237 Psychology and Linguistics Building

Edward Klima, Ph.D., Professor of Linguistics

(Chairman of the Department)

Leonard Newmark, Ph.D., Professor of Linguistics

Sige-Yuki Kuroda, Ph.D., Associate Professor of Linguistics

Ronald W. Langacker, Ph.D., Associate Professor of Linguistics

Sanford Schane, Ph.D., Associate Professor of Linguistics

Paul Chapin, Ph.D., Assistant Professor of Linguistics

Matthew Y-Ch Chen, Ph.D., Assistant Professor of Linguistics

Margaret H. Langdon, Ph.D., Assistant Professor of Linguistics

Timothy S. Smith, Ph.D., Assistant Professor of Linguistics

Benjamin K. T'sou, Ph.D., Acting Assistant Professor of Linguistics

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Broadly speaking, linguistics is simply the study of language as language. Like other rapidly developing fields, linguistics resists simple classification into one of the traditional categories of academic disciplines. Considered as one of the humanities, linguistics concentrates on the historical development of a particular language or language family, or on the relation between a language and the literature composed in that language. Considered as a social science, linguistics may be related to anthropology, in describing language as part of culture; or it may be related to psychology, in describing language as a kind of behavior. One branch of linguistics, phonetics, may even be considered a natural science, related to the physical science of acoustics and the biological sciences of anatomy and physiology. Considered as an engineering science, linguistics has found many applications in fields as far apart as language pedagogy and mechanical translation. Finally, linguistics may be considered a formal science in its own right, related to mathematics and formal logic.

(The Department of Linguistics supervises the teaching of foreign languages. See *Interdisciplinary Courses: Language.*)

The Major Program

An undergraduate major in linguistics is intended to give a student the background that will best prepare him for graduate work in this field. Because linguistics shares its object matter — language — with so many other disciplines, this major is unlike many others in that it requires relatively few courses in the major department itself. The major in linguistics will consist of twelve courses: six basic courses in the Department of Linguistics, complemented by six other courses directly related to the study of language. For all courses counted toward the major in linguistics, the student must receive grades of C or better.

All linguistics majors must take at least six upper-division courses in the Department of Linguistics. These are normally preceded by Linguistics 1A-1B-1C (in special cases, Linguistics 100 may substitute for the sequence).

The foreign language proficiency requirements for linguistics majors exceed those set

by the undergraduate colleges in both breadth and depth. In terms of depth, the student must pass the ETS Graduate School Examination in French, German, Russian, or Spanish. In terms of breadth, the student must achieve competence in at least one additional foreign language. Competence is defined as the successful completion of three one-quarter courses or the equivalent. The remaining courses of the linguistics major must be relevant to the study of language but may be taken in departments other than Linguistics: for instance, Mathematics, Applied Physics and Information Science, Philosophy, Psychology, Anthropology, or Literature. These courses need not all be taken in the same department, but they must form a coherent program of study in conjunction with the required core of linguistics courses. The courses to complete the major are selected in consultation with the departmental undergraduate adviser.

The noncontiguous Minor (Revelle College)

Because of the great flexibility of the linguistics major, the classification of this major as humanities, natural science, or social science must be determined for each student on the basis of his specific program. The classification of his major program will in turn determine what areas will be acceptable for the student's noncontiguous minor.

The Minor Program

The Linguistics minor consists of six courses, of which at least three must be upper division; the departmental requirement is Linguistics 1A-1B-1C (or in special cases Linguistics 100) in addition to one upper-division course other than 100. The remaining five courses must be relevant to the study of language but may be taken in departments other than Linguistics: for instance, Mathematics, Applied Physics and Information Science, Philosophy, Psychology, Anthropology, Sociology or Literature. These courses need not all be taken in the same department, but they must form a coherent program of study. The courses to complete the minor are selected in consultation with the departmental undergraduate adviser. The content of these courses will determine whether the Linguistics minor is classified as humanities, natural science, or social science.

The Graduate Program

In order to develop scholars capable of original research and effective teaching, the Linguistics faculty has planned a graduate program aimed at imparting: (a) a thorough understanding of contemporary linguistic theory and linguistic analysis, (b) a broad knowledge of the major achievements of descriptive and historical linguistics, and (c) intensive training in a specialized area of linguistic study, within linguistics itself or in conjunction with related disciplines.

Preparation

Since linguistics is a highly technical and analytic field, linguistics students will find their undergraduate training in mathematics and the natural sciences especially valuable. Undergraduate work in certain of the social sciences and humanities, particularly psychology, anthropology, philosophy, and literature, is also good preparation for linguistics. All applicants are expected to have substantial experience with foreign languages, but since few institutions offer serious linguistics courses for undergraduates, the student may begin his graduate program here with no previous course work in linguistics proper. Because the basic graduate courses offered by the Department of Linguistics are three-quarter sequences, new graduate students will normally be admitted only in the fall quarter of any academic year. Applicants for admission to graduate status in Linguistics are normally required to submit scores on the Graduate Record Examinations Aptitude Test given by the Educational Testing Service of Princeton, New Jersey.

Program of Study

The graduate program is aimed essentially towards the Ph.D. in Linguistics, with a provision for granting the M.A. (Plan II) upon completion of the basic graduate requirements. In the student's first two years of graduate study, his basic courses will stress linguistic theory and the structure of English, particularly from the point of view of generative grammar and language analysis. For his advanced work, he will choose, subject to the approval of the Department's Graduate Committee, an area of specialization based on his individual interests: for example, linguistic theory, Romance linguistics, English linguistics, psycholinguistics, language acquisition, or anthropological linguistics.

Language Requirements

A candidate for the M.A. degree must demonstrate (1) his ability to read French, German, or Russian by achieving a scaled score of at least 500 on the Social Science option of the Graduate School Foreign Language Test given by the Educational Testing Service of Princeton, New Jersey, and (2) his knowledge of the structure of an Indo-European language and of a non-Indo-European language, either through his performances in courses on the structure of the language or in a descriptive paper acceptable to the Department's Graduate Committee.

A candidate for the Ph.D. degree, in addition to meeting language requirements (1) and (2) above, must demonstrate (3) reading knowledge of a second foreign language — French, if he has not used it in fulfilling the M.A. requirements, otherwise German or Russian, and (4) oral fluency in some language other than his native one. The language chosen for oral fluency may be one of those in which he has satisfied a reading requirement.

Departmental Examinations

Candidates for both the M.A. and Ph.D. degrees must pass the departmental comprehensive examination. This written examination gauges the student's general familiarity with modern descriptive and comparative linguistics. Normally, a student may take the examination no earlier than three quarters and no later than eight quarters after beginning graduate study. To be eligible to take the comprehensive examination, the student must have satisfied language requirement (1) above.

Candidates for the Ph.D. degree must also take a qualifying examination — a two-hour oral examination which tests the student's knowledge in his area of specialization. The qualifying examination, which normally requires from six to nine quarters of course preparation at the graduate level, may be taken only after the student has passed the departmental comprehensive examination and satisfied all language requirements.

Apprentice Teaching and Research

As part of his preparation for a future academic career, every linguistics student at UCSD is given special opportunities to participate in one of the Department's teaching and research programs under the supervision of a professor. Depending on his qualifications, the student may conduct conversation classes or analysis conferences in the Basic Language Program administered by the Department, or he may be asked to assist a professor in the teaching of a graduate or undergraduate linguistics course, or he may do research in linguistics under the supervision of his doctoral committee chairman. Such apprentice training, equivalent to a half-time assistantship for three quarters, is an integral part of the linguistics graduate program at UCSD and as such constitutes one of the requirements for the Ph.D.

Dissertation

The candidate will write a substantial dissertation incorporating the results of original and independent research carried on under the supervision of his doctoral committee. He will be recommended for the Doctor of Philosophy degree after he has made a successful oral defense of his dissertation before the doctoral committee.

COURSES

LOWER DIVISION

1A-1B-1C. Linguistics F-W-S Language as object, language as system, language as communication. A general introduction to language; English dialects; phonetics and language change; structural linguistics and formal models; language acquisition and biological foundations of language; structural poetics; human language and animal communication. Linguistics 1A may be taken independently.

UPPER DIVISION

100. General Linguistics S An introduction to the study of language. The analytical and descriptive methods and devices of general linguistics. Phonological, morphological and syntactic systems. Comparative and historical linguistics, psycholinguistics, anthropological linguistics, and their relationships to general linguistics. Prerequisite: consent of instructor.

101. Introduction to Syntax F Examination of the syntactic structures of natural languages, with special reference to the structure of English. Exercises in syntactic description. The empirical justification of syntactic analyses. Syntactic theory and universals. Prerequisites: Linguistics 1A-1B-1C, or Linguistics 100.

102A. Articulatory Phonetics F Elementary anatomy and physiology of the speech mechanisms. Extensive practice in producing and transcribing the sounds used in a wide variety of the languages of the world. Discussion of phonological/phonetic feature systems. Prerequisites: Linguistics 1A-1B-1C, or Linguistics 100.

102B. Introduction to Phonology W Examination of the phonological structures of natural languages. Exercises in phonological description. The empirical justification of phonological analyses. Prerequisite: Linguistics 102A.

151. Introduction to Historical Linguistics S Language change. Genetic and areal relationships. The comparative method. Internal reconstruction. Prerequisites: Linguistics 1A-1B-1C or Linguistics 100.

164. Language Structures Detailed investigation of the structure of one or several non-Indo-European languages. Prerequisites: linguistics 101 and Linguistics 102B.

174. Sociolinguistics W Introduction to the study of the social dimension in linguistics. Topics covered may include: Bilingualism, code switching, pidgins, creole language, social factors affecting linguistic change, languages in contact, language in context. Prerequisites: Linguistics 1A-1B-1C or Linguistics 100 or equivalent.

175. Readings in Contemporary Chinese I Continuation of Chinese Studies 175. Introduction to simplified characters used in the Republic of China. Half of the selections to be used in class will be drawn from literature written in simplified characters. Prerequisite: Lang/Ch 175.

176. Readings in Contemporary Chinese II Continuation of Chinese Studies 175. Introduction to simplified characters used in the Republic of China. Half of the selections to be used in class will be drawn from literature written in simplified characters. Prerequisite: Lang/Ch 175.

198. Directed Group Study in Language and Linguistics (2 or 4) F-W-S Study of specific language structures or linguistic topics not covered in regular course work, under the direction of an Undergraduate Major Adviser in the Linguistics Department. Prerequisite: consent of instructor. (May be repeated for credit.)

199. Independent Study of Linguistics (2 or 4) F-W-S The student

will undertake a program of research or advanced reading in linguistics under the supervision of a faculty member of the Linguistics Department. Prerequisite: consent of instructor. (May be repeated for credit.)

GRADUATE

- 201A. Linguistic Theory F** Introduction to the theory of generative grammar; transformational rules and other rules schemata. Models for syntactic description; formalization of grammars.
- 201B. Linguistic Theory W** Advanced problems in syntactic theory; deep and surface grammar; semantic considerations in syntax. Prerequisite: Linguistics 201A or equivalent.
- 201C. Linguistic Theory S** Introduction to the theory of generative grammar; transformational rules and other rule schemata. Models for syntactic description; formalization of grammars. Advanced problems in syntactic theory; deep and surface grammar; semantic considerations in syntax.
- 202A. Articulatory Phonetics F** Elementary anatomy and physiology of the speech mechanisms. Extensive practice in producing and transcribing the sounds used in wide variety of the languages of the world. Discussion of phonological/phonetic feature systems.
- 202B. Elementary Phonology F** Introduction to phonological theory. Theoretical constructs and formalism. General problems in phonological analysis. Prerequisite: Linguistics 202A or equivalent. Linguistics 202A and 202B may be taken concurrently.
- 202C. Advanced Phonology S** Advanced problems in generative phonology. Phonological processes, universal constraints, and naturalness conditions. Emphasis on some selected current theoretical issues. Prerequisite: Linguistics 202B or equivalent.
- 211A-211B. Linguistic Analysis W-S** The techniques of linguistic analysis (phonetics, phonemics, morphology, syntax). Application of these techniques under simulated field conditions to the recording and analysis of a language by direct elicitation from native informants. May be repeated for credit.
- 224A-224B. Modern English (3-3) S-F** A detailed study of the syntax, phonology, and semantics of modern English, with particular emphasis on current research on the general theory of grammars, as developed through the study of English.
- 225. Topics in Syntactic Theory** Theoretical and descriptive problems in the analysis of the syntactic and semantic structure of English and other languages. May be repeated for credit.
- 231A-231B. Formal Linguistics (3-3)** Theory of formal grammars, with particular emphasis on context-free grammars. Aspects of theories of automata and computation related to grammatical systems. Relationship of the hierarchies of automata and grammars.
- 234. Computational Linguistics (3) F** Parsing algorithms for formalized grammars. Approaches to natural-language processing. The computer as a linguist's tool.
- 235. Topics in Formal Linguistics** Advanced material in special areas of the study of formal grammars to be selected by the instructor. May be repeated for credit. Prerequisites: 231A-231B or consent of instructor.
- 236. Experimental Phonetics** Detailed study of the acoustic structure of speech and of the basic anatomy and physiology of normal speech production. Laboratory techniques in these areas will be covered. Relations between experimental phonetics research and phonological theory will be discussed. Prerequisite: consent of instructor (Satisfactory/Unsatisfactory grades permitted.)
- 241. Romance Linguistics (3) W** The history and structure of the Romance languages in the context of generative grammar. Topics offered on a regular basis will include: historical French syntax, historical French phonology, modern French syntax, modern French phonology, historical Romance phonology, historical Romance syntax. Other Romance languages and Latin will be considered, according to student interest.
- 245. Topics in Phonological Theory** Current theoretical issues in phonological theory. Since the topic can change from year to year, course may be repeated for credit.
- 247. Topics in Experimental Phonetics F** Detailed study of the acoustic structure of speech and of the basic anatomy and physiology of normal speech production. Laboratory techniques in these areas will be covered. Relations between experimental phonetics research and phonological theory will be discussed. May be repeated for credit. Prerequisite: consent of instructor.
- 251. Historical Linguistics (3) S** Topics offered on regular basis will include: Indo-European phonology and morphology; the techniques of linguistic reconstruction; theory of language change; advanced problems of historical linguistics.
- 262. Albanian Linguistics** Grammatical analysis of Albanian — its phonology, morphology, and syntax.
- 263. Topics in Chinese Linguistics** Synchronic and diachronic descriptions of Chinese. Survey of some of the following areas: phonology, syntax, dialectology, phonological change, syntactic change, semantic structure, history of Chinese linguistics. Since the topic can change from year to year, course may be repeated for credit.
- 264. Language Structures (3)** Grammatical analysis of a specific language. Language considered in a given quarter may be Sanskrit, Japanese, Albanian, Diegueno, Hungarian, Old Norse, Tongan or Uto-Aztecan. May be repeated for credit.
- 265. Topics in American Indian Linguistics** Subjects covered may include: the genetic classification of American Indian languages; the structure of individual languages; change and reconstruction; areal relationships; survey of individual language families. Since the topic can change from year to year, course may be repeated for credit.
- 268. Topics in Japanese Linguistics** Selected topics from special areas of Japanese syntax and phonology to be selected by the instructor. Since the topic can change from year to year, course may be repeated for credit.
- 271. Anthropological Linguistics (3)** In a given quarter the topic may be: language and culture; the interrelationships of language and other aspects of human behavior; Indian languages of North America; Oceanic languages; or advanced problems in anthropological linguistics.
- 274. Sociolinguistics** Introduction to the study of the social dimension in linguistics. Topics covered may include: bilingualism, code switching, pidgins, creole language, social factors affecting linguistic change, languages in contact, language in context.
- 275. Topics in Semantics** Advanced material in special areas of the study of meaning and its relation to formal aspects of human language. Since the topic can be changed from year to year, course may be repeated for credit.
- 279. Literary Studies and Linguistics (4)** Fundamentals of linguistics. The relationship of literary theories and current linguistic theories. Examination of formalist and structuralist analyses of literary texts. The contribution of various literary theorists (Jakobson, Ingarden, Spitzer, etc.) to poetics. Structural analysis of selected texts, mostly in English.
- 281. Psycholinguistics (3)** The study of models of language and of language acquisition from the point of view of modern linguistics and psychology.
- 285. Topics in Foreign Language Acquisition (3) S** Seminar will investigate the theories that underlie the teaching of foreign languages, with particular concentration on contemporary statements claiming a basis in modern psychology and linguistics. May be repeated for credit.
- 286. Topics in the Language of the Deaf** The structure of American sign language and other gestural languages of the deaf. Perception of language in the visual mode. Since the topic can change from year to year, course may be repeated for credit.
- 287. Topics in Orthography** The relationship of orthographic systems to structural linguistics. Since the topic can change from year to year, course may be repeated for credit.
- 290. Issues in Contemporary Linguistics (3)** Discussion of a selected topic drawn from the history of linguistics and general linguistics.
- 291. Topics in History of Linguistics** Salient features in the development of the various aspects of linguistic theory will be surveyed, and the contributions of principal schools, such as the Neogrammarian, Prague, Structuralist traditions, will be assessed. Since the topic can change from year to year, course may be repeated for credit.
- 292. Seminar in Language Universals** The methods and concepts of universal grammar. Discussion and evaluation of proposed universals. Original research into universal semantic, syntactic, and phonological tendencies. Since the topic can change from year to year, course may be repeated for credit.
- 296. Directed Research (1-6) F-W-S** Individual research (Satisfactory/Unsatisfactory grades permitted.) May be repeated for credit.
- 298. Fieldwork (1-6) F-W-S** Linguistic analysis of language in the field. May be repeated for credit.
- 299. Doctoral Research (1-9) F-W-S** Directed research in/on dissertation topic for students who have been admitted to candidacy for the Ph.D. degree. Prerequisite: admission to candidacy. (Satisfactory/Unsatisfactory grades permitted.)
- 500. Apprentice Teaching in Linguistics (1-4) F-W-S** The course, designed to meet the needs of graduate students who serve as LA's and TA's, includes analyses of texts and materials, discussion of teaching techniques and theories, conducting discussion sections, preparation and grading of routine examinations, under the supervision of the instructor assigned to the course. As a requirement for the Ph.D. degree a student must serve as an apprentice teacher for the equivalent of 50% time for three academic quarters. Enrollment in this course for a total of 12 units (1-4 units per quarter) documents the fulfillment of this requirement. (Satisfactory/Unsatisfactory grades only.)
- 505. Apprentice teaching in Third College Programs F-W-S** A course designed to meet the needs of graduate students who serve as TA's in Third College. Planning of courses, analysis of texts and materials related to the courses, discussion of teaching techniques, formulation of paper and examination topics and consultation with instructor(s). (Satisfactory/Unsatisfactory grades only.)

LITERATURE

Office: 1003 Humanities-Library Building

Jaime Alazraki, Ph.D., Professor of Spanish Literature

* Michel Benamou, Agrege, Professor of French Literature

* Ronald Berman, Ph.D., Professor of English Literature

Carlos Blanco Aguinaga, Ph.D., Professor of Spanish Literature

Diego Catalan, Ph.D., Professor of Spanish Literature

Robert C. Elliott, Ph.D., Professor of English Literature

Edwin Fussell, Ph.D., Professor of American Literature

* Claudio Guillen, Ph.D., Professor of Spanish and Comparative Literature

Frederic Jameson, Ph.D., Professor of French Literature

Reinhard Lettau, Ph.D., Professor of German Literature

Louis Marin, Agrege, Professor of French Literature

Roy Harvey Pearce, Ph.D., Professor of American Literature

John L. Stewart, Ph.D., Professor of American Literature

(Provost of John Muir College)

Andrew Wright, Ph.D., Professor of English Literature

(Chairman of the Department)

Bernhard Blume, Ph.D., Professor of German Literature, Emeritus

Jack Behar, Ph.D., Associate Professor of American Literature

David K. Crowne, Ph.D., Associate Professor of English and

Comparative Literature

Thomas K. Dunseath, Ph.D. Associate Professor of English Literature

Donald T. Wesling, Ph.D., Associate Professor of English Literature

Martin W. Wierschin, Ph.D., Associate Professor of German Literature

and German Philology

Leonard Barkan, Ph.D., Assistant Professor of English Literature

Jeffrey Barnouw, Ph.D., Assistant Professor of English and

Comparative Literature

Nathalie Babel Brown, Ph.D., Assistant Professor of French

and Russian Literature

Alain J. J. Cohen, Ph.D., Assistant Professor of French Literature

Abraham J. Dijkstra, Ph.D., Assistant Professor of American and

Comparative Literature

Ismith Khan, Ph.D., Assistant Professor of Caribbean and

Comparative Literature

Susan Kirkpatrick, Ph.D., Assistant Professor of Spanish and

Comparative Literature

* Keith D. Lowe, Ph.D., Assistant Professor of English Literature

Arturo Madrid, Ph.D., Assistant Professor of Spanish Literature

Fred V. Randel, Ph.D., Assistant Professor of English Literature

Jonathan Saville, Ph.D., Assistant Professor of French and

Comparative Literature

George H. Szanto, Ph.D., Assistant Professor of Dramatic and

Comparative Literature

Anthony G. Wilden, Ph.D., Assistant Professor of French Literature

Wai-Lim Yip, Ph.D., Assistant Professor of Chinese and

Comparative Literature

Katharina Mommsen, Ph.D., Visiting Professor of German Literature

Heinz Wetzel, Ph.D., Visiting Professor of German Literature

Hellmut Amnerlahn, Ph.D., Visiting Associate Professor of

German Literature

Saul Steier, M.A., Acting Assistant Professor of English

Literature

Cynthia Walk, M.A., Acting Assistant Professor of English

Literature

* On Leave 1972-73

* * *

All literature courses at UCSD are offered by a single Department of Literature. The Department brings together teacher-scholars and students who would elsewhere be separated by the languages in which the national literatures are written. Here they are united by the nature of the studies they pursue. This lends a general and comparatist aspect to both undergraduate and graduate programs, which lead to the bachelor of arts, the candidate in philosophy, and the doctor of philosophy degrees. All students must show knowledge of a foreign literature by doing upper-division or graduate work in that literature in the original language. Courses are offered not only in the literatures themselves but in the theoretical aspects of literature and — often in cooperation with other departments — in the relation of literary study with other disciplines; for instance, philosophy, visual arts, music, sociology, history, psychology, linguistics, and communications.

With special permission, undergraduates may take graduate courses for credit under the rubric "Special Studies, Lit. 199", and graduate students may also take undergraduate courses for credit under certain circumstances.

THE UNDERGRADUATE PROGRAM

Lower-Division Preparation

In both Muir and Revelle Colleges, the only prerequisite to upper-division courses is completion of the college freshman-sophomore requirements. However, literature majors who do not elect to take Literature 10 or 11 as part of their lower-division program may find that, before enrolling in upper-division courses in a foreign literature, they must bring their language proficiency up to the appropriate level by taking such lower-division courses during their junior year. Literature/English 21, 22, 23 is recommended for students planning to major in literature with English and American as their primary or secondary literature. Lower-division students may take advanced courses with permission of the instructor.

The Major in Literature

Five programs are open to those majoring in literature: English-American, French, German, Spanish, and General Literature. In each case, whatever his primary field of concentration, a student is expected to study a second literature. The range of second literatures includes Chinese, Classical Greek, Italian, Latin, and Russian, and also the previously mentioned French, German, Spanish, and (for those concentrating in a foreign literature) English-American.

A major consists of:

1. nine upper-division courses in a primary literature (in the case of a General Literature program, any combination of nine upper-division courses offered by the Department);
2. three courses, at least one of which must be upper-division, in a second literature (literature 10 may not be counted as part of this requirement);
3. enough other upper-division courses to make a total of 14 upper-division courses in the Literature Department.

Other than the obligation to study a foreign literature, the major has no requirements of specific courses. The student's major program should be worked out with the help of a departmental advisor and must be approved by him each quarter.

Students who plan on teaching careers and graduate school are strongly advised to take in the Winter Quarter of their senior year Literature 191, to be followed in the Spring Quarter by Literature 199 in the literature of their specialization. In this case, Literature 199 will center on writing a long paper, planning for which will begin in Literature 191.

The Noncontiguous Minor

The Department offers a wide range of possibilities for a noncontiguous minor in the Revelle College major program. The options include courses in a single national literature, courses in more than one literature, and a combination of lower and upper-division Department of Literature courses in languages and literature. Revelle College students who wish to pursue a noncontiguous minor involving literature are required to consult with the Department's advisor and to obtain his signature on their proposed program.

The Department also offers the opportunity of inter-departmental majors under the Muir College Special Projects and under the "Literature and Society" concentration in Third College.

THE GRADUATE PROGRAM

Doctor's Degree Program

Doctoral programs are offered in English and American Literature, in French Literature, in German Literature, in Spanish Literature, and in Comparative Literature. The Department does not offer the M.A., but the C.Phil. degree is conferred upon all students advanced to candidacy for the Ph.D.

Preparation

The following are requirements for admission to graduate study in Literature.

1. A Baccalaureate degree with a major in one of the literatures offered by the Department, or in another field approved by the departmental Committee on Graduate Studies.
2. Satisfactory scores on the Graduate Record Examination, including the advanced examination in the literature of the student's field.
3. A working knowledge of one foreign language, to be tested during the first quarter of residence.

Course of Study

Although most students will choose to concentrate in a national literature, there will necessarily be a distinctly comparatist emphasis in their studies. Each student will undertake a comparatist project-course work and guided independent study in a literature other than, but related to, the one in which he is specializing. The program of study makes explicit provision for a significant amount of independent work. Tutorial work and interdisciplinary study are encouraged; in addition, all graduate students work in close association with an advisor who directs their independent study preparatory to the Qualifying Examination. No specific courses are required — on the contrary, graduate students take those seminars best suited to their individual needs and interest. Students are expected to take two seminars each quarter in their first year and at least one each quarter after that until they pass the Qualifying Examination. Since topics change from year to year, all graduate courses are offered for repeated registration.

Teaching

The Department requires for the completion of the Ph.D. degree that each graduate student have done apprentice teaching as an integral part of his training. The minimum amount required is equivalent to the duties expected of a quarter-time teaching assistant for three academic quarters. The duties of a teaching assistant normally entail grading papers and examinations, conducting discussion sections, and related activities. Each teaching assistant is expected to attend the lectures for the course in which he participates.

Language Requirements

Each graduate student is required to develop (or demonstrate that he already possesses) a working knowledge of one language other than that of the literature in which he primarily specializes. That is, the student should be able to read literary and secondary texts and to follow seminar discussions or lectures in that language. Speaking fluency is not required. In consultation with a faculty member in the appropriate section, each student is to prepare a project of study involving this second language. The project must include regular enrollment in at least one seminar in the literature of the second language, or in suitable upper-division courses.

The Ph.D. program in Spanish Literature requires, in addition to the above, a reading knowledge of Latin, to be tested by an examination conducted by the department. No record of the results of this examination is kept in the Graduate Division. A student in this program is expected to minor in another Romance literature and to choose a second minor (his comparatist project) in a non-Romance literature relevant to his field of specialization.

The Ph.D. program in German Literature requires in addition that a student who concentrates his research in a period before 1700 will be required to know or learn Latin. Each student will be required to take a two-course sequence consisting of a cultural history of the German language and an introduction to Middle High German. Equivalent work done elsewhere will be counted toward a fulfillment of the requirement.

The Ph.D. program in Comparative Literature requires (a) knowledge in depth of two foreign languages, (b) a reading ability in French, German, or Italian, (c) when the student's field of concentration demands it, a reading ability in a classical or non-Western language (Greek, Latin, Chinese, Arabic, etc.). A student in the program is expected to attend graduate seminars or undertake guided independent study in three literatures, one of which can be English or American.

The Qualifying Examination

The Qualifying Examination, to be taken normally at the end of the third year, concentrates on areas and topics defined by the student's interests and designed to meet demands of scope, variety and methodological awareness. The examination in English and American literature, for example, requires three questions concerning 1) a literary genre, 2) a period, generation or movement, and 3) a major writer, with minimal overlap of content. One of these three topics is dealt with in a paper of at least thirty pages, the other two in written examination essays, then all three are reviewed in a two-hour oral examination. Ideally the paper should provide the germ of a dissertation, so that the Qualifying Examination would not only help the student organize his preliminary study (instead of trying to 'cover' a comprehensive field for a general examination), but would provide a transition to actual work on the Ph.D. thesis.

The Dissertation

A suitable dissertation is required for the Ph.D. degree. The student concentrates on the dissertation after he has passed the Qualifying Examination.

COURSES

GENERAL LITERATURE

LOWER DIVISION

Lit/1A-1B-1C. The Interpretation of Literature (Muir College) F-W-S

Taking as its premise the importance of close scrutiny, this sequence will emphasize problems of type and genre in the process of understanding and interpreting particular works and relating them to literary tradition. Must be taken in sequence. (This sequence may be used in fulfilling the Muir College humanities requirement.) Two hours lecture and one hour discussion.

Lit/3A-3B-3C. Literature and Society F-W-S The interaction of art and culture. The course will provide an approach both to the nature of literature, and to that of national culture itself.

3A. French Society in Novel and Film

3B. China in Poetry and Painting

3C. Argentina and the Latin-Am Novel

UPPER DIVISION

Lit/109A-109B-109C. The Greco-Roman World An intensive study of the intellectual life of the Greco-Roman World with special emphasis on the development of the unique features of Greco-Roman literature, philosophy, historiography, and art. A primary purpose will be to understand the relationships between the intellectual activity and the social and political environment in which it took place. (Cross-listed as Philosophy 109A-109B-109C and History 109A-109B-109C.)

Lit/111,112,113,114. Writing Workshop A workshop for students seriously interested in writing. Intensive study of the means of expression provided by the different literary forms. Discussion and scrutiny of original works of students.

Three hours seminar.

Lit/122. The Literature of Renaissance Humanism

111. Fiction F

112. Expository Writing

113. Drama S

114. Verse F

Prerequisites: submission of original work already completed and consent of instructor.

Lit/115. Writing the Short Story W Discusses the fundamentals of short story writing. Student's works will be read and discussed in the class along with the works of some of the best contemporary short story writers. The course aims at helping the student to get started as well as offering constructive criticism to those who have already put their hands to it. Prerequisite: upper-division standing or consent of instructor.

Lit/116. Writing the Long Narrative The student will work throughout the quarter on a single project, either fiction (novel) or nonfiction (biography, history). Excerpts of students' works will be read and discussed in class; constructive criticism will be offered. Prerequisite: Any course in fiction writing or example of student's work submitted to instructor.

Lit/120. The Classical Tradition S Greek and Roman literature in translation. Prerequisite: upper-division standing or consent of instructor.

Lit/122. The Literature of Renaissance Humanism The course will consider one or more essential figures of Renaissance humanism. The intent of the course will be to investigate the breadth of Renaissance culture: hence historical, aesthetic, philosophical, political as well as literary readings will be included. Prerequisite: upper-division standing or consent of instructor.

Lit/123. Studies in 18th Century European Literature In translation. Topics to be considered include the age of sensibility, enlightenment, neo-classicism. Attention given to historical and cultural contexts.

Lit/124. Studies in European Romanticism W In translation. Attention given to historical and cultural contexts. Topics to be considered include the concept of nature, the reaction to science, the role of the imagination. May be repeated as topics vary.

Lit/125A-125B. The French Revolution and its Cultural Impact on England and Germany The literature and philosophy of revolutionary and Napoleonic Europe, 1789-1815, will be studied in conjunction with the political, social, and economic history of the period. In each quarter both standard historical studies and major literary and philosophical texts will be read and discussed. The first quarter will cover 1795, second quarter will cover to 1815. (NOTE: Cross-listed as History 153A-153B.)

Lit/127. The Novel F-S Aspects of the novel, not confined to a single national literature. Texts may be read in English. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/128. The Drama F Aspects of the drama, not confined to a single national literature. Texts may be read in English. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/129. Lyric and Epic Poetry Studies in lyric and/or epic poetry. Not confined to a single national literature.

Lit/It/Tr 148. Italian Literature in Translation One or more periods or authors in Italian literature.

Lit/Gr/Tr 149. German Literature in Translation W One or more aspects of German literature such as the contemporary novel, 19th century poetry. Texts may be read in English. Topic varies from quarter to quarter. Prerequisite: upper-division standing or consent of instructor.

Lit/Ch/Tr 150. Masterpieces of Chinese Literature in Translation Course will focus on a few representative masterpieces of Chinese literature in its classical age, with emphasis on the formal conventions and the social or intellectual presuppositions that are indispensable to their understanding. Prerequisite: upper-division standing or permission of department.

Lit/Ch/Tr 151. Masterpieces of Chinese Literature in Translation The course will focus on a few representative masterpieces of Chinese literature in its classical age, with emphasis on the formal conventions and the social or intellectual presuppositions that are indispensable to their understanding. Prerequisite: upper-division standing or consent of instructor.

Lit/It/Tr 151. Italian Literature in Translation One or more periods or authors in Italian literature. Prerequisite: upper-division standing or consent of instructor.

Lit/Ru/Tr 151. Russian Literature in Translation F-W-S One or more aspects of Russian literature. Texts may be read in English. Topic varies from year to year. May be repeated for credit two times.

Lit/152. Men, Literature, and Ideas W-S This course will center on writers or movements of international literary, cultural, or ideological significance. The texts studied, if foreign, may be read either in the original language or in English. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/153. Introduction to Chicano Literature S Course introduces students to Chicano literary works. Central to this study are the particular life experience of the Chicano and the unique expression given that experience by Chicano authors, whether in novels, short stories, poetry, or dramatic works. Prerequisites:

speaking and reading knowledge of Spanish or consent of instructor. May be repeated for credit three times.

Lit/154. The New Literatures A consideration of one or more literatures of *emerging nations*. Texts may be read in English. Examples: Caribbean literature or African literature. Topic varies. May be repeated for credit with instructor's approval.

Lit/161. The Forms of Folklore F A survey of the range of folkloristic phenomena as exemplified by major and minor forms — narrative, legend, myth, superstition, speech, custom, games and music. Examples will be considered both as artistic entities and as social documents. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/190. Seminars W These seminars are devoted to a variety of special topics, including the works of single authors, genre studies, problems in literary history, relations between literature and the history of ideas, literary criticism, literature and society, and the like. The student may enroll in more than one section in a single quarter. Texts may be read in English. Three hours. Prerequisite: upper-division standing or consent of instructor.

Lit/191. The Study of Literature W Critical approaches to literature, with theoretical readings and practical applications. As the first element in the two-quarter Senior Major sequence, this course is recommended for all majors in literature and is prerequisite to Literature 192 as given in the several national literatures. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/195. Apprentice Teaching of Writing F-W-S Emphasis on practical aspect of teaching, but students will also conduct a seminar on the principles of teaching in these areas focusing on techniques of teaching reading skills, practical use of classic notions of rhetoric, setting practical and individualized goals for each student and separating the single writing task into stages. Prerequisite: upper-division standing.

GRADUATE

Lit/500. Apprentice Teaching in Literature F-W-S This course, designed to meet the needs of graduate students who serve as TA's, includes analyses of texts and materials, discussion of teaching techniques, conducting discussion and/or laboratory sections, formulation of topics and questions for papers and examinations, and grading papers and examinations under the supervision of the instructor assigned to the course. Participation in the undergraduate teaching program is required for the Ph.D. degree. The amount of teaching required is equivalent to the duties expected of a .25 FTE Teaching Assistant for three academic quarters. Enrollment for two units in this course documents the requirement for each quarter. (Satisfactory/Unsatisfactory grade only.)

Lit/501. Apprentice Teaching in Humanities F-W-S This course, designed to meet the needs of graduate students who serve as TA's, includes analyses of literary, historical and philosophical texts and materials, discussion of teaching techniques, conducting discussion and/or laboratory sections, formulation of topics and questions for papers and examinations, and grading papers and examinations under the supervision of the instructor assigned to the course. Participation in the undergraduate teaching program is required for the Ph.D. degree. The amount of teaching required is equivalent to the duties expected of a .25 FTE Teaching Assistant for three academic quarters. Enrollment for 2 units in this course documents the requirement for each quarter. (Satisfactory/Unsatisfactory grades only.)

Lit/502. Apprentice Teaching in Subject A (1-4) F-W-S Consideration of pedagogical methods appropriate to the teaching of composition to students who have failed to meet the proficiency requirements and standards for college reading and writing. Supervised teaching in Subject A courses. Prerequisite: student must be a Teaching Assistant. (Satisfactory/Unsatisfactory grades only.)

Lit/505. Apprentice Teaching in Third College F-W-S This course, designed to meet the needs of graduate students who serve as TA's, includes analyses of texts and materials, discussion of teaching techniques, conducting discussions and/or laboratory sections, formulation of topics and questions for papers and examinations, and grading papers and examinations under the supervision of the instructor assigned to the course. Participation in the undergraduate teaching program is required for the Ph.D. degree. The amount of teaching required is equivalent to the duties expected of a .25 FTE Teaching Assistant for three academic quarters. Enrollment for two units in this course documents the requirement for each quarter. (Satisfactory/Unsatisfactory grades only.)

ARABIC LITERATURE

LOWER DIVISION

Lit/Ar 1. Beginning Classical Arabic Fundamentals of Arabic grammar, exercises in vocabulary and accidence and in reading.

Lit/Ar 2. Intermediate Classical Arabic Continuing instruction in Arabic grammar, with reading of simple texts. Prerequisite: Lit/Ar 1 or equivalent.

UPPER DIVISION

Lit/Ar 100. Introduction to Classical Arabic Literature Reading and discussion of selections from representative authors. Review of grammar as needed. Prerequisite: Lit/Ar 2 or equivalent.

Lit/Ar 199. Special Studies Tutorial individual guided reading in an area not normally covered in courses. May be repeated for credit.

CHINESE LITERATURE

UPPER DIVISION

Lit/Ch 101. Readings in Contemporary Chinese Literature S Intended for students who have the competence to read contemporary Chinese texts: poetry, short stories, and criticism in vernacular Chinese.

Lit/Ch 198. Directed Group Study F-W-S Directed group study in areas of Chinese literature not normally covered in courses. Prerequisites: upper-division standing and permission of Department.

Lit/Ch 199. Special Studies F-W-S Tutorial individual guided reading in an area not normally covered in courses. Prerequisite: upper-division standing or permission of Department.

COMPARATIVE LITERATURE

GRADUATE

Lit/CL 210. Classical Studies S Analysis of significant works of the Greek and Roman tradition, with attention to their interest for later European literature.

Lit/CL 221. Renaissance Studies One or more major writers, texts or trends of European Renaissance Literature.

Lit/CL 224. 17th Century Studies One or more major writers, texts or trends of 17th century European literature.

Lit/CL 231. 18th Century Studies (4) One or more major writers, texts or trends of 18th century European literature.

Lit/CL 241. Romanticism (4) S A study of the Romantic movement in various national literatures.

Lit/CL 243. Symbolism (4) A study of poetic imagery and of the changes in its symbolic and thematic significance from the 18th to the 20th century.

Lit/CL 252. Modernism (4) A sample investigation into the concept of period dealing with the question of the existence of modernism, the description of the phenomenon and the causes to which it is to be attributed.

Lit/CL 262. Comparative Prosody (4) W An investigation of the essentials of "universals" of versification on the basis of examples chosen from various literatures, including an Oriental one, as well as the methodological problems that such investigation raises.

Lit/CL 263. Theory and Practice in Translation An introduction to the intellectual origins, the tools of research, and the principle aims of Comparative Literature.

Lit/CL 271. Critical Theory (4) F Problems of literary analysis; competing schools and major figures in literary criticism.

Lit/CL 272. Literature and Social History Special topics in practical criticism involving social and economic historical perspectives.

Lit/CL 273. Art and Literature (4) W An investigation into themes and styles common to literature and visual arts.

Lit/CL 274. Genre Studies (4) W A consideration of a representative selection of works relating to a theme, form, or literary genre.

Lit/CL 276. The Modern Theatre (4) F A study of plays and dramatic theory from the eighteenth century to the present.

Lit/CL 279. Literary Studies and Linguistics (4) S Fundamentals of linguistics. The relationship of literary theories and current linguistic theories. Examination of formalist and structuralist analyses of literary texts.

Lit/CL 297. Directed Studies (1-12) F-W-S Guided and supervised reading in a broad area of literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/CL 298. Special Projects (4) F-W-S Treatment of a special topic in comparative literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/CL 299. Thesis (1-12) F-W-S Research for the dissertation. Offered for repeated registration. (Satisfactory/Unsatisfactory grades permitted.)

DUTCH LITERATURE

UPPER DIVISION

Lit/Du 199. Special Studies F-W-S Tutorial; individual guided reading in an area not normally covered in courses. Prerequisite: Permission of Department.

ENGLISH AND AMERICAN LITERATURE

LOWER DIVISION

Lit/En 10. Reading and Writing F-W-S Intensive course in reading and rhetoric limited to students recommended by the Provost. May be repeated for credit.

Lit/En 21-22-23. The English and American Literary Imagination F-W-S a critical reading of major English and American authors, considered in relation to their own periods and to ours. One or more quarters may be taken separately. Two hours lecture and one hour discussion.

UPPER DIVISION

Lit/En 101. English Literary Prose F The development of major forms and modes of English and literary prose, including the novel, the essay, biography, and other genres. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/En 102. English Dramatic Literature W-S The development of the drama in English. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/En 121. The Medieval Period W Major English literary works of the Middle Ages as seen against the historical and intellectual background of the period. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/En 122. The Renaissance F-S Major literary works of the Renaissance as seen against the historical and intellectual background of the period. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/En 123. The 18th Century W Major literary works of the 18th century. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/En 124. The 19th Century F Readings in the Romantics and Victorians: the intellectual background of the age. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/En 125. American Literature of the 19th Century W-S A critical study of major American writers of the 19th century. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/En 126. The Modern Period F-W A critical study of major American and English writers of our period. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/En 130. Themes in English Intellectual and Literary History One or more themes in English literature, not confined to a single period or genre: for instance, love, death, politics, imagination. Topic varies. May be repeated for credit with instructor's approval.

Lit/En 150. Shakespeare: Comedies and Histories F A survey of Shakespeare's dramatic development from the early plays to his mid career. Recommended for majors in literature whose primary literature is English. Two hours lecture and one hour discussion. Prerequisite: upper-division standing.

Lit/En 151. Shakespeare: Tragedies and Romances W A survey of the plays of Shakespeare's late period. Recommended for majors in literature whose primary literature is English. Two hours lecture and one hour discussion. Prerequisite: upper-division standing.

Lit/En 190. Seminars F-W-S These seminars are devoted to a variety of special topics, including the works of single authors, genre studies, problems in literary history, relations between literature and the history of ideas, literary criticism, literature and society, and the like. Three hours. The student may enroll in more than one section in a single quarter. Prerequisite: upper-division standing or consent of instructor.

Lit/En 198. Directed Group Study F-W-S Research seminars and research, under the direction of a member of the staff. May be repeated for credit. Prerequisite: special permission of the department.

Lit/En 199. Special Studies (2 or 4) F-W-S Tutorial; individual guided reading in an area not normally covered in courses. May be repeated for credit. Prerequisite: upper-division standing.

GRADUATE

Lit/En 211A-211B. Old English Literature (4-4) Lit/En 211A is a study of Old English language, forms and syntax, and reading of some prose and verse. Lit/En 211B is a study of Old English poetry. Prerequisite: Lit/En 211A for 211B.

Lit/En 214. Middle English Literature (4) W-S Consideration of one or more major figures, texts, or trends in Middle English Literature.

Lit/En 221. 16th Century English Literature (4) W Critical study of one or more major figures, texts, or literary trends in Tudor England.

Lit/En 224. 17th Century English Literature (4) F-S Consideration of one or more major figures, texts, or trends in 17th century English literature, including the metaphysical poets and Jacobean Drama. Topic varies from year to year.

Lit/En 226. Shakespeare (4) S Shakespeare's plays in relation to the Elizabethan background; selected major texts.

Lit/En 231. Restoration and 18th Century English Literature (4) S Consideration of one or more figures, texts, or trends in Restoration and 18th century English literature, including Dryden, Pope, Swift, the early novel, satire. Topic varies from year to year.

Lit/En 236. Later 18th Century English Literature (4) W Consideration of one or more major figures, texts, or trends in later 18th century English literature. Topic varies from year to year.

Lit/En 241. English Literature of the Romantic Period (4) W-S A study of the major poetry and related prose of early 19th century literature.

Lit/En 245. 19th Century American Studies (4) W-S Consideration of

some of the principal writers and movements in 19th century American literature. Topic varies from year to year.

Lit/En 246. Victorian Literature (4) F-W Consideration of one or more major figures, texts, or trends in the Victorian period.

Lit/En 251. 20th Century English Literature (4) F Consideration of one or more major figures, texts, or trends in 20th century English literature.

Lit/En 252. Studies in Modern American Literature and Culture (4) F-S Consideration of one or more major figures, texts, or trends in American literature, in particular the relationship between literature and culture.

Lit/En 271. Genres in English F Consideration of one or more genres present in English and/or American literature: for instance, the ballad, landscape poetry, comedy, satire, the familiar essay. Topic varies. May be repeated for credit.

Lit/En 297. Directed Studies (1-12) F-W-S Guided, supervised reading in a broad area of English and American literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/En 298. Special Projects (4) F-W-S Treatment of a special topic in English and American literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades permitted.)

Lit/En 299. Thesis (1-12) F-W-S Research for the dissertation. Offered for repeated registration. Prerequisite: advancement to candidacy for the Ph.D. degree.

FRENCH LITERATURE

LOWER DIVISION

Lit/Fr 10. Readings and Interpretations F-W-S The course is entirely taught in the language of the literature concerned and emphasizes the development of reading ability, listening comprehension and writing skills. It includes grammar review, lectures and class discussions. Approximately half of the reading selections are from modern and classical authors, half from nonliterary disciplines — humanities, social sciences, pure and applied sciences. The course is designed to prepare students for Literature 11 and Literature 25.

Prerequisites:

1. A score of 550 or higher in the Language Placement Examination administered by the UCSD Testing Office.

or

2. Satisfactory performance in a language proficiency test conducted by the Department of Linguistics.

Lit/Fr 11. Readings in French Literature and Culture F-W-S An introduction to French literature. May be taken for three quarters starting with any quarter. Reading and discussion of selections from French literature, scholarship and science. Prerequisite: proficiency in a foreign language.

Lit/Fr 25. Composition and Conversation F-W-S A course designed for students who wish to improve their ability to speak and write French. Prerequisite: Completion of Revelle or Muir language requirement.

UPPER DIVISION

Lit/Fr 122. The 17th and 18th Centuries Major French literary works of the period as seen against the historical and intellectual background of their time. Prerequisite: upper-division standing or consent of instructor.

Lit/Fr 130A-130B-130C. Themes in French Intellectual and Literary History F-W-S Three quarter sequence is designed as an introduction to French literature and literary history. Each quarter will center on a specific theme or problem, giving a chronological picture of French literature from the beginning to modern times. It is recommended that majors whose primary literature is French take this sequence as early as possible. Prerequisites: upper-division standing or consent of instructor. 130A for 130B, 130B for 130C. Courses may be taken out of normal order only by permission of the instructor.

Lit/Fr 140. Composition and Stylistics W-S Analysis of classical and modern French literary texts to increase the student's sensitivity to style and improve his ability to write and speak French. Strongly recommended for students who take French as their primary literature.

Lit/Fr 151. Major French Authors F A study in depth of the works of a major French writer. Recommended for students whose primary literature is French. May be repeated for credit.

Lit/Fr 190. Seminars F-W-S These seminars are devoted to a variety of special topics, including the works of single authors, genre studies, problems in literary history, relations between literature and the history of ideas, literary criticism, literature and society, and the like. The student may enroll in more than one section in the single quarter. Three hours. Prerequisite: upper-division or permission of department.

Lit/Fr 192. Practicum in Literary Criticism A workshop in the primary literature of the student's major: analysis, explication, thematic studies. This course presupposes a knowledge of the critical approaches considered in Lit/General 191, as well as the completion of the works on the Department's reading list in French literature. Central to the course is the writing of a long paper, the senior essay. Recommended for all literature majors whose primary literature is French. Three hours seminar. Prerequisite: Lit/General 191.

Lit/Fr 198. Directed Study Group F-W-S Research seminars and research, under the direction of a member of the staff. May be repeated for credit. Prerequisite: special permission of department.

Lit/Fr 199. Special Studies F-W-S Tutorial; individual guided reading in areas of French literature not normally covered in courses. May be repeated for credit. Prerequisite: upper-division standing or permission of department.

GRADUATE

Lit/Fr 211. Introduction to Old French Language and Literature (4) Introduction to the reading of Old French, and a study of the medieval period through original texts. It will touch on the basic moments of medieval French literature: the chanson de geste, the Roman de Bretagne, lyric poetry, the theater, Villon, etc., and will thus provide the graduate student with the literary, cultural and linguistic background necessary to go on to more work in depth in the medieval field.

Lit/Fr 221. 16th Century French Literature (4) F Critical study of one or more major figures, texts, or literary trends of French Renaissance.

Lit/Fr 224. 17th Century French Literature (4) S Consideration of one or more major figures, texts, or trends in the 17th century French literature.

Lit/Fr 231. 18th Century French Literature (4) F-W Consideration of one or more major figures, texts, or trends in the 18th century French literature.

Lit/Fr 241. 19th Century French Literature (4) S Consideration of one or more major figures, texts, or trends in 19th century French literature.

Lit/Fr 251. 20th Century French Literature (4) W Selected topics in modern French literature and thought.

Lit/Fr 297. Directed Studies (1-12) F-W-S Guided and supervised reading in a broad area of French literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/Fr 298. Special Projects (4) F-W-S Treatment of a special topic in French literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/Fr 299. Thesis F-W-S Research for the dissertation. Prerequisite: student must be advanced to candidacy for the Ph.D. degree. (Satisfactory/Unsatisfactory grades only.)

Lit/Fr 301. Art of Teaching French Language and Literature (4) Su The linguistic and critical theories from which techniques of teaching are derived. Practical applications and problems of curricula development will be stressed. Prerequisite: knowledge of French.

GERMAN LITERATURE

LOWER DIVISION

Lit/Ge 10. Readings and Interpretations F-W-S This course is entirely taught in the language of the literature concerned and emphasizes the development of reading ability, listening comprehension and writing skills. It includes grammar review, lectures and class discussions. Approximately half of the reading selections are from modern and classical authors, half from nonliterary disciplines — humanities, social sciences, pure and applied sciences. The course is designed to prepare students for Literature 11 and Literature 25.

Prerequisites:

1. A score of 550 or higher in the Language Placement Examination administered by the UCSD Testing Office.

or

2. Satisfactory performance in a language proficiency test conducted by the Department of Linguistics.

Lit/Ge 11. Readings in German Literature and Culture F-W-S An introduction to German literature. May be taken for three quarters, starting with any quarter. The instructor will advise students when they have achieved sufficient proficiency to proceed to upper-division courses in which an ability to read extensive texts in German is called for. Prerequisite: proficiency in a foreign language.

Lit/Ge 25. Composition and Conversation F A course designed for students who wish to improve their ability to speak and write German. Prerequisite: Lit/Ge 10 or equivalent.

UPPER DIVISION

Lit/Ge 101. German Literary Prose F The development of major forms and modes of German literary prose. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/Ge 102. German Dramatic Literature S The development of the drama in German. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/Ge 103. German Poetry W The development of major forms and modes of German verse. Prerequisite: upper-division standing or consent of instructor.

Lit/Ge 123. 18th Century German Literature Major literary works as seen against the historical and intellectual background of the period. Prerequisite: upper-division standing or consent of instructor.

Lit/Ge 140. Composition and Stylistics F Analysis of classical and modern German literary texts to increase the student's sensitivity to style and improve his ability to write and speak German. Strongly recommended for students who take German as their primary literature.

Lit/Ge 151. Goethe S A study of some major works in the context of Goethe's life and milieu. Recommended for literature majors whose primary literature is German. Prerequisite: upper-division standing or consent of instructor.

Lit/152. Major German Authors W A study in depth of the works of a major German author. May be repeated for credit.

Lit/Ge 190. Seminars These seminars are devoted to a variety of special topics, including the works of single authors, genre studies, problems in literary criticism, literature and society, and the like. The student may enroll in more than one section in a single quarter. Prerequisite: upper-division standing or consent of instructor.

Lit/Ge 192. Practicum in Literary Criticism A workshop in the primary literature of the student's major: analysis, explication, thematic studies. This course presupposes a knowledge of the critical approaches considered in Lit/191 as well as the completion of the works on the Department's reading list in German literature. Central to the course is the writing of a long paper, the senior essay. As the second element in the two-quarter senior major sequence, it is recommended for all literature majors whose primary literature is German. Prerequisite: Lit/191.

Lit/Ge 198. Directed Group Study F-W-S Research seminars and research, under the direction of a member of the staff. May be repeated for credit. Prerequisite: special permission of department.

Lit/Ge 199. Special Studies F-W-S Tutorial; individual guided reading in areas of German literature not normally covered in courses. May be repeated for credit. Prerequisite: upper-division standing and permission of department.

GRADUATE

Lit/Ge 210A. Middle High German (4) Introduction to the Middle High German language. Reading of texts with exercises in semantics, grammar, etymology, and syntax.

Lit/Ge 210B. Middle High German (4) Middle High German II. Analysis of texts representing a variety of genres.

Lit/Ge 231. 18th Century German Literature F-S Consideration of one or more major figures, texts, or trends in 18th century German literature.

Lit/Ge 238. Goethe W A study of Goethe's work in the context of Goethe's life and milieu and of German Classicism.

Lit/Ge 241. German Romantic Prose (4) A study of the critical and poetic works of major romantic writers with special attention to romantic poetics.

Lit/Ge 242. 19th Century German Literature S Consideration of one or more major figures, texts, or trends in 19th century German literature. Topic varies. May be repeated for credit.

Lit/Ge 251. The 20th Century (4) S A study of the structural, philosophical and social aspects of 20th century German literature.

Lit/Ge 271. Theory of Genres (4) An historical approach to the lyric/epic/dramatic and related distinctions, concentrating on the critical reflection and innovative practice of the "German movement" (from Lessing and the Sturm-und-Drang to the Romantik).

Lit/Ge 297. Directed Studies (1-12) F-W-S Guided and supervised reading in a broad area of German Literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/Ge 298. Special Projects (4) F-W-S Treatment of a special topic in German literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades permitted.)

Lit/Ge 299. Thesis (1-12) F-W-S Research for the dissertation. Prerequisite: student must be advanced to candidacy for the Ph.D. degree.

GREEK LITERATURE

LOWER DIVISION

Lit/Gr 1. Beginning Greek F Fundamentals of Greek grammar, exercises in vocabulary and accidence in reading.

Lit/Gr 2. Intermediate Greek Continuing instruction in Greek grammar, with reading of single texts. Prerequisite: Lit/Gr 1 or equivalent.

UPPER DIVISION

Lit/Gr 100. Introduction to Greek Literature Reading and discussion of selections from representative authors. Review of grammar as needed. Prerequisite: Lit/Gr 2 or equivalent.

Lit/Gr 199. Special Studies F-W-S Tutorial; individual guided reading in areas of Greek literature not normally covered in courses. Prerequisite: upper-division standing or permission of Department, upon demonstration of proficiency equivalent to successful completion of Lit/Gr 100.

GRADUATE

Lit/Gr 297. Directed Studies (1-12) F-W-S Guided and supervised reading in a broad area of Greek literature. (Satisfactory/Unsatisfactory grades only.)

Lit/Gr 298. Special Projects (4) F-W-S Treatment of a special topic in Greek literature. (Satisfactory/Unsatisfactory grades permitted.)

HEBREW LITERATURE

Lit/He 199. Special Studies F-W-S Tutorial; individual guided reading in areas of Hebrew literature not normally covered in courses. Prerequisite: upper-division standing or permission of department.

ITALIAN LITERATURE**LOWER DIVISION**

Lit/It 10. Readings and Interpretations F-W-S The course is entirely taught in the language of the literature concerned and emphasizes the development of reading ability, listening comprehension and writing skills. It includes grammar review, lectures and class discussions. Approximately half of the reading selections are from modern and classical authors, half from nonliterary disciplines — humanities, social sciences, pure and applied sciences. The course will satisfy the Muir College language requirement and is designed to prepare students for Literature 11 and Literature 25.

Prerequisites:

1. A score of 550 or higher in the Language Placement Examination administered by the UCSD Testing Office.

or

2. Satisfactory performance in a language proficiency test conducted by the Department of Linguistics.

Lit/It 11. Readings in Italian Literature and Culture F-W-S An introduction to Italian literature. May be taken for three quarters starting with any quarter. Reading and discussion of selections from Italian literature, scholarship and science. Prerequisite: proficiency in a foreign language.

UPPER DIVISION

Lit/It 199. Special Studies F-W-S Tutorial; individual guided reading in areas of Italian literature not normally covered in courses. Prerequisite: upper-division standing or permission of department.

GRADUATE

Lit/It 215. Dante (4) A study of the poet, his cultural background and his political-historical mission. Prerequisite: knowledge of Italian.

Lit/It 297. Directed Studies (1-12) F-W-S Guided and supervised reading in a broad area of Italian literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/It 298. Special Projects (4) F-W-S The treatment of a special topic in Italian literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades permitted.)

LATIN LITERATURE**LOWER DIVISION**

Lit/La 1. Beginning Latin F Fundamentals of Latin grammar, exercises in vocabulary and accidence and in reading. Two hours lecture and one hour discussion.

Lit/La 2. Intermediate Latin W Continuing instruction in Latin grammar, with reading of simple texts. Two hours lecture and one hour discussion. Prerequisite: Lit/La 1 or equivalent.

UPPER DIVISION

Lit/La 100. Introduction to Latin Literature Reading and discussion of selections from representative authors of the Augustan age. Review of grammar as needed. Prerequisite: Lit/La 2 or equivalent.

Lit/La 199. Special Studies F-W-S Tutorial; individual guided reading in areas of Latin literature not normally covered in courses. Prerequisite: upper-division standing or permission of Department, upon demonstration of proficiency equivalent to successful completion of Lit/La 100.

GRADUATE

Lit/La 297. Directed Studies (1-12) F-W-S Guided and supervised reading in a broad area of Latin literature. (Satisfactory/Unsatisfactory grades only.)

Lit/La 298. Special Projects (4) F-W-S Treatment of a special topic in Latin literature. (Satisfactory/Unsatisfactory grades permitted.)

PORTUGUESE LITERATURE

Lit/Por 199. Special Studies F-W-S Tutorial; individual guided reading in an area not normally covered in courses. Prerequisite: permission of the Department.

RUSSIAN LITERATURE**LOWER DIVISION**

Lit/Ru 10. Readings and Interpretations F-W-S The course is entirely taught in the language of the literature concerned and emphasizes the development of reading ability, listening comprehension and writing skills. It includes grammar review, lectures and class discussions. Approximately half of the reading selections are from modern and classical authors, half from nonliterary disciplines — humanities, social sciences, pure and applied sciences. The course will satisfy the Muir College language requirement and is designed to prepare students for Literature 11 and Literature 25.

Prerequisites:

1. A score of 550 or higher in the Language Placement Examination administered by the UCSD Testing Office.

or

2. Satisfactory performance in a language proficiency test conducted by the Department of Linguistics.

Lit/Ru 11. Readings in Russian Literature F-W-S An introduction to Russian literature. May be taken for three quarters, starting with any quarter. Prerequisite: proficiency in a foreign language or in special cases permission of instructor.

UPPER DIVISION

Lit/Ru 103. Russian Poetry Consideration of one or more major figures, texts or trends in Russian poetry. Prerequisite: consent of instructor.

Lit/Ru 124. 19th Century Russian Literature F Consideration of one or more major figures, texts, or trends in 19th century Russian literature.

Lit/Ru 126. The Modern Period S Consideration of one or more major figures, texts or trends in the modern period of Russian literature.

Lit/Ru 128. Advanced Language and Literature W A study of selected shorter works of Russian fiction and poetry with equal attention paid to literary values and to problems of language. In addition there will be grammatical study, as well as writing and conversation in Russian. Prerequisite: upper-division standing or consent of instructor. May be repeated once for credit.

Lit/Ru 198. Directed Study Group F-W-S Directed group study in areas of Russian literature not normally covered in courses. Prerequisites: upper-division standing and permission of department.

Lit/Ru 199. Special Studies F-W-S Tutorial; individual guided reading in areas of Russian literature not normally covered in courses. Prerequisite: upper-division standing or permission of department.

SPANISH LITERATURE**LOWER DIVISION**

Lit/Sp 9. Reading and Interpretations: Spanish for Native Speakers W Spanish for Native Speakers is designed to emphasize the development of greater speaking and writing abilities as well as reading skills by means of lectures, class discussions, compositions and readings from Chicano and Latin American authors. Equivalent to Lit/Sp 10. Prerequisite: consent of instructor.

Lit/Sp 10. Readings and Interpretations F-W-S The course is entirely taught in the language of the literature concerned and emphasizes the development of reading ability, listening comprehension and writing skills. It includes grammar review, lectures and class discussions. Approximately half of the reading selections are from modern and classical authors, half from nonliterary disciplines — humanities, social sciences, pure and applied sciences. The course is designed to prepare students for Literature 11 and Literature 25.

Prerequisites:

1. A score of 550 or higher in the Language Placement Examination administered by the UCSD Testing Office.

or

2. Satisfactory performance in a language proficiency test conducted by the Department of Linguistics.

Lit/SP 11. Readings in Spanish Literature and Culture F-W-S An introduction to Spanish and Spanish-American literature. May be taken for three quarters, starting with any quarter. The instructor will advise students when they have achieved sufficient proficiency to proceed to upper-division courses in which an ability to read extensive texts in Spanish is called for. Prerequisite: proficiency in a foreign language.

Lit/Sp 24. Composition and Conversation: Spanish for Native Speakers S This course is designed for native speakers who have had formal training in the language but who need to expand their knowledge of grammar, vocabulary and idiomatic expressions both at the speaking and writing level. Readings will be from Chicano and Latin American authors. Equivalent of Lit/Sp 25. Prerequisite: consent of instructor.

Lit/Sp 25. Composition and Conversation F-W-S A course designed for students who wish to improve their ability to speak and write Spanish. Prerequisite: Lit/Sp 10 or equivalent.

Lit/Sp 31. Survey of Medieval and Golden Age Literature A critical reading of major Medieval and Golden Age works, considered in relation to their own periods and to ours.

Lit/Sp 32. Survey of Modern Spanish Literature S A critical reading of major modern Spanish writers (1750 to present) considered in relation to their historical context.

Lit/Sp 33. Survey of Spanish-American Literature F A critical reading of major Spanish-American writers, considered in relation to their historical context.

UPPER DIVISION

Lit/Sp 101. Spanish Literary Prose F-S The development of major forms and modes of Spanish literary prose, including the novel, the essay, biography, and other genres. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 102. Spanish Dramatic Literature The development of the drama in Spanish. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 103. Spanish Poetry The Development of major forms and modes of Spanish verse. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 121. The medieval Period Major Spanish literary works of the Middle Ages and Renaissance as seen against the historical and intellectual background of the period. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 122. Renaissance and Baroque F Studies in selected topics in 16th and 17th century Spanish literature. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 124. The 19th Century F Consideration of one or more major figures, texts, or trends in 19th century Spanish literature. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 125. Spanish-American Literature studies in selected topics in Spanish-American literature. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 126. The Modern Period W Selected topics in Modern Spanish Literature. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 130. Spanish American Fiction The development of major forms and modes of Spanish American Fiction. The approach will be either historical or topical. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 131. Spanish American Poetry The development of major forms and modes of Spanish American poetry. The approach will be either historical or topical. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 132. Spanish American Essay A study of the essay in Spanish American literature from either an historical or a topical point of view. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 151. Cervantes A critical reading of the "Quijote". Required of literature majors whose primary literature is Spanish.

Lit/Sp 190. Seminars F-W-S These seminars are devoted to a variety of special topics, including works of single authors, genre studies, problems in literary history, relations between literature and the history of ideas, literary criticism, literature and society, and the like. The student may enroll in more than one section in a single quarter. Three hours. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 192. Practicum in Literary Criticism A workshop in the primary literature of the student's major: analysis, explication, thematic studies. This course presupposes a knowledge of the critical approaches considered in Literature 191, as well as the completion of the works on the Department's reading list in Spanish literature. Central to the course is the writing of a long paper, the senior essay. Required of literature majors whose primary literature is Spanish. Prerequisite: Lit/Gen 191.

Lit/Sp 198. Directed Group Study in Spanish Literature F-W-S Research seminars and research, under the direction of a member of the staff. May be repeated for credit. Prerequisite: special permission of department.

Lit/Sp 199. Special Studies F-W-S Tutorial, individual guided reading in areas of Spanish literature not normally covered in courses. Prerequisite: upper-division standing or permission of department.

GRADUATE

Lit/Sp 201. Reading Medieval Texts Introduction to the reading of Medieval Spanish. It will provide the student with the linguistic and cultural background necessary to go on to more work in depth in the medieval field.

Lit/Sp 202. Spanish Language in America Selected topics on the history, structure and peculiarities of the Spanish Language in America.

Lit/Sp 203. History of the Spanish Language (4) Readings and discussions in the monographic literature of a selected topic.

Lit/Sp 214. Studies in Medieval Literature (4) S Consideration of one or more major figures, texts, trends or problems in medieval Spanish literature.

Lit/Sp 216. 15th Century Spanish Literature and Culture (4) F Consideration of one or more major figures, texts, trends or problems in 15th century Spanish literature.

Lit/Sp 224. Golden Age Studies (4) Consideration of one or more major figures, texts, trends or problems in Spanish Golden Age studies.

Lit/Sp 226A, 226B. Cervantes (4) A critical reading of the "Quijote". Lit/Sp 226A covers part I, Lit/Sp 226B covers part II. Prerequisite: Lit/Sp 226A for 226B.

Lit/Sp 231. 18th Century Spanish Literature (4) W Consideration of one or more major figures, texts, trends or problems in 18th century Spanish literature.

Lit/Sp 252. Studies in Modern Hispanic Literature and Culture (4) F Major trends and figures considered in the context of late 19th and 20th century Hispanic culture.

Lit/Sp 254. Modern Spanish Poetry (4) A historical approach to modern Spanish poetry.

Lit/Sp 258. Spanish-American Prose (4) W Consideration of one or more major figures, texts, trends or problems in Spanish-American prose.

Lit/Sp 259. Spanish-American Poetry (4) F Consideration of one or more major figures, texts, trends or problems in Spanish-American poetry.

Lit/Sp 271. Literary Theory (4) S Problems and approaches in literary theory in the context of Spanish and Spanish-American literature.

Lit/Sp 297. Directed Studies (1-12) F-W-S Guided and supervised reading in a broad area of Spanish literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/Sp 298. Special Projects (4) F-W-S Treatment of a special topic in Spanish literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades permitted.)

Lit/Sp 299. Thesis (1-12) F-W-S Research for the dissertation. Offered for repeated registration. Prerequisite: advancement to candidacy for the Ph.D. degree. (Satisfactory/Unsatisfactory grades only.)

MATHEMATICS

Office: 7313 Applied Physics and Mathematics Building

Donald W. Anderson, Ph.D., Professor of Mathematics

Errett A. Bishop, Ph.D., Professor of Mathematics

Theodore T. Frankel, Ph.D., Professor of Mathematics

Adriano M. Garsia, Ph.D., Professor of Mathematics

Ronald K. Getoor, Ph.D., Professor of Mathematics

*Hubert Halkin, Ph.D., Professor of Mathematics

Jacob Korevaar, Ph.D., Professor of Mathematics,

(Chairman of the Department)

* * Helmut Rohrl, Ph.D., Professor of Mathematics

Murray Rosenblatt, Ph.D., Professor of Mathematics

Stefan E. Warschawski, Ph.D., Professor of Mathematics

John W. Evans, M.D., Ph.D., Associate Professor of Mathematics

Carl H. FitzGerald, Ph.D., Associate Professor of Mathematics

* * William B. Gragg, Jr., Ph.D., Associate Professor of Mathematics

xAlfred B. Manaster, Ph.D., Associate Professor of Mathematics

Burton Rodin, Ph.D., Associate Professor of Mathematics

Norman A. Shenk, Ph.D., Associate Professor of Mathematics

* * Lance W. Small, Ph.D., Associate Professor of Mathematics

xxDonald R. Smith, Ph.D., Associate Professor of Mathematics

Stanley G. Williamson, Ph.D., Associate Professor of Mathematics

Allen B. Altman, Ph.D., Assistant Professor of Mathematics

L. Andrew Campbell, Ph.D., Assistant Professor of Mathematics

John D. Donald, Ph.D., Assistant Professor of Mathematics

Richard Escobedo, Ph.D., Assistant Professor of Mathematics

Philip Erdelsky, Ph.D., Assistant Professor of Mathematics

Jay P. Fillmore, Ph.D., Assistant Professor of Mathematics

Francis J. Flanigan, Ph.D., Assistant Professor of Mathematics

David Golber, Ph.D., Assistant Professor of Mathematics

Patrick J. Ledden, Ph.D., Assistant Professor of Mathematics

(Assistant Provost of Muir College)

Jon C. Luke, Ph.D., Assistant Professor of Mathematics

Richard R. Patterson, Ph.D., Assistant Professor of Mathematics

Michael J. Sharpe, Ph.D., Assistant Professor of Mathematics

Frank B. Thiess, Ph.D., Assistant Professor of Mathematics

John J. Wavrik, Ph.D., Assistant Professor of Mathematics

Arthur Sard, Ph.D., Research Associate in Mathematics

* * *

*On leave fall 1972

**On leave 1972/73

xOn leave winter, spring 1972/73

xxOn leave fall, winter 1972/73

* * *

The Undergraduate Program

The upper-division curriculum provides programs for mathematics majors as well as courses for students who will use mathematics as a tool in the physical and behavioral sciences and the humanities. A major is offered in Revelle, Muir and Third College. Foreign languages recommended for mathematics majors are French, German and Russian.

The student majoring in mathematics will take, in addition to the basic sequence Mathematics 2A-2B-2C-2D-2E, at least twelve one-quarter courses in the upper-division offerings of the Department. This program must include Mathematics 100A-100B (or 101A-101B) and Mathematics 140A-140B. More advanced courses on the same material may be substituted with the approval of the major advisor. The remaining eight courses shall be chosen from areas in analysis, geometry, algebra, applied mathematics and mathematical logic, fitted to the interests of the student, with the approval of the major advisor. The Department recommends that students include "Calculus on Manifolds" (Mathematics 150A-150B-150C) or "Introduction to Analysis and Topology" (Mathematics 190A-190B) in their program. Mathematics majors whose main interest is in computer sciences are advised to include in their program "Numerical Analysis" (Mathematics 170A-170B-170C), "Elementary Mathematical Logic" (Mathematics 160A-160B), and "Introduction to Computer Science" (APIS 161A-161B-161C). For the B.A. degree, a minimum average of "C" in the major is required, and in particular a minimum average of "C" is required in each of the sequences 100A-100B (or 101A-101B) and 140A-140B.

Students who expect to major in mathematics should complete Mathematics 2D and 2E before the end of the sophomore year. This will enable them to complete a strong major curriculum in the most orderly fashion as far as preparation and continuity are concerned. Students will be encouraged to progress at a rate commensurate with their abilities.

The mathematics major in John Muir college is required to take Science 4A-4B-4C or the equivalent.

With the approval of his advisor, the Third College mathematics major may replace some of the eight required upper-division mathematics courses by courses in related fields in which mathematics plays a basic role.

A MATHEMATICS MAJOR WITH SPECIALIZATION IN EARTH SCIENCES is also available for undergraduates. See Earth Sciences for description of this program, which may be arranged by consultation with advisors in the Department of Mathematics and Scripps Institution of Oceanography.

The Graduate Program

The Department of Mathematics offers a graduate program leading to the M.A. and Ph.D. degrees.

Admission to the graduate program is in accordance with the general requirements of the Graduate Division of the University of California. Students with a bachelor's degree and a background in mathematics comparable to the requirements for the undergraduate major in mathematics at this university may apply for admission.

Master's Degree Program

Requirements for the Master of Arts degree are to be met according to Plan II (comprehensive examination). (See *Graduate Division: The Master's degree*.) Students will be expected to have at least 18 units in graduate courses in mathematics, 9 units of graduate courses in mathematics or a related field approved by the Department, and 9 units of graduate or upper-division courses. The latter may be in mathematics or in a related field, subject to approval by the Department. No research or teaching units may be used in satisfying the requirements for the master's degree. The comprehensive examination will cover basic topics in two of the following six areas, to be selected by the candidate from two of the following three groups:

1. Algebra or topology
2. Real analysis or complex analysis
3. Any of the other subjects listed in the Ph.D. program below.

A detailed list of the depth requirements in each of these areas, with literature references and approved courses, is available in the office of the Mathematics Department.

A reading knowledge of one foreign language (French, German, or Russian) is required. In exceptional cases other languages may be substituted. The foreign language examinations, which consist of the translation of selected passages in mathematics, are administered by the Department.

Doctor's Degree Program

During the first two years the student will acquire a general background in mathematics and prepare himself for the departmental qualifying examinations. Written examinations must be taken in four of the following subjects: algebra, applied analysis, complex analysis, differential geometry, mathematical logic, numerical analysis, and computer sciences, ordinary or partial differential equations, probability and mathematical statistics, real analysis, topology, an approved minor outside the Department.

Students preparing for a doctor's degree and concentrating in pure mathematics must include algebra, topology, and at least one of real and complex analysis. Students concentrating in applied mathematics must include at least one of algebra and topology and at least one of complex and real analysis.

A detailed list of the depth requirements in each of these areas, with literature references and approved courses, is available in the office of the Mathematics Department.

After satisfactory completion of the departmental examinations, a doctoral committee appointed by the Graduate Division will conduct the student's oral qualifying examination. Before taking the oral qualifying examination the student must demonstrate a satisfactory reading knowledge of two foreign languages (chosen from French, German, or Russian). In exceptional cases other languages may be substituted. The foreign language examinations, which consist of the translation of selected passages in mathematics, are administered by the Department.

Successful passing of the oral qualifying examination advances the student to candidacy for the doctor's degree. The student will subsequently devote himself to study and research for his doctoral dissertation. After completion of the dissertation he will take the final examination, which is conducted by his doctoral committee. The examination is oral and deals primarily with the dissertation and its relationship to the general field in which the subject lies.

COURSES

A beginning student in Revelle College normally takes the Mathematics 2 or 1 sequence, a student in John Muir College may take the Mathematics 1, 2, or 5 sequence, and a student in Third College normally starts with the Mathematics 1, 2, or 4 sequence.

Certain transfers from one sequence to another are possible, but such transfers should be carefully discussed with the student's adviser. Good students, who begin

the Mathematics 1 sequence, and who wish to transfer to the faster paced Mathematics 2 sequence, should normally follow Mathematics 1A with 2A. Transfers at a later stage are discouraged and may result in loss of credit.

LOWER DIVISION

1A. Elements of Mathematical Analysis F-W Differentiation and integration of algebraic and trigonometric functions. Fundamental theorem of calculus. Applications. Three lectures, two recitations. Prerequisite: two years high school mathematics.

1B. Elements of Mathematical Analysis W-S Further applications of the definite integral. Calculus of logarithmic and exponential functions. Methods of integration. Taylor series, complex numbers. Three lectures, two recitations. Prerequisite: Mathematics 1A.

1C. Elements of Mathematical Analysis F-S Vector geometry, velocity and acceleration vectors. Partial derivatives, multiple integrals. Ordinary differential equations. This course includes the material of the former Mathematics 40. Three lectures, two recitations. Prerequisite: Mathematics 1B.

2A. Calculus and Analytic Geometry F Differential and integral calculus of functions of one variable: limit, continuity; differentiation of algebraic and trigonometric functions; applications. Definite integral, primitive functions, fundamental theorem of the calculus. Elements of analytic geometry as needed in the development of the calculus. Three lectures, two recitations. Prerequisites: three or more units of high school mathematics; one-half unit of trigonometry is desirable.

2B. Calculus and analytic Geometry F-W Applications of the definite integral, calculus of logarithmic, exponential and hyperbolic functions. Methods of integration. Plane analytic geometry, polar coordinates. Vector geometry, vector functions and their derivatives. Three lectures, two recitations. Prerequisite: Mathematics 2A. (Credit is not given for both Mathematics 1B and Mathematics 2B.)

2C. Calculus and Analytic Geometry W-S Partial differentiation, multiple integration. Gradient, divergence, curl. Theorems of Green, Gauss, and Stokes. Note: Mathematics 2C and Mathematics 2D may be taken in either order. Three lectures, two recitations. Prerequisite: Mathematics 2B. Credit is not given for both Mathematics 1C and Mathematics 2C.

2AS-2BS-2CS. Calculus Supplement (2) F-W-S This course is intended for students who want to obtain a broader view of the material presented in Mathematics 2. Advanced topics which clarify that material and applications which give it greater meaning will be studied. Prerequisite: concurrent enrollment in the corresponding quarter of Mathematics 2A-2B-2C.

2AH-2BH-2CH. Calculus and Analytic Geometry F-W-S The material covered in Mathematics 2AH, 2BH, and 2CH is the same as the material covered in Mathematics 2A, 2B, and 2C. However, in this honor sequence a greater emphasis on rigor is stressed in the lectures and the students are confronted with tougher problems. Prerequisites: three or more units of high school math; in addition, one-half unit of trigonometry is desirable.

2D. Calculus and Analytic Geometry F-S Infinite series. Ordinary differential equations. Note: Mathematics 2C and Mathematics 2D may be taken in either order. Three lectures, two recitations. Prerequisite: Mathematics 2B. (Credit is not given for Mathematics 1C and Mathematics 2D.)

2E. Matrices and Linear Transformations F-W-S Linear equations, matrices, vector spaces, linear transformations, determinants, eigenvalues, orthogonal and unitary transformations, quadratic forms. Systems of differential equations, exponential of a matrix. Three lectures and one recitation. Prerequisite: Mathematics 2D.

2EH. Calculus and Analytic Geometry The material covered in Mathematics 2BH, 2CH, and 2EH is the same as the material covered in Mathematics 2B, 2C, and 2E. However, in this honors sequence there is greater emphasis on rigor in the lectures, and the students are confronted with tougher problems. The combination of 2BH, 2CH, and 2EH makes a very nice integrated one year honors sequence in calculus. Prerequisite: 2CH.

4A. Discrete Structures and Processes W Elementary theory of graphs with applications to probability, determined games, coloring and labyrinth problems, computer logic. Polyhedra, lattices, crystallography. The instruction will take the form of a 3 hour mathematics workshop involving instructor guided problem sessions and one hour recitation. Prerequisite: consent of instructor.

4B. Continuous Structures and Processes S Coordinate geometry. Vectors, transformations and functions. Rational and irrational numbers, infinite processes. Integrals, derivatives. Course instruction will take the form of a mathematics workshop involving instructor guided problem solving sessions. Prerequisite: 4A.

4C. Introductory Calculus Limits, continuity, differentiation and integration of algebraic and trigonometric functions. Applications. Prerequisites: Mathematics 4A and 4B.

5A. Introduction to Mathematics F Topics in Euclidean geometry. Projective geometry. Three lectures, two recitations. Prerequisite: two units of high school mathematics.

5B. Introduction to Mathematics W Sets and logic. Axiomatic method. Properties of real numbers. Coordinate geometry. Three lectures, one recitation. Prerequisite: Mathematics 5A.

5C. Introduction to Mathematics S Basic notions of calculus: functions,

differentiation of elementary functions, applications. Definite and indefinite integral and applications. Three lectures, one recitation. Prerequisite: Mathematics 5B.

10A. Elementary Probability Theory F Probability models for random phenomena: sampling models, product models for two-stage experiments, independence, conditional probability and the general model for two-stage experiments, random variables and their distributions, expectations and variances, the binomial model and the normal and Poisson approximation. Prerequisite: consent of department or four units high school mathematics.

10B. Elementary Topology S Theory of graphs, bridge problems, knots, braids, polyhedra in three-space and Euler formula, orientability, Mobius strips, coloring problems, tiling problems for the plane, surfaces in three-space with self-intersections. Prerequisite: consent of department or four units of high school mathematics.

10C. Elementary Number Theory F Division algorithm, greatest common divisor, least common multiple, primes, fundamental theorem, congruences and residues, Wilson's theorem, simultaneous linear congruences, polynomial congruences, primitive roots, quadratic residues, Legendre symbol, reciprocity law. Prerequisite: consent of department or four units high school mathematics.

10D. Theory of Games F Basic concepts, choosing strategies, solutions of 2×2 games and $2 \times n$ games, methods for solving infinite games; outline of linear programming, algebra of the simplex method, degeneracy, duality. Prerequisite: consent of department or four units high school mathematics.

10E. Computer Sciences W Numerical algorithms, algorithms for games, algorithm for finding paths in a labyrinth, the word problem, computing machine with automatic control programs, Turing machines, realization of algorithms in Turing machines, the universal Turing machine, algorithmically unsolvable problems; fundamentals of Fortran computations, transfer of controls, double precision, subscripted variables, the DO statement, input and output. Prerequisite: consent of department or four units high school mathematics.

10F. Groups in Geometry W Regular polygons, isometry in the plane, two-dimensional crystallography, similarity in the Euclidean plane, inversion on circles and spheres, isometry and similarity in the Euclidean space, finite groups of rotations and of isometries, geometrical crystallography, discrete groups. Prerequisite: consent of department or four units high school mathematics.

10G. Elementary Logic and Set Theory F Connectives, truth tables, tree diagrams, logical relations, variants of conditional, valid arguments, indirect method of proof, switching circuits, introduction to set theory, operations on subsets, laws of set operations, two-digit number system. Prerequisite: consent of department or four units high school mathematics.

10H. Approximation Theory W Polynomials, evaluation of polynomials, linear approximations, zeros of functions, zeros of polynomials, basic sets of polynomials, polynomial approximations, divided differences, ordinary differences, polynomial interpolation, the pi factor, evaluation of functions, numerical differentiation, numerical integration, remainder in numerical integration. Prerequisite: consent of department or four units high school mathematics.

10I. Projective Geometry S Projective plane, Desargue's theorem, projective transformations, the theorem of Pappus, coordinates for the projective plane, cross ratio, synthetic definition of conic, Pascal's theorem, tangents, polarities, complex projective plane. Prerequisite: consent of department or four units high school mathematics.

10J. Elementary Statistics W Joint distributions and correlation. Unbiased estimation, estimation of population characteristics by sampling, other means of choosing estimators. Tests of significance, particularly those involving the test statistics chi-square, sample mean, Student's *t*, Wilcoxon's statistic. Prerequisite: consent of department or four units high school mathematics.

10S. Introduction to Systems Analysis A study of the mathematical tools used in systems analysis. Matrices and graphs, input-output analysis, feedback. System identification and optimization. Examples of systems analysis in economics, biology and the social sciences.

80A-80B. Basic Statistics Analysis of experimental data. Basic probability models — binomial, Poisson, normal. Expectation and variance, sampling models, normal approximation. Unbiased estimation, regression, correlation. Hypothesis testing, including non-parametric tests. Experimental design. Emphasis on application of methods of statistical inference to experimental data. Prerequisite: Mathematics 1C or 2B or consent of instructor.

UPPER DIVISION

(See also course listings: Earth Sciences) F-W-S

100A-100B-100C. Introduction to Algebra F-W-S An introduction to the methods and basic structures of higher algebra: sets and mappings, the integers, rational, real and complex numbers, groups, rings (especially polynomial rings) and ideals, fields, real and complex vector spaces, linear transformations, inner product spaces, matrices, triangular form, diagonalization. Three lectures, one recitation. Prerequisite: Mathematics 2E.

101A-101B-101C. Honors Algebra F-W-S An intensive course in groups, rings, ideals, modules, fields and field extensions, linear algebra, inner product spaces and canonical forms. The instructor may develop certain of these structures in the process of investigating some major problem of algebra. Three lectures, one recitation. Prerequisite: consent of instructor.

102A-102B. Matrix Theory F-W Linear algebra from a computational yet geometric point of view. Elementary Hermitian matrices, Schur's theorem, normal

matrices and quadratic forms. Moore-Penrose generalized inverse and least squares problems. Vector and matrix norms. Characteristic and singular values, Gerschgorin theorems. Three lectures, one recitation. Prerequisite: Mathematics 2E.

109. Undergraduate Seminar F-W-S Reports by students on assigned reading material and/or discussion of assigned problems in areas compatible with the student's background. Designed to develop insight and originality as well as mathematical techniques. Three periods. Prerequisite: permission of department.

110A. Introduction to Ordinary and Partial Differential Equations W Bessel, Hermite, Legendre and other special functions. Orthogonal expansions, eigenvalue problems. Sturm-Liouville theory. Some partial differential equations of mathematical physics. Boundary value problems, separation of variables. Three lectures, one recitation. Prerequisites: Mathematics 2C, 2D.

110B. Integral Transforms S Additional topics on Fourier series, Fourier, Laplace and other transforms. Applications to ordinary and partial differential equations. Three lectures, one recitation. Prerequisites: Mathematics 110A, 120.

111A-111B. Mathematical Model Building F-W This course is intended to acquaint students with mathematical model building in fields such as natural science, engineering science, economics. Instructors from various departments will mathematize specific problems in their fields by extracting the pertinent data and structures from the available information. Three lectures. Prerequisites: Mathematics 2C, 2D, 2E, or consent of instructor.

112. Vector Analysis S Vector algebra and calculus. Applications to geometry and mechanics. Curvilinear motion. Kepler's laws. Motion of a rigid body. Curves and surfaces in space. Frenet-Serret formulas. Fundamental forms. Line and surface integrals. Level curves and surfaces. Conservative fields. Stokes' theorem, Green's theorem, the divergence theorem. Harmonic functions. Potential theory. Applications. Three lectures, one recitation. Prerequisites: Mathematics 2C, 2D.

120. Complex Variables F-W-S Complex numbers, complex valued functions, analytic functions. Cauchy-Riemann equations, elementary functions and conformal mapping, basic concepts of two-dimensional potential theory, complex integration, Cauchy's theorem, Cauchy's formula, power series, residue theory and applications. Three lectures, one recitation. Prerequisites or co-registration: Mathematics 2C, 2D.

121. Introduction to Ordinary and Partial Bessel, Hermite, Legendre and other special functions. Orthogonal expansions, eigenvalue problems, Sturm-Liouville theory. Some partial differential equations of mathematical physics. Boundary value problems, separation of variables. Prerequisite: Mathematics 100.

122. Integral Transforms Additional topics on Fourier series, Fourier, Laplace and other transforms. Applications to ordinary and partial differential equations. Prerequisites: Mathematics 120, 121.

130A-130B. Ordinary Differential Equations F-W Existence and uniqueness of solutions of differential equations and of systems. Linear systems with constant and variable coefficients; solutions in matrix form. Local and global theorems of continuity and differentiability. Autonomous systems. Stability: Lyapounov's theorem. Three lectures. Prerequisites: Mathematics 2C, 2D, 2E.

131A. Elements of Partial Differential Equations and Integral Equations F Basic concepts and classification of partial differential equations. First order equations, characteristics. Hamilton-Jacobi theory, Laplace's equation, wave equation, heat equation. Separation of variables, eigenfunction expansions, existence and uniqueness of solutions. Three lectures. Prerequisite: Mathematics 110A.

131B. Elements of Partial Differential Equations and Integral Equations W Relation between differential and integral equations, some classical integral equations, Volterra integral equations, integral equations of the second kind, degenerate kernels, Fredholm alternative, Neumann-Liouville series, the resolvent kernel. Three lectures. Prerequisite: Mathematics 131A.

131C. Elements of Partial Differential Equations and Integral Equations S Maximum-minimum problems, method of Lagrange, classical problems in the calculus of variations, general formulation of a variational problem special methods of solution, Euler-Lagrange equations, applications to physics: Fermat principle, Lagrangean and Hamiltonian formulation of mechanics, theorem of E. Noether. Three lectures. Prerequisite: Mathematics 131B.

140A-140B-140C. Foundations of Analysis F-W-S Axioms, the real number system, topology of the real line, metric spaces, continuous functions, sequences of functions, differentiation, Riemann-Stieltjes integration, partial differentiation, multiple integration, Jacobians. Additional topics at the discretion of the instructor: power series, Fourier series successive approximations or other infinite processes. Three lectures, one recitation. Prerequisites: Mathematics 2C, 2D.

150A-150B-150C. Calculus on Manifolds F-W-S Differentiable functions, implicit and inverse function theorems. Integration in Euclidean *n*-space. Manifolds, exterior differential forms and their integrals. Stokes theorem. Three lectures. Prerequisites: Mathematics 2E, 140A.

151. Differential Geometry S Curvature and torsion of space curves, Fenchel's theorem. Surfaces in space, Gaussian and mean curvature, minimal surfaces. Intrinsic geometry of surfaces, geodesics, parallel displacement, Jacobi fields, Gauss-Bonnet theorem. Three lectures. Prerequisites: some knowledge of matrices and quadratic forms, and consent of instructor.

152A. Introduction to Geometry F or S Review of vector spaces, Bilinear forms, inner-product geometry, affine geometry, projective geometry, quadrics. Grassmannians. Three lectures. Prerequisite: Mathematics 100A.

152B. Introduction to Geometry W Dilatations and translations, coordinates, affine geometry associated with a field, theorems of Desargue and Pappus, projective geometry. Three lectures. Prerequisite: Mathematics 152A.

152C. Introduction to Geometry S Algebraic curves in the complex plane, regular and singular points, Bezout's theorem, local parametrization, Plucker's formulas, Luroth's theorem. Three lectures. Prerequisite: Mathematics 152B.

160A-160B. Elementary Mathematical Logic W-S Propositional and predicate calculi. Interpretations and formal theories. Completeness theorems. Some decision procedures. An introduction to recursive theory. Undecidability of the predicate calculus. Incompleteness of elementary number theory. Three lectures. Prerequisite: Mathematics 2C.

170A. Numerical Analysis F Numerical approximations, interpolation, roots of equations and systems of linear equations, linear eigenvalue problems. Three lectures. Prerequisite: Mathematics 2E.

170B. Numerical Analysis W Difference equations, numerical differentiation and integration, numerical solution of ordinary differential equations, stability and error propagation. Three lectures. Prerequisite: Mathematics 170A.

170C. Numerical Analysis S Selected special topics such as: extreme values, linear programming, Monte Carlo methods, introduction to numerical analysis of partial differential equations. Three lectures. Prerequisite: Mathematics 170B.

171A-171B. Mathematical Programming F-W Elementary topological properties of Euclidean spaces. Convex sets, separation theorems. Simplexes, Sperner lemma, Brouwer fixed-point Duality, linear programming. Constrained maxima, Kuhn-Tucker theorem, mathematical programming. Three lectures. Prerequisites: Mathematics 2C, 2D, and 2E or 100A.

180A. Introduction to Probability Probability spaces, independence conditional probability, random variables, distributions, expectations, joint distributions, central limit theorem. Prerequisite: Mathematics 2C and 2D.

180B. Introduction to Probability Random vectors, multivariate densities, covariance matrix, multivariate normal distribution, Poisson process. Other topics if time permits. Prerequisites: Mathematics 180A and 2E.

180C. Introduction to Probability Markov chains in discrete and continuous time, random walk, recurrent events. If time permits, topics chosen from stationary normal processes queuing theory. Prerequisite: Mathematics 180B.

181A. Introduction to Statistics W Random samples, linear regression, least squares, testing hypotheses and estimation. Neyman-Pearson lemma, likelihood ratios. Three lectures, one recitation. Prerequisite: Mathematics 180A.

181B. Introduction to Statistics S Goodness of fit, special small sample distribution and use, nonparametric methods, Kolmogorov-Smirnov statistics, sequential analysis. Three lectures. Prerequisite: Mathematics 181A.

190A-190B. Introduction to Analysis and Topology W-S Set theory, Zorn's lemma, metric spaces, continuous mappings, completions, fixed-point theorems, Baire's theorem, compactness, Lebesgue number connectedness. Uniform convergence on subsets, function algebras, Ascoli's theorem, Stone-Weierstrass theorems, structure of function algebras. Three lectures, one recitation. Prerequisites: Mathematics 140A, 140B.

199. Independent Study for Undergraduates F-W-S Independent reading in advanced mathematics by individual students. Three periods. Prerequisite: permission of department.

GRADUATE

200A-200B-200C. Algebra (3-3-3) F-W-S Algebraic structures, Jordan-Holder theorem, Sylow theorems, rings and ideals, principal ideal rings, algebraic field extensions, Galois theory, transcendental field extensions, simple and semi-simple modules, Wedderburn theory, representation of finite groups, places and valuations, polynomial and power series rings. Prerequisites: Mathematics 100A-100B-100C or consent of instructor.

201A-201B-201C. Number Theory (3-3-3) Elementary number theory, divisibility, continued fractions, quadratic reciprocity, quadratic forms. Algebraic and analytic methods applied to Diophantine equations, representation and distribution of prime numbers, transcendental numbers, partitions. Prerequisites: Mathematics 100A-100B-100C.

202A-202B-202C. Commutative Algebra (3-3-3) F-W-S Noetherian rings and modules; theory of multiplicity; local and semi-local rings; regular local rings; completions; spectrum of a ring; schemes. Prerequisites: Mathematics 200A-200B-200C, 290A.

203A-203B-203C. Algebraic Geometry (3-3-3) Places. Hilbert nullstellensatz. Varieties; product of varieties; correspondences; normal varieties. Divisors and linear systems; Riemann-Roch theorem; resolution of singularities of curves. Grothendieck schemes; cohomology. Hilbert schemes; Picard schemes. Prerequisites: Mathematics 100A-100B-100C, 152C, 200A-200B-200C.

204A-204B-204C. Categorical Algebra (3-3-3) Categories; functors; presentable functors; limits and continuous functors; adjoint functors; Abelian categories; homological algebra. Prerequisite: Mathematics 200A or consent of instructor.

205A-205B-205C. Lie Algebras (3-3-3) Universal enveloping algebra, cohomology, solvable and nilpotent Lie algebras, theorems of Engel and Lie, semi-simple

Lie algebras, representations, Levi decomposition, reductive algebras, Cartan subalgebra, root space decomposition and Weyl group, classification. Prerequisites: Mathematics 100A-100B-100C or consent of instructor.

207A-207B. Topics in Algebra (3-3) Advanced material in special areas of Algebra to be selected by the instructor. Prerequisite: consent of instructor.

208. Seminar in Algebra (3) Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

211A-211B-211C. Applied Complex Analysis and Special Functions (3-3-3) F-W-S Complex function theory with special emphasis on applications: two-dimensional potential theory, dispersion relations, etc. Differential equations and special functions. Series expansion, generating functions, integral representations and asymptotic behavior. Prerequisite: Mathematics 140A.

212A. Mathematical Methods in Physics and Engineering (4) F Vector spaces and linear transformations, eigenvalue problems, tensor algebra, Metrics, norms, completeness, the spaces L^p and C , Distributions, Delta sequences, Properties of Lebesgue integrals, Stieltjes integrals, line integrals. Prerequisites: Mathematics 2D-2E and 140A, or advanced calculus.

212B. Mathematical Methods in Physics and Engineering (4) W Scalar products, orthogonal series in Hilbert space, best approximation. Compact symmetric operators, expansions in eigenvectors. Applications to matrices, quadratic forms, integral equations. Regular and singular Sturm-Liouville problems, Green's functions. Prerequisite: Mathematics 212A or consent of instructor.

212C. Mathematical Methods in Physics and Engineering (3) S Fourier transforms of functions and distributions, Laplace transforms, applications to boundary value problems. Simple second order elliptic, hyperbolic and parabolic partial differential equations. Uniqueness theorems, maximum principles. Spherical harmonics. Wave propagation. Prerequisite: Mathematics 212B or consent of instructor.

214A. Asymptotic Methods in Analysis (3) Euler-MacLaurin sum formula; Poisson sum formula; Laplace method; saddle-point method; method of stationary phase; asymptotic expansions; asymptotic solution of differential equations. Prerequisites: Mathematics 212A-212B-212C, or consent of instructor.

215A-215B-215C. Mathematical Theory of Process Optimization (3-3-3) Optimal control problems for systems described by nonlinear differential equations; necessary conditions, sufficient conditions; existence theorems, applications to classical calculus of variations and to problems in electrical and aerospace engineering. Optimal control problems for systems described by nonlinear difference equations, applications to the theory of optimal economic growth. Prerequisites: Mathematics 171A-171B or 212A-212B-212C, or 240A-240B-240C, or Economics 212, or AMES 255A-255B, or consent of instructor.

217. Topics in Applied Mathematics Advanced topics to vary from year to year. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

220A-220B-220C. Complex Analysis (3-3-3) F-W-S Complex numbers and functions. Cauchy theorem and its applications, calculus of residues, expansions of analytic functions, analytic continuation, conformal mapping and Riemann mapping theorem, harmonic functions, Dirichlet principle, Riemann surfaces. Prerequisites: Mathematics 190A-190B, or consent of instructor.

221A-221B-221C. Several Complex Variables (3-3-3) Formal and convergent power series, Weierstrass preparation theorem; Cartan-Ruckert theorem; analytic sets; mapping theorems; domains of holomorphy; proper holomorphic mappings; complex manifolds; modifications. Prerequisites: Mathematics 200A, 220A-220B-220C, or consent of instructor.

225A-225B-225C. Conformal Mapping (3-3-3) Riemann's mapping theorem; behavior of the mapping function at the boundary, including discussion of prime ends. Analytic functions of class H_p . Mapping of multiple connected domains onto canonical domains, variational techniques in conformal mapping; univalent functions; constructive methods; uniformization. Prerequisites: Mathematics 220A-220B-220C.

227A-227B-227C. Topics in Complex Analysis (3-3-3) F-W-S Advanced topics to vary from year to year. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

228. Seminar in Complex Analysis (3) (Satisfactory/Unsatisfactory grades permitted.)

230A-230B-230C. Ordinary Differential Equations (3-3-3) Existence and uniqueness theorems. Linear systems with constant and periodic coefficients. Sturm-Liouville theory. Eigenfunction expansions. Stability and asymptotic behavior of nonlinear systems. Poincare-Bendixon theorem. Perturbation theory. Linear systems in the complex domain and their singularities. Control theory. Equations in Banach space. Prerequisites: Mathematics 100; 220A-220B.

231A-231B-231C. Partial Differential Equations (3-3-3) Existence and uniqueness theorems, Cauchy-Kowalewski theorem, first order systems, Hamilton-Jacobi theory, initial value problems for hyperbolic and parabolic systems, boundary value problems for elliptic systems, Green's function, eigenvalue problems, perturbation theory. Prerequisites: Mathematics 131A-131B, or consent of instructor.

232A-232B-232C. Calculus of Variations (3-3-3) Euler-Lagrange equation, theory of fields, Hamilton-Jacobi theory, sufficient conditions, Weierstrass E test, Mayer, Lagrange and Bolza problems. Optimal control, Pontryagin's Maximum Principle, existence theorems, sufficient conditions. Caratheodory's approach to calculus of variations. Prerequisites: Mathematics 240A-240B-240C.

233. Singular Perturbation Theory for Differential Equations (3) Regular and singular perturbation problems; boundary value problems for ordinary differential equations containing a parameter; singular perturbation of eigenvalue problems; two-parameter singular perturbation problems for ordinary differential equations; relaxation oscillations; initial value problems for nonlinear systems; singular perturbation problems for partial differential equations. Prerequisites: Mathematics 130A-130B, 131A-131B-131C or consent of instructor.

240A-240B-240C. Real Analysis (3-3-3) F-W-S Lebesgue integral and Lebesgue measure; Fubini theorems; functions of bounded variation; Stieltjes integral; derivatives and indefinite integrals; the spaces L and C ; equi-continuous families; continuous linear functionals; general measures and integrations. Prerequisites: Mathematics 190A-190B or consent of instructor.

241A-241B-241C. Functional Analysis (3-3-3) F-W-S Metric spaces and contraction mappings; topological vector spaces; continuous linear operators; open mapping theorem; closed graph theorem; uniform boundedness principle; Hahn-Banach theorem; representation of continuous linear functionals; conjugate space; weak topologies; extreme points; Krein-Milman theorem; fixed-point theorems; Riesz convexity theorem; Banach algebras. Prerequisites: Mathematics 240A-240B-240C, or consent of instructor.

243A-243B-243C. Fourier Analysis (3-3-3) Convergence and summability of Fourier series. Fourier transform, Hilbert transform. Trigonometric approximation and interpolation. Tauberian theorems, prime number theorem. Applications of Fourier analysis to probability theory: characterization of infinitely divisible and stable laws. Prerequisite: Lebesgue integration, or consent of instructor.

244B-244C. Distributions (3-3) Various definitions of distributions; derivatives and antiderivatives; structure of distributions; spaces of test functions and distributions; multiplication and convolution Fourier transforms; division problems; generalized functions: applications. Prerequisites: Mathematics 212A-212B-212C or 240A-240B-240C.

248. Seminar in Real Analysis (3) F-W-S (Satisfactory/Unsatisfactory grades permitted.)

250A-250B-250C. Differential Geometry (3-3-3) F-W-S Differential manifolds, Sard theorem, tensor bundles, Lie derivatives, DeRham theorem, connections, geodesics, Riemannian metrics, curvature tensor and sectional curvature, completeness, characteristic classes. Differential manifolds immersed in Euclidean space. Prerequisites: Mathematics 100A-100B-100C; 151.

257A-257B-257C. Topics in Differential Geometry (3-3-3) Advanced material in special areas of Differential Geometry to be selected by the instructor. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

258. Seminar in Differential Geometry (3) Advanced material in special areas of differential geometry to be selected by the instructor. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

260A-260B-260C. Mathematical Logic (3-3-3) Propositional calculus and quantification theory. Completeness theorem; theory of equality; compactness theorem. Skolem-Lowenheim theorems; Vaught's test; Craig's lemma. Elementary number theory and recursive function theory. Undecidability of true arithmetic and of Peano's axioms. Church's thesis; set theory; Zermelo-Frankel axiomatic formulation. Cardinal and ordinal numbers. The axiom of choice and the generalized continuum hypothesis. Incompleteness and undecidability of set theory. Relative consistency proofs. Prerequisite: Mathematics 100A-100B-100C or consent of instructor.

262. Topics in Combinatorial Mathematics (3) Development of a topic in combinatorial mathematics starting from basic principles. Problems of enumeration, existence, construction, and optimization with regard to finite sets. Some familiarity with computer programming desirable but not required. Prerequisites: Mathematics 100A-100B-100C.

267A-267B-267C. Topics in Mathematical Logic (3-3-3) F-W-S Advanced material in special areas of Mathematical Logic to be selected by the instructor. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

268A-268B-268C. Seminar in Formal Languages (3-3-3) Advanced material in special areas of formal languages to be selected by the instructor. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

270A-270B-270C. Numerical Analysis (3-3-3) F-W-S Accuracy of numerical calculations; interpolation; numerical quadrature; continued fractions in numerical analysis; determination of the zeros of a polynomial; elimination methods for linear equations; eigenvalue problem for hermitean matrices; eigenvalue problem for general matrices; iterative methods for linear equations. Prerequisites: Mathematics 2D-2E, 100A-100B, 102A, or consent of instructor.

274A-274B-274C. Numerical Aspects of Differential Equations (3-3-3) Ordinary differential equations; one-step methods for initial value problems; extrapolation methods for initial value problems; multi-step methods for initial value problems; boundary value problems. Partial differential equations: initial value problems for systems of quasilinear hyperbolic differential equations. Prerequisites: Mathematics 110A-110B, 130A-130B, or consent of instructor.

280A-280B-280C. Probability Theory (3-3-3) Probability measures; Borel fields; conditional probabilities; sums of independent random variables; limit theorems; zero-one laws; stochastic processes. Prerequisites: advanced calculus and consent of instructor.

281A-281B-281C. Mathematical Statistics (3-3-3) Testing and estimation; sufficiency; regression analysis; sequential analysis; statistical decision theory; nonparametric inference. Prerequisite: advanced calculus and consent of instructor.

282A-282B-282C. Stationary Processes and Prediction Theory (3-3-3) Ergodic theorems; Fourier analysis of Gaussian processes; prediction theory. Combinatorial identities and the Szegő theorems. Entropy. The fundamental theorems of information theory. The Kolmogorov-Sinai theorem. Prerequisite: Lebesgue integration.

286A-286B. Topics in Probability (3-3-3) Advanced topics in probability selected by instructor and to vary from year to year. Prerequisite: Mathematics 280A or consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

288. Seminar in Probability and Statistics (1-3) Work in advanced topics in probability theory and/or statistics. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

289A-289B-289C. Teaching of Mathematics (1-3,1-3,1-3) Teaching and tutorial services connected with courses and seminars. Prerequisite: consent of department chairman. (Satisfactory/Unsatisfactory grades permitted.)

290A-290B-290C. Topology (3-3-3) F-W-S Topological spaces; filters and limits; Hausdorff spaces; compact and locally compact spaces; uniform spaces; function spaces; singular homology and cohomology CW complexes; duality theorems; the cohomology ring, axiomatic homology and cohomology theory; homotopy of mappings; homotopy groups; homotopy sequences. Prerequisites: Mathematics 190A-190B or 290A for 290B-290C.

292A-292B-292C. Differential Topology (3-3-3) Differential manifolds and submanifolds. Mappings and approximations. Smoothing maps. Manifolds with boundary. Triangulation of differential manifolds. Non-degenerate smooth functions. Morse inequalities. Calculus of variations. Applications to Lie groups and symmetric spaces. Prerequisites: Mathematics 250B, 290B-290C, or consent of instructor.

297A-297B-297C. Topics in Topology (3-3) F-W-S Advanced material in special areas of topology to be selected by instructor. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

298. Seminar in Topology Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

299. Reading and Research (1-12, 1-12, 1-12) Independent study and research for the doctoral dissertation. One to three credits will be given for independent study (reading), and one to six for research. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

500. Apprentice Teaching (1-3) Supervised teaching as part of the mathematics instructional program on campus (or, in special cases such as the CTF program, off campus). Prerequisite: consent of adviser. (Satisfactory/Unsatisfactory grades only.)

MUIR

Office: Provost, Muir College

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COURSES

199. Special College Project A course of independent work on a research or creative project to satisfy a Muir graduation requirement. Students wishing to enroll must submit a written request with a description of the project. (For information on other requirements, consult the Provost's Office, Muir College.) Prerequisites: upper-division status, approval by adviser for project and by Provost.

MUSIC

Office: Building 407, Matthews Campus
Robert Erickson, M.A., Professor of Music
Peter Farrell, M.M., Professor of Music
Kenneth Gaburo, D.M.A., Professor of Music
* Wilbur Ogdon, Ph.D., Professor of Music
John Silber, Ph.D., Professor of Music
(Chairman of the Department)

Keith Humble, Dip.Mus., Associate Professor of Music
* Thomas Nee, M.A., Associate Professor of Music
Roger Reynolds, M.M., Associate Professor of Music
(Director, Project for Music Experiment)

James L. Campbell, M.S., Assistant Professor of Music
Pauline Oliveros, B.A., Assistant Professor of Music
Bertram J. Turetzky, M.A., Assistant Professor of Music

* * *

Albert Gillis, M.M., Visiting Professor of Music
Edwin London, Ph.D., Visiting Professor of Music
* On sabbatical leave, 1972/73
* * On leave, 1972/73

* * *

The music department is dedicated to:

Exploring and performing the widest scope of music from all times and places with an on-going emphasis on contemporary materials.

Creative scholarship, experimental research and its applications in electronics, computers, acoustics, extended instrumental techniques and possible social contexts for music.

Continually renewing our educational approaches, curriculum and subject matter in an attempt to achieve an integrated progression from the undergraduate to the graduate level.

The broadest possible range of student action and participation in departmental affairs — whether in performing, educational, or organizational situations.

The departmental curriculum includes the following categories of study:

I.

Experimental Studies — Seminars of an exploratory nature. Students who enroll in these courses do so as experimentalists themselves, joining individual faculty members in the common pursuit of research problems. Experimental Studies Seminars treat areas of present faculty research interests, such as:

Timbre Research: study of harmonic and inharmonic partials, volume/brightness, attack transient, formant, loudness, modulation and beats, phase, noise bands and spatial orientation for their effects upon musical timbre. Readings, experiments, projects.

Compositional Linguistics: the application of linguistic data to music composition and analysis: consideration of the vocal phenomenon and implications such as Music as Language.

Time Perception in Aesthetic Situations: intensive discussion and projects based on relevant research publications in psychology, physiology, biology, communications, etc.

Upper-Division Courses:

Music 106A-106B-106C. Experimental Studies Seminars F-W-S

Music 108A-108B. Studies in New Instrumental Resources F-W

Music 199. Independent Study F-W-S

Graduate Courses:

Music 206A-206B-206C. Experimental Studies Seminars

Music 208A-208B. Seminar in New Instrumental Resources

Music 240. Experimental Instruction

Music 299. Advanced Research Projects and Independent Study

II.

Composition — Studies in composition are primarily of an experimental nature, pursued through seminars and individual instruction. Students are expected to expand their theoretical and technical knowledge and to incorporate it into their compositions. Provision is made for composing as an instructional mode of learning for those whose principal interest lies in another area.

Upper-Division Courses:

Music 103. Seminar in Composition F-W-S

Music 199. Independent Study F-W-S

Graduate Courses:

Music 203A-203B-203C. Advanced Problems and Projects in Composition

Music 299. Advanced Research Projects and Independent Study

III.

Performance — Performers are obligated to learn new as well as old skills, and to exercise them in all media, and to conduct, manage, and take part in complex productions, whether in a musical or theatrical capacity.

Upper-Division Courses:

*Music 128. Principles and Practice of Conducting F

Music 130A-130B-130C. Seminar in Chamber Music Performance F-W-S

Music 131. Projects in Chamber Music Performance F-W-S

Music 132. Pro-seminar in Music Performance F-W-S

Music 135. Concert Orchestra F-W-S

Music 136. Reading Orchestra F-W-S

Music 140. Concert Chorus F-W-S

Music 141. Chamber Chorus F-W-S

Music 199. Independent Study F-W-S

Graduate Courses:

Music 201A-201B-201C. Advanced Problems and Projects in Conducting and Performance

Music 230. Advanced Seminar in Performance of Music for Small Ensembles

Music 232. Pro-seminar in Music Performance

Music 299. Advanced Research Projects and Independent Study

* Not offered 1972/73.

IV.

Technology — In addition to developing his or her instrumental capability, a performer is expected to develop a practical ability to use electro-acoustic devices in performance, composition, and research.

Upper-Division Courses:

Music 104B. Projects in Electroacoustic Transmission of Music Information W-S

Music 105A-105B. Electronics in Music F-W

*Music 120A-120B. Audio Circuitry for Musicians F-W

Graduate Courses:

Music 202. Problems and Projects in the Specialized Use of Electronics in Performance

Music 204. Projects Seminar in Electroacoustic Transmission of Music Information

Music 299. Advanced Research Projects and Independent Study

* Not offered 1972/73

V.

Theoretical Studies — Seminars and studies in analytic theory and systematic musicology, concerned with fields of knowledge representing formed systems of established practice. Theoretical Studies Seminars treat areas of present faculty research interests, such as:

Structural Analysis: the theories of Heinrich Schenker are applied to selected pre-twentieth century compositions in order to formulate notions about their essential structure.

Notation: testing notation as a means of private storage and public dissemination of information: economy, generality, appropriateness, definition.

Other areas of research may include Twentieth Century Music Systems, Contemporary Structural Analysis, Tuning and Temperament, Instrumentation.

Upper-Division Courses:

Music 100A-100B-100C. Music Theory and Practice I F-W-S

Music 101A-101B-101C. Music Theory and Practice II F-W-S

Music 102A-102B-102C. Music Theory and Practice III F-W-S

Music 104A. Principles of Electroacoustic Transmission of Music Information F

Graduate Courses:

Music 299. Advanced Research Projects and Independent Study

VI.

Literature and Special Studies — Analytical, critical and interpretative studies of the music of selected historical periods, cultures and media.

Upper-Division Courses:

Music 110. Laboratory Survey of Music Literature F-W-S

Music 111. Seminar in Non-Western Music

*Music 112. Studies in Vocal and Choral Literature F

*Music 113. Studies in Opera F

Music 114. Music of the 20th Century F

Music 116. Seminar in Medieval and Early Renaissance Music S

Music 117. Seminar in Late Renaissance Music W

Music 123. The Orchestra and its Literature S

Music 124. Studies in Chamber Music S

Music 199. Independent Study F-W-S

Graduate Courses:

Music 212. Seminar in Vocal and Choral Literature

Music 213. Opera Studies

Music 214. Seminar in 20th Century Music

Music 215. Seminar in Bach and Related Studies

Music 216. Seminar Studies in Late-Medieval and Early-Renaissance Music

Music 217. Seminar Studies in Late-Renaissance and Early-Baroque Music

Music 223. Seminar Studies in Orchestral Literature

Music 224. Seminar Studies in Chamber Literature

Music 297. Candidates Tutorial

Music 299. Advanced Research Projects and Independent Study

* Not offered 1972/73.

VII.

Complementary Disciplines — are approved studies exterior to the Department of Music pertinent to the student's needs and/or desires. (Psychology, linguistics, physics, electronics, visual arts, etc.)

The Undergraduate Program

Undergraduate courses offered by the Department of Music serve various purposes:

1. Enable students to undertake a major consisting of eighteen courses or less, according to the students' previous preparation or abilities.
2. Enable Muir College students to incorporate music courses into a special project undertaken in lieu of a major.
3. Provide a sequence of courses acceptable as a noncontiguous minor in Revelle College.
4. Enable students to satisfy the fine arts sequence of Muir College and the fine arts requirement of Revelle College.
5. Allow a choice of elective courses to all students, with or without prior music training.

Prerequisite to acceptance into a curriculum program leading to a B. A. with a major in music is a competence in the reading and hearing of pitch and rhythmic relations as well as a satisfactory level of performance. These levels may be satisfied through examinations administered by the department the week prior to the beginning of classes. Music 2A-2B-2C and Music 30A-30B-30C are courses designed to prepare those abilities.

Major requirements for entering the curriculum program:

1. Music 1A-1B-1C
2. Demonstration of pitch, rhythmic and performance ability through examinations
 - a. preparation for pitch/ rhythm ability in Music 2A2B-2C.
 - b. preparation for performance ability in Music 30A-30B-30C.

Courses required for the B. A. in Music:

1. The nine-quarter sequence: Music Theory and Practice; Music 100A-100B-100C; Music 101A-101B-101C; Music 102A-102B-102C.
2. Three-quarter sequence: Laboratory Survey of Music Literature; Music 110A-110B-110C.
3. The six-quarter sequence: Seminar in Chamber Music Performance; Music 130A-130B-130C-130D-130E-130F.
4. The six-quarter sequence: Music Performance through Directed Ensemble; Music 135, or Music 136, or Music 140, or Music 141.
5. The three-quarter sequence: Contemporary Issues in Music; Music 143.

Special Interest Programs for Music Majors:

Each student should select one Special Interest six-course sequence offered by the Department to develop in depth understanding and skills. Current special interest programs are: Pro-seminar in Music Performance; Composition; Music Communications; Music Electronics; Theoretical Studies; Literature Studies.

Since some music courses require musical abilities, non-music students wishing to take those courses as electives are asked to obtain the consent of the instructor prior to enrollment.

Students within the music major are advised to plan for private lesson expenses on their major instrument.

The Graduate Program

The department offers the degree of Master of Arts in Music and the degree of Doctor of Philosophy in Music.

In addition to fulfilling the University's general requirements for admission to graduate studies, the student, during his first quarter of residence, will be asked to confirm appropriate levels of musicianship and of theoretical-historical knowledge of the field through advisory examinations. The department requires all graduate students take music examinations administered by the department the week prior to the start of classes.

Students applying for admission to music graduate programs must submit, along with

their application, tapes demonstrating their level of performance, a repertory sheet of works performed during the past year, and when applicable, tapes and scores of their compositions.

All graduate students are required to approve their course schedule with their adviser prior to registering for classes. Any significant change in their schedule should be reviewed with the adviser.

One year of 201A-201B-201C, Advanced Problems and Projects in Conducting and Performance, for 1 unit, is required of all graduate students. The year in which this requirement is fulfilled will be at the discretion of the Music Faculty. It is suggested that those music students with a performance ability maintain a continuous commitment to this course during residency.

Master's Degree Program

The M.A. degree in music is awarded according to Plan I: 36 course units and a research thesis. The candidate for the M.A. degree will elect a minimum of three categories of study, each category consisting of a minimum of three courses. Approved groups of courses could be formed from the seven categories of study: Experimental Studies, Composition, Performance, Technology, Theoretical Studies, Literature and Special Studies. The remaining requirement, beyond any non-credit remedial course work determined by the department or the Graduate Division, and the thesis, would be a three-unit candidate's tutorial, taken as a three quarter sequence during the first year of graduate study. This tutorial is intended to serve two functions: (1) the supervision of independent remedial studies and (2) the guided preparation for thesis research.

The department will require a reading ability in one or more foreign languages if the student's research area calls for such proficiency.

Doctor's Degree Program

The student entering graduate studies leading to the Ph.D. degree in music at UCSD will be expected to have reached a superior level of musical competence and to have accomplished a program of masters study acceptable to the Department of Music of UCSD.

The requirements for the Ph.D. will include the following: (1) successful completion of requirements leading to a Master of Arts degree in accord with degree Plan I of the University of California and the Department of Music, UCSD, (2) a minimum of eight approved courses beyond the M.A., (3) demonstration through qualifying written and oral examinations of a comprehensive understanding of the literature and theory of the field, (4) an acceptable dissertation, and (5) a final oral examination.

The required eight courses beyond requirements for the M.A. would be assigned by an advisory committee after review of the student's academic background and abilities, as confirmed by appropriate departmental testing. However, the student should not expect these eight courses, alone, to prepare him for such examinations. The student will choose other electives in music and electives in other disciplines (such as history, literature, art history, philosophy, physics) when useful to this purpose. He will also undertake independent studies, supervised by an appropriate member of the faculty, and prepare himself in the library and laboratory for those qualifying examinations.

COURSES

LOWER DIVISION

1A-1B-1C. The Nature of Music F-W-S Development of music perception and discrimination through participation projects in tape music composition and small-group improvisation, and through critical observation of the preparation and performance of selected ensemble literature by experienced musicians. Prerequisites: 1A for 1B; 1B for 1C; or consent of course committee.

2A. Basic Musicianship I The learning of standard music notation and the practice of fundamental music skills through reading, writing, singing and hearing pitch and time relationships.

2B. Basic Musicianship II The continuing practice of reading, writing, singing and hearing pitch-time relationships; music manuscript editing and the writing of performance parts; problems in arranging. Prerequisite: 2A or consent of department.

2C. Basic Musicianship III The continuing development of music skills and experimental projects in basic music theory using electronic instrumentation. Instruction in the operation of music recording equipment. Note: This series of courses serves as preparation for the major for those students unable to demonstrate the level of musicianship expected of beginning music majors. Prerequisite: 2B or consent of department.

10. Projects and Studies in Music F A study of the nature of music, how it is made, how to listen to it. Projects include improvising in groups, tape music composition, and invention of music notation. Old, new, and newest music will be listened to and studied. This course may be used in satisfying the Revelle College fine arts requirement.

11A-11B-11C. Listening Laboratory in Music Literature A three quarter survey of the world's art music in recorded and live performance. Two to four hours of assigned music listening weekly and one, two-hour discussion section. Occasional papers or reports. Not open to music majors. Prerequisites: Music 1A-1B-1C for Muir students; Music 10 for Revelle students.

30A-30B-30C. Seminar in Chamber Music Performance Class instruction in instrumental/vocal performance skills for those who need to improve their proficiency. May be passed by examination. May be repeated for credit. (limited to students preparing for music majors.)

UPPER DIVISION

- 100A-100B-100C. Music Theory and Practice I** An integrated approach to the study of music through hearing, writing, analyzing, conducting and performance. Emphasis on intervallic structures, instrumentation, and on divisive and additive principles of musical time measurement. Prerequisites: Music 2A-2B-2C or proficiency by examination.
- 101A-101B-101C. Music Theory and Practice II** An integrated study of the materials and processes of music emphasizing harmonic structures and textures along with their corollary time and timbral relationships. Prerequisites: 100C and 101A or proficiency by examination.
- 102A-102B-102C. Music Theory and Practice III** Advanced study of the materials and processes of music emphasizing polyphonic structures and textures along with corollary rhythmic and timbral relationships. Prerequisites: 101C for 102A or proficiency by examination.
- 103. Seminar in Composition F-W-S** (Composition) Individual projects in composition critically reviewed in seminar with fellow student and faculty composers. Three consecutive quarters are equivalent to one undergraduate course. Students enroll in the fall and receive a grade at the end of the spring quarter. Prerequisites: Music 101A-101B-101C., or permission of department.
- 104A. Principles of Electroacoustic Transmission of Music** A study, involving electroacoustic principles, of the transmission of musical information. Operational techniques of microphones, amplifiers, magnetic tape recorders, loudspeakers and broadcast and recording facilities will be discussed. Three meetings. Prerequisites: Music 2A-2B-2C and consent of instructor.
- 104B. Projects in Electroacoustic Transmission of Music Information** An investigation into the experimental use of electronic instruments relating to the storing and retrieving of aural information and applied to the multivarying conditions caused by complex sound events. Prerequisites: 104A and consent of instructor.
- 105A. Electronics in Music** Exercises in electronic sound generation and processing with emphasis on voltage controlled systems. Prerequisite: consent of instructor.
- 105B. Projects Seminar in Electronics in Music Performance** Prerequisite: consent of instructor.
- 106A-106B-106C. Experimental Studies Seminars F-W-S** (Experimental Studies) Individual and Group problems in experimental studies. Seminar topics determined according to present research interest of faculty member directing the course. An elective for qualified undergraduates. Prerequisite: consent of instructor.
- 107. Theoretical Studies Seminar** Seminars offered by faculty within areas of present research interests, such as; structural analysis, notation, 20th century music systems, contemporary structural analysis, tuning and temperament, instrumentation. May be repeated for credit.
- 108A-108B. Studies in New Instrumental Resources F-W** (Experimental Studies) Extensions of conventional instrumental technique and tone production, and their application to music composition, notation and performance. Must be taken in sequence or may be taken separately with instructor's consent. An elective for qualified undergraduates.
- 110A-110B-110C. Laboratory Survey of Music Literature** A three quarter survey of the extant music repertory in recorded and live performance. Two to four hours of assigned listening weekly, with score when advisable. Occasional readings, papers and reports. Required of all music majors. Prerequisites: Music 1A-1B-1C and 2A-2B-2C or consent of department.
- 111. Non-western Music** A critical study of specific musical elements in certain non-Western Cultures, such as West African drumming, music of South India, etc. Music majors are required to take an additional project seminar for course credit. Prerequisite: consent of instructor.
- 112. Studies in Vocal and Choral Literature F** (Literature and Special Studies) A critical study of representative works for solo voice (with piano or other accompaniment) and/or for choral ensemble. Since the selected literature will vary from year to year the course can be repeated for elective credit. Music majors are required to take additional projects seminar session.
- 113. Studies in Opera F** (Literature and Special Studies) A critical study of representative operas. At least one opera discussed will be selected because of the opportunity to see it in staged performance. Music majors are required to take an additional projects seminar session.
- 114. Studies in Music of the 20th Century** (Literature and Special Studies) An exploration of materials and methods used in the music of our time. There will be an extra discussion group for music majors. May be repeated for credit.
- 115. Seminar in Bach Studies W** (Literature and Special Studies) A study of the art of J. S. Bach, with particular attention to problems of style and structure. Music majors are required to take an additional projects seminar session for course credit. Prerequisite: ability to read music or consent of instructor.
- 116. Seminar in Medieval and Early Renaissance Music S** (Literature and Special Studies) The development of an operational and intellectual account of medieval and early Renaissance music. Music majors are required to take an additional projects seminar session.
- 117. Seminar in Late Renaissance and Early Baroque Music W** (Literature and Special Studies) Functional performance problems and realizations of music of the sixteenth and seventeenth centuries. Music majors are required to take additional projects seminar session.
- 120A-120B. Audio Circuitry for Musicians (2-2) F-W** (Performance and Technology) AC and DC circuit analysis; soldering and assembly techniques; projects. Two units each quarter.
- 123. The Orchestra and its Literature S** (Literature and Special Studies) A study of the instruments of the orchestra: their resources, tonal effects; their use by major composers; methods of writing for modern instruments; analysis of representative scores. Music majors are required to take an additional projects seminar session. Three meetings. Prerequisite: ability to read music.
- 124. Studies in Chamber Music S** (Literature and Special Studies) A critical study of representative works for small ensemble. The literature studied is selected and may vary from course to course. The course can be repeated for elective credit. Music majors are required to take an additional projects seminar session. Three meetings.
- 128. Principles and Practice of Conducting F** (Performance and Technology) The theory and practice of conducting as related to the study of instrumental and choral literature. Prerequisite: consent of instructor.
- 130A-130B-130C. Seminar in Chamber Music Performance (2-2-2) F-W-S** (Performance and Technology) Performance of representative chamber music literature. Prerequisites: proficiency on a musical instrument and consent of instructor through audition. May be repeated for credit.
- 131. Projects Course in Chamber Music Performance (0-0-4) F-W-S** (Performance and Technology) Individual projects in the preparation of chamber music for performance. Three consecutive quarters are equivalent to one undergraduate course. Students enroll in the fall and receive a grade at the end of the spring quarter.
- 132. Pro-Seminar in Music Performance** These seminars are devoted to workshops in instrumental/vocal performance with special attention to technique and style, as well as the interpretation of representative literature. The seminars meet two hours a week with a maximum enrollment of six. A high standard of performance and analytic insight must be demonstrated. Seminars may be repeated but no more than six units may be credited toward graduation. Prerequisite: consent of instructor through audition.
- 133A-133B-133C. Perspectives of Jazz (4-2-2) F-W-S** A study of the music from a theoretical, historical and applied manner (i.e., theory, harmony, ear-training, listening, styles, aesthetics, history (readings/discussion), performance training). Prerequisite: consent of instructor.
- 135. Concert Orchestra (2) F-W-S** (Performance and Technology) Activity. Study and performance of orchestral literature. Prerequisite: consent of instructor by audition. (May be repeated for credit.)
- 136. Reading Orchestra (2) F-W-S** (Performance and Technology) Activity. Study of standard orchestral literature in coached rehearsal sessions. Course may be repeated for credit. Prerequisite: consent of instructor by audition.
- 140. Concert Chorus (2) F-W-S** (Performance and Technology) Activity. Study and performance of choral literature. Course may be repeated for credit. Prerequisite: consent of instructor by audition.
- 141. Chamber Chorus (2) F-W-S** (Performance and Technology) Activity. Study and performance of literature for small choral ensemble. Course may be repeated for credit. Prerequisite: consent of instructor by audition.
- 142. Women's Chorus (2) F-W-S** Study and performance of music literature for choral ensembles composed of women's voices. May be repeated for credit.
- 143. Contemporary Issues in Music** Bi-weekly seminars on contemporary issues in music. Required of all music majors.
- 199. Independent Study (2 or 4) F-W-S** (All Categories) Independent reading, research, or creative work under the direction of a faculty member. Prerequisites: consent of instructor and departmental approval.

GRADUATE

- 201A-201B-201C. Advanced Problems and Projects in Conducting and Performance (1 or 3, 1 or 3, 1 or 3)** The general nature of this course conforms to the category *Performance and Technology* in the graduate curriculum. Specific content is determined from year to year. (Satisfactory/Unsatisfactory grades permitted.)
- 202. Problems and Projects in the Specialized Use of Electronics in Performance (3)** (Performance and Technology). May be repeated for credit.
- 203A-203B-203C. Advanced Projects in Composition (3-3-3)** (Composition) (Satisfactory/Unsatisfactory grades permitted.)
- 204. Projects Seminar in Electroacoustic Transmission of Music Information (3)** (Performance and Technology). Prerequisites: Music 104A and consent of instructor.
- 205. Advanced use of Electronics in Music** (Theoretical Studies) Seminar in advanced theoretical and applied research in the generation and processing of electronic sound for composition and performance. Prerequisite: consent of instructor.
- 206A-206B-206C. Experimental Studies Seminars (3-3-3)** (Experimental Studies) Seminars offered by faculty within areas of present research interests, such as: timbre, compositional linguistics, time perception in aesthetic situations, psychoacoustics, socio-musical studies, time and motion.

207A-207B-207C. Theoretical Studies Seminar (3-3-3) (Theoretical Studies) Seminars offered by faculty within areas of present research interests, such as: structural analysis, notation, twentieth century music systems, contemporary structural analysis, tuning and temperament, instrumentation.

208A-208B. Seminar in New Instrumental Resources (3-3) (Experimental Studies) Extensions of conventional instrumental technique and tone production, and their application to music composition, notation and performance. Must be taken in sequence or may be taken separately with instructor's consent.

209A-209B. Advanced Music Theory and Practice Advanced integrated studies in music theory, composition and styles study through analysis and performance. Two quarters of 209 may be taken as a substitute for one quarter of 207, with permission from the professor. Must be taken in sequence; credit is received only at the end of the second quarter.

211. Non-Western Music A critical study of specific musical elements in certain non-Western Cultures, such as West African drumming, music of South India, etc. Music majors are required to take an additional project seminar for course credit. Prerequisite: consent of instructor.

212. Seminar in Vocal and Choral Literature (3) (Literature and Special Studies) A critical and historical study of selected works and repertory.

213. Opera Studies (3) (Literature and Special Studies) A detailed analytical study of selected operas in production in San Diego, Los Angeles, or San Francisco. Prerequisite: consent of instructor.

214. Seminar in 20th Century Music (3) (Literature and Special Studies) Detailed study of selected literature through the study of scores and writings, supplemented when possible by performance participation.

215. Seminar in Bach and Related Studies (3) (Literature and Special Studies) A study of content and structure in selected compositions of J. S. Bach. Prerequisite: consent of instructor.

216. Seminar Studies in Late-Medieval and Early-Renaissance Music (3) (Literature and Special Studies) Problems of style and performance in selected music of the 13th, 14th, and 15th centuries.

217. Seminar Studies in Late-Renaissance and Early-Baroque Music (3) (Literature and Special Studies) The study of early music as it has to do with theoretical systems, critical analyses, music and documentary source materials.

223. Seminar Studies in Orchestral Literature (3) (Literature and Special Studies) Problems of performance and interpretation in representative works of orchestral music, including works for chamber orchestra, opera scenes, and choral works. Students will be responsible for problems of editing, bowings, and conducting.

224. Seminar Studies in Chamber Literature (3) (Literature and Special Studies) A critical and historical study of selected works and repertory.

230. Advanced Seminar in Performance of Music for Small Ensemble (3) (Performance and Technology) Performance of representative chamber music literature through coached rehearsal and seminar studies. (Course may be repeated for credit since literature studied varies from quarter to quarter.)

232. Pro-Seminar in Music Performance These seminars are devoted to workshops in instrumental/vocal performance with special attention to technique, style, and interpretation. The seminars meet two hours a week with maximum enrollment of six. A high standard of performance must be demonstrated. Seminars may be repeated but no more than six units may be credited toward the degree.

240. Experimental Instruction A graduate teaching seminar in experimental approaches to music learning. Required of all graduate students the first year. May be repeated for credit.

243. Seminar on Contemporary Issues in Music Bi-weekly seminars on contemporary issues in music. Required of all graduate students during residence. (Satisfactory/Unsatisfactory grades only.)

297. Candidates Tutorial (1-1-1) (Literature and Special Studies) A course requirement for all prospective M.A. and Ph.D. candidates, the tutorial is taken with the student's graduate advisor and provides for supervised independent remedial music studies and guided preparation for thesis research. Students are to enroll for three quarters for a total of three units. (Satisfactory/Unsatisfactory grades only.)

299. Advanced Research Projects and Independent Study (1-12, 1-12, 1-12) (All Categories). (Satisfactory/Unsatisfactory grades permitted.)

500. Apprentice Teaching Participation in the undergraduate teaching program is required of all graduate students in the first year.

NATURAL SCIENCES

Office: Provost, Revelle College

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The two sequences of courses described below are given jointly by the Departments of Physics, Chemistry, and Biology. They are to be used by Revelle College students in fulfilling the natural science requirement of the college. The courses contain material equivalent to traditional lower-division chemistry, biology, and physics courses, but are organized in such a way as to eliminate unnecessary overlap of content.

The sequence Natural Science 1A-1B-1C-1D-1E is intended for students whose mathematics proficiency is at the level of the Mathematics 1 sequence. The material of this sequence is presented in a manner which minimizes the dependence on mathematics in the early quarters. Students who are enrolled in Mathematics 2A-2B-2C or have advanced standing will usually take the sequence Natural Science 2A-2B-2C-2D-2E. In either case, the courses are intended to be taken in the given order. Individual departments may recommend that the above sequences be supplemented with Natural Science 2F or 2FL.

If warranted by enrollment and the numbers of students with advanced mathematics placement, an honors option may be offered within the Natural Science 2 sequence.

COURSES

1A. Natural Science: Chemistry F The rudiments of chemistry including the chemical bond are covered from the point of view of atomic structure and the periodic table. Three hours lecture, one hour recitation.

1B. Natural Science: Chemistry W Thermochemistry and electrochemistry are developed on a description level. An introduction to organic chemistry is provided in order to form a basis for the biology taught in Natural Science 1C. Prerequisite: one quarter or one semester of any college level introductory chemistry course, but preferably Natural Science 1A.

1BL. Natural Science: Chemistry W A laboratory course designed to demonstrate various concepts discussed in Natural Science 1A, 1B, as well as to acquaint students with simple laboratory techniques. Lecture portion to be taught concurrently with Natural Science 1B. Prerequisite: one quarter or one semester of any college level introductory chemistry course, but preferably Natural Science 1A.

1C. Natural Science: Biology F An introduction to the general principles of biology with emphasis on the cell, heredity, and the chemical and physical bases of living processes. Three hours lecture, one hour recitation.

1D. Natural Science: Physics W Basic physical concepts such as energy, momentum, and angular momentum are studied, and are applied in order to understand motion in space and the behavior of ideal gases. Three hours lecture, two hours recitation.

1E. Natural Sciences: Physics S Basic electricity and simple quantum ideas are used in gaining an understanding of the physical basis for atomic structure and chemical binding. Three hours lecture, two hours recitation.

1EL. Natural Science Physics S A lecture and laboratory course dealing with electrical, optical and quantum phenomena with applications to biology and technology. The lecture portion of this course is concurrent with Natural Science 1E. 3 hours lecture; 2 hours recitation; and 4 laboratory exercises during the quarter. Prerequisites: elementary trigonometry, vectors, calculus and Natural Science 1D or the equivalent.

2A. Natural Science: Physics W Introductory lectures on the range of natural phenomena which can be understood in terms of the physical sciences are followed by the study of particle motion. Applications are made to astronomy and to the structure of matter. Three hours, two hours recitation, three hours problem session.

2B. Natural Science: Physics S A continuation of Natural Science 2A to the electrical effects of stationary and moving charges, time dependent fields, and waves. Three hours lecture, two hours recitation, two hours problem session.

2C. Natural Science: Physical Chemistry F The study of waves is followed by an introduction to the quantum theory as applied to atoms and their radiation. The exclusion principle is used to study the chemistry and physics of covalent and ionic binding in molecules and solids. Three hours lecture, two hours recitation, three hours laboratory.

2D. Natural Science: Chemistry W The interactions of atoms and bulk properties of matter are further explored. Elementary thermodynamics, kinetic theory of gases, states of matter, ionic and covalent bonding are developed in more detail, with emphasis on systems of biological interest. Three hours lecture, one hour recitation, one three-hour laboratory.

2DL. Natural Science: Chemistry W Recommended for students intending to major in chemistry and others who wish to acquire some proficiency in the experimental methods of modern chemistry. Students in this course attend the same lecture and classroom sessions as those in Natural Science 2D. The laboratory will include work in qualitative and quantitative analysis, including instrumental methods. Three lectures, one recitation, two three-hour laboratory sessions.

2E. Natural Science: Biology S An introduction to the general principles of biology, with emphasis on the cell, heredity, and the chemical and physical bases of living processes. Three hours lecture, one hour recitation.

2F. Natural Science: Chemistry S A further development of the chemical properties of matter; acids and bases; complex ions; oxidation-reduction; electrochemistry; rates of chemical reactions. Three lectures, one recitation, one three-hour laboratory.

2FL. Natural Science: Chemistry (2) S A laboratory course that will include further analytical work, along with other physical measurements, including the study of kinetics. Emphasis will be on precision and accuracy as well as on the theoretical basis of experimental design. One hour recitation and two 3-hour laboratory sessions.

NEUROSCIENCES

Office: 3034 Basic Science Building
 Reginald G. Bickford, M.D., Professor of Neurosciences
 Theodore H. Bullock, Ph.D., Professor of Neurosciences
 J. Anthony Deutsch, D.Phil., Professor of Psychology
 Robert Galambos, M.D., Ph.D., Professor of Neurosciences
 David M. Green, Ph.D., Professor of Psychology
 Robert B. Livingston, M.D., Professor of Neurosciences
 John S. O'Brien, M.D., Professor of Neurosciences
 (Chairman of the Group in the Neurosciences)
 George S. Reynolds, Ph.D., Professor of Psychology
 Robert Tschirgi, M.D., Ph.D., Professor of Neurosciences
 Silvio Varon, M.D., Professor of Biology
 Donald J. Dalessio, M.D., Associate Adjunct Professor of Neurology
 John W. Evans, M.D., Ph.D., Associate Professor of Mathematics
 Youssef Hatefi, Ph.D., Associate Adjunct Professor of Neurochemistry
 James R. Nelson, M.D., Associate Adjunct Professor of Neurosciences
 Roger N. Rosenberg, M.D., Associate Professor of Neurosciences
 Charles E. Spooner, Ph.D., Associate Professor of Neurosciences
 G. David Lange, Ph.D., Assistant Professor of Neurosciences
 Allen I. Selverston, Ph.D., Assistant Professor of Biology

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The Graduate Program

The group in the Neurosciences accepts for the Ph.D. degree candidates with undergraduate majors in such disciplines as biology, chemistry, engineering, microbiology, mathematics, physics, psychology, and zoology. A desire and competence to understand how the nervous system functions is more important than previous background and training.

Doctor's Degree Program

This program receives guidance from a campus-wide group of faculty interested in nervous system mechanisms. No specific course requirements exist. Each student, in consultation with a faculty committee, selects from the courses offered those relevant to his interests and goals so as to provide a good grounding in several disciplines of pre-clinical neurosciences. The student's program will include formal courses selected from the UCSD *General Catalog* and informal seminars offered by the Department. A regular schedule of rotation through the laboratories of faculty members is a feature of the first year; the student works on research projects and is exposed to the various approaches, techniques, and disciplines represented on the campus. He may work under the preceptorship of appropriate faculty members anywhere on the campus. Close association among the student, faculty, and other research personnel is encouraged in order to achieve an informal, tutorial type of instruction. A period of study at one of the other campuses of the University of California can be arranged by mutual agreement between the Neurosciences Department and neuroscientists in those locations.

Dissertation

During the second year each student is expected to propose and initiate work on a thesis problem under the guidance of a faculty preceptor. The Department is presently conducting animal research and clinical studies in fields of neuroanatomy, neurochemistry, neuropharmacology, neurophysiology, comparative neurology, physiology of excitable membranes, synaptic transmission, neuronal integration and coding, nervous system tissue culture, application of immunological techniques to nervous tissue brain function, sensory physiology, motor mechanisms and systems analysis as applied to neurological problems and neurological disorders. Facilities for research on marine forms, vertebrate and invertebrate, are available.

Examinations

Frequent oral and written exercises and defense of propositions in laboratory and seminar settings can be expected; the aim is to sharpen student skills in the presentation of scientific material. The oral examination to qualify for candidacy for the Ph.D. degree is taken before the end of the second year. Following the preparation of the dissertation in a form adaptable for publication, an oral defense of the thesis completes the requirement.

Teaching

The Department provides experience in instruction. Generally, this involves assisting in laboratory exercises and demonstrations in relation to teaching Basic Neurology. Other types of teaching opportunity also exist since the Department is deeply committed to innovations in education. Students are encouraged to develop their own talents for the creation and evaluation of learning resources.

COURSES

UNDERGRADUATE

199. Neurosciences Independent Research F-W-S Laboratory research under the supervision of individual members of the faculty of the Neurosciences Department in one or a combination of neurosciences disciplines, e.g., neuroanatomy, neurophysiology, neurochemistry, neuropharmacology. Prerequisite: approval of department chairman.

GRADUATE

- 221. Computer Applications in the Study of the Nervous System (3) F** Techniques of experimental control and data processing using small and medium sized digital computers. Laboratory experience programming and operating such machines including exercises illustrating principles of digital logic design. Two hours of lecture; four hours of laboratory. Prerequisites: consent of instructor; minimal knowledge of computer applications. (Satisfactory/Unsatisfactory grades permitted.)
- 222. Selected Topics in the Neurosciences (1) F-W-S** Lectures, group discussions, and demonstrations covering recent advances and current research problems in selected disciplines of the neurosciences. (Satisfactory/Unsatisfactory grades only.)
- 223. Quantitative Theories of Nervous System Function (2) W** Detailed analysis of selected models of nerve membrane function, simple neuron interactions and sensory data processing. The application of linear algebra and transform techniques to input output relations of nervous systems. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades only.)
- 224. Biogenic Amines and Brain Function (2) F** Lectures and discussions concerned with biogenic amines as synaptic transmitters in the brain and neuropharmacological agents whose effect on brain functions may possibly be mediated by modifying the actions of biogenic amines. Prerequisite: medical student or graduate student status in biology, marine biology, psychology, neurosciences or consent of instructor. (Satisfactory/Unsatisfactory grades only.)
- 226. Neuropharmacology (2) W** This course is designed to meet the needs of those medical students desiring further knowledge of the actions of CNS therapeutic agents beyond that covered in the Basic Neurology SM205 course of the Core Curriculum. Prerequisites: Basic Neurology SM205, Organ Physiology, and Pharmacology SM206. (Satisfactory/Unsatisfactory grades only.)
- 227. Neurosciences Concepts (1) W** Analytical, critical and creative discussions of neurosciences phenomena and concepts. Entire quarter is devoted to one problem area, e.g., brain mechanisms involved in — perception, memory, visceral regulation, development, etc., with attempt to establish improved theoretical and experimental approaches. (Satisfactory/Unsatisfactory grades only.)
- 228. Physiological Basis of Audition (2) S** Based on examinations of the recent literature, lectures and student reports, will cover the physiological correlates of pitch, loudness, localization, and other aspects of hearing. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades only.)
- 229. Problems in Neurophysiology (1) F** Review and exploration of mechanisms and physiological and behavioral consequences of centrifugal projections going to sensory relay nuclei and receptor organs. Prerequisite: Basic Neurology SM205. (Satisfactory/Unsatisfactory grades only.)
- 230. Current Topics in the Neurosciences (1) F-W-S** Seminars by campus and departmental faculty, post-doctoral fellows, and guest lecturers on topics of current research and teaching interest in the neurosciences. (Satisfactory/Unsatisfactory grades only.)
- 232. Basic Mechanisms in Clinical Neurology (1) F-W-S** A basic science course covering all the major disciplines of the neurosciences. The emphasis will be on the correlation of clinical neurological disorders and the basic mechanisms involved in the production of patient symptoms and physical findings. Prerequisite: medical student or graduate student status or consent of instructor. (Satisfactory/Unsatisfactory grades only.)
- 233. Comparative Neurology (4) F** Survey of structure and function of nervous systems of invertebrates and vertebrates. Two hours lecture, three hours laboratory, and two hours discussion. Prerequisites: Neurobiology or Basic Neurology, Physiological Psychology or other introduction to the nervous system. (Satisfactory/Unsatisfactory grades only.)
- 234. Neurochemistry (4) W** A survey of the chemistry, metabolism, and pharmacology of the nervous system. Prerequisite: undergraduate biochemistry. (Satisfactory/Unsatisfactory grades only.)
- 235. Ultrastructure of the Nervous System (1) F-W-S** A laboratory course with exposure to techniques in electron microscopy of the nervous system; imbedding, fixation, sectioning, and use of the electron microscope. Limited to six students per quarter. Prerequisite: undergraduate biology. (Satisfactory/Unsatisfactory grades only.)
- 236. Introduction to Neuropharmacology (2) W** An introduction to the principles of pharmacology and a survey of the neuropharmacological agents utilized in the neuroscience research areas. Prerequisite: consent of instructor (Satisfactory/Unsatisfactory grades only.)
- 237. Moral and Ethical Aspects of Medicine (1) F-W-S** This course will investigate and discuss many of the issues of value judgement which are related to and affect medical practice, education, and research. These issues will be raised through visiting speakers, residents, faculty, staff, and student seminar presentations, reprints, films and tapes. Intended for medical students, residents, and resident staff.
- 238. Systems Neurophysiology and Functional Neuroanatomy F** Advanced structure and function of nervous systems especially of mammals and other vertebrates. Three lectures and two four-hour laboratories per week. Enrollment limited. Prerequisite: graduate standing in the Neurosciences doctoral program or permission of instructor.

- 296. **Neurosciences Independent Research** (1-12) F-W-S Independent study. (Satisfactory/Unsatisfactory grades only.)
- 299. **Neurosciences Thesis Research** (1-12) F-W-S Independent study. (Satisfactory/Unsatisfactory grades only.)
- 496. **Clinical Independent Study** F-W-S Independent clinical study for medical students. (Satisfactory/Unsatisfactory grades only.)

Additional Phil. Course (Sect. 4)	Sequence Course (Sect. 3)	Sequence Course (Sect. 3)
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*Upper-Division course in related fields.

PHILOSOPHY

Office: 3112 Humanities-Library Building
 Stanley W. Moore, Ph.D., Professor of Philosophy
 Frederick A. Olafson, Ph.D., Professor of Philosophy
 Richard H. Popkin, Ph.D., Professor of Philosophy
 Avrum Stroll, Ph.D., Professor of Philosophy
 (Chairman of the Department)
 Herbert Marcuse, Ph.D., Honorary Professor
 Edward N. Lee, Ph.D., Associate Professor of Philosophy
 Giorgios H. Anagnostopoulos, Ph.D., Assistant Professor of Philosophy
 Rudolf A. Makkreel, Ph.D., Assistant Professor of Philosophy
 (Graduate Adviser)
 Thomas C. Mark, Ph.D., Assistant Professor of Philosophy
 Ronald D. Scales, Ph.D., Assistant Professor of Philosophy
 (Undergraduate Adviser)
 Helen E. Longino, M.A., Acting Assistant Professor

* * *

Arthur C. Danto, Ph.D., Visiting Professor of Philosophy
 Roger Barriteau, M.A., Lecturer in Philosophy
 Roger S. Ruffin, LL.B., Lecturer in Philosophy

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THE UNDERGRADUATE PROGRAM

Students who wish to major in philosophy must have satisfied the general lower-division requirements. These requirements must include either the Humanities sequence 1 through 6 (Revelle College) or Philosophy 10, 11, 12 (other colleges) or their equivalent.

The following courses are required of philosophy majors:

1. Philosophy 101-106 (History of Philosophy)
2. Philosophy 110 (Symbolic Logic)
3. One of the following sequences:
 - (a) Philosophy 112A-112B (Philosophy of Science)
 - (b) Philosophy 120A-120B (Political Philosophy)
 - (c) Philosophy 123A-123B (Ethics)
 - (d) Philosophy 150A-150B (Aesthetics)
 - (e) Contemporary Anglo-American Philosophy (130A-130B)
 - (f) Contemporary European Philosophy (140A-140B)
4. Three additional upper-division courses in Philosophy (may include courses listed in 3 which are not used in satisfaction of 3).
5. Two upper-division courses from one or more of the following fields: History, Linguistics, Literature, or, with the approval of the undergraduate adviser, from fields of study that are closely related to the individual student's major philosophical interest.

The total is fourteen courses — twelve in philosophy, two in related fields. Special and independent studies courses (including courses numbered 199) may not be used to satisfy major requirements, nor may Philosophy 180 be used to satisfy major requirements. Courses taken at another institution or in University extension which are accredited by the Office of Admissions may be used in satisfaction of major requirements with the approval of the department. Major requirements may be met by examination. It is required that a passing grade and an over-all average of 2.0 must be obtained in courses taken at UCSD fulfilling the major requirements before certification of completion will be granted.

MAJOR PROGRAM IN PHILOSOPHY (Recommended Schedule)

	FALL	WINTER	SPRING
Junior Year	Philosophy 101 Philosophy 110 — — — —	Philosophy 102 Additional Phil. Course (Sect. 4) * — — — —	Philosophy 103 Additional Phil. Course (Sect. 4) * — — — —
Senior Year	Philosophy 104 Sequence Course (Sect. 3) or	Philosophy 105 Sequence Course (Sect.) or	Philosophy 106 Additional Phil. Course (Sect. 4) or

The Graduate Program

The Department of Philosophy offers programs leading to the M.A. and Ph.D. There is no sequence of required courses in either program. Courses of study are arranged according to the need, interest, and experience of the individual student.

It is the intention of the graduate program to enable the student to obtain an understanding of divergent philosophical traditions and to develop as a philosopher in his own right. To this end, the Department offers courses and seminars in the history of philosophy, and in the study, from a variety of perspectives, of traditional and contemporary philosophical issues.

Master's Degree Program

An M.A. is offered under the Comprehensive Examination Plan. Under this plan, credit must be obtained for 36 quarter units; at least 14 units must be from graduate courses in philosophy; no more than 9 units may be from upper-division courses. In addition, a comprehensive written examination must be passed prior to the conclusion of the seventh quarter in residence. This examination is identical to the written examination required of Ph.D. candidates.

Candidates for an M.A. degree must demonstrate reading proficiency in one foreign language (Classical Greek, Latin, French or German) before the comprehensive examination is attempted and before the beginning of the fourth quarter in residence.

Doctor's Degree Program

From the time of his initial enrollment until advancement to candidacy the student will be expected to take in each year of residence at least twelve units in graduate philosophy courses (specifically, those numbered 201-295). The balance of the student's course work, which will normally total 36 units per year, may be made up from upper-division courses in philosophy, upper-division and graduate courses in other departments, and, if the student is a Teaching Assistant, Philosophy 200.

Prior to the conclusion of the seventh quarter in residence all students must pass a written comprehensive examination administered by the Department. This examination is in three parts:

- I. History of philosophy: ancient, medieval, renaissance, early modern, and nineteenth century.
- II. Metaphysics and epistemology: traditional metaphysics and epistemology, contemporary metaphysics and epistemology, logic and philosophy of science.
- III. Value theory: aesthetics, ethics, philosophy of religion, political and social philosophy.

Students are allowed four hours to complete each part (I, II, and III). All three parts of the written comprehensive examination must be attempted during one (three-day) examination period. The student will be expected to write on only two of the subjects listed in Part III. This examination serves to determine: (a) whether the student qualifies for an M.A. in Philosophy, and (b) whether the student shall be encouraged to continue work for a Ph.D. Each student who attempts the examination will receive from the Graduate Adviser official and written evaluations of his performance.

Students failing any part(s) of the examination shall be required to retake only the part(s) failed. No part of the examination may be attempted more than twice. Those students who pass the examination will be informed as to whether they are encouraged or permitted to begin preparation for the Oral Qualifying Examination. Such encouragement can be given only if the student's work in the Department and performance on the exams is of such a quality that staff members indicate a willingness to assist the student in the preparation of his prospectus and, eventually, to serve on his doctoral committee.

After passing the written comprehensive examination, the student must submit a prospectus of his dissertation to his Doctoral Committee. This committee will then orally examine the student on the subject of his intended research. This examination will seek to establish that the thesis proposed is a satisfactory subject of research, and that the student has the preparation and abilities necessary to complete the research. This oral qualifying examination must be passed before the beginning of the tenth quarter in residence. Students who are passed will be Advanced to Candidacy for the Ph.D.

Under the supervision of his doctoral committee, each candidate will write a dissertation demonstrating a capacity to engage in original and independent research. The candidate will defend his thesis in an oral examination by the doctoral committee. (See Graduate Division: The Ph.D.)

Participation in undergraduate teaching is one of the requirements for a Ph.D. in Philosophy. The student is required to serve as a Teaching Assistant for the equivalent of one-quarter time for three academic quarters. The duties of a Teaching Assistant normally entail grading papers and examinations, conducting discussion sections, and related activities, including attendance at lectures for the course in which he is assisting.

Candidates for a Ph.D. degree must demonstrate reading proficiency in one foreign language before the comprehensive examination is attempted and before the beginning of the fourth quarter in residence. Reading proficiency in a second foreign language must be demonstrated before the oral qualifying examination is attempted and before the end of the ninth quarter in residence.

COURSES

LOWER DIVISION

The Department of Philosophy cooperates in the teaching and administration of the Humanities sequence for Revelle College students. (See *Interdisciplinary Courses: Humanities.*)

10. The Nature of Philosophy F An introduction to metaphysics and the theory of knowledge, dealing with such matters as the ultimate constituents and structure of the world, the nature of mind, knowledge and truth. Two hours lecture, one hour discussion.

11. The Nature of Philosophy W An introduction to value theory, dealing with questions about morality, politics, religion and art. Two hours lecture, one hour discussion.

12. Introduction to Logic S An inquiry into the nature of argument, inference and proof, fallacies, etc. Two hours lecture, one hour discussion.

20-21-22. Theories of Society F-W-S A course dealing with the historical and systematic development of social and political thought and institutions. Analysis and critical examination of representative texts drawn from classical and contemporary sources. (Philosophy 20-21-22 may be used in fulfilling the Revelle College social science requirement.)

30A-30B-30C. Judaic Studies A three-quarter sequence involving the study of the deep and surface structures of the life styles of one specific culture. The approach from several disciplines addresses itself to analyses of the social, political, and economic institutions, the aesthetic structuring through formal artistic expression, and the cultural forms of everyday living.

UPPER DIVISION

101. History of Philosophy: Greek Philosophy F Greek philosophy through Plato. Examination of original material in Greek philosophy, including those of the pre-Socratics and Plato. Two hours lecture, one-hour discussion.

102. History of Philosophy: Hellenistic and Roman Philosophy W Greek and Roman philosophy from Aristotle to Plotinus. Examination of original materials of Hellenistic philosophy, including those of the Socratic schools down through the Stoic, Epicurean, Sceptic and Neo-Platonic. Two hours lecture, one-hour discussion. Prerequisite: Philosophy 101.

103. History of Philosophy: Medieval Philosophy S Medieval and Renaissance Philosophy. Examination of materials in Medieval and Renaissance Philosophy, including those by Medieval Christian, Jewish, and Moslem philosophers and representative figures of the later humanistic tradition. Two hours lecture, one-hour discussion. Prerequisite: Philosophy 102.

104. History of Philosophy: Early Modern Philosophy F 16th and 17th century philosophy. Examination of original materials in early modern philosophy; from the late Renaissance and Reformation to Descartes, Leibniz, and Spinoza. Two hours lecture, one-hour discussion.

105. History of Philosophy: 18th Century Philosophy W Examination of original materials of 18th century philosophy, including the work of Locke, Berkeley, and Hume, Kant, and French Enlightenment figures. Two hours lecture, one-hour discussion. Prerequisite: Philosophy 104.

106. History of Philosophy: 19th Century Philosophy S Examination of original materials of 19th century, including Kant and Hegel. Two hours lecture, one-hour discussion. Prerequisite: Philosophy 105.

109A-109B-109C. The Greco-Roman World An intensive study of the intellectual life of the Greco-Roman World with especial emphasis on the development of the unique features of Greco-Roman literature, philosophy, historiography, and art. A primary purpose will be to understand the relationships between the intellectual activity and the social and political environment in which it took place. Prerequisite: upper-division standing. (Cross-listed as Literature 109A-109B-109C and History 109A-109B-109C.)

110. Symbolic Logic F Introduction to mathematical logic.

112A. Philosophy of Science F An introductory examination of the nature, import and procedures of science in the light of its historical development.

112B. Philosophy of Science W An examination of the nature and historical development of some of the major conceptions of science such as time, space, motion, causality, determinism. Three hours lecture-discussion. Prerequisite: Philosophy 112A.

120A. Political Philosophy S An examination of problems and theories concerning the nature of the state, society and government. Two or three lecture-discussions.

120B. Political Philosophy An advanced course in some of the fundamental questions and theories concerning state, society and government. Three-hour lecture-discussion. Prerequisite: Philosophy 120A.

123A. Ethics F An inquiry into the nature of human conduct. Three-hour lecture-discussion.

123B. Ethics An advanced course dealing with current topics in Ethics such as Action theory, freedom and responsibility. Prerequisite: Philosophy 123A.

130A. Contemporary Anglo-American Philosophy W The history of contemporary analytical philosophy from Mill to Austin emphasizing the development of formalistic and ordinary language approaches to philosophical issues.

130B. Contemporary Anglo-American Philosophy S An examination of current problems, approaches and conceptions in the philosophical thought of the contemporary Anglo-American tradition. Prerequisite: Philosophy 130A.

140A. Contemporary European Philosophy W An examination of the philosophy of the life of Nietzsche and others, their rejection of systematic philosophy and turn to psychology and history. Husserl's phenomenological critique of both naturalism and psychologism.

140B. Contemporary European Philosophy S A study of how existential themes and the phenomenological method meet in such contemporary figures as Heidegger, Sartre, Merleau-Ponty and others. Two or three lecture-discussions. Prerequisite: Philosophy 140A.

150A. Aesthetics W A study of the relations of aesthetic experience to ordinary experience and the problems of relating the different arts by such general concepts as expression and artistic form.

150B. Aesthetics S An examination of some special aesthetic problems such as the cultural relevance of art, the nature of critical evaluation and the understanding of styles. Two or three lecture-discussions. Prerequisite: Philosophy 150A.

162. Philosophy of Law F An introduction to some major topics and problems: The nature of law and legal systems; the relationship of law to morality, and of legal obligation to moral and political obligation; natural law theory and civil disobedience; theories of punishment; responsibility, and legal reasoning.

170. Metaphysics W The content of this course will vary from year to year, but in each case it will center about fundamental problems in metaphysics such as the mind-body problem, problem of universals or the other minds problem. The discussion of these issues may be either historical or analytic or both, depending upon the interests of the instructor.

172. Epistemology A course dealing with topics in the theory of knowledge, such as the nature of knowledge and belief, the justification of knowledge claims, knowledge of the external world, knowledge of other minds, the nature of perception, memory.

180. Senior Colloquium A seminar dealing with the examination of specific philosophical problems and topics and designed for seniors of high standing who major in Philosophy. Prerequisites: senior status and permission of department. May be repeated for credit.

199. Individual Study F-W-S Prerequisite: permission of departmental adviser.

GRADUATE

200. Topics in the History of Philosophy (4) A course of studies designed to prepare students for advanced work in seminars.

201. Topics in the History of Philosophy: Greek Philosophy. F A course of studies designed to prepare students for advanced work in seminars in pre-Socratic and Platonic philosophy.

204. Topics in the History of Philosophy: Early Modern Philosophy. S Philosophical and intellectual currents of the Renaissance, with reference to the origins and development of classical humanism and medieval scholasticism and the emergence of a Renaissance philosophy of man.

205. Topics in the History of Philosophy: 17th and 18th Century Philosophy W-S An examination of the origins and development of early modern philosophy, together with its philosophical and intellectual foundations, including a study of Descartes, Malebranche, Spinoza, Leibniz, etc. (Satisfactory/Unsatisfactory grades permitted.)

212. Seminar in Philosophy of Science. S An examination of such problems as concept formation, the explanation of law, the role of logic and mathematics in the sciences.

223. Seminar in Ethics. An examination of the nature of moral problems, judgments and principles, with emphasis on recent developments in moral philosophy and classic formulations of ethical theories.

224. Seminar in Social and Political Philosophy. F-W An analysis of social philosophies and ideologies as they emerge from basic types of social structure.

230. Seminar in Contemporary Analytic Philosophy. F An analysis of some important problems in recent and contemporary Anglo-American philosophy as illustrative of major movements of thought.

240. Seminar in Contemporary European Philosophy. W An analysis of some important problems in recent and contemporary Continental philosophy as illustrative of major movements of thought.

264. Seminar in Philosophy of History. An examination of basic concepts, categories and presuppositions of historical experience in the context of representative philosophies of history.

270. Seminar in Contemporary Epistemology and Metaphysics. F-W A detailed examination of some fundamental issues in contemporary philosophy, especially those centering about the theories of meaning and reference.

280. Department of Philosophy Colloquium. Special topics submitted by visiting philosophers for critical appraisal by staff and students. (Satisfactory/Unsatisfactory grades permitted.)

285. Seminar on Special Topics. F A seminar for examination of a specific philosophical problem. (Satisfactory/Unsatisfactory grades permitted.)

290. Directed Independent Study. F-W-S Supervised study of individually selected philosophical topics. May be repeated for credit. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades optional.)

295. Research Topics. F-W-S Advanced, individual research studies under the direction of a member of the staff. May be repeated for credit. Prerequisite: permission of graduate adviser. (Satisfactory/Unsatisfactory grades optional.)

299. Thesis Research (1-12) F-W-S (Satisfactory/Unsatisfactory grades permitted.)

500. Apprentice Teaching F-W-S A course designed to meet the needs of graduate students who serve as teaching assistants in Philosophy courses at UCSD. Analysis of texts and materials relating to the courses, discussions of teaching techniques, formulation of paper and examination topics in consultation with the instructor of the course. (Satisfactory/Unsatisfactory credit only.)

501. Studies and Teaching in Humanities (1-4) F-W-S A course designed to meet the needs of graduate students who serve as teaching assistants in the Humanities Sequence in Revelle College, Cultural Traditions in Muir College, and Third College programs. Prerequisite: required of all Teaching Assistants assigned to Humanities Sequence.

PHYSICAL EDUCATION

Office: Gymnasium

Theodore W. Forbes, Ed.D., Supervisor
(Chairman of the Department)

Howard F. Hunt, M.A., Associate Supervisor

Frank N. Vitale, M.A., Associate Supervisor

John W. Cates, M.A., Assistant Supervisor

J. Barry Cunningham, M.A., Assistant Supervisor

Bert N. Kobayashi, M.A., Assistant Supervisor

J. Charles Millenbah, B.S., Assistant Supervisor

Robert Moss, B.A., Assistant Supervisor

Andrew Skief, Jr., B.S., Assistant Supervisor

James R. White, M.A., Assistant Supervisor

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The Department of Physical Education schedules a wide variety of activity classes in physical conditioning, aquatics and lifetime sports, enabling students to maintain personal fitness and to develop skills in sports of their choice. Most classes meet twice weekly for one hour and participants are issued a locker and towel. Students are encouraged to take one or more classes, which are held in the modern, well equipped Gymnasium or on nearby tennis courts, playing fields or golf driving range.

The Department also directs extracurricular and enrichment programs to afford undergraduate students an opportunity to participate in a variety of wholesome and competitive sports commensurate with their abilities.

Intramural Sports

The program of intramural sports constitutes an important phase of the comprehensive physical education program. Opportunities are provided for all students to experience, on a voluntary basis and under actual game conditions, the activities in which they have received instruction in the activity classes or in which they have already acquired a degree of proficiency. Participation in intramural sports is rewarding not in terms of academic credit or material awards, but in terms of health, social and moral benefits, and enjoyment of the sport for itself. Teams are formed within the dormitories and by special-interest groups and clubs, and competition is scheduled in such diverse areas as flag football, volleyball, basketball, tennis, track, handball, golf, table tennis, etc.

Recreation

Recreation programs offer students an opportunity to participate in individual or group activities. All students are entitled to use the gymnasium, pool, tennis courts and playing fields at no charge. The spouses and children of UCSD students, as well as faculty and staff and their families, are entitled to the privilege of using facilities at a slight charge. Any group of students with a common interest in a particular sport or activity may be organized and receive support from the Department. Already active are the following clubs: Scuba, Skin Diving, Soaring, Sailing, Water Ski, Snow Ski, Karate, Angling, Rugby, Surfing, Fencing, Judo, Soccer and Muir Outing.

Extramural Athletics

Undergraduate students possessing a high degree of proficiency in sport skills may compete against other southern California colleges and universities in regularly scheduled athletic events. Presently, 27 UCSD teams represent the campus. Participation is entirely voluntary; students are encouraged to compete for the sheer joy of participating.

COURSES

NOTE: Please refer to the *Schedule of Classes* issued quarterly by the Registrar's Office for specific courses offered each quarter.

1. Weight Training and Physical Conditioning (Men) F-W-S Participation in individual exercise routines, running, weight and strength exercises to increase general physical fitness, endurance and muscular efficiency.

2. Women's Conditioning F-W-S Designed to meet the individual needs of each woman enrolled in the class through personal evaluation, diet, measurements, and exercise.

3. Swimming F-W-S Instruction designed to permit students to gain or improve swimming strokes, techniques, and aquatic skills on an individual basis. Classes are offered in beginning, intermediate, and advanced sections.

4. Synchronized Swimming for Women S Designed for advanced swimmers. Fundamentals in individual and group water ballet. Opportunity for public presentations.

5. Skin Diving, Basic (1/2) F-W-S Introduction to skin diving techniques and methods. Includes lectures on equipment, environment and principles of skin diving with pool training.

6. Lifesaving F-W-S The American Red Cross Senior Lifesaving Certificate will be awarded to students who satisfactorily complete the course. Emphasis is placed upon the knowledge and skills which will prepare a student to save his own life or the life of another in an emergency. Prerequisite: advanced swimming or consent of instructor.

7. Water Safety Instruction W-S Standard American Red Cross course designed to train authorized water safety instructors to teach ARC swimming and lifesaving courses thereafter. Only holders of the A.R.C. Senior Lifesaving Certificate are eligible to register. Students must pass Part I (12 hours) in order to qualify for Part II (15 hours). Examinations.

8. Sailing F-S The course is designed to make sailing an easily understood sport and provide students an opportunity for a lifetime of stimulating and relaxing activity. Special emphasis is placed on nautical terms, water and safety rules, demonstrations and practical exercises on rigging and boat handling.

9. Tennis F-W-S Instruction in the fundamentals of the serve, strokes, volley, rules, scoring, tactics, and court strategy. Classes are offered in beginning, immediate, and advanced sections.

10. Golf F-W-S Instruction and practice in the fundamentals of golf. Emphasis is placed upon the golf swing and techniques of using all clubs under varying conditions. Classes are offered in beginning and intermediate sections.

11. Gymnastics (Women) F-W-S The fundamentals of gymnastics, including instruction in the use of apparatus and in simple tumbling routines. Designed for the student of beginning and intermediate ability.

14. Modern Dance F-W-S Opportunities in dance techniques. Pattern variations will be discovered in time, space, and design. These, together with the technical skills, will produce a means of communication through body control.

15. Volleyball F-W-S An emphasis on fundamental skills in serving, spiking, blocking, and teamwork techniques. Opportunity for team competition. Classes are offered in men's, women's, and coed sections.

17. Karate F-W-S Instruction and training in the fundamentals of Sho-tokan Karate, emphasizing: (1) basic stances and techniques; (2) "kata," ancient stylized sequences of defensive and counteroffensive movements; (3) sparring, a graded progression from strictly controlled defense and counterattack situations to free sparring for competition.

19. Techniques of Officiating F-W Designed to give a thorough knowledge and mastery of rules, field layout, and scorekeeping under actual game conditions. A prerequisite for student employment in officiating at intramural athletic contests.

20. Badminton F-W-S Instruction in the fundamentals of the serve, strokes, volley, rules, scoring, tactics, and court strategy. Classes are offered in beginning, intermediate and advanced sections. Designed to allow both men and women students, novice and expert, an opportunity to enjoy participation.

22. First Aid F-W-S Standard and Advanced course. Upon successful completion of the course, a Red Cross certificate is awarded. Prepares student to render effective First Aid in treatment of wounds, burns, breaks, fractures, dislocations, artificial resuscitation and other emergency conditions.

23. Basketball F-W-S Instruction in fundamentals is combined with opportunities for team play. Some pre-knowledge of the game is desirable since emphasis will be on vigorous competition.

24. Beginning Surfing F-W-S Beginning surfing techniques are taught in the pool including mounting, sitting, paddling, turning surfboard and safety techniques. Only after mastery of pool techniques will student be allowed to surf in ocean. Prerequisites: ability to swim 400 yards, basic lifesaving skills and UCSD beginning swimmers certificate.

Intercollegiate Athletics A large variety of intercollegiate sports activities is offered to all undergraduate students. The program is designed for those who possess a high degree of proficiency in sport skills. Competition with other colleges and universities is scheduled.

25. Water Polo F

- 26. Wrestling F-W
- 27. Basketball F-W
- 28. Basketball/Frosh F-W
- 29. Cross Country F
- 30. Crew F-W-S
- 31. Sailing F-W
- 32. Swimming W-S
- 33. Volleyball F-W-S
- 34. Tennis W-S
- 35. Rugby W
- 36. Golf W-S
- 37. Track W-S
- 38. Baseball W-S
- 40. Gymnastics F-W-S
- 41. Soccer F-S
- 42. Fencing F-W-S
- 46. **Beginning Fencing (Foil) (1/2) F-W-S** Classical French style. Protocol, on guard, advance and retreat, attacks (simple and compound), parries (simple and compound), strategy and basic rules.
- 47. **Gymnastics "Circus Stunts" W-S** Advanced gymnastic techniques involving "circus type" activities including trampolining, tumbling, vaulting, juggling, free exercise, unicycling and riding the Balla Rolla Board. Particular stress will be placed upon individual cardio-respiratory endurance, agility, strength, coordination and kinesthetic balance.
- 48. **Intermediate Fencing (Foil) (1/2) F-W-S** Designed for the intermediate student of fencing to continue his training in the classical French style. Prerequisite: Physical Education 46.
- 49. **Intermediate Fencing (Sabre) (1/2) F-W-S** Designed for the intermediate student of fencing to continue his training in classical Hungarian Sabre Style. Prerequisites: Physical Education 46 and 48.
- 50. **Beginning Fencing (Theatrical) (1/2) W** Fencing techniques useful to students involved in performing arts. Emphasis will be on choreography and dramatic presentation. Prerequisite: Physical Education 46, with 48 recommended.
- 53. **Advanced Skin Diving (1/2) F-W-S** Advanced techniques in skin diving and practical experience in ocean dives. Prerequisite: Physical Education 5 or consent of instructor.
- 54. **Divemaster/Master Scuba Diver (1) S** Designed to orient and assist the more experienced SCUBA diver in gaining proficiency in diving skills and in the acquisition of knowledge of diving and the ocean environment. Prerequisite: current certification through SIO, NAUI, LA County, or NASDA; or consent of the instructor.
- 55. **Modified Activities for Physically Handicapped F-W-S** Particular emphasis is placed upon modified individual fitness and sports programs offering opportunities for social and physical development for those unable to engage in normal physical education classes. Programs are modified to fit the student rather than the student to fit the programs.
- 56. **Cycling F-S** The wonderful world of the bicycle builds the exercise habit into daily routines. Proper riding techniques, care, maintenance, and safety considerations add to the extra thrills of exploring backroads, byways and paths in a 50 mile radius of the campus.
- 57. **Jogging F-W-S** Designed to introduce students to a lifetime habit of running, which medical and physical education experts agree is the best method for achieving and maintaining total fitness and weight control.
- 58. **Introduction to Lifetime Sports F-W-S** Designed to introduce students to the following lifetime sports: badminton, cycling, golf, physical fitness, salt and fresh water fishing, skin and SCUBA diving, surfing, swimming, tennis and volleyball.
- 59. **Techniques of Fresh and Salt Water Fishing** An introduction to the techniques and equipment required to capture one of the world's favorite pastimes, sports fishing. Some of the interesting aspects of this course will include the study of topography and lunar effect on the success of the fisherman.
- 60. **Basketball Officiating F** Techniques and analysis of basketball officiating stressing mechanics and practical application of rules leading to official's rating for student employment.
- 61. **Exercise, Nutrition and Weight Control (1/2)** Theory and practice of regular exercise and nutritional needs for development, maintenance and continuing good health.
- 62. **Senior Diver/SCUBA (1/2)** Introduces the basic certified SCUBA diver to all aspects of SCUBA diving to inspire self-confidence and to enhance his enjoyment of this activity. Prerequisite: Current certification as a SCUBA diver under NAUI, SIO/UC, NASDS, PADI, YMCA, or LA County. Student must furnish all basic SCUBA gear.

PHYSICS

Office: 3426 Physics-Chemistry Building
 William Ian Axford, Ph.D., Professor of Physics
 Keith A. Brueckner, Ph.D., Professor of Physics
 E. Margaret Burbidge, Ph.D., Professor of Astronomy
 Geoffrey R. Burbidge, Ph.D., Professor of Astrophysics
 George Feher, Ph.D., Professor of Physics
 William R. Frazer, Ph.D., Professor of Physics
 Walter Kohn, Ph.D., Professor of Physics
 Norman M. Kroll, Ph.D., Professor of Physics
 Leonard N. Liebermann, Ph.D., Professor of Physics
 Ralph H. Lovberg, Ph.D., Professor of Physics
 John H. Malmberg, Ph.D., Professor of Physics
 George E. Masek, Ph.D., Professor of Physics
 Bernd T. Matthias, Ph.D., Professor of Physics
 Carl E. McIlwain, Ph.D., Professor of Physics
 William A. Nierenberg, Ph.D., Professor of Physics
 Laurence E. Peterson, Ph.D., Professor of Physics
 Oreste Piccioni, Ph.D., Professor of Physics
 Sheldon Schultz, Ph.D., Professor of Physics
 Harry Suhl, Ph.D., Professor of Physics
 (Chairman of the Department)
 Robert A. Swanson, Ph.D., Professor of Physics
 William B. Thompson, Ph.D., Professor of Physics
 John C. Wheatley, Ph.D., Professor of Physics
 David Y. Wong, Ph.D., Professor of Physics
 Herbert F. York, Ph.D., Professor of Physics
 Barry Block, Ph.D., Associate Professor of Physics
 Joseph C. Y. Chen, Ph.D., Associate Professor of Physics
 Donald R. Fredkin, Ph.D., Associate Professor of Physics
 John M. Goodkind, Ph.D., Associate Professor of Physics
 Robert J. Gould, Ph.D., Associate Professor of Physics
 Francis R. Halpern, Ph.D., Associate Professor of Physics
 Shang-Keng Ma, Ph.D., Associate Professor of Physics
 Thomas M. O'Neil, Ph.D., Associate Professor of Physics
 Lu Jeu Sham, Ph.D., Associate Professor of Physics
 Wayne Stein, Ph.D., Associate Professor of Physics
 Nguyen-Huu Xuong, Ph.D., Associate Professor of Physics
 Werner A. W. Mehlhop, Ph.D., Assistant Professor of Physics
 Herbert B. Shore, Ph.D., Assistant Professor of Physics
 Wayne Vernon, Ph.D., Assistant Professor of Physics
 Dieter K. Wohlleben, Ph.D., Assistant Professor of Physics
 in Residence

* * *

The Major Program

The upper-division program is intended to provide basic education in several principal areas of physics, with some opportunity for study in neighboring areas in the form of restricted electives. Provision is made, both in the main course and in the elective subjects, for some training in a few of the more technological aspects of physics.

In the junior year the emphasis is on macroscopic physics; the two principal physics subjects are electromagnetism and mechanics. The mathematics background required for the physics program is completed in this year.

In the senior year a sequence of courses in quantum physics provides the student with the modern view of atomic and some aspects of sub-atomic physics, and teaches him the principal analytical methods appropriate in this domain. The relation of the microscopic to the macroscopic world is the subject of courses in thermodynamics and statistical physics, with illustrations drawn from gas dynamics and solid state physics. The quantum physics sequence aims at an integrated, descriptive and analytical treatment of those areas of physics in which quantum effects are important, particularly atomic and nuclear physics and elementary particles.

Students who plan to do graduate study in physics should choose German, Russian, or French (preferably German or Russian) for meeting the language requirement.

Students entering the upper division with a deficient background will have to make up this deficiency in the junior year. For example, a student who failed to take Mathematics 2D and 2E or Natural Science 2DL and 2F will be required to take these courses in the junior year in place of the non-contiguous minor. Such a student may find it necessary to use some or all of his senior year free electives to complete the non-contiguous minor.

The following courses are required for the physics major:

(a) Lower-division preparation required:

Natural Science 2A-2B-2C-2DL-2E-2F (or upper-division chemistry course with associated laboratory).

Mathematics 2A-2B-2C-2D-2E.

(b) Upper division:

	Fall	Winter	Spring
Junior Year	Physics 100A Physics 110A	Physics 100B Physics 110B	Physics 100C Physics 120A

	*Restricted Elective	Math 110A	*Restricted Elective
Senior Year	Physics 120B Physics 130A Physics 140	Physics 120C or 131 Physics 130B Physics 141	Physics 132 or 170 *Restricted Elective

*Restricted electives may be chosen from upper-division or graduate courses in physics, chemistry, biology, or mathematics, subject to the approval of the Physics Department. One of the restricted electives in the junior year must be in mathematics; Mathematics 120 is strongly recommended.

Physics Major with Specialization in Biophysics

The upper-division program is essentially the same as the standard physics major with some modification to provide the education in biology and chemistry needed for advanced work in biophysics. Students entering the program with deficient backgrounds in mathematics or chemistry will be required to remedy the deficiency in their junior year. The consequent rearrangement of the upper-division program will be devised by consultation between the student and the departmental adviser for biophysics.

The following courses are required for the physics major with specialization in biophysics:

(a) Lower-division preparation required:

Natural Science 2A-2B-2C-2DL-2E-2FL

Mathematics 2A-2B-2C-2D-2E.

(b) Upper division:

	Fall	Winter	Spring
Junior Year	Physics 100A Physics 110A Chemistry 140A Chemistry 143A	Physics 100B Math 110A Chemistry 140B Chemistry 143B	Physics 100C *Restricted Elective Physics 120A
Senior Year	Physics 130A Physics 120B Biology 110A	Physics 130B Physics 131 Biology 110B	Chemistry 100B **Restricted Elective Biology 110C

*Mathematics 120 is recommended.

**Biology 102 is recommended.

Physics Major with Specialization in Biophysics-Premedical

The upper-division program is essentially the same as the standard physics major with some modification to provide the education in biology and chemistry needed for the study of medicine. Students entering the program with deficient backgrounds in mathematics or chemistry will be required to remedy the deficiency in their junior year. The consequent rearrangement of the upper-division program will be devised by consultation between the student and the departmental adviser for biophysics.

The following courses are required for the physics major with specialization in biophysics-premedical:

(a) Lower-division preparation required:

Natural Science 2A-2B-2C-2DL-2E-2FL

Mathematics 2A-2B-2C-2D-2E.

(b) Upper division:

	Fall	Winter	Spring
Junior Year	Physics 100A Physics 110A Biology 101A	Physics 100B Math 110A Biology 101B	Physics 100C *Restricted Elective Physics 120A
Senior Year	Physics 130A Physics 120B Chemistry 140A Chemistry 143A	Physics 130B Physics 131 Chemistry 140B Chemistry 143B	Chemistry 100B **Restricted Elective Biology 101C

*Mathematics 120 is recommended.

**Biology 102 is recommended.

PHYSICS MAJOR WITH SPECIALIZATION IN EARTH SCIENCES: See *Earth Sciences* for a description of this program, which may be arranged by consultation with advisers in the Department of Physics and Scripps Institution of Oceanography.

Noncontiguous Minor in Physics (Revelle College)

Students majoring in fields other than the sciences may arrange noncontiguous minor programs in physics by consulting with the Physics Department. Examples of such programs are the following:

1. Mathematics 2D, 110A; Physics 110A, 130A-130B-130C
2. Mathematics 2D, 110A; Physics 110A, 130A, 160, 161
3. Mathematics 2D, 2E; Physics 100A-100B-100C, 120A
4. Mathematics 2D, 2E; Physics 110A-110B, 140, 141

Because of the large number of mathematics prerequisites required for physics courses, students who elect noncontiguous minors in the field of physics may find it desirable to supplement the noncontiguous minor by devoting some of their free elective time to additional courses in physics.

The Graduate Program

The Department of Physics offers curricula leading to the Master of Science and Doctor of Philosophy degrees.

The entering graduate student is required to have a sound knowledge of undergraduate mechanics, electricity and magnetism; to have had senior courses or their equivalent in atomic and quantum physics, nuclear physics, and thermodynamics; and to have taken upper-division laboratory work. An introductory course in solid state physics is desirable. Upper-division courses are available for students with minor deficiencies in undergraduate training.

In view of the language requirement for the Ph.D. (see below), it is advantageous for an entering student to have proficiency in a foreign language.

Master's Degree Program

Requirements for the Master of Science degree can be met according to Plan II (comprehensive examination). (See *Graduate Division: The Master's Degree*.) The comprehensive examination is identical to the first-year written examination for Ph.D. students. A list of acceptable courses is available in the Physics Department office. There is no foreign language requirement.

Doctor's Degree Program

The Ph.D. program consists of three components: graduate courses, apprenticeship in research, and thesis research. In addition, opportunities for teaching are provided. The Department has developed a flexible program which provides a broad, advanced education in physics while at the same time giving the student opportunity for emphasizing his special interests.

An entering student is assigned a faculty adviser to guide him in his program. Many students spend their first year as teaching assistants or fellows and begin apprentice research in their second year. After two years of graduate study, or earlier, they complete the departmental examinations and begin thesis research. Typically, thesis work takes two or three years.

Entrance Testing

An entrance test covering undergraduate physics is given to every entering graduate student during registration week for the purpose of enabling the faculty to give him better guidance in his graduate work. Performance on this test has no bearing on the student's status in graduate school.

First Year Written Examination

A student is required to take a written examination after completing one year of graduate work at UCSD. The examination is on the level of material usually covered in undergraduate courses and the following first-year graduate physics courses. It is offered twice a year, at the beginning of the Fall and Spring quarters, and lasts two days, four hours per day. The examination may be repeated once, the next time it is offered.

First Year Graduate Courses

Fall:

- Physics 200A (Theoretical Mechanics)
- Physics 203A (Adv. Classical Electrodynamics)
- Mathematics 212A (Mathematical Methods)

Winter:

- Physics 200B (Theoretical Mechanics)
- Physics 212A (Quantum Mechanics)
- Mathematics 212B (Mathematical Methods)

Spring*:

- Physics 203B (Adv. Classical Electrodynamics)
- Physics 212B (Quantum Mechanics)
- Mathematics 212C (Mathematical Methods)

*Students who have not had an introductory course in solid state physics may take Physics 152.

Second Year Oral Examinations

A student is required to take two oral examinations after completing two years of graduate work or earlier.

General. The general oral examination, administered by a faculty committee, tests general mastery of advanced physics. Students are asked to indicate areas in which they have special competence and are questioned more intensively in these areas. The examination is offered twice a year, at the beginning of the Fall and Spring quarters, and lasts approximately one hour.

This examination will be waived for students who obtain credit (C or better) in 6 advanced courses selected from the following groups, provided that they obtain at least a 3.0 average in 5 out of the 6. The selection must include all of Group I and at least one course from each of Groups II and III.

Second Year Graduate Courses**Group I. (3)**

Physics 212C (Quantum Mechanics) Fall

Physics 210A (Statistical Mechanics) Fall

Physics 210B (Statistical Mechanics) Winter

Group II. (1-2)

Physics 213 (Theoretical Nuclear Physics) Winter

Physics 215 (High Energy Nuclear Physics) Spring

Group III. (1-2)

Physics 211 (Solid State Physics) Spring

Physics 216 (Atomic and Molecular Theory) Fall

Group IV. (0-2)

Physics 219 (Introductory Astrophysics) Fall

Physics 218 (Introductory Plasma Physics) Spring

Oral Presentation of a Topic

This examination is held two weeks following the general oral examination and lasts approximately one hour. Three topics of current interest in physics, together with relevant references, are made available to students. Each student presents to a faculty committee a one-half hour talk on the topic he has chosen. This is followed by approximately one-half hour of questioning related to the topic.

The oral examinations may be repeated once the next time they are offered.

Qualifying Examination

After a student has passed the departmental examinations, he should obtain a faculty research supervisor. When he is ready to demonstrate his ability to engage in thesis research and has met the foreign language requirement (see below), he may take the Qualifying Examination.

Thesis Defense

When a student has completed his thesis, he is asked to present and defend it before his doctoral committee.

Foreign Language Requirements

A graduate student may satisfy the departmental language requirements by demonstrating either (a) reading knowledge of two languages (one language must be German or Russian; the second may be German, Russian, French, Italian, or Spanish) or (b) reading and speaking knowledge of one language (German, Russian, French, Italian, or Spanish; English will be acceptable for foreign students, on the approval of the Department.)

Advanced Courses and Seminars

In addition to the above-listed basic course, the Department offers a weekly general departmental colloquium, advanced courses for students doing specialized research, and seminars in the main departmental areas of interest. Students are strongly urged to enroll for credit in appropriate advanced courses and seminars.

Course Credit by Examination

Students have an option of obtaining credit for a physics graduate course by taking the final examination without participating in any class exercises. They must, however, officially register for the course and notify the instructor and the Department office of their intention no later than the first week of the course.

COURSES**LOWER DIVISION**

The Department of Physics cooperates in the teaching and administration of the Natural Science sequences for Revelle College students. (See course listings: *Natural Sciences*.)

5A. Physics Topics in physics particularly relevant to the study of medicine. Material will be selected from subject areas such as mechanics, diffusion, hydrostatics and hydrodynamics, and elasticity. This course is primarily for students in the Third College Health Sciences Program. Prerequisite: Science/Technology 1C or equivalent basic course in physics.

5B. Physics A continuation of Physics 5A. It is intended for students in the Third College Health Sciences Program. Prerequisite: Physics 5A.

UPPER DIVISION

(See also course listings: *Earth Sciences*.)

100A. Electromagnetism F Coulomb's law, electric fields, electrostatics; conductors and dielectrics; steady currents, elements of circuit theory. Four hours lecture. Prerequisite or co-registration: Mathematics 2D.

100B. Electromagnetism W Magnetic fields and magnetostatics, magnetic materials, induction; AC circuits; displacement currents; development of Maxwell's equations. Three hours lecture. Prerequisite: Physics 100A; prerequisite or co-registration: Mathematics 2E.

100C. Electromagnetism S Electromagnetic waves, radiation theory; application to optics; motion of charged particles in electromagnetic fields; relation of electromagnetism to relativistic concepts. Four hours lecture. Prerequisite: Physics 100B.

110A. Mechanics F Mechanics of systems of particles; conservation laws; planetary motion; linear oscillators; statics and dynamics of plane rigid bodies. Four hours lecture. Prerequisite or co-registration: Mathematics 2D.

110B. Mechanics W Special relativity; Lagrange's and Hamilton's equations; small oscillations of coupled systems; non-inertial frames; general motion of rigid bodies. Four hours lecture. Prerequisite: Physics 110A; prerequisite or co-registration, Mathematics 2E.

115A-115B-115C. The Perspective of Physics F-W-S An introduction to physics both classical and modern with the development where required of mathematics. Primary emphasis will be placed on learning the way a physicist deals with the natural world by studying the development of physics, its interaction with other intellectual disciplines, and the analysis of simple situations. The limitation and value of the physicist's analysis will be discussed together with the impact of physical thought and its successes on other fields.

120A-120B. Physical Measurements S-F A laboratory-lecture course covering the basic elements in physical measurements with emphasis on electronic methods. The lecture will provide an introduction to circuit theory and error analysis. Three hours lecture, four hours laboratory.

130A. Quantum Physics F Atomic physics in the nineteenth century; radioactivity, Rutherford experiments; Bohr model, optical spectra, X-ray spectra, electron spin, vector model. Four hours lecture. Prerequisites: Mathematics 110A, Physics 110A.

130B. Quantum Physics W Atomic structure according to wave mechanics; Schrodinger equation for hydrogen-like atoms; Pauli principle, Heisenberg principle; particle in a periodic potential. Four hours lecture. Prerequisites: Physics 130A; registration, Physics 132.

130C. Quantum Physics S Elementary nuclear physics; quantum mechanics of radiation; elementary particles and scattering. Three hours lecture. Prerequisites: Physics 100C, 130B.

131. Modern Physics Laboratory (2) W Experiments in radioactivity, x-rays, atomic physics, resonance physics, solid state physics, etc. Four hours. Prerequisite: Physics 130A.

132. Modern Physics Laboratory (2) S Experiments in atomic physics, optics, physical electronics, fluid dynamics, surface physics, etc. Four hours. Prerequisite: Physics 130A.

140. Thermodynamics F Classical thermodynamics including the first, second and third laws; thermodynamic potentials; phase transitions; applications to low temperature physics, radiation, and chemical reactions. Four hours lecture. Prerequisite or co-registration: Mathematics 2D.

141. Statistical Physics W Elementary statistical mechanics, probabilistic interpretation of entropy, fluctuation phenomena, transport phenomena. Four hours lecture. Prerequisites: Physics 110A, 140.

150. Continuum Mechanics S Mechanics of continuous media; waves, instabilities, applications to earth sciences, oceanography, and aerodynamics. Three hours lecture. Prerequisite: Physics 110B.

152. Introduction to Solid State Physics S Crystal symmetry, free electron gas, band structure, properties of insulators, semiconductors and metals; atomic diffusion, alloys, electronic transport phenomena. Four hours lecture. Prerequisites: Physics 130B, 141.

160. Survey of Astronomy and Astrophysics F Introduction to modern astronomy and astrophysics. Three hour lecture. Prerequisite: Physics 110A.

161. Astrophysics W The physics of stars, interstellar matter, and stellar systems. Three hours lecture. Prerequisites: Physics 130A, 160.

162. Astrophysics S Continuation of Physics 161. Three hours lecture. Prerequisites: Physics 130B, 141, 161.

170. Advanced Laboratory (2) S Experimental study of a special problem in optics, cryogenics, resonance physics, nuclear physics, etc., using existing apparatus or developing new apparatus, or both. Hours by arrangement. Prerequisites: Physics 131 or 132.

171. Advanced Electronic Laboratory F Electrical networks, vacuum tube and solid state electronics, analysis and design, and components. Power supplies, Amplifiers, noise and feedback, oscillators, digital and logic circuits, microwaves and special topics. Emphasis on applications to physical research. Six hours. Prerequisite: consent of instructor.

195. Physics Instruction F-W-S Each student will be responsible for and teach a class section of a lower-division physics course. He will also attend a weekly meeting on teaching methods and materials conducted by the professor who supervises his teaching. Prerequisite: consent of instructor.

199. Special Project (2 or 4) F,W,S Independent reading or research on a problem by special arrangement with a faculty member. Four hours. Prerequisite: consent of instructor.

GRADUATE

200A. Theoretical Mechanics (4) F Lagrangian mechanics with applications to linear and non-linear motion in inertial and non-inertial frames.

200B. Theoretical Mechanics (3) W Variational principles, Hamilton's equations, and Hamilton-Jacobi theory. Special relativity. Rigid body and continuum mechanics. Prerequisite: Physics 200A.

203A. Advanced Classical Electrodynamics (3) F The boundary value

problems of electrostatics and the electrostatics of macroscopic media, magnetostatics and the properties of magnetic materials, currents in extended media, macroscopic properties of superconductors, electromagnetic induction and quasi-static phenomena, Maxwell theory and wave propagation. Prerequisite: Physics 100C or equivalent.

203B. Advanced Classical Electrodynamics (4) S Application of Maxwell's equations to radiating systems and boundary value problems, such as wave guides and diffraction phenomena; relativistic electrodynamics; radiation by moving charges; classical electron theory; nonlinear phenomena. Prerequisites: Physics 100C or equivalent; Physics 203A.

206. Topics in Bio-Physics and Physical Bio-Chemistry (3) W Application of physical methods to bio-chemistry, e.g., X-ray diffraction, optical rotatory dispersion and circular dichroism, magnetic resonance. (Same as Chemistry 206.) Prerequisite: consent of instructor.

210A-210B. Statistical Mechanics (3-2) F-W Systems of weakly interacting elements; ensemble theory; applications to gases, plasmas, and liquids; elements of theory phase transitions; fluctuations and non-equilibrium processes. Prerequisites: Physics 140, 141, 152 or equivalent; Physics 212B.

211. Solid State Physics S Basic graduate course in solid state physics, dealing with topics such as lattice dynamics, magnetism in insulators, electronic band structure, transport phenomena and electrodynamics in metals, optical properties. Prerequisite: Physics 152 or equivalent.

212A. Quantum Mechanics (4) W Physical basis of quantum mechanics, the Schrodinger equation and the quantum mechanics of one-particle system, matrices and the transformation theory of quantum mechanics, approximation methods for discrete stationary states. Prerequisite: Physics 130B or equivalent.

212B. Quantum Mechanics (4) S Translational and rotational invariance, angular momentum and spin, the formal theory of scattering. Prerequisite: Physics 212A.

212C. Quantum Mechanics (4) F Approximation methods in the continuum and for time-dependent problems; identical particles and the quantum theory of atomic structure; the statistical matrix and the quantum mechanical theory of measurement. Prerequisite: Physics 212B.

215. High Energy Nuclear Physics (3) S An introduction to the elementary particles with particular emphasis on the invariance principles by which they are classified.

216. Atomic and Molecular Physics (3) F Structure of atoms, the Hartree-Fock method, correlation energy and relativistic corrections. Structure of molecules, the Born-Oppenheimer method, the molecular electronic state, the stability and build-up of molecules, molecular orbital theory. The interaction of atoms and molecules with external fields. Atomic and molecular collisions. Prerequisite: Physics 212C.

218. Introductory Plasma Physics (3) S Elementary properties of plasma; occurrence of plasma; positive column; magnetized plasma; magnetohydrodynamics; high frequency behavior of plasma; collisionless kinetic theory; application of plasma physics.

219. Introductory Astrophysics (3) F Fundamentals of radiative transfer; theory of gray and non-gray stellar atmospheres; Eddington's approximation, principles of invariance. Formation of absorption lines, curve of growth, c resonance radiation. Convection theory. Stellar structure: polytropes, nuclear reactions, stellar models. Stellar evolution. Prerequisites: Physics 130C, 141, or equivalent.

220. Group Theoretical Methods in Physics (3) F Study of the representations and applications of groups to problems in physics, particular emphasis on the permutation of unitary groups. Prerequisite: Physics 212C.

221. Advanced Mechanics (3) S Advanced topics such as general relativity, hydrodynamics and shock waves, elasticity. Prerequisite: Physics 200B.

222. Advanced Nuclear Physics (3) S Nuclear structure; the collective model; radiation theory; beta decay; introduction to the many-body problem.

223A. Advanced Astrophysics (3) W Theory and observation of white dwarfs, degenerate matter. Interstellar matter: theory and observation of emission lines and continua; thermal energy balance. The Crab Nebula; synchrotron radiation; Fermi acceleration; X-ray, optical, and radio flux spectra. Other topics of current interest. Prerequisite: Physics 219.

223B. Advanced Astrophysics (3) S Kinematical and dynamical properties of the Galaxy; spiral structure. Stellar dynamics. Masses and rotation of galaxies. Theory and observation of galactic nuclei, radiogalaxies. Evolution of the universe, observational cosmology, cosmic blackbody radiation. Other topics of current interest. Prerequisite: Physics 223A.

224. Advanced Quantum Mechanics (3) S Covariant perturbation theory, mass and charge renormalization of quantum electrodynamics, radiative corrections to scattering and atomic energy levels, introduction to dispersion theory. Prerequisite: Physics 212C.

230A. Advanced Solid State Physics F A sequel to Physics 211 for students intending to specialize in solid state physics and related subjects. Examples of topics to be covered are electron-electron and electron-phonon interactions, superconductivity, Landau theory of Fermi liquids, surfaces, disordered systems. Prerequisite: Physics 211.

230B. Advanced Solid State Physics W Selection of topics of current interest. Examples: magnetic and electric resonances, surface physics, superconductivity, ferroelectrics, disordered systems, phase transitions, liquid helium, ferromagnetism. Topics given in this course may vary from year to year. Prerequisite: Physics 211.

231. Collision Theory (3) S Collision theory and its application to atomic and molecular processes. Description of collision processes, scatterings and resonances in composite systems. Rearrangement collisions and the methods of approximation. Prerequisites: Physics 212A, 212B.

232A-232B. Advanced Plasma Physics (3-3) F-W Vlasov equations and elementary excitations of an infinite medium; kinetic theory with applications to diffusion, scattering, etc.; quasi-linear theory and turbulence. Invariants of single-particle motions; stability theory; magnetohydrodynamics and generalizations to include resistivity and finite Larmor radius; microinstabilities; applications to fusion, MHD power generation and propulsion. Prerequisites: Physics 203B, 210B.

233. Elementary Particle Theory (4) F Current problems in elementary particle theory, especially the theory of strong interactions. Prerequisite: Physics 215.

234. High Energy Experimental Physics (4) S Current elementary particles research. Techniques used in experiments with high energy accelerators. Prerequisite: Physics 215.

236. Many-Body Theory (4) S Dilute classical systems; virial expansions; relation to statistical mechanics; quantum mechanical formulations; dilute systems, perturbation theory; calculation of ground state energy; nuclear matter; uncharged and charged Bose and Fermi liquids; collective modes of motion; screening; superconductivity and superfluidity; Green's function method; the self-consistent field; interacting systems of magnetic moments, ferromagnetism. Prerequisites: Physics 210A-210B; 212C.

239. Special Topics (1-2) From time to time it will be possible to give a self-contained short course on an advanced topic in special areas of research. (Satisfactory/Unsatisfactory grades permitted.)

250. Solid State and Cryogenics Physics Seminar (1) F-W-S Discussions of current research in solid state physics. (Satisfactory/Unsatisfactory grades only.)

251. High Energy Physics Seminar (1) F-W-S Discussions of current research in nuclear physics, principally in the field of elementary particles. (Satisfactory/Unsatisfactory grades only.)

252. Plasma Physics Seminar (1) F-W-S Discussions of recent research in plasma physics. (Satisfactory/Unsatisfactory grades only.)

253. Astrophysics and Space Physics (1) F-W-S Discussion of recent research in astrophysics and space physics. (Satisfactory/Unsatisfactory grades only.)

254. Atomic and Molecular Physics Seminar (1) F-W-S Discussions of current research in atomic and molecular structures and collisions. (Satisfactory/Unsatisfactory grades only.)

299. Research in Physics (1-12) F-W-S (Satisfactory/Unsatisfactory grades permitted.)

PHYSIOLOGY AND PHARMACOLOGY

Office: 2042 Basic Science Building

Samuel H. Barondes, M.D., Professor of Psychiatry

Henrik Bendixen, M.D., Professor of Anesthesia

Eugene F. Bernstein, M.D., Ph.D., Professor of Surgery

Theodore H. Bullock, Ph.D., Professor of Neurosciences

Morris E. Friedkin, Ph.D., Professor of Biology

Harold T. Hammel, Ph.D., Professor of Physiology

Nathan O. Kaplan, Ph.D., Professor of Chemistry

Allen Lein, Ph.D., Professor of Medicine

(Associate Dean, School of Medicine)

Arnold J. Mandell, M.D., Professor of Psychiatry

Steven E. Mayer, Ph.D., Professor of Medicine

(Co-chairman of the Group in Physiology and Pharmacology)

John Ross, Jr., M.D., Professor of Medicine

S. Jonathan Singer, Ph.D., Professor of Biology

Daniel Steinberg, M.D., Ph.D., Professor of Medicine

John B. West, M.D., Ph.D., Professor of Medicine

(Co-chairman of the Group in Physiology and Pharmacology)

Henry O. Wheeler, M.D., Professor of Medicine

Benjamin W. Zweifach, Ph.D., Professor of Bioengineering

Colin M. Bloor, M.D., Associate Professor of Pathology

James W. Covell, M.D., Associate Professor of Medicine and Bioengineering

Darrell D. Fanestil, M.D., Associate Professor of Medicine

Dean L. Franklin, Associate Adjunct Professor of Medicine

Arnost Fronck, M.D., Ph.D., Associate Professor of Bioengineering

Burton E. Sobel, M.D., Associate Professor of Medicine

Charles E. Spooner, Ph.D., Associate Professor of Neurosciences

Palmer W. Taylor, Ph.D., Assistant Professor of Medicine

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The Graduate Program

The graduate program leads to the Ph.D. degree in one or both of the following aspects of the life sciences: (1) the function and metabolism of cells, organs, and organ systems; (2) the fundamental mechanisms of action of drugs, their effectiveness, and their use in better understanding of biochemical, physiological, and pathological processes. Students are encouraged to design and execute investigations in a self-critical and independent manner and to develop proficiency as teachers. Entrance requirements are flexible. Undergraduate preparation should include courses in calculus, organic chemistry, physical chemistry, and biochemistry.

Doctor's Degree Program

The first year of graduate study includes major courses of the School of Medicine core curriculum: biochemistry, organ physiology, pharmacology, and basic neurology. Via a laboratory rotation program, students are familiarized with faculty research activities. Additional course work depends on the student's interest and the direction of his thesis project. Projects must be chosen and qualifying examinations taken by the end of the second year.

The graduate program is interdepartmental and interdisciplinary; it involves faculty of the Departments of Biology, Chemistry, Medicine, Neurosciences, Psychiatry, the Bioengineering Group, and Scripps Institution of Oceanography. Specialized research fields are the physiology of respiration and temperature regulation, cardiovascular physiology and pharmacology (including bioengineering approaches to these disciplines), neurotransmitter metabolism, metabolism of specialized tissues, chemotherapy and drug action at the molecular and biochemical levels. Besides taking formal advanced courses in these areas, students participate in seminars, journal clubs, and the activities of postdoctoral fellows.

The graduate program in physiology and pharmacology is also designed to educate physician-scientists. The flexibility of this program and that of the School of Medicine permits students admitted to both degree programs to obtain an M.D. and a Ph.D. in about six years.

Examinations

Students obtain letter grades in the program's basic courses. At the end of the second year, candidacy for the Ph.D. degree is determined by a two-part examination. The first part tests student competence and ability to design a pertinent research problem in an area unrelated to his major interest; the second deals with his dissertation problem. After preparing the dissertation, an oral defense of the thesis completes the requirement for the Ph.D. degree.

Teaching

Teaching experience is an important part of the program. Students direct laboratory exercises and discussion sections of the School of Medicine core courses.

COURSES

203. Biomathematics and Computing (2) W Essentials of probability, biomedical statistics and computing.

204. Cell Biology and Biochemistry (10) F Study of the fundamental properties of cells in relation to inheritance, metabolism, transport, membrane behavior, replication, reproduction, development, and specialized functions.

204L. Cell Biology and Biochemistry (3) F A variety of laboratory projects for first year medical students and graduate students.

205. Basic Neurology (7) S Interdisciplinary survey of structure, function, chemistry and pharmacology of normal human nervous system emphasizing neurological mechanisms underlying development, sensory and motor capabilities and higher nervous processes. Prerequisites: P/P 206 or equivalent and consent of instructor.

205L. Basic Neurology Laboratory (2) S Interdisciplinary survey of structure, function, chemistry and pharmacology of the normal human nervous system, emphasizing neurological mechanisms underlying development, sensory and motor capabilities and higher nervous processes. Prerequisites: P/P 206 or equivalent and consent of instructor.

206. Organ Physiology and Pharmacology (12) W Medical physiology, pharmacology and elements of histology are introduced. Basic functions of the major organ systems and their interactions in man are studied. Major topics include: general principles of drug action, fluid balance and electrolyte metabolism, blood, heart and circulation, respiration, renal function, etc. Prerequisites: P/P 204 or equivalent and consent of instructor.

206L. Organ Physiology and Pharmacology Laboratory (3) W Selected laboratory exercises demonstrating basic principles of pharmacology and organ physiology. Electrocardiography, hemodynamics, myocardial control mechanisms, renal functions, gastrointestinal function, dose-response relationships in pharmacology, autonomic mechanisms and other aspects of physiology and pharmacology are illustrated in laboratory setting. Prerequisites: P/P 204 or equivalent and consent of instructor.

209. Endocrinology, Reproduction and Metabolism (5) S An integrated introduction to the physiology and pharmacology of the endocrine and reproductive systems in man followed by a review of metabolic regulation and nutrition. An overview of the endocrine system is presented. Regulation of hormone secretion, mechanisms of hormonal action and clinical implications are discussed. The basic aspects of

the biology of reproduction are covered in detail, including discussion of human embryology, endocrine control, the reproductive cycle and facets of population dynamics. Finally, metabolic regulation is reviewed, with emphasis on endocrine influences, and related nutritional problems are discussed (energy balance, temperature regulation, obesity, diabetes mellitus, hypercholesterolemia). Pharmacologic agents influencing the endocrine and reproductive systems are reviewed, including the use of hormones as drugs. Prerequisites: P/P 206 or equivalent and consent of instructor.

221. Selected Topics in Cardiovascular Instrumentation (2) S Basic principles of design of modern instruments and techniques — both laboratory and clinical — through a series of 12 seminars dealing with different problems in cardiovascular area. Topics will range from electronic monitoring and display systems, to video and x-ray procedures, to systems analysis and on-line computational methods. Prerequisites: P/P 206 and 206L and consent of instructor.

222. Psychopharmacology (2) W Seminars on the behavioral and biological factors underlying drug induced phenomena in man. Prerequisite: P/P 205.

223. Metabolic Basis of Inherited Disease (2) S A brief introductory review of patterns of inheritance and cytogenetics followed by detailed consideration of the biochemical abnormalities and their phenotypic expression as disease. Discussion of biochemical methods for localizing enzyme defects and biological and physiological characterization of disordered metabolism. Prerequisites: P/P 204 and 204L or permission of instructor.

224. Special Topics in Pharmacology (2) S A course designed to complement the pharmacology taught in the core curriculum by introduction of new topics or review of areas that involve both organ physiology and pathology. Specific aspects will be assigned to individual students and discussed by the group. Prerequisites: P/P 206 and 206L and permission of instructor.

225. The Mechanics and Energetics of Cardiac Contraction (2) S The mechanics of cardiac muscle contraction and those factors which determine the energy requirements for contraction will be discussed in depth. Students will be required to review and present pertinent discussions on current literature relating to these subjects. Prerequisites: P/P 206 and 206L.

226. Respiration Physiology (3) S Physiology of the respiratory system including structure and function of the lung, ventilation, diffusion, pulmonary circulation, gas exchange and ventilation-perfusion relationships, mechanics of breathing, blood gas transport, comparative physiology of gas exchange, environmental physiology of respiration. Prerequisites: P/P 206 and 206L.

229. Biochemical and Molecular Pharmacology (3) F A survey of the biochemical and molecular basis of drug action. Emphasis will be placed on the fundamental concepts and newer developments in drug-receptor interactions, drug metabolism and disposition. Prerequisite: P/P 204 or equivalent.

297. Graduate Seminar (1) F-W-S Discussion of current research and pertinent literature by graduate students. Assignments will be rotated among participating students.

298. Directed study (1-12) F-W-S Reading and laboratory study of special topics under the direction of a faculty member. Exact subject matter to be arranged in individual cases.

299. Independent Study or research (1-12) F-W-S Independent study or research.

POLITICAL SCIENCE

Office: 1512 Humanities-Library Building

A department of Political Science is being formed. In the absence of a regular department, visiting professors will teach the following sequences of courses in 1972-73.

COURSES

LOWER DIVISION

10-11-12. Introduction to Political Science F-W-S Utilizing text, reading, and case studies, the three quarters will constitute an introductory course to political science and institutions. In the context of their historical past, present situations in political, democratic, and foreign policy will be presented.

13. Politics, Politics, Politics Concerned with the "flesh" of the political system. The particular emphasis will be on the presidential elections, primaries and conventions. Guest lecturers from within the political arena will take part during the quarter.

UPPER DIVISION

100. Systems of Political Thought F To induce students to think systematically about politics, especially those broad socio-economic problems which periodically disrupt the established procedures of political decision making; to be aided in this aim by other political thinkers who have reflected on the characteristics of political authority, social organization, justice, freedom and the distribution of property. Prerequisite: lower-division political science.

101-102. Comparative Politics W-S A focus on the problems of political and economic development, on the politics, economics, and ideologies of Western Europe and Communist systems. The course will also develop new perspectives of society in the United States and frequent reference to conditions and trends in American Political Life. Prerequisite: lower-division political science.

120. The Supreme Court and Fundamental Freedoms W The course will focus on selected legal problems in the area of constitutional rights. Source material will include both writings about these problems and opinions of appellate courts, largely the Supreme Court of the United States. Examples of topics to be covered are: the Supreme Court and racial discrimination, war and the Court, speech and protest, criminal due process, etc.

131. Selected Topics in Latin American Politics A comparative analysis of contemporary political issues in Latin America. Material to be drawn from two or three countries. Among the topics: development; nationalism; neoimperialism; political change.

150. Political Change in the United States An analysis of the political structure of the present-day United States, and a review of proposed strategies for producing change in that structure. Particular attention will be given to the topic as it relates to Third World peoples within the United States. Prerequisite: sophomore standing.

175. History of India, 1905 to Present The growth of Indian Nationalism and Muslim Separatism. Political and economic development since independence. Prerequisite: upper-division standing or consent of instructor.

199. Independent Study for Undergraduates F-W-S Independent reading in advanced political science by individual students. Prerequisite: consent of instructor.

PSYCHOLOGY

Office: 5217 Psychology-Linguistics Building

Norman H. Anderson, Ph.D., Professor of Psychology

J. Anthony Deutsch, D.Phil., Professor of Psychology

David M. Green, Ph.D., Professor of Psychology

George Mandler, Ph.D., Professor of Psychology

Donald A. Norman, Ph.D., Professor of Psychology

George S. Reynolds, Ph.D., Professor of Psychology

(Chairman of the Department)

Edmund J. Fantino, Ph.D., Associate Professor of Psychology

Harry L. Munsinger, Ph.D., Associate Professor of Psychology

Ebbe B. Ebbesen, Ph.D., Assistant Professor of Psychology

David E. Rumelhart, Ph.D., Assistant Professor of Psychology

J. Edward Russo, Ph.D., Assistant Professor of Psychology

* * *

Ursula Bellugi-Klima, Ed.D., Associate Adjunct Professor of Psychology

Robert Galambos, Ph.D., M.D., Professor of Neurosciences

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The Major Program

The Department offers courses in all major areas of experimental psychology, with emphasis in the areas of human information processing, animal learning, physiological psychology, developmental psychology, and social psychology. The Department emphasizes modern research in the experimental and theoretical analysis of human and animal behavior. Students who major in psychology can expect to develop a knowledge of a broad range of content areas as well as basic skills in experimental and analytic procedures.

The major program is designed to involve the student in current research problems of the field. To understand modern experimental psychology requires skills in laboratory techniques and a thorough knowledge of quantitative methods, including computer techniques, the construction and evaluation of theories, probability theory, statistics, and experimental design. These skills are taught in the junior year through the sequence of courses: Psychology 105, 106, 107 and 110, 111, 112 and 115, 116, 117. The Psychology 110 series are lecture-seminar courses which introduce the study of contemporary issues and numerical methods in experimental psychology. The Psychology 115 series is a laboratory which introduces the experimental techniques necessary to study the issues raised in the 105 and 110 series. The three sequences are designed to be taken concurrently, during the entire junior year, for they offer an integrated introduction to the experimental areas.

In the senior year, in the three-quarter sequence of Psychology 198, each student performs a research project of his choice, guided by a member of the staff. In addition, students may choose from a wide variety of courses to complete the major program. A minimum of three upper-division courses in psychology is required in addition to the 105, 110, 115 and 198 course sequences. Psychology majors will be assisted by departmental advisers in selecting a program suitable for their particular interests. A qualified major may elect to take graduate seminars in psychology, subject to approval by his adviser and the instructors of the relevant courses.

Prerequisites for a Psychology Major

Experimental psychology uses the tools and knowledge of science: calculus, probability theory, computer science, chemistry, biology, and physics. Accordingly, students in upper-division courses must have an adequate background in these topics. Prerequisites for individual courses are specified in the catalog listings for the courses.

A student who wishes to enter the major in psychology must know calculus through

the level of Mathematics 1C. Probability theory and statistics will be taught as part of the psychology major during the junior year.

The basic science requirement can be met by taking five of the lower-division science courses offered in the colleges. Some knowledge of programming is highly recommended. This may be acquired through APIS 10, which can also count as one of the science courses.

The College Science and Mathematics Requirements Each college imposes its own science and mathematics requirement upon its students. A student who wishes to major in psychology must also fulfill the special prerequisites listed above. These prerequisites are automatically met by the Revelle College requirements. Muir College and Third College students will have to take either the Mathematics 1A, 1B, 1C or 2A, 2B, 2C sequence, as well as a total of five science courses from the ones offered to them.

Major Program in Psychology (Recommended Schedule)

	FALL	WINTER	SPRING
Junior Year	Psychology 105 Psychology 110 Psychology 115*	Psychology 106 Psychology 111 Psychology 116*	Psychology 107 Psychology 112 Psychology 117*
Senior Year	Psychology 198 Psychology elective — — — —	Psychology 198 Psychology elective — — — —	Psychology 198 Psychology elective — — — —

*Note that 115, 116, and 117 each carry two credits (half-course).

The Noncontiguous Minor for Revelle College

A limited number of students may enroll in psychology in order to fulfill the requirements of the noncontiguous minor. The noncontiguous minor will normally consist of three of the lower-division courses in psychology and three courses selected from the upper-division offerings of the Department. Please note carefully the prerequisites for the upper-division courses. Students who wish to pursue a noncontiguous minor should consult with one of the departmental undergraduate advisers before enrolling for these courses. Lower-division psychology courses may not be used simultaneously to satisfy both the social science requirement and the noncontiguous minor requirement.

The Graduate Program

The Department of Psychology provides broad training in experimental psychology. Increased specialization and the general burgeoning of knowledge make it impossible to provide training in depth in every aspect of experimental psychology, but most aspects are represented in departmental research. The Department concentrates especially on human information processing. In addition, the Department has programs of study in animal learning, social psychology, physiological psychology (including motivation and emotion), and developmental psychology.

Preparation

Apart from the general University requirements, the Department generally expects adequate undergraduate preparation in psychology. A major in the subject, or at least a strong minor, is normally a prerequisite, but exceptions may be made for applicants with good backgrounds in such fields as biology and mathematics.

Language Requirements

There is no foreign language requirement.

Master's Degree Program

Normally, students will be accepted only for the Ph.D. Students in the doctoral program may, however, qualify for the M.A.

Plan II has been adopted by the Department (see *Graduate Division: The Master's Degree*). Each candidate must complete a two-course requirement in quantitative methods and at least six additional units in graduate courses other than the research courses 296, 298, and 299. Each candidate must also pass the master's examination, which is offered by the Department once each year.

Doctor's Degree Program

Qualifying Examination

By the end of the second year a student proceeding to the Ph.D. degree will be examined by a doctoral committee on (a) the specific area in which the student expects to submit a doctoral dissertation, (b) problems, experiments, and interpretations which the student expects to encounter in research, and (c) the fields of psychology with which the student has become familiar during the first two years of study at UCSD.

Course of Study

All students are expected to fulfill the requirement in quantitative methods (normally Psychology 201A-201B). Other courses are divided into areas according to content. The areas include developmental, human learning and memory, learning and motivation, mathematical models, physiological, sensory, social, and human judgment. Within areas, courses are divided into basic seminars and advanced seminars. Basic

seminars (Psychology 202-219) are intended to cover current psychological knowledge and to provide the basis for more intensive and specialized study. *Advanced seminars* (Psychology 220-239) focus on specific areas of current knowledge and research. Certain graduate and upper-division courses in other departments may be considered as advanced seminars with the approval of the Department.

In the first year of study, the student is required to take at least six courses from within the Department. The courses must be chosen from at least four different areas, and at least one course must be an advanced seminar. Course work in the second year will usually be confined to advanced seminars and interdisciplinary work. There are no further course requirements.

Teaching

In order to acquire adequate teaching experience, all students are required to participate in the teaching activities of the Department for one quarter of half-time teaching in every year of residence. (Psychology 500.)

Research

From the first year of graduate study all students are enrolled in a research practicum (Psychology 296). Students are assigned to current research projects in the Department, and receive the personal supervision of a member of the staff.

Comprehensive Evaluation

Each student's work will be evaluated by the staff at the end of the first year of residence. This evaluation will consider all aspects of the student's performance: his work in courses and seminars, his ability to perform research, and his teaching. In addition, each student must submit a research paper based on his work during the first year. Admission to second-year standing depends upon the outcome of this evaluation. During the second year the Department will survey the student's general preparation in psychology. Additional written or oral evidence of competence in certain areas may be sought at this time, and, where necessary, additional course work may be required.

COURSES

LOWER DIVISION

10. Developmental Psychology F An introduction to the psychological development of the human organism with special reference to cognitive development in the child. Three hours lecture, one hour recitation.

11. Perception and Information Processing W An introduction to basic principles of perception, learning, and information processing. Three hours lecture, one hour recitation.

14. Social Psychology S An introduction to concepts and methods in social psychology. Three hours lecture, one hour recitation.

UPPER DIVISION

105. Introduction to Experimental Psychology Introduction to experimental work in operant psychology. Prerequisites: Mathematics 1C; co-registration in Psychology 110 and 115.

106. Introduction to Experimental Psychology Introduction to experimental work in social psychology. Prerequisites: Mathematics 1C; co-registration in Psychology 111 and 116.

107. Introduction to Experimental Psychology Introduction to experimental work in human information processing. Prerequisites: Mathematics 1C; co-registration in Psychology 112 and 117.

110. Experimental Method of Quantitative Techniques Introduction to the experimental method in psychology and to mathematical techniques necessary for experimental research. Prerequisites: Mathematics 1C; co-registration in Psychology 105 and 115.

111. Experimental Method of Quantitative Techniques Intermediate examination of the experimental method in psychology and mathematical techniques necessary for experimental research. Prerequisites: Mathematics 1C; co-registration in Psychology 106 and 116.

112. Experimental Method of Quantitative Techniques Advanced examination of the experimental method in psychology and to mathematical techniques necessary for experimental research. Prerequisites: Mathematics 1C; co-registration in Psychology 107 and 117.

115. Laboratory in Psychology (2) Laboratory work in operant psychology to accompany Psychology 105. Prerequisites: Mathematics 1C; co-registration in Psychology 105 and 110.

116. Laboratory in Psychology (2) Laboratory work in social psychology to accompany Psychology 106. Prerequisites: Mathematics 1C; co-registration in psychology 106 and 111.

117. Laboratory in Psychology (2) Laboratory work in human information processing to accompany Psychology 107. Prerequisites: Mathematics 1C; Co-registration in Psychology 107 and 112.

132. Sensory Mechanisms S An introduction to sensory mechanisms involving auditory and visual phenomena. Prerequisite: Psychology 103.

133. Physiological Psychology W Intensive introduction to current knowledge of physiological factors in learning, motivation, perception, and memory. Prerequisite: Psychology 103.

134. Social Psychology W Introduction to group behavior, attitude change, social perception. Prerequisite: permission of instructor.

135. Human Information Processing An intensive introduction to the study of the human as an information processing system. Covers topics in perception, memory, cognition, and artificial intelligence. Prerequisite: Psychology 11 or 101-103. Some knowledge of programming would be useful (e.g., APIS 10).

137. Developmental Psychology W Intensive survey of current knowledge of cognitive and intellectual factors in human development.

138. Introduction to Mathematical Psychology W An introduction to mathematical models in learning, perception, memory, and sensory processes. Prerequisites: Psychology 115, 116, and 117 or Psychology 11 and Mathematics 180A.

140. Control and Analysis of Human Behavior F An examination of the principles and techniques currently or potentially involved in the control and modification of human behavior. Prerequisites: Psychology 105, 110 and 115 sequences.

141. Choice and Decision S Introduction to theory, method, and empirical findings in the areas of choice and decision behavior. Three hours lecture. Prerequisite: psychology major or Mathematics 181A and Psychology 11.

142. Experimental Social Psychology F Introduction to the experimental investigation of human and animal social behavior. Three hours lecture. Prerequisite: major in psychology.

143. Emotion S Introduction to current theories and research in emotion, with special reference to theories of anxiety. Three hours lecture. Prerequisite: senior majoring in psychology, or three upper-division psychology courses.

144. Theories in Social Psychology W A survey of theories and systems in social psychology. Prerequisite: Psychology 14. (Psychology 134 and 144 may not both be taken for credit.)

145. Psycholinguistics Presentation and discussion of grammar and psychology, theories of grammatical development, semantics, and the biological basis of language. Prerequisite: permission of instructor. (Normally limited to major in psychology and linguistics and graduate students in those departments.)

146. Cognitive Processes W An introduction to contemporary models of cognition and the process of thinking. Prerequisite: Psychology 135 or equivalent.

147. Psychology of Knowledge and Explanation Discussion of psychological theory and evidence on such topics as epistemology, ordinary language, reasons and causes, existence, socio-cultural determinants of thought, ethics. Prerequisite: senior majoring in psychology, philosophy, anthropology, sociology, or political science.

148. Algebraic Psychology General theory of judgement based on algebraic models. Emphasis on varied substantive applications, including person perception, social attitudes and opinions, decision-making, and psychophysical judgment. Prerequisites: Psychology 101-103 or equivalent.

180. Special Topics F-W-S Selected seminars by members of the staff. Prerequisite: major in psychology.

195. Instruction in Psychology F-W-S Introduction to teaching of introductory psychology. Each student will be responsible for and teach a class section in one of the lower-division psychology courses. Prerequisites: major in psychology and permission of instructor at least one quarter before start of course.

198. Research in Psychology F-W-S Research seminars and research, under the direction of a member of the staff. Prerequisites: Psychology 105, 110, 115.

199. Independent Study F-W-S Independent study or research under direction of a member of the staff. Prerequisite: special permission of Department.

GRADUATE

201A-201B-201C. Quantitative Methods in Psychology (3-3-3) An intensive course in statistical methods and the mathematical treatment of data, with special reference to research in psychology.

202. Sensory Mechanisms (3) An introduction to problems and methods. Seminar.

203. Physiological Psychology (3) The central nervous system and its relation to behavior. Seminar.

204. Social Psychology (3) The behavior of man as a function of social variables. Seminar.

205. Human Information Processing An intensive introduction to the study of the human as an information processing system. Covers topics in perception, memory, cognition, and artificial intelligence.

206. Conditioning and Learning (3) Classical and operant conditioning in lower animals. Seminar.

207. Developmental Psychology (3) The original behavioral repertory of the child and its subsequent development. Seminar.

208. Choice and Decision Making Theory and current empirical findings in areas of optimal decision making and individual human choice behavior, emphasizing mathematical models of choice and decision making. Will include measurement of utility, identifying and testing rules of combination for decision components, and empirical findings related to the process of decision making. Prerequisite: graduate standing in psychology.

209. Judgment and Decision Making (3) Survey of principal problems of

judgment as they relate to decision making, psychophysics, social and personality psychology. Seminar. Prerequisite: graduate study in psychology.

210. Motivation and Learning (3) Basic problems in theory and research on human and animal motivation and learning. Seminar. Prerequisite: graduate study in psychology.

220. Detection Theory in Psychology (2) The application of detection theory to human information processing. Advanced seminar.

221. Judgmental Processes (2) The psychology of judgments and information integration. Advanced seminar.

222. Brain Functions (2) Selected topics. Advanced seminar.

223. Advanced Topics in Psychophysics (2) Advanced seminar.

224. Verbal Learning and Memory (2) Selected problems. Advanced seminar.

225. Experimental Analysis of Behavior (2) Advanced seminar in modern techniques and findings, with special emphasis on operant conditioning and lower animals. Advanced seminar.

226. Contemporary Problems in Vision (2) Advanced seminar on recent research in vision. Prerequisite: graduate student in psychology.

227. The Human Dyad (2) Interaction processes, properties of the dyad as an entity, variables associated with its change and stability. Advanced seminar. Prerequisite: graduate study in psychology or consent of instructor.

228. Advanced Topics in Mathematical Psychology (2) Advanced seminar on selected mathematical models in learning, perception, sensory processes, memory, and decision.

229. Selected Topics in Social Psychology (2) Advanced seminar on theoretical issues in attitudes and social perception with special attention to current research.

230. Advanced Topics in Developmental Psychology (2) Theoretical and methodological problems in cognitive, perceptual, and social development. Advanced seminar.

231. Advanced Topics in Human Information Processing (2) Selected discussions of advanced topics. Advanced seminar. Prerequisite: Psychology 205 or consent of instructor.

240. Advanced Quantitative Methods (2) Selected topics in advanced experimental design and data analysis. Prerequisite: graduate enrollment in psychology or consent of instructor.

260. Advanced Topics Advanced seminar on special topics in theoretical and experimental psychology. Prerequisite: graduate student in psychology.

280. Seminar in Communication and Information Research (1) (Satisfactory/Unsatisfactory grades permitted.)

296. Research Practicum (1-12) F-W-S Research in psychology under supervision of individual staff members. (Satisfactory/Unsatisfactory grades permitted.)

298. Library Research (1-12) F-W-S Reports and surveys of the literature on selected topics. Prerequisite: graduate student in psychology.

299. Independent Study and Thesis Research (1-12) F-W-S (Satisfactory/Unsatisfactory grades permitted.)

500. Apprentice Teaching (4) Required teaching practicum for students enrolled in graduate program in psychology. (Satisfactory/Unsatisfactory grade only.)

SCIENCE

Office: 2126 Humanities and Social Sciences Building

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These courses are to be used by Muir College students in fulfilling the science requirements of various majors. The Science 3 series is a course in university level chemistry; the Science 4 series is a course in university level physics. Although these courses are intended primarily for students planning to major in a science, they are excellent courses for any student who is adequately prepared.

COURSES

LOWER DIVISION

3A. General Chemistry Introductory chemistry with emphasis on the applications of chemistry to molecular biology. Required for Muir students majoring in biology. Three hours lecture.

3AL. General Chemistry Laboratory This laboratory course should be taken with Science 3A.

3B. General Chemistry A continuation of General Chemistry 3A. Three hours lecture. Prerequisite: Science 3A.

3BL. General Chemistry Laboratory This laboratory course should be taken with Science 3B. Prerequisite: Science 3AL.

3C. Thermochemistry F This course will be required of all Muir students

majoring in biology. Thermodynamics, physical chemistry, and chemical reactions will be studied with occasional reference to reactions of biological interest. Emphasis will be on general principles and problem solving. Three lectures, two 3-hour laboratories. Prerequisite: Science 3B.

4A. The Physics of Equilibrium and Motion F An introduction to the science of mechanics. The principle of static equilibrium, Newton's laws of motion with applications to orbital and harmonic motion. The concepts of energy and work. The conservation laws are discussed with a view to their application to particle physics as well as to classical mechanics. Prerequisites: concurrent registration in Mathematics 1A or 2A.

4B. Waves Energy and Properties of Matter W An introduction to continuum mechanics, dimensional analysis and wave motion. Elementary geometrical optics with applications to optical instruments. Calorimetry and heat transport. Prerequisite: concurrent registration in Mathematics 1B or 2B.

4C. Electromagnetic Theory S Electric field and potential, Laplace's and Poisson's equations. Capacitors and capacitance. Stationary electric currents. Ohm's law. Magnetic fields, vector potential. The law of induction. The displacement current. Maxwell's equations. Electromagnetic waves, AC circuits. Prerequisites: concurrent registration in Mathematics 1C or 2C.

4D. Modern Physics W Subatomic particles, wave-particle duality, introductory quantum theory, atomic structure and spectra, periodic table, molecular binding and spectra, nuclear physics. Prerequisites: Science 4A-4B-4C sequence or equivalent and Mathematics 1C or 2C.

4E. Science: Laboratory F Introduction to experimental physics and electronics. Wave experiments in microwaves, optics, and acoustics. Magnetic field measurements. Properties of materials.

UPPER DIVISION

103A. Organic Chemistry (Muir) The properties and reactions of alkanes, cycloalkanes, arenes, alkyl halides and alcohols. The mechanism of S_N1 , S_N2 , E1, and E2 reactions. Prerequisite: Science 3C.

103B. Organic Chemistry (Muir) Continuation of Science 103A. The properties and reactions of aldehydes, ketones, carbohydrates, carboxylic acids, esters, amides, proteins, and aromatic compounds. Special emphasis is placed on organic reactions analogous to reactions which occur in typical biochemical pathways. Prerequisite: Science 103A.

103BL. Organic Chemistry Laboratory (Muir) (2) Independent experience in modern methods of organic product isolation, identification, synthesis and instrumentation. Introduction to spectroscopic and electromagnetic measurement and correlation with theoretical properties and mechanism of action. Prerequisite: concurrent enrollment in Science 103B.

Note: (Transfer students who have completed equivalent lower-division courses in organic chemistry have met this requirement.)

SCIENCE AND TECHNOLOGY

Office: Building 303, Matthews Campus

Richard W. Dutton, Ph.D., Professor of Biology

(Coordinator of Science and Technology)

* William R. Frazer, Ph.D., Professor of Physics

Silvio S. Varon, M.D., Professor of Biology

Melvin I. Simon, Ph.D., Associate Professor of Biology

Faustina F. Solis, M.S.W., Associate Professor of Community

Medicine

Joseph W. Watson, Ph.D., Associate Professor of Chemistry

(Provost of Third College)

Juan Yguerabide, Ph.D., Associate Professor of Biology

Edward C. Alexander, Ph.D., Assistant Professor of Chemistry

Willie C. Brown, Ph.D., Assistant Professor of Biology

Arthur F. Diaz, Ph.D., Assistant Professor of Chemistry

Richard Escobedo, Ph.D., Assistant Professor of Mathematics

P.A. George Fortes, M.D., Ph.D., Assistant Professor of

Biology

Ramon Pinon, Jr., Ph.D., Assistant Professor of Biology

Jeffrey F. Raskin, M.A., Assistant Professor of Visual Arts

Frank B. Thiess, Ph.D., Lecturer in Mathematics

* * *

Diego R. Munoz, Ph.D., Lecturer in Mathematics

Roy H. Ogawa, Ph.D., Acting Assistant Professor of

Mathematics

James E. White, B.A., Acting Assistant Professor of

Mathematics

* On leave 1972-73.

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The Science and Technology Program gives students an understanding of the basic laws of nature and their relation to the foundations of a technological society. The

basic sequence, which is required of all students in Third College, consists of three quarters covering biology, chemistry, and physics (Science and Technology 1A-1B-1C).

Health Sciences Major Program

The Health Sciences Major Program (the biology major in Third College) which is the first specialized science program in Third College, has been developed out of the College's commitment to educate large numbers of competent minority students for careers in the natural sciences. It is designed to prepare students for medical or dental school; graduate school in biology; or in the allied health professions.

To accomplish these aims the Health Science major includes:

1. an introductory freshman year sequence (three quarters of science and technology, three quarters of mathematics — including calculus);
2. a more content-oriented sophomore sequence (four quarters of science);
3. a core series of biomedical courses (ten quarters);
4. a supplementary series of courses (four quarters) chosen from Public Health Sciences, Environmental Biology, Clinical Chemistry, Biotechnology, or other course grouping in accordance with the selected major;
5. a field work project in the community.

The mathematics requirement for students in Third College consists of two quarters (8 units) of any college level mathematics. The mathematics requirement may be satisfied by one of the following four methods:

1. *Mathematics 10D, 10J.* Designed especially for non-science majors who do not intend to take further courses in mathematics. Provides basic mathematical skills useful in the social sciences as well as techniques helpful in the Science and Technology sequence.
2. *Mathematics 1, 2.* Strongly recommended for science or mathematics majors who have sufficient high school background in mathematics.
3. *Mathematics 4A-4B-4C.* Designed for those who may wish to pursue a science major, but are not yet prepared to begin the calculus sequence.
4. Two quarters of any other college level mathematics course.

The Science Majors

Science and Technology is an interdisciplinary program of the Third College. Therefore, students declaring a science or mathematics major (other than Health Science) are expected to satisfy the lower-division science and mathematics requirements of the College in addition to the departmental major requirements of the respective science or mathematics department offering the major. (See the appropriate department under *Departments of Instruction*.) It is also recommended that students consult a faculty member affiliated with the Science and Technology Program, in the department offering the major.

COURSES

LOWER DIVISION

1A. Introduction to Modern Biology F The course will present an introduction to modern biology. A detailed exploration of specific areas will be used to illustrate biological principles. The laboratory will extend and further explore the material covered in the lectures and discussions.

1B. Chemistry W This course is designed to introduce some of the fundamental concepts and theories of chemistry; topics of atomic and molecular structure, electro-chemistry, kinetics, and thermodynamics; elementary problem solving and basic chemical laboratory techniques.

1C. Physics S A topical treatment of some of the basic principles of physics developed in the context of a study of contemporary urban and environmental problems. A quantitative study of physics will be undertaken proceeding inductively from selected topics such as: Urban Transportation Systems, the Generation and Distribution of Electrical Energy, Nuclear Energy, Physics of the Environment, Pollution, etc. Some of the areas of physics treated will be: Kinematics and Dynamics, Hydrodynamics, Thermodynamics, Basic Electric Circuit Theory, Basic Ideas of Atomic and Nuclear Physics.

1D. Science and Technology W Course will attempt to provide an appreciation of the importance of biological and health sciences to the individual student and his community; to link the Sci/Tech sequence to other major areas in Third College; to develop understanding of scientific method and logic through rigorous examination of the students' understanding and analysis of the information available on the various topics listed in the outline. Prerequisites: Sci/Tech 1A, 1B, 1C.

2A. Chemistry F This course is the second part of the three-part introductory chemistry sequence. Lecture material includes electrochemistry, kinetics and thermodynamics while the laboratory stresses the use of analytical instruments. Prerequisite: Sci/Tech 1A or consent of instructor.

2B. Chemistry W Third part of the introductory chemistry sequence. The areas of electrochemistry, kinetics, and thermodynamics are further developed. Prerequisite: Sci/Tech 2A or permission of instructor.

5A. Physics F Topics in physics particularly relevant to the study of medicine. Material will be selected from subject areas such as mechanics, diffusion, hydrostatics and hydrodynamics, and elasticity. This course is primarily for students in the Third College Health Sciences Program. Prerequisite: Sci/Tech 1C or equivalent basic course in physics.

5B. Physics W A continuation of Physics 5A, intended for students in the Third College Health Sciences Program. Prerequisite: Physics 5A.

5C. Physics S Study of wave-motion, sound, geometrical and physical optics with biological applications.

89. Chemical Structures (2) An introduction to the structure of biologically important molecules. The course scopes the structural aspects common to simple molecules and complex biological molecules. Prerequisite: Sci/Tech 1B and consent of instructor.

90. Graphic Approach to Math/Science (2) Group studies directed at designing, testing and developing a variety of graphic approaches as a method of introducing fundamental math to young children. The group will work with minority children in the community.

UPPER DIVISION

100. Interaction of Science and Society A survey of the history of science from the development of navigational aids for the increase of trade and facilitation of exploration to the industrial revolution. The role of social organization and economics in the setting of goals and priorities in research and development will be discussed as well as the impact of both basic and applied research on the relationships of western countries to the underdevelopment world. Prerequisite: upper-division standing.

195. Undergraduate Teaching F-W-S Course is designed to provide undergraduate students with teaching experience in science laboratory courses. The students will assist in the preparation and running of laboratory sections. Prerequisites: accomplishment of above average grade in course in question and approval of instructor.

SCRIPPS INSTITUTION OF OCEANOGRAPHY

Office: 1156 Ritter Hall

- Gustaf Arrhenius, D.Sc., Ph.D., Professor of Marine Geology
 Robert S. Arthur, Ph.D., Professor of Oceanography
 George E. Backus, Ph.D., Professor of Geophysics
 Andrew A. Benson, Ph.D., Professor of Biology
 James N. Brune, Ph.D., Professor of Geophysics
 Edward C. Bullard, Sc.D., F.R.S., Professor of Geophysics
 Theodore H. Bullock, Ph.D., Professor of Neurophysiology
 Charles S. Cox, Ph.D., Professor of Oceanography
 Harmon Craig, Ph.D., Professor of Geochemistry and Oceanography
 Joseph R. Curray, Ph.D., Professor of Oceanography
 Seibert Q. Duntley, Sc.D., Professor of Physics
 Albert E. J. Engel, Ph.D., Professor of Geology
 Edward W. Fager, Ph.D., D.Phil., Professor of Marine Ecology
 J. Freeman Gilbert, Ph.D., Professor of Geophysics
 Edward D. Goldberg, Ph.D., Professor of Chemistry
 Harold T. Hammel, Ph.D., Professor of Physiology
 Richard A. Haubrich, Ph.D., Professor of Geophysics
 Francis T. Haxo, Ph.D., Professor of Biology
 Douglas L. Inman, Ph.D., Professor of Oceanography
 John D. Isaacs, B.S., Professor of Oceanography
 Charles D. Keeling, Ph.D., Professor of Oceanography
 Devendra Lal, Ph.D., Professor of Nuclear Geophysics
 Ralph A. Lewin, Ph.D., Professor of Biology
 Henry W. Menard, Ph.D., Professor of Geology
 Walter H. Munk, Ph.D., Professor of Geophysics
 William A. Nierenberg, Ph.D., Professor of Physics (Vice Chancellor of Marine Sciences and Director of Scripps Institution of Oceanography)
 Fred B. Phleger, Ph.D., Professor of Oceanography
 Russell W. Raitt, Ph.D., Professor of Geophysics
 Per F. Scholander, M.D., Ph.D., Professor of Physiology
 George G. Shor, Jr., Ph.D., Professor of Marine Geophysics
 Fred N. Spiess, Ph.D., Professor of Oceanography
 Victor Vacquier, M.A., Professor of Geophysics
 Benjamin E. Volcani, Ph.D., Professor of Microbiology
 Edward L. Winterer, Ph.D., Professor of Geology (Chairman of the Department)
 Warren S. Wooster, Ph.D., Professor of Oceanography
 Claude E. ZoBell, Ph.D., Professor of Marine Microbiology
 Milton A. Bramlette, Ph.D., Professor of Geology, Emeritus
 Carl H. Eckart, Ph.D., Professor of Geophysics, Emeritus
 Denis L. Fox, Ph.D., Professor of Marine Biochemistry, Emeritus
 Carl L. Hubbs, Ph.D., Professor of Biology, Emeritus
 Martin W. Johnson, Ph.D., Professor of Marine Biology, Emeritus
 Norris W. Rakestraw, Ph.D., Professor of Chemistry, Emeritus
 Roger Revelle, Ph.D., Professor of Oceanography, Emeritus
 Francis P. Shepard, Ph.D., Professor of Submarine Geology, Emeritus
 Charles D. Wheelock, M.S., Professor of Naval Architecture, Emeritus
 Robert W. Elsner, Ph.D., Associate Professor of Physiology
 James T. Enright, Ph.D., Associate Professor of Oceanography
 David Epel, Ph.D., Associate Professor of Biology
 Carl H. Gibson, Ph.D., Associate Professor of Engineering Physics

and Oceanography

James W. Hawkins, Ph.D., Associate Professor of Geology
 Robert R. Hessler, Ph.D., Associate Professor of Oceanography
 John A. McGowan, Ph.D., Associate Professor of Oceanography
 Michael M. Mullin, Ph.D., Associate Professor of Oceanography
 William A. Newman, Ph.D., Associate Professor of Oceanography
 Melvin N. A. Peterson, Ph.D., Associate Professor of Oceanography
 Richard H. Rosenblatt, Ph.D., Associate Professor of Marine Biology
 (Vice Chairman of the Department)
 Charles W. Van Atta, Ph.D., Associate Professor of Engineering Physics
 and Oceanography
 Jeffrey L. Bada, Ph.D., Assistant Professor of Oceanography
 Wolfgang H. Berger, Assistant Professor of Oceanography
 Russ E. Davis, Ph.D., Assistant Professor of Oceanography
 Paul K. Dayton, Ph.D., Assistant Professor of Oceanography
 D. John Faulkner, Ph.D., Assistant Professor of Oceanography
 Joris M. T. M. Gieskes, Ph.D., Assistant Professor of Oceanography
 Myrl C. Hendershott, Ph.D., Assistant Professor of Oceanography
 Nicholas D. Holland, Ph.D., Assistant Professor of Marine Biology
 John D. Mudie, Ph.D., Assistant Professor of Geophysics
 Robert L. Parker, Ph.D., Assistant Professor of Geophysics
 George N. Somero, Ph.D., Assistant Professor of Biology
 Bruce A. Taft, Ph.D., Assistant Professor of Oceanography

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Elbert H. Ahlstrom, Ph.D., Adjunct Professor of Oceanography
 Reuben Lasker, Ph.D., Associate Adjunct Professor of Marine Biology
 Theodore Enns, Ph.D., Research Physiologist and Lecturer
 Richard W. Eppley, Research Biologist and Lecturer
 Joseph L. Reid, M.S., Research Oceanographer and Lecturer
 William R. Riedel, M.S., Research Geologist and Lecturer
 Edward Brinton, Ph.D., Associate Research Biologist and Lecturer
 Abraham Fleminger, Ph.D., Associate Research Biologist and Lecturer
 Osmund Holm-Hansen, Ph.D., Associate Research Biologist and Lecturer
 John R. Beers, Ph.D., Assistant Research Zoologist and Lecturer
 Angelo F. Carlucci, Ph.D., Assistant Research Microbiologist and Lecturer

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The Graduate Department of the Scripps Institution of Oceanography offers graduate instruction leading to M.S. and Ph.D. degrees in oceanography, in marine biology and in earth sciences. Emphasis is on the Ph.D. program. A student will normally concentrate his work in one of several curricular programs within the Department. These programs now include: biological oceanography, marine biology, marine chemistry, geological sciences, geophysics, physical oceanography and applied ocean sciences.

No undergraduate major is offered in the Department though most courses in the Department are open to enrollment for qualified undergraduate students with the consent of the instructor. The interdisciplinary nature of research in marine and earth sciences is emphasized; students are encouraged to take courses in several programs and departments, and to select research problems of interdisciplinary character. The research vessels and other facilities of the Scripps Institute and its associated laboratories (including the Institute of Geophysics and Planetary Physics) are available to department students, many of whom participate in oceanographic research at sea.

The Curricular Programs

Biological Oceanography is the field of study concerned with the interactions of populations of marine organisms with one another and with their physical and chemical environment. Since these interactions are frequently complex, and since the concepts and techniques used in investigating the environment and the populations are drawn from many fields, biological oceanography is, of necessity, interdisciplinary. Therefore, studies in physical oceanography, marine chemistry, and marine geology, as well as biology, are pertinent. Research activities in this curriculum include studies of the factors influencing primary and secondary productivity and nutrient regeneration, food-chain dynamics, community ecology of benthic and pelagic forms, population dynamics, fishery biology, taxonomy and zoogeography of oceanic organisms, behavior as it affects distribution, and sampling problems. Theoretical, experimental, and direct observational approaches to these problem areas are undertaken by both faculty and students.

Marine Biology is the study of marine organisms, their development, and their adaptations. It is, therefore, concerned with the physiological and biochemical processes in marine organisms, their genetic relationships, and the relationship between them and their environment, both biotic and physical. It encompasses several major areas of modern biology, and is interpreted from the viewpoints gained through understanding the physical and chemical dynamics of the seas. Research activities in the curriculum currently include microbiology, ultrastructure, photobiology (photosynthesis and respiration, energy-transfer processes and comparative anatomy and physiology of vertebrate and invertebrate vision), barobiology, cardiovascular physiology, comparative biochemistry, comparative and cellular physiology, neurophysiology, systematics, distribution, ecology, evolution of marine animals and plants, developmental biology and larval ecology.

Marine Chemistry is concerned with chemical processes operating within the marine environment: the oceans, the marine atmosphere, and the sea floor. The interactions of the components of seawater with the atmosphere, with the sedimentary solid phases, and with plants and animals form the basis for research programs. These

include: investigations of the carbon system, natural products, chemical interactions between marine organisms, physical and inorganic chemistry of sediment water systems, organic chemistry in the marine environment, distribution of noble gases in seawater, and effects of pollutants on the marine environment.

Geological Sciences emphasizes the application of observational, experimental and theoretical methods of the basic sciences to the understanding of the solid earth, ocean, atmosphere, and the solar system. Principal sub-programs at Scripps are Marine Geology, Petrology, and Geochemistry. Expedition work at sea and field work on land are emphasized as an essential complement to laboratory and theoretical studies. Marine Geology is the field of study concerned with the origin, properties, and history of ocean basins and with the geological processes that affect them. Research areas include tectonics and vulcanism; geomorphology, structure, and deformation of the oceanic crust and continental margins, utilizing both geophysical and geological techniques; deep sea and continental margin sedimentation, stratigraphy, and paleontology; and beach and nearshore processes. Petrology is the study of the origin and history of the rock complexes of the earth's crust and upper mantle, with emphasis on the igneous, metamorphic, and sedimentary rocks of the oceanic islands, abyssal plains and deep-sea trenches, the characteristics and interrelations of the oceanic and continental crust, and studies of lunar and meteoritic materials. The Geochemistry Program is designed for students with undergraduate majors in either geology or chemistry. Areas of advanced study and research include the geochemistry of the ocean, the atmosphere, and the solid earth, nuclear geochemistry, circulation and mixing of oceanic water masses based on carbon, oxygen, carbon-14, radium, radon, stable isotopes, and rare gases, studies of volcanic and geothermal phenomena, the interaction of sediments with seawater and interstitial waters, geochemical cycles, and the history and composition of the ocean and sedimentary rocks.

Geophysics emphasizes the application of general experimental and theoretical methods of physics to fundamental problems in the atmosphere, oceans, and interior of the Earth, and in the solar system. Research interests within the curricular group include: magnetohydrodynamic phenomena in the Earth's core, hydrodynamics of oceans and atmospheres, geophysical inverse problems, theoretical seismology, the design of geophysical arrays, multichannel data-processing methods, nonlinear tidal prediction, long-period resonant and equilibrium fluctuations in the Earth and its oceans, radiative transfer in the sea and the atmosphere, interactions of weakly nonlinear wave fields, studies of oceanic crustal structure, acoustic propagation in the oceans, interpretation of regional geomagnetic data, processes of ocean-floor spreading, and irreversible thermodynamics.

Physical Oceanography is the field of study that deals with mechanisms of energy transfer through the sea and across its boundaries, and with the physical interactions of the sea with its surroundings. Research activities within this curricular group include: study of the general circulation of the oceans, including the relations of ocean currents to driving forces and constraints of the ocean basins; fluctuations of currents, and the transport of properties; the mechanisms of transport of energy, momentum, and physical substances within the sea and across its boundaries; properties of wind waves, internal waves, tsunami and planetary waves; the thermodynamic description of the sea as a system not in equilibrium; optical and acoustic properties of the sea; and the influence of surf on near-shore currents and the transport of sediments.

Applied Ocean Sciences is concerned with man's purposeful and useful intervention into the sea. The curriculum is interdepartmental, combining the resources of the Scripps Graduate Department, the Department of Applied Mechanics and Engineering Sciences, and the Department of Applied Physics and Information Science to produce oceanographers who are knowledgeable of modern engineering and engineers who know about the oceans. Instruction and research are not restricted to structural, mechanical, material, electrical, and physiological problems of operating within the ocean but include the applied environmental science of the sea as well. Since physical, chemical, geological, and biological aspects of the oceans and all forms of engineering may be involved, the curriculum provides maximum flexibility in meeting the needs of each individual student. Present research activities within the curricular group include studies of: deep circulation and deep fish populations; deep-sea autonomous vehicles, instruments, basic control devices and special collecting gear; seismic surveys of the mantle; ocean bottom microseisms and crustal displacements associated with earthquakes; surveys of bathymetric-magnetic trends; deep-sea drilling; design and construction of special purpose ocean vehicles (ships, submarines, platforms) such as FLIP; remotely operated cable-connected vehicles and stations on the sea floor; sonar systems and sonar signal processing equipment; underwater communication and signal detection; underwater photography and television; visibility by swimmers; underwater lasers; remote sensing of sea-surface temperature, roughness, and marine resources from aircraft and orbital spacecraft; meteorology above the oceans; turbulent flows, formation of barrier beaches; mechanisms of currents, sand transport and sediment transport in the surf zone, the shelf and in submarine canyons; diving and hyperbaric physiology. Studies of air-sea interaction, turbulence in mixing from FLIP, the University DC3 and ships of the Scripps' fleet.

Requirements for Admission

Candidates for admission should have a bachelor's or master's degree in one of the physical, biological, or earth sciences; in some cases a degree in mathematics or engineering science is accepted. The student's preparation should include:

1. Mathematics through differential and integral calculus.
2. Physics, one year with laboratory (the course should stress the fundamentals of mechanics, electricity, magnetism, optics, and thermodynamics, and should use calculus in its exposition).

3. Chemistry, one year with laboratory.
4. An additional year of physics or chemistry.
5. Biology and geology, minimum of one quarter each.
6. Preparation in at least one foreign language chosen from the following: German, Russian, a Romance language (French for the marine biology program).
7. Applicants for admission are required to submit scores on the verbal and quantitative tests of the Graduate Record Examinations given by the Educational Testing Service of Princeton, New Jersey.

Specific additional requirements for admission to the various curricular programs are as follows:

Biological oceanography — two years of chemistry, including general and organic chemistry (physical chemistry requiring calculus may be substituted for physics requiring calculus where a more elementary physics course was taken); a course in general geology, and a year of general biology (or zoology, or botany). Normal preparation should also include at least one course in three of the following categories: systematics (e.g., invertebrate zoology), population biology (e.g., ecology), functional biology (e.g., comparative physiology), morphology (e.g., embryology). In special cases other advanced courses in mathematics or natural sciences may be substituted for one or more of the above.

Marine biology — a major in one of the biological sciences (or the equivalent), with basic course work in botany, microbiology, or zoology; two years of chemistry, including organic (biochemistry and physical chemistry will be expected of students in experimental biology, although the student may, if necessary, enroll in these courses at UCSD after admission). Training in several of the following areas is strongly recommended: cellular biology, molecular biology, comparative physiology, genetics, developmental biology, ecology, comparative anatomy, vertebrate and invertebrate zoology, plant taxonomy. A strong scholastic record in a narrower biological field may be considered in lieu of breadth of background.

Marine chemistry — major in chemistry or biochemistry.

Geological sciences — major in one of the earth sciences or physical or inorganic chemistry. Physical chemistry with calculus is required, and preparation beyond the minimum requirements in mathematics, physics, and chemistry is strongly recommended.

Geophysics — major in physics or mathematics, or equivalent training.

Physical oceanography — major in a physical science, including three years of physics and mathematics.

Applied ocean sciences — major in physical science or engineering science, including three years of physics or applicable engineering and three years of mathematics at college level.

Candidates with preparation different from that given above can be admitted only if their undergraduate or previous graduate record has been outstanding.

Programs of Study

Because of limited facilities, the Department does not encourage students who wish to proceed only to the M.S. If circumstances warrant, the degree is normally offered under Plan II (comprehensive examination) after completion of course work established by the Department. See *Graduate Division Announcement: the Master's Degree*.

The program of study for the Ph.D. degree is determined in consultation with the student's adviser (after the first year, the chairman of his guidance or doctoral committee). General requirements of the curricular groups are as follows:

Biological Oceanography

The student will be expected to be familiar with the material presented in the following courses: SIO 210A, 240, 260, 270, 270L, 275A-275B, 276A-276B, 280, 280L, and either 293A or 294A. Other course work ordinarily will be recommended by the student's advisory committee, usually including at least one advanced-level course in physical, chemical, or geological oceanography. Participation in an oceanographic cruise (minimum of two weeks duration) is required.

Marine Biology

At the time of the student's departmental examination (no later than the second quarter of his second year), the student will be expected to demonstrate his competence in general biology and in the material covered in the following courses: SIO 210A, 260, 280, 280L and 289, as well as any other course work recommended by his advisory committee. All students are expected to enroll in a seminar during two quarters of each year.

Marine Chemistry

Students in this curriculum will be expected to take courses within the areas of physical and biological oceanography and marine geology or marine biology, as well as courses in the Department of Chemistry, which will be assigned according to personal needs after consultation with a faculty adviser.

Geological Sciences

There are no general course requirements under this curriculum, other than the four "basic courses" (SIO 210A, 248A-248B-248C, 260, and 280.) Additional courses to be taken in oceanography and related areas will be based on the needs of the individual student, as determined in consultation with his advisory committee. No more than 3

units per quarter of SIO 299 are permitted prior to passing the qualifying examination. In some cases these requirements may also include course work in selected subject areas at other campuses.

Geophysics

There is no single course of study appropriate for the geophysics curriculum; instead, the individual needs and interests of the student will determine the recommendations of his advisory committee with regard to course work in oceanography, earth sciences, and/or related areas. Each student, in the winter quarter of his second year of residence, must take a curricular examination (departmental). The examination is prepared and given by a committee composed of five members of the Geophysics curricular group. The examination covers the areas of the student's formal training, including undergraduate training, through the fall quarter of the second year of residence. There are no formal language requirements. However, a student's thesis adviser may require the student to demonstrate proficiency in foreign languages. Any student who can demonstrate the ability to translate, at sight, any two of French, German, or Russian into English cannot be required to demonstrate greater proficiency.

Physical Oceanography

Students in this curricular program will be expected to have a reading knowledge of German or Russian and to demonstrate proficiency in the subjects treated by the following courses: SIO 210A, 211A, 212A-212B, 214, 216A, 220, 223, 225, or 211B, 240, 260 and 290. Additional requirements chosen from oceanography or other fields will be based on the objectives and needs of the individual student.

Applied Ocean Sciences

Students must: (a) take or demonstrate their knowledge of four basic courses: SIO 210A, 240, 260 and 280; and (b) attend the Applied Ocean Sciences Seminar throughout their entire period of enrollment. Any additional course requirements will depend upon the needs and interests of each individual student and will be set by his advisory committee.

Language Requirements

The Department has no formal language requirements. Graduate students are expected to have satisfied the entrance requirement of preparation in at least one important foreign language. Within the Department, curricular programs may require demonstration of ability to use certain foreign languages pertinent to a student's research. All students must be proficient in English.

Departmental and Qualifying Examinations

Doctoral candidates normally will be required to take a departmental examination not later than early in the second year of study. The examination will be primarily oral, although written parts may be included. The student will be required to demonstrate in quantitative and analytical manner his comprehension of required subject material and of the pertinent interactions of physical, chemical, biological, or geological factors.

After the student has passed the departmental examination, and has completed an appropriate period of additional study, the Department will recommend appointment of a Doctoral Committee. This Committee will determine the student's qualifications for independent research, normally by means of a qualifying examination late in the second year of study or early in the third year, and will supervise the student's performance and reporting of his research.

The nature of the qualifying examination varies between curricular groups. In biological oceanography, marine biology, geological sciences, physical oceanography, and applied ocean sciences, the student will be expected to describe his proposed thesis research and satisfy the committee, in an oral examination, of his mastery of this and related topics. In marine chemistry, the student will be expected to present, in an oral examination, both a major and a minor proposition. The major proposition will consist of a statement of an original research problem or scientific idea within his area of interest. He should be prepared to discuss the theory and experimental techniques that may be involved, the significance of the proposition, and its relationship to previous knowledge. The minor proposition should consist of a research problem or scientific idea outside the student's main field of interest. In geophysics, the student presents an original research problem, in the form of a written proposition, to his candidacy committee. The student's oral presentation and defense of his proposition completes the examination.

Dissertation

A requirement for the Ph.D. degree is the submission of a dissertation and a final examination in which the thesis is publicly defended. It is expected that each doctoral candidate will submit a manuscript based on his dissertation for publication in a scientific journal.

Special Financial Aids

In addition to teaching and research assistantships, fellowships, traineeships and other awards available on a campus-wide competitive basis, the Department has available a certain number of fellowships and research assistantships supported from research grants and contracts, or from industrial contributions.

COURSES

UPPER DIVISION

199. Special Studies (2 or 4) Independent reading or research on a problem by special arrangement with a faculty member. Prerequisite: consent of instructor.

GRADUATE

207A-207B. Problems in General and Physical Oceanography (2-2) W-S Presentation of reports, review of literature, and discussion of various regions and aspects of the ocean, oceanography, and related fields. Seminar.

208. Oceanography Field Course (2-4) F-W-S Methods of measurement, observation, and sampling used at sea; oceanic cruise dealing with problems of current interest; analysis and interpretation of results with a report. Prerequisites: SIO 210A, 240, 260, 270A.

209. Special Topics (1-4) F-W-S Within the next few years, lectures on various special subjects will be offered by members of the staff. The emphasis will be on topics that reveal the interdependence of the biological, chemical, geological, and physical processes operating in the oceans. (Satisfactory/Unsatisfactory grades permitted.)

210A. Physical Oceanography (3) F Physical description of the sea; physical properties of seawater, methods and measurements, boundary processes, regional oceanography. Prerequisites: the mathematics and physics required for admission to the graduate curriculum in the Scripps Institution of Oceanography (see text), or consent of instructor.

210B. Physical Oceanography F Introduction to mechanics of fluids on a rotating earth; transport and boundary-layer phenomena, turbulent flow, and wave motion; emphasis on applications to biological, chemical, and geological oceanography. Prerequisites: SIO 210A and consent of instructor.

211A-211B. Ocean Waves (3-3) W-S Propagation of waves, long waves, internal waves, generation by wind, action of surf, effects of earth rotation. Nonlinear aspects of wave motion. Prerequisite: SIO 210B or consent of instructor.

212A. Dynamical Oceanography W Dynamics of ocean currents: transport phenomena; geostrophy; inertial motion; free, steady motion in a two-layer system. Prerequisites: differential equations and consent of instructor.

212B. Dynamical Oceanography S Turbulent boundary layers at sea surface and bottom; wind currents and theories of ocean circulation; applications of boundary layer techniques. Prerequisites: SIO 212A and consent of instructor.

213A-213B. Radiative Transfer in the Sea (2-3) F-W Geometrical radiometry; radiant energy measurements; example of light fields; effects of air-sea boundary and scattering-absorbing on underwater light fields; experimental and theoretical determination of optical constants in the sea. Application: underwater visibility, marine biology, radiant energy transport problems. Prerequisite: consent of instructor.

214. Introduction to Fluid Mechanics (3) F A survey of classical problems in laminar flow and approximate techniques of analysis. Topics include the equations of motion; parallel viscous flows; low Reynolds number flow; inviscid flow and boundary layers; wave motion. Prerequisite: consent of instructor.

216A-216B. Physics of Sediment Transport (3-3) W-S Mechanics and energetics of sediment transport by water, wind, waves, and density flows. Application to the near-shore environment and to the formation of sedimentary structures. Laboratory and field demonstrations. Prerequisite: consent of instructor; SIO 214, 211B recommended.

219. Special Topics in Physical Oceanography (1-4) F-W-S

220. Topics in Geophysical Continuum Mechanics (3) Mathematical foundations, physical limitations and selected geophysical applications of continuum mechanics. Topics include finite strain; thermodynamics of stress-strain relations; phenomenology and mechanisms of dissipation; continuum theory of dislocations; and generation and propagation of elastic waves in a nearly homogeneous medium. Prerequisites: differential and integral calculus, differential equations, linear algebra.

221. Topics in Geophysical Fluid Dynamics (3) W Effects of viscosity, density gradients, and gravitational and electromagnetic fields on fluid motion. Topics include forced and free convection and percolation, Alfvén waves, and the theory of the origin and secular variation of the earth's magnetic field. Prerequisite: SIO 220.

222A-222B. Hydrodynamics (3-3) Applications of hydrodynamics to the motion of stratified fluids, such as the atmosphere and oceans. Internal waves, steady currents, and related phenomena. Prerequisite: consent of instructor.

223. Geophysical Measurements (3) W Design of geophysical experiments and analysis of geophysical measurements, interpretation of geophysical time series; wave number filters, theory of arrays, geophysical systems analysis. Prerequisite: elementary complex variables.

225. Tides and the Rotation of the Earth S Tide-generating potentials, static and dynamic theory of ocean tides (surface and internal), bodily tides, atmospheric tides, tidal friction and the length of day. Prerequisite: consent of instructor.

226A-226B. Internal Constitution of the Earth (3-3) Study of the physical nature of the Earth's interior revealed by observations of seismic waves, gravity and geomagnetic fields, electrical conductivity, heat flow, and related information

from various geological sciences. Fundamentals of geophysical techniques of observation and analysis. Critical discussion of current knowledge. Prerequisites: calculus and differential equations, basic physics.

227A-227B. Seismology (3-3) Equation of motion, exact transient solution of canonical problems, interface pulses, geometrical diffraction theory, ray theory and mode theory in plane-layer media, free oscillations of the Earth, radiation from moving sources, source determination, anisotropic and heterogeneous media, dissipation, interpretation problems. Prerequisite: consent of instructor.

229. Geomagnetism (3) Survey of the application of electromagnetic theory to the solid earth, the main geomagnetic field, the dynamo model of its source, implications of the dynamo theory, induction by external variations, the electrical conductivity inverse problem and its solution, electromagnetic anomalies, induction in simple bodies, induction in the oceans, magnetotelluric theory. Prerequisites: advanced calculus, differential equations, complex variables and familiarity with Maxwell's equations, or consent of instructor.

230. Introduction to Inverse Theory (3) W Linear theory of Backus and Gilbert; non-linear theory, which is an approximation based on the linear solution; Backus' inference treatment and the instructor's own variational methods. Examples will be drawn from gravity, geomagnetism and seismology. Prerequisite: consent of instructor.

231A-231B. Seismological Methods (3) F-W Problems and techniques in seismology, seismic wave propagation, free oscillations of the earth, earthquake source mechanism, seismogram analysis, instrumentation. Prerequisite: consent of instructor.

232. Interpretation of Seismograms (1) W Principles and practice in the interpretation of seismograms. A variety of seismogram types will be analyzed in detail. Prerequisite: consent of instructor.

240. Marine Geology (3) W Introduction to the geomorphology, sedimentation, stratigraphy, volcanism, structural geology, tectonics, and geological history of the oceans. Prerequisites: the physics, chemistry, and geology required for admission to the graduate curriculum in SIO, or consent of instructor.

241. Continental Margin Sediments (3) F Lectures, reading, and discussion of Quaternary sediments, environments of deposition, and physiography of the continental margin, including the shore zone, continental shelf and slope, deep sea fans, and continental rise. Prerequisite: SIO 248 or consent of instructor.

242A-242B. Marine Micropaleontology (3-3) W-S Introduction to the ecology of Foraminifera, with applications to problems of oceanography and paleoceanography. Prerequisites: SIO 240 or consent of instructor for 242A; 242A for 242B.

243. Marine Stratigraphy (3) F Principles of stratigraphy as applied to marine environments; laboratory study and interpretation of microfossils in oceanic sediments. Prerequisite: SIO 240 or consent of instructor.

244. Marine Geophysical Exploration (3) F Methods of geophysical exploration (primarily seismic and acoustic) on land and sea, with emphasis on field methods and interpretational assumptions and techniques.

245. Sedimentary Petrology (3) W Characteristics and origin of sediments and sedimentary rocks. Prerequisite: consent of instructor.

246A. Problems in Paleocceanography (2) S Discussion of current research concerning the physics, chemistry, and biology of ancient oceans. Seminar.

246B. Biogenous Deep-Sea Sediments (3) A survey of the biology and chemistry of fossils in deep-sea deposits, and of factors controlling their distribution. Laboratory: introduction to ecological and preservational analysis of biogenous remains.

247. Tectonics (3) The large scale structural and morphological features of continents and ocean basins, crustal deformation, oceanic rises, mountain-building, permanency of continents.

248A-248B-248C. Seminar in Marine Geology (3-3-3) F-W-S An advanced discussion of the geomorphology, sedimentation, stratigraphy, volcanism, structural geology, tectonics, and geological history of the oceans. Prerequisites: the requirements for admission to the Geological Sciences Curricular Group of the Scripps Institution of Oceanography or consent of instructor.

249. Special Topics in Marine Geology (1-4) F-W-S

250. Geochemistry (3) S The chemistry of low temperature mineral-water systems. Calculation and representation of equilibrium and of reacting systems. Electrolyte chemistry of natural waters. Application of methods developed to chemistry of weathering, underground waters, lakes, marine environments.

251. Thermodynamics of Natural Processes (3) W Applications of thermodynamics to general problems in the earth sciences. Topics include chemical and phase equilibria in heterogeneous multicomponent systems; properties of substances at high temperatures and pressures; models for solid solutions and gaseous mixtures; phase equilibria in silicate melts; adiabatic and pseudo-adiabatic transport; steady-flow systems; closed and open system models of the atmosphere, oceans, and solid earth. Prerequisites: Chemistry 102A or 202A, or Physics 140, Mathematics 2D or equivalent.

252A. Nuclear Geochemistry (3) Geochemistry of stable and radioactive isotopes, with emphasis on oceanic and atmospheric applications. Topics include mixing and circulation studies in the ocean, atmosphere-sea interaction, the carbon cycle, volcanic contributions to the atmosphere and ocean, isotope fractionation effects

and stable isotope variations in minerals and rocks. Prerequisites: Mathematics 20 or equivalent, SIO 210A.

252B. Nuclear Geophysics (3) S Natural radioactivity on the earth; artificial radioactivity on the earth; radioactive nuclei as tracers or tools for studying earth sciences and meteoritics; experimental data and information to date.

253A. Igneous and Metamorphic Petrology (3) W Physical, chemical and mineralogic properties of igneous and metamorphic rocks. Emphasis is on the origin and genetic relationships as interpreted from field occurrences, theoretical studies and experimental data. Prerequisites: physical geology, geochemistry, mineralogy, physical chemistry (may be taken concurrently).

253B. Mineralogic and Petrographic Laboratory (2) F Principles of optical mineralogy and their application to the study of rocks and minerals. Principles of X-ray diffraction and fluorescence, mineral separation techniques, sample preparation. Emphasis is placed on practical application of techniques to the study of sediments, rocks, and minerals. Prerequisites: physical geology, geochemistry, mineralogy, physical chemistry (may be taken concurrently).

254. Advanced Igneous Petrology (3) S The origin and evolution of igneous rocks is considered in terms of field and laboratory evidence. Experimental and theoretical studies bearing on igneous processes are discussed and evaluated in the light of geologic occurrences. Special emphasis is given to igneous rocks of the ocean basins and their margins. Typical rock types are analyzed in the laboratory and their history is interpreted. Prerequisite: consent of instructor.

255. Crustal Evolution (3) W The properties, origin, and evolution of the rocks in the earth's crust. Prerequisite: one year of graduate study in Scripps Institution of Oceanography or consent of instructor.

256A. Field Geology (4) W Mapping of a field area and preparation of a geological report. Principles of stratigraphy and descriptive structural geology are outlined in the lecture room and in the field. Field work is done on weekends in a local area. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

256B. Earth Sciences Spring Field Trip (1) S Classical areas of the southwest United States, such as the Colorado Plateau, Mojave Desert, Sierra Nevada and the Peninsular Range, are examined in successive years during six-day field trips. Normally required of all first- and second-year graduate students in marine geology. (Satisfactory/Unsatisfactory grades permitted.)

256C. Earth Sciences Summer Field Course (6) Participation in a department summer expedition for four to six weeks. Field studies in geology, geochemistry and geophysics are conducted at sea and on islands and coastal regions. Areas recently studied include Central America and the Caribbean, Easter Island, the southeastern Pacific, the western Mediterranean and Melanesia. (Satisfactory/Unsatisfactory grades permitted.)

257. Seminar in Petrology (3) Discussions of current research in petrology and mineralogy.

258. Seminar in Geology (3) F-W-S Discussions of current research and special topics in geology not treated in the general courses.

259. Seminar in Geochemistry (3) F-W-S The subject matter will vary from year to year and will normally cover an area of geochemistry not treated extensively in other courses.

260. Marine Chemistry (3) W Chemical description of the sea; the distribution of chemical species in the world oceans, and their relationships to physical, biological, and geological processes.

261. Physical Chemistry of Seawater (3) The consideration of seawater as an electrolyte solution with emphasis upon its structure and physical-chemical properties. Thermodynamic considerations of mixed electrolyte solutions with particular reference to seawater. Prerequisite: Chemistry 202A.

262. Major Sedimentary Cycle (3) W Role of the oceans in the major sedimentary cycle, with emphasis upon the interaction of the oceans with the atmosphere, biosphere, and sediments. Geochronologies in the sedimentary cycles.

263. Major Chemical Cycles in the Sea (3) S The distribution of chemical species in the world oceans and their relation to physical and biological processes, with emphasis on transport and exchange.

264. Solids in Nature (3) W Experimental and theoretical evaluation of geologically important properties of solids. Characteristic differences between solid types, electronic structure of solids microscopic significance of thermodynamic concepts. Interaction between matter and radiation, structure of geologically important crystals and glasses, order and disorder. Band structure of solids, excited states, the dynamics of phase change. Conductivity, magnetic and optical properties of solids, with particular consideration of geological systems. Prerequisite: consent of instructor.

265. Chemistry of Natural Products (3) W Topics will be chosen from the following headings: classification of organic natural products, applications of spectroscopy to structure determination, biosynthesis and synthesis of natural products, chemical ecology and natural products from the marine environment. Prerequisites: undergraduate organic chemistry or biochemistry.

266. Geochemistry of Organic Compounds (3) S Distribution, sources, and stability of organic compounds in the geological environment. Major emphasis will be on the synthesis of organic compounds on the primitive earth; organic material in

ancient rocks and sediments; and the cycle of organic material in the sea. Prerequisite: organic chemistry; (biochemistry recommended).

267. Management of the Marine Environment F Definition of problems involving man's alteration of the chemistry of the ocean. The relative contributions of man and of other natural inputs to the marine environment will be compared. Problems in the national and international management of ocean resources will be dealt with. Prerequisite: open to second year SIO students.

268. Seminar in Marine Chemistry F Discussion of topics related to the chemistry of the marine environment not treated in general courses.

269. Special Topics in Marine Chemistry (1-4) F-W-S

270. Biological Oceanography: Processes and Events (3) W An analysis of the concepts and theories used to explain the biological events observed in the ocean. Prerequisites: SIO 210A, 280 or the consent of instructor.

270L. Laboratory in Biological Oceanography (2) S Laboratory and discussion of the phylogeny, comparative morphology; life histories and taxonomy of marine organisms. Emphasis will be placed on planktonic groups. Prerequisite: SIO 280 (or concurrent registration), or the consent of instructor.

272. Oceanic Zoogeography (3) S The patterns of distribution and abundance of oceanic organisms; the nature of oceanic habitats; the relation of zoogeography to paleoceanography. Lectures, student reports, and discussions. Prerequisite: SIO 240 and 270 recommended.

273. Introduction to Animal Behavior (3) F Sensory capacities, instinct, and learning; a comparative examination of the relative importances of concurrent stimuli, inherited neural and motor organization, and the modification of central organization by past experience (including biorhythmicity), in determining animal behavior. Emphasis, where possible, on ecologically oriented studies and on studies involving invertebrate animals.

275A-275B. Marine Ecology (3-3) W-S Single-species population dynamics and interspecific relationships in communities; theory, observation, and interpretation. Behavior, environmental factors, and productivity as they relate to the distribution and abundance of organisms. Prerequisite: SIO 280.

275C. Topics in Community Ecology (3) W Maintenance of community structure, with special emphasis on the importance of competition, predation, energetics, and stability as they affect patterns of distribution and abundance; interrelationships between community structure and population phenomena such as trophic specialization, reproductive strategies, and life histories. Prerequisite: consent of instructor.

276A-276B. Applied Statistics (3-3) Methods of statistical analysis, including both parametric and nonparametric procedures; sampling and design of experiments, with emphasis on those procedures particularly useful in marine studies. Prerequisite: the mathematics required for admission to SIO or consent of instructor.

277. Deep-Sea Biology (2) The ecology, zoogeography, taxonomy, and evolution of deep-sea organisms, with emphasis on the benthos. Prerequisite: consent of instructor.

278. Problems in Biological Oceanography (2) F-W-S Presentation of reports, review of literature, and discussion of current research in biological oceanography. Seminar.

279. Special Topics in Biological Oceanography (1-4) F-W-S

280. Marine Communities and Environments (3) F Marine environments and their effects on ecological processes and community structure; distribution patterns, adaptations, and evolution of marine organisms. Prerequisites: bachelor's degree in science or consent of instructor; concurrent registration in SIO 280L required for students in marine biology and biological oceanography curricula.

280L. Laboratory in Marine Organisms (2) F Laboratory and discussion of the phylogeny, comparative morphology and taxonomy of the major groups of marine organisms. Prerequisite: registration in SIO 280.

281. Environmental Physiology and Biochemistry of Marine Organisms (3) W Emphasis on adaptation to environmental factors such as temperature, pressure, and salinity. Prerequisites: adequate training in biology and physical sciences, and consent of instructor.

282. Physiology of Marine Vertebrates (3) W Fundamental aspects of comparative physiology. Included are studies of the physical-chemical basis of living systems and the principles and adaptations of animal function. Prerequisite: bachelor's degree in science or consent of the instructor.

282L. Laboratory in Physiology (4) W Research techniques and problems in selected areas of environmental physiology.

283. Isotope Tracer Techniques and Related Topics in Physiology (3) W Biological transport and related processes as determined by isotope tracers. Laboratory includes methods of measuring radioactive and stable isotope tracers, and tracer experiments in marine organisms. Prerequisite: consent of instructor.

284. Cell Physiology of Marine Organisms (4) W Deals with (1) how methods of cell biology can solve problems peculiar to marine animals and (2) how marine animals provide favorable systems for elucidation of general problems of cell biology; laboratory includes training in electron microscopy, cytochemistry and autoradiography. Prerequisites: basic courses in biology and chemistry; consent of instructor.

285. Marine and Comparative Biochemistry (3) S Biochemistry of major products of marine organisms, with emphasis on carbohydrates and lipids. The current concepts of their structural and physiological function will be presented and discussed. Prerequisites: organic chemistry required, physical chemistry and biochemistry recommended.

285L. Methods in the Comparative Biochemistry of Marine Organisms (4) S Emphasis on biochemical techniques of usefulness to marine biologists. Techniques to be covered include: enzyme purification and assay; starch and acrylamide gel electrophoresis; ultracentrifugation; and ion exchange chromatography. Prerequisites: adequate training in biology and biochemistry, and consent of instructor.

286. Cellular Structure and Biochemical Function (3) Lectures and laboratory studies of subcellular structures and their function in cell metabolism. Experiments involving techniques for isolation and biochemical assay with special reference to marine organisms. Prerequisites: preparation in biology and biochemistry; consent of instructor. SIO 285 and Biology 201 are recommended as background.

287. Marine Microbiology W Ecology, biochemical activities, and methods of studying microorganisms in the sea. Emphasis will be on bacteria. Prerequisite: consent of instructor.

288A-288B. Ecology of Shore Microbes (3-3) Field and laboratory investigations of the ecology, physiology, and metabolic activities of marine littoral microorganisms: algae, bacteria, fungi, and protozoans. Special methods of isolating and culturing selected organisms, individual research projects. Prerequisites: preparation in biological sciences, including physiology or microbiology. Introductory courses in chemistry and biology of the sea are recommended.

289. Marine Plants (3) W they play in the ecology of the seas. Prerequisite: consent of instructor.

291. Physiology of Marine Algae (3) S Lectures and laboratory in comparative physiology of algae with emphasis on marine problems. Prerequisites: basic courses in biology and chemistry.

292. Developmental Biology of Marine Organisms (5) W A survey of developmental patterns, and their experimental modification, in selected groups of marine organisms. Emphasis will be on the morphogenesis, physiology and biochemistry of development, larval adaptation and evolution. Prerequisite: SIO 280 or consent of instructor.

293A. Advanced Invertebrate Zoology (4) The natural history, zoogeography, taxonomy and phylogeny of invertebrates. Prerequisite: consent of instructor.

293B. Advanced Invertebrate Zoology (4) W The natural history, zoogeography, taxonomy and phylogeny of the arthropods, with emphasis on marine forms. Prerequisite: consent of instructor.

294A. Biology of Fishes (4) S The comparative evolution, morphology, physiology, and ecology of fishes. Special emphasis on local and deep-sea and pelagic forms in laboratory. Prerequisite: graduate standing or consent of instructor.

294B. Seminar in Advanced Ichthyology (2) F-W Discussion of special topics related to ichthyology. Prerequisite: graduate standing or consent of instructor. (Satisfactory/Unsatisfactory grades only.)

296. Special Topics in Marine Biology (1-4) F-W-S

297. Marine Biology Seminar (1) F-W-S A seminar dealing with various topics in the biological sciences. Lectures given by visiting scientists and resident staff and students. (Satisfactory/Unsatisfactory grades only.)

298. Special Studies in Marine Sciences (1-2) F-W-S Reading and laboratory study of special topics under the direction of a faculty member. Exact subject matter to be arranged in individual cases. Prerequisite: graduate standing. (Satisfactory/Unsatisfactory grades permitted.)

299. Research (1-12) F-W-S (Satisfactory/Unsatisfactory grades permitted.)

SOCIOLOGY

Office: 7001 Humanities and Social Sciences Building

Aaron Cicourel, Ph.D., Professor of Sociology

(Chairman of the Department)

Joseph R. Gusfield, Ph.D., Professor of Sociology

Jack D. Douglas, Ph.D., Associate Professor of Sociology

Randall Collins, Ph.D., Assistant Professor of Sociology

Hugh B. Mehan, Ph.D., Assistant Professor of Sociology

Paul Wong, Ph.D., Assistant Professor of Sociology

Bennetta Jules-Rosette, M.A., Acting Assistant Professor of Sociology

Kenneth H. Jennings, M.A., Acting Assistant Professor of Sociology

Bruce C. Johnson, M.A., Acting Assistant Professor of Sociology

Anthony Ngubo, M.A., Acting Assistant Professor of Sociology

Gail M. Omvedt, M.A., Acting Assistant Professor of Sociology

Reyes Ramos, M.A., Acting Assistant Professor of Sociology

Will Wright, M.A., Acting Assistant Professor of Sociology

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The Major Program for Undergraduates

The following required program is in operation for undergraduates with a major concentration in Sociology:

Required Courses:

1. A total of fifteen courses in Sociology, including IA - IB and other required courses. In fulfilling this requirement students may offer up to four upper-division courses from among the regular offerings in the Departments of Anthropology, Economics, History, Political Science and Psychology.
2. Sociology IA - IB. This sequence is required for most upper-division Sociology courses and should be taken as soon as possible. (Students who have previously taken Sociology 10, 11, and 12 may substitute them for IA - IB.)
3. Sociology 102 (Explaining Human Behavior)
4. Any one course from each of the following cluster areas:
 - a) Social Organization and Institutions: Sociology courses numbered 110-119.
 - b) Social Interaction: Sociology courses numbered 100-108 not including Sociology 102.
 - c) Social Change and Control: Sociology courses numbered 120-142.
5. It is strongly recommended that among the courses offered for concentration the student include at least one Senior Seminar (Sociology 190). Such seminar may be included in the appropriate cluster area.
6. One Independent Study (Sociology 199) will be allowed to count toward a major. It is highly recommended that this be taken on a pass/fail basis. 199 courses from other departments will not be accepted for credit toward the major.
7. Students may take no courses, except Sociology 199 and 109, for pass/fail credit toward the major.

THE GRADUATE PROGRAM

The Department of Sociology offers courses leading to degrees of C. Phil. and Ph.D. The program emphasizes the analysis of natural settings in studying social interaction and the comparative and cross-cultural study of social change.

THE PROGRAM

A. Admission

Qualified and interested students may be admitted from a broad range of undergraduate preparations, including the sciences as well as humanities and the social sciences. Adequate preparation for graduate work in Sociology varies considerably with individual cases and no specific courses are prerequisites.

B. Candidate in Philosophy Degree

The Department will grant a Candidate in Philosophy Degree to students after they pass the oral qualifying examination leading to the Ph.D. This degree indicates successful completion of all graduate work except the doctoral research and dissertation, and special requirements pertinent to the doctoral research.

C. Doctor of Philosophy Degree

The training program is predicated on a division between levels of sociological knowledge. The initial year is largely concentrated on development of overall knowledge of sociology as a means for uniting theory, empirical studies, and methods of investigation. The second year is chiefly concentrated on the development of depth in specific fields. The third year is the formulation and execution of a Ph.D. study. Under normal circumstances, it is anticipated that a candidate will complete his dissertation in approximately 3-4 years after entrance to the graduate program.

At the core of the program is a group of 6 one-quarter courses integrating theoretical materials with empirical studies and providing instruction in practical methods of conducting research. These courses will occupy approximately 2/3 of a normal program during the initial year of graduate study. The purpose of the core curriculum is to provide the student with an introduction to the major theoretical ideas and issues in sociology; classics of research that have been carried out in response, or as the result of, these basic ideas, and finally to provide the student with an understanding of the methods and techniques used in developing such research. As a further means of achieving its goals, the course provides practice in a variety of methods of data collection and analysis, including participant observation, field study observations, interviewing, survey data-collection and analysis, and the use of appropriate statistical techniques, and historical research.

The remainder of the program will require a minimum of three courses in a department or departments other than Sociology and the development of a depth in three areas of specialization, as designated in consultation with a faculty advisor. No specific courses are prescribed for specializations since these will be arranged by combinations of formal seminars, independent study and tutorial.

Areas of specialization currently available through present and expected members of the staff are political sociology; complex organizations; mass culture; sociology of science; sociology of education; social movements; collective behavior; occupations and professions; deviance; social stratification; comparative race and ethnic relations; sociology of everyday life; modernization and new nations; sociolinguistics; cognitive sociology; sociology of religion; social change; medical sociology; computer applications in sociology.

During the initial year, the student will be expected to complete examinations based

on the content of the core curriculum and, in addition, complete research papers in connection with these courses. On the basis of this and his other work, each student will be evaluated by the department in a written statement of evaluation at the end of his or her first year.

For Ph.D. candidacy, the Department requires a minimum of three consecutive quarters of residence, with a minimum registration of three courses per quarter.

The Department also requires that all students who have not had previous experience in undergraduate teaching participate in the Department's undergraduate program as Teaching Assistants under supervision of department faculty.

Qualifying Examination

An oral examination will be conducted by the student's Doctoral Committee. It is based on knowledge of three areas of specialization and a written statement proposing a specific research study as the basis for the Ph.D. dissertation. In evaluating the student's admission to candidacy, the faculty will also consider his previous written work as represented by three papers chosen by the candidate and filed with his committee. Typically the Qualifying Examination is taken early in the Fall of the student's third year of graduate work.

Dissertation Research and Preparation

The nature and requirements for dissertation research will vary greatly, depending upon the specific problem chosen. Following approval of the proposed research, the student is to undertake the study in frequent communication and consultation with his or her committee. The final thesis and summary will be deposited with the department one month before the final examination.

Final Examination

Approximately one month after completion, the student will take a final, oral examination based on his dissertation, and conducted by his committee. The examination will be open to all faculty and students in the department.

COURSES

LOWER DIVISION

IA - IB. Sociological Analysis F-W An introduction to the major ideas, concepts, and methods in the study of societies; social interaction and social structure: the construction and acquisition of social roles and organizations; major institutions and processes of change. To be taken in sequence.

10. American Society S An introduction to American society in historical and world perspectives, touching on the following topics: the American cultural tradition; industrialization, capitalism, and the welfare state; careers, work, and leisure; the changing forms of family and kinship stratification; the distribution of wealth, power and prestige; politics; community, national, and international; ethnic and racial groups; the changing positions of religion, education, the mass media, and the arts; predicting future trends.

UPPER DIVISION

Prerequisite: Sociology IA - IB or consent of instructor. Additional prerequisites may be specified below.

100. Sociology of Everyday Life S A general introduction to the objective observation, description and analysis of everyday life. The aim of the course is to demonstrate the theory and method of observation by which studies of everyday experience become information basic to the study of society.

101. Sociological Investigations A basic course on the relations between sociological theory and field research. There is a strong emphasis on the theory and methods of participant observation. Students will write a paper using these methods.

102. Explaining Human Behavior F An investigation of the fundamental, theoretical issues in sociology. There will be special consideration of the theoretical issues concerning change and conflict in a complex, pluralistic society such as American society.

103. The Acquisition of Social Rules S The course examines "socialization" as the acquisition of rules by children and others new to social groups. The course further examines the development of adult social competence.

104. Communications An analysis of the construction of messages in television and newspapers. The major emphasis will be on the development of the news media and the construction of news messages.

105. Popular Culture An historical and comparative analysis of selected forms of the transmission of cultures. The major emphasis will be directed toward the understanding of the leisure and artistic activities in contemporary mass societies.

106. Introduction to Sociolinguistics F Investigation of the fundamental relations between the forms of language and other aspects of human social order. Special emphasis is given to the interaction between selected modes of language investigations and theories of social cognition and behavior. Prerequisites: Sociology 100, 101 or consent of instructor.

107. Advanced Sociolinguistics S A review of recent approaches to the study of language and how their respective methods make the phenomena available. Demonstrations and projects focus on the productive and perspectival nature of language representation systems. Prerequisite: one course in sociolinguistics or consent of instructor.

108. Sociology of Culture A study of the concept of culture, its origins, and

its applications primarily to modern societies. Included will be discussions of the role in society of various symbolic systems, such as art, science, myths, history, language.

109. Special Topics F-W-S Devoted to specific topics, interest in which has jointly developed among a small group of students and an interested faculty member. Prerequisite: one sociology course. May be repeated for credit.

110. The Family The institution of family in the United States and other societies. Types of family and kinship systems and their relation to social change and social structures; functions of families in modern and pre-modern societies; related topics.

111. Organizations Determinants of organizational structure; the effects on organizational and individual behavior. Formal and informal structures; effects on goals and values. Industrial organizations; governments; voluntary associations; schools, prisons, hospitals, communities as organizations; professions; the organization of science.

112. Social Stratification W The causes and effects of social rankings in various societies. Theories of stratification; the dynamics of informal social groupings; determinants of institutional power; and the nature of struggles for power; the distribution of wealth and its causes; the dynamics of social mobility; the effects of stratification on life styles, culture and deviance.

113. Occupations and Professions Analysis of the social organization of work in modern societies, the concept of career, the development of professionalization. Occupational subcultures; work, leisure and alienation; social relationships of work groups in organizations; human relations in work situations; professional and occupational associations.

114. Sociology of Economic Life The interrelations between economic institutions and the culture and social structure of modern societies; role of industrialization in social change; analysis of economic power, market, corporate organizations; business as a cultural form.

116. Sociology of Education The relationship between the child's language socialization and the teacher's conception and implementation of the curriculum. Special attention will be given to the social organization of psychological testing and classroom evaluation. Prerequisites: Sociology 1A and 1B or consent of instructor.

117. Comparative Educational Systems The social organization of elementary, secondary and higher education in historical and comparative perspectives. Topics include the relationship of education to stratification, student culture, politics, science and scholarship, and economic development. Education is considered in American, European and non-Western societies. Prerequisite: upper-division status.

120. Urban Social Problems S Concerns the facts and theories of contemporary social problems in urban America. The emphasis will be on social problems, not on urbanism.

121. Sociology of Deviance, Law and Crime W Concerns the fundamental problems of rule-making and the uses of rules especially laws. Such subjects as addiction, marijuana use and suicide will be considered.

122. Sociology of Law Functions of law in society; social source of legal change; social conditions affecting the administration of justice; role of social science in jurisprudence.

123. Study of Social Problems Course will critically examine the sociological theories of social problems and present a systematic theory of social problems. The students will do a research project on such problems as drugs, crime, urban crises, etc., to critically assess the value of the systematic theory. Prerequisites: Sociology 1A and 1B or consent of instructor.

130. Modernizing Societies and New Nations F Analysis of social change in contemporary societies undergoing transformation from peasant to industrial forms and from colonial to national status. Relationship between economic development and cultural change. Special reference to political institutions, social movements and class-caste structure in contemporary Asia.

131. Technology and Social Change The impact of technological change on social institutions and processes; the social structure of technical discovery, invention and acceptance in modern and developing societies; the ethical and social issues emerging from technological change.

132. Societies and Cultures in the Modern World F-S Comparative study of the institutions and cultures of diverse societies with special emphasis on non-European cultural and social systems; social and ethical issues in change; methods of comparative analysis; institutions in peasant and industrial societies; cross-national differences.

133. Social Change W A general introduction to processes of change in modern societies and new nations. Major theories of change; major contemporary trends; conflicts and movements of change; role of technology, ideas and institutional change.

134. The City of San Diego S A research-oriented course on the institutions and sub-communities of San Diego. Readings will be drawn from the sociological studies of urban communities and from studies on the political structure of American cities. Lecturers will include people from the political and planning agencies of the city and its subcommunities. Students will work on individual or joint projects. Prerequisite: sociology majors with upper-division status.

135. Comparative Race and Ethnic Relations F An historical and comparative analysis of race and ethnic relations in the United States, western Europe and Asia. The course will analyze the origins of slavery, the various approaches to

minority community development and the causes and consequences of discrimination and prejudice in various national settings.

- 136. The Chicano Community F** Origins of the Mexican-American immigrant in rural Mexico; context of contact; patterns of settlement in the United States; the Mexican community, social structure and social change; acculturation and generational patterns; community leadership and change. Prerequisites: Sociology 1A and 1B or consent of instructor.
- 140. Social Protest F** Violence and Protest. The anti-war movement; student protest; black militancy; racial attitudes in America; white militancy; police and judicial response to protest; the theory of collective behavior as an interpretation of protest; counter-insurgency as a societal response.
- 142. Forms of Social Control F** The organization, development and mission of social control agencies in the 19th and 20th centuries, with emphasis on crime and madness; agency occupations (police, psychiatrists, correctional work, etc.); theories of control movements.
- 143. Power in American Society S** The concept of power: definitions, types and social locations. Review of the literature on power structures, local and national, in the United States. Evaluation of the several approaches to power structure (pluralist, power elite, ruling class). Analysis of such related topics as normal politics vs. crisis politics, and agencies of change in American politics. Prerequisites: Sociology 1A and 1B or consent of instructor.
- 150. History of Social Thought** Major figures and schools from early 19th century through the present, including Comte, Marx, Tocqueville, Spencer, Durkheim, Weber, Simmel, Freud, Sumner, Mead, Park, Parsons, and Mannheim.
- 151. Sociological Theories** An analysis of leading theories of sociology with an emphasis on contemporary perspectives. Theoretical issues include functionalism, ethnological bases of sociology, Marxism, systems analysis and the problem of objectivity. Prerequisite: senior standing or three sociology courses.
- 152. Myth and Symbols in Society W** A study of the contribution of mythical symbols and narratives to the establishment of social meanings and behavior in primitive and modern societies. Included will be a review of different theories of myth and narrative, such as those of Levi-Strauss, Cassirer, and Propp.
- 153. Sociology of Knowledge** The analysis of political ideology and its relationship to forms of scientific thought, especially of the social sciences. The analysis of the social influences and institutions affecting the development and transmission of knowledge, including the analysis of universities, communications agencies, and markets for popular and high culture.
- 180. Designs of Sociological Research S** This course will acquaint students with a variety of sociological methods of quantitative research. The course will: (1) teach students how to understand tabular presentations of quantitative materials, (2) provide a basis of evaluating different studies, and (3) present strengths and weaknesses of different research designs. Prerequisite: Sociology 102 or consent of instructor.
- 181. The Structure of Sociological Method W** An investigation of selected sociological methods viewed as idealized prescriptions for adequate scientific procedure and as incomplete descriptions of actual research occasions. These occasions as social events are analyzed with the theories they are usually used to test. Prerequisite: one upper-division sociology course.
- 187. Cinema of Dissent** A study of the cinema as a method of dissent and as a medium for the analysis of race and class relationships. Included will be films which reveal and challenge accepted attitudes toward minority groups and social classes and describe lives and social relationships in Third World communities. Films will be shown, with discussion, and readings will be required.
- 190. Senior Seminar W-S** A research seminar on special topics of interest to available staff; provides majors and minors in sociology with research experience in close cooperation with faculty. Prerequisites: senior standing plus three sociology courses or consent of instructor. May be repeated for credit.
- 191. Youth in American Society** A seminar on recent research in the development of youth as a social category, including the analysis of student and youth movements and subcommunities and generational conflict in the United States and elsewhere. Prerequisite: one upper-division sociology course.
- 199. Independent Study F-W-S** Tutorial; individual guided reading and study in an area not covered by the present limited course offerings. Prerequisite: upper-division standing or permission of department.

GRADUATE

- 200. Analyzing Everyday Life (4)** A graduate seminar in the objective observation, description, and analysis of everyday life. This seminar will systematically examine phenomenological ethnomethodological and existential theories of society in contrast to structural theories. (Satisfactory/Unsatisfactory grades permitted.)
- 206. Introduction to Sociolinguistics F** Investigation of the fundamental relations between the forms of language and other aspects of human social order. Special emphasis is given to the interaction between selected modes of language investigation and theories of social cognition and behavior. (Satisfactory/Unsatisfactory grades permitted.)
- 207. Advanced Sociolinguistics S** A review of recent approaches to the study of language and how their respective methods make the phenomena available. Demonstrations and projects focus on the productive and perspectival nature of language representation systems. (Satisfactory/Unsatisfactory grades permitted.)
- 209. Special Topics F-W-S** Devoted to specific topics, interest in which has jointly developed among a small group of students and an interested faculty member. Graduate students will be assigned an additional paper and/or examination of more complex design and material. (Satisfactory/Unsatisfactory grades permitted.)
- 212. Social Stratification** The causes and effects of social rankings in various societies. Theories of stratification; the dynamics of informal social groupings; determinants of institutional power, and the nature of struggles for power; the distribution of wealth and its causes; the dynamics of social mobility; the effects of stratification on life styles, culture, and deviance. Graduate students will be assigned an additional research paper and/or examination of more complex material and design. (Satisfactory/Unsatisfactory grades permitted.)
- 215. Seminar in Political Sociology** Research and readings in sociological analysis of political institutions. Readings on politics and stratification power structure. Political elites; conflict groups, participation. Student research in selected areas. (Satisfactory/Unsatisfactory grades permitted.)
- 223. Social Problems and Social Solutions** This is a seminar concerned with the facts and theories about social problems and the possible solutions to those problems. (Satisfactory/Unsatisfactory grades permitted.)
- 224. Sociology of Deviant Behavior (4)** Introduction to the sociological study of conformity and deviance, with emphasis on processes of social control.
- 235. Comparative Race and Ethnic Relations** An historical and comparative analysis of race and ethnic relations in the United States, western Europe, and Asia. The course will analyze the origins of slavery, the various approaches to minority community development and the causes and consequences of discrimination and prejudice in various national settings. (Satisfactory/Unsatisfactory grades permitted.)
- 251. Sociological Theories S** An analysis of leading theory of sociology with an emphasis on contemporary perspectives. Theoretical issues include functionalism, ethnological method bases of sociology, Marxism, systems analysis and the problem of objectivity. Graduate students will be assigned an additional research paper and/or examination of more complex material and design. (Satisfactory/Unsatisfactory grades permitted.)
- 252. Recent Trends in Sociological Research f** Required of all graduate students during first term of residence; procedures for reading and evaluating journal articles and monographs in process of theory and hypothesis development in selected areas of current sociological research.
- 253. Recent Trends in Sociological Research W** A continuation of Soc. 252, with emphasis on data collection methods and current issues in sociological method through analysis of research studies and practice in research activity. (Satisfactory/Unsatisfactory grades permitted.)
- 254. Recent Trends in Sociological Research S** Continuation of 252 and 253. Required of all graduate students during first term of residence; procedures for reading and evaluating journal articles and monographs in process of theory and hypothesis development in selected areas of current sociological research. (Satisfactory/Unsatisfactory grades permitted.)
- 255. Seminar in Sociological Theory** The analysis of a specific issue of theorist with opportunities for supervised research of students in problems of sociological theory. (Satisfactory/Unsatisfactory grades permitted.)
- 256. Practicum in Empirical Research I (3-6) F** This course would accompany 252-253 and provide practical, supervised experiences in varieties of research methods, including participant-observation, field reports, survey research, questionnaire design, interviewing. (Satisfactory/Unsatisfactory grades permitted.)
- 257. Issues in Theory and Method W** An examination of major perspectives and methodological approaches in contemporary sociology: functionalism, symbolic interaction, ethnomethodology, casual inference and other perspectives examined as strategies for research. (Satisfactory/Unsatisfactory grades permitted.)
- 258. Practicum in Empirical Research II S** Continuation of Sociology 256 and 257, with emphasis on the development of an individual and complete piece of research by students. (Satisfactory/Unsatisfactory grades permitted.)
- 290. Graduate Seminar F-W-S** A research seminar on special topics of interest to available staff; provides majors and minors in sociology with research experience in close cooperation with faculty. (Satisfactory/Unsatisfactory grades permitted.)
- 291. Youth in American Society** A seminar on recent research in the development of youth as a social category, including the analysis of student and youth movements and subcommunities and generational conflict in the United States and elsewhere. (Satisfactory/Unsatisfactory grades permitted.)
- 298. Independent Study F-W-S** Tutorial individual guided study, and/or independent research in an area not covered by present course offerings. (Satisfactory/Unsatisfactory grades permitted.)
- 299. Thesis Research (1-12) F-W-S** Open to graduate students engaged in thesis research. (Satisfactory/Unsatisfactory grades permitted.)
- 500. Apprentice Teaching (1-4) F-W-S** Supervised teaching in lower divisional contact classes, supplemented by seminar on methods in teaching sociology. (Satisfactory/Unsatisfactory grades only.)

SUBJECT A

Office: 2024 Humanities and Social Sciences Building
Suzanne Jacobs, Ed.M., Supervisor of Subject A

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Subject A (Fee, \$45.00)

A course in English composition for those who have failed to demonstrate an acceptable level of written English as defined by University standards. It must be taken before, or at the same time as, the student first takes a course demanding substantial written work. Students must continue to take Subject A until they pass.

1. English Composition (0) Regularly supervised practice in writing English. Students are assigned writing at weekly intervals and are encouraged to turn in work being done for other courses for critical analysis of the writing to make it clearer, better organized, and more forceful. The purpose is to give meaning to writing instruction and encourage the student to do closer reading and better thinking in his related courses.

Writing Clinic The staff of Subject A offers non-credit assistance in writing to all students who request it. The instruction, given informally in one or more tutorial sessions, focuses on immediate writing tasks as course papers, letters of application, and scholarly articles.

TEACHER EDUCATION PROGRAM

Office: 7067 Humanities and Social Science Building
Hugh B. Mehan, Ph.D., Assistant Professor of Sociology
(Director of the Program)

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Recognizing the campus-wide need for teacher training, a Teacher Education Program has been developed and will open in the Fall of 1972 under the auspices of Third College. This teacher credentialing program will have a bicultural emphasis, focusing on the interrelationship of language, culture, and learning particularly as applied to the education of minorities.

An official outline and details of the courses for the Teacher Education Program will be provided in subsequent publications.

THIRD COLLEGE

Office: Provost, Third College

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COURSE

198. Special Studies in College Planning and Administration (4) F-W-S As a member of the Third College Board of Directors, the student will participate in the development and evaluation of the curriculum of Third College, as well as in matters of general college administration and planning. Prerequisite: member of the Third College Board of Directors and approval of provost.

THIRD WORLD STUDIES

Office: Building 410, Matthews Campus
Carlos Blanco-Aguinaga, Ph.D., Professor of Spanish Literature
(Coordinator of Third World Studies)

Mario Barrera, Ph.D., Assistant Professor of Political Science
Joyce Justus, Ph.D., Assistant Professor of Anthropology
Ismith M. Khan, Ph.D., Assistant Professor of Caribbean and Comparative Literature

Arturo Madrid, Ph.D., Assistant Professor of Spanish Literature
Edward Reynolds, Ph.D., Assistant Professor of History
Benjamin K. T'sou, Ph.D., Assistant Professor of Sociology

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Roger F. Barriteau, M.A., Lecturer in Philosophy
Anthony Ngubo, M.A., Lecturer in Sociology
Rosaura Sanchez, M.A., Acting Assistant Professor
(Coordinator of Bilingual Sequence)
Samuel D. Selvon, Lecturer in Literature

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The Third World Studies Program has three main objectives:

1. To provide a perspective on world affairs and problems which has not been historically available — namely, an understanding of the Third World and of

its relationship to the West from a Third World perspective. In order to understand this perspective it is necessary to see how the West has viewed and presently views the Third World. Thus, the program becomes totally inclusive. For example, besides trying to understand what kind of society existed in Meso-America when the Spaniards arrived in 1520, the student must also have an understanding of the historical development in Europe which resulted in Spain's decision to seek wider trade abroad.

2. To provide a means of cutting across disciplinary lines in order to integrate past and present knowledge concerning the Third World and its relationship with the West. The program is not conceived as being exclusively historically oriented or as being predominantly a social science program, but rather one that synthesizes both the social sciences and the humanities.
3. To provide an understanding of the relationship between internal Third World societies (Asian-American, Black, Chicano, and Native American) and external Third World societies (African, Asian, and Latin American) through a comparative approach. Third World societies are compared as they existed before contact with the West, in the various colonial relationships with the West, as well as in their evolution to independence and nationhood in the 20th century. There is insistence on both the similarities and differences which Third World societies have among themselves and the similarities and differences with Western societies.

The Major Program

Students interested in the area of Third World Studies may choose either an interdisciplinary major with a disciplinary focus (anthropology, economics, history, literature, political science, sociology, etc.) or a specific departmental major within the humanities or social sciences.

All students majoring in Third World Studies are expected to satisfy the lower-division Third World Studies requirement of Third College in addition to the interdisciplinary or departmental major requirements. (Refer to the appropriate department under: *Departments of Instruction*.) It is also recommended that students consult the Coordinator of Third World Studies or a Third World Studies faculty member, in the department of the selected major.

In addition, a Bilingual Sequence is being developed. New courses will be offered in 1972-73, in such areas as *Spanish for Chicanos*, *Chicano Dialectology*, *Chicano Literature* and *Spanish Phonetics*. An official listing and descriptions of these new courses will be provided in subsequent publications.

COURSES

LOWER DIVISION

1A. The Colonial Experience F European colonialism will be viewed as the common experience shared by all Third World peoples. Policies developed by the major colonial powers for administering their respective colonial possessions will be discussed as well as the effects these various policies had on political, social, and economic systems in the colonies.

1B. Responses to the Colonial Experience W Primary resistance, nativistic movements, messianic movements, anti-colonial movements, and movements for national independence will be discussed as responses to the colonial experience. Reasons for their emergence at different times and for their occurrence in different forms will be advanced.

1C. The Contemporary Scene S Neo-colonialism and neo-imperialism will be examined as new types of relationships emerging between the metropolitan powers and their former colonial possessions. The effects of supra-national movements (Pan Africanism, Black Nationalism, Pan Ethnicism) on the world today and their possible contributions to the growth and development of a Third World will be discussed.

9. Reading and Interpretations: Spanish for Native Speakers W Spanish for Native Speakers is designed to emphasize the development of greater speaking and writing abilities as well as reading skills by means of lectures, class discussions, composition, and readings from Chicano and Latin American authors. Equivalent to Lit/Sp 10. Prerequisite: consent of instructor.

24. Composition and Conversation: Spanish for Native Speakers S This course is designed for native speakers who have had formal training in the language but who need to expand their knowledge of grammar, vocabulary, and idiomatic expressions both at the speaking and writing level. Readings will be from Chicano and Latin American authors. Equivalent to Lit/Sp 25. Prerequisite: consent of instructor.

UPPER DIVISION

100A-100B-100C. Third World Studies F-W-S This course will provide upper-division students with information and understanding of non-western social, political, and cultural conditions. Students will have extra research and one extra paper to write above and beyond the regular core course work. Prerequisite: college program approval.

101A. The Colonial Experience F European colonialism will be viewed as the common experience shared by all Third World peoples. Policies developed by the major colonial powers for administering their respective colonial possessions will be discussed as well as the effects these various policies had on political, social, and economic systems in the colonies. Prerequisite: upper-division standing.

101B. Responses to the Colonial Experience W Primary resistance, nativistic movements, messianic movements, anti-colonial movements, and movements

for national independence will be discussed as responses to the colonial experience. Reasons for their emergence at different times and for their occurrence in different forms will be advanced. Prerequisite: upper-division standing.

101C. The Contemporary Scene S Neo-colonialism and neo-imperialism will be examined as new types of relationships emerging between the metropolitan powers and their former colonial possessions. The effects of supra-national movements (Pan Africanism, Black Nationalism, Pan Ethnicism) on the world today and their possible contributions to the growth and development of a Third World will be discussed. Prerequisite: upper-division standing.

110. Introduction to Fiction Writing F Writing skills are as varied as the individual's background, experience, or inclination. This course aims at bringing the fundamental aspects of fiction writing to the beginning writer's work so that he may explore and develop his own potential. Prerequisite: consent of instructor.

111. Writing the Short Story W Course discusses the fundamentals of short story writing. Students' works will be read and discussed in class along with the works of some of the best contemporary short story writers. The course aims at helping students to get started as well as offering constructive criticism to those who have already put their hands to it. Prerequisite: upper-division standing or consent of instructor.

112. Writing the Long Narrative The student will work throughout the quarter on a single project, either fiction (novel) or nonfiction (biography, history). Excerpts of students' works will be read and discussed in class; constructive criticism will be offered. Prerequisite: any course in fiction writing or example of student's work submitted to instructor.

131. Selected Topics in Latin American Politics F A comparative analysis of contemporary political issues in Latin America. Material to be drawn from two or three countries. Among the topics: nationalism; neo-imperialism; political change. Prerequisites: juniors and seniors only or consent of instructor.

142. Political Philosophies of Third World Leaders S The course is a study and comparison of the political philosophies of modern Third World leaders. Since a major concern of the course is the problems that such leaders have met within the applications of their theoretical preconceptions to the actual political situations. A biographical approach shall be taken. Particular attention shall be paid to the influence of indigenous non-western political and religious customs and outlooks upon the political viewpoints of the leaders under study.

143. Contemporary Chicano Issues W The course, interdisciplinary in nature, will study the contemporary Chicano experience from cultural, social, and historical perspectives, and provide students with information and understanding of the important characteristics of the Chicano community by exerting a critical analysis of the societal context in which "La Raza" has sought to maintain and develop its culture. Prerequisite: consent of instructor.

149. Topics in Contemporary Non-Western Philosophies An inquiry into philosophical themes as articulated by philosophers of and in terms of non-Western political and cultural contexts. Prerequisite: consent of instructor.

152. Contemporary Caribbean Literature F There has been an unusual outburst of literary activity in the Caribbean since 1950 which is a unique cultural expression of Blacks, East Indians, Chinese, and Spaniards brought to the area by colonial powers. The distinctive qualities and problems of the literature of this multi-racial society borne of colonialism will be studied through the works of McKay, Selvon, Lamming, Naipaul, Harris, Salbey, and Khan, focusing on their parallels in contemporary America. Prerequisite: upper-division standing or consent of instructor.

153. Introduction to Chicano Literature S Course introduces students to Chicano literary works. Central to this study are the particular life experiences of the Chicano and the unique expression given that experience by Chicano authors, whether in novels, short stories, poetry, or dramatic works. Prerequisites: speaking and reading knowledge of Spanish or consent of instructor.

198. Directed Group Studies F-W-S Directed group study on a topic or in a field not included in the regular curriculum, by special arrangement with a faculty member. Prerequisites: upper-division standing and consent of instructor.

199. Independent Study F-W-S Tutorial; individual guided reading and research projects (to be arranged between student and instructor) in an area not normally covered in courses currently being offered in the department. Prerequisites: upper-division standing and approval of instructor.

URBAN AND RURAL STUDIES

Office: Building 411, Matthews Campus
 Nolan E. Penn, Ph.D., Professor of Psychiatry
 (Coordinator of Urban and Rural Studies)
 Charles W. Thomas, Ph.D., Professor of Urban and Rural Studies
 Robert J. Heifetz, Ph.D., Associate Professor of Urban and Rural Studies
 Faustina Solis, M.S.W., Associate Professor of Community Medicine
 Mario Barrera, Ph.D., Assistant Professor of Political Science
 Roger S. Ruffin, Senior Lecturer
 William J. Siembieda, M.C.P., Lecturer in Urban and Rural Studies
 Milton J. Silverman, Lecturer in Urban and Rural Studies

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The Undergraduate Program

The undergraduate program in Urban and Rural Studies is designed to provide a broad educational experience for persons who wish to become actively engaged in a variety of professional careers requiring a broad understanding of the problems of urban and rural life, including participation in advanced degree programs, programs of research, and other educational and community activities. The program is interdisciplinary in its orientation, emphasizing the contributions that the social sciences and related professions can make to an understanding of urban and rural problems. It provides the student the opportunity to understand the relationship between urban and rural research and the practices of other social sciences and professions.

The curriculum in Urban and Rural Studies will provide students with a broad exposure to the theoretical constructs and empirical applications of various disciplines as they relate to the human problems of our society. The goal of the curriculum is to train action-oriented students of urban and rural affairs who can bridge the apparent gaps between disciplines and begin to provide an interdisciplinary synthesis of the complex dimensions of the urban and rural environment.

The department will offer courses in the following areas: Social Policy and Planning; Community Dynamics, Organization, and Development; Third World Perspectives in Urban and Rural Issues; Technology and Future Settlements; Social, Political, and Economic History of Urbanization; and Methodology.

Social Policy and Social Planning: This area deals with the study of social needs and alternative means for meeting them. It is concerned with the definition of social well-being, the development of options for the prevention and compensation of social inequities arising from the process of economic development, the allocation of resources to meet human needs and the evaluation of performance toward meeting those ends. It investigates means for achieving the optimum allocation of resources among social services to achieve complex social needs, evaluating the results of such allocations, the relationship between user and provider goals in the provision of services, and strategies of change toward achieving a more adequate fit between social service performance and user needs. Emphasis will be placed on the impact of alternative policy and programs on meeting the specific needs of Third World people.

Community Dynamics, Organization, and Development: A study of the effects of conflict of institutions, social mobility, individuation, anomie and ethnocentrism on community dynamics. The positive interaction between delivery systems and ethnocentrism is examined. Linkages or frames of reference for community organization and development are based upon those theoretical constructs which have been found applicable to the social sciences.

Third World Perspectives in Urban and Rural Studies: An examination of the political, social, and economic status of Third World peoples in urban and rural areas, particularly within the United States. Areas such as social policy and its impact on Third World peoples, goals and alternative futures, and strategies for change will be studied from a Third World perspective.

Technology and Future Settlements: This area will examine the role of technology as a tool for societal change and adaptation; review of technological innovations and their effects on the structure of human settlements; understanding of technological change in relation to how it has impacted on people living in urban and rural areas, especially tracing its social impact on the forces that control technology. Included in the area would be an understanding of cybernetics, and social implications of the ways in which technological advances are implemented, and the use of technology as a planning tool.

Social, Political, and Economic History of Urbanization: This area focuses on the distribution of social costs and benefits of the urbanization-industrialization process, identifying, through comparative analysis, forces generating various forms of urbanization. It will examine the origins and results of alternative means for compensating those suffering consequences of social costs of development as well as means for preventing such costs. The contributions of historic, literary, economic, and social science analyses will form the primary intellectual base of this interdisciplinary area. Special emphasis will be placed upon the impact of urbanization on Third World people.

Methodology in Urban and Rural Studies: This area will cover the application of scientific and other methods to the analysis of social phenomena, and contribute to a general understanding of the ways in which methodological strategies themselves can be evaluated. Students will study the uses of observation, personal and official documents, measurement, laboratory techniques, surveys, organizational analysis, cross-cultural comparisons, and so forth. Statistical and computer applications, as well as problems of data collection and analysis, simulation, and model building, will be studied and evaluated as to their effectiveness in the resolution of human urban and rural problems.

Additional courses focusing more specifically on issues will be offered. For example, law (American criminal justice, and legal appraisal of American institutions), welfare, housing, transportation, education, health and mental health, employment, affluence (poverty, human resources, and social ecology).

Degree Requirements

To receive the A.B. Degree with a major in Urban and Rural Studies, the student must meet the requirements of Muir, Revelle, or Third College, and the following requirements in Urban and Rural Studies.*

Each student majoring in Urban and Rural Studies will be required to take URS 6A-6B-6C or 106 (for majors with upper-division standing) plus eleven additional upper-division courses in Urban and Rural Studies. This includes one required fieldwork course and one required Senior Fieldwork Seminar.**

All three courses in the 6A-6B-6C or 106 sequence are prerequisites for most upper-division courses in Urban and Rural Studies, therefore, the above sequence should be taken as soon as possible. Credit will not be given for both 6C and 106.

Additional fieldwork courses may be taken upon petition to the department faculty, but no more than four fieldwork courses (URS 196) can be applied towards the eleven upper-division course requirements in Urban and Rural Studies.

In the Senior Fieldwork Seminar, URS seniors will construct a final paper or other document which will be in the form of a "Senior Thesis" acceptable for filing in the URS Resources Reading Room.

Majors are required to develop a minor in fields outside of Urban and Rural Studies consisting of at least four courses relevant to the main focus of the student's major program. These courses are to be selected by the student with the approval of his faculty adviser.

One course, for present purposes, means four units of credit.

*The faculty will encourage individualized educational programs leading to the A.B. degree in Urban and Rural Studies brought to them by students. Such programs will be reviewed by the faculty and will serve to promote innovation within the established educational norms of the University. As soon as possible after the student has declared a major in Urban and Rural Studies, a faculty adviser will be assigned to assist the student in developing a program of study.

**The field component is seen as a test of theory, concepts, and strategies learned in the classroom through the above course sequence, as well as serving in part as a service to the community. In so relating students and faculty to community issues, University education and research will be kept relevant to the issues of the day, testing theory with practice, while developing new and innovative relations with communities traditionally underserved by institutions of higher education.

COURSES

LOWER DIVISION

1A-1B-1C. Introduction to Urban and Rural Studies An analysis of urbanization in an industrial society. Urbanization will be approached as a complex system of human interactions. Housing, health, social welfare, and alternative strategies for change will be major areas of concern in the course. Methodology for urban studies will be presented. This course must be taken in sequence.

6A-6B-6C. Introduction to Urban and Rural Studies F-W-S An analysis of urbanization in an industrial society. Urbanization will be approached as a complex system of human interactions. Housing, health, social welfare, and alternative strategies for change will be major areas of concern in the course. Methodology for urban and rural studies will be presented. This course must be taken in sequence.

10. Community Dynamics and Ethnicity An examination of the interaction of migration and urbanization on community as a social system. Characteristics of agencies and organizations which deliver services or influence changes will be approached from the use of ethnicity as a conceptual model. Prerequisites: sophomore standing and consent of instructor.

UPPER DIVISION

101. Community Dynamics and Ethnicity F An examination of the interaction of migration and urbanization on community as a social system. Characteristics of agencies and organizations which deliver services or influence changes will be approached from the use of ethnicity as a conceptual model. Prerequisite: consent of instructor.

102. Community Conflict and Change Investigates socio-economic and political phenomena bearing on man's continued coexistence with his environment and institutions. Topics examined include community dynamics, translating information into policy, translating policy into legislation, translating policy and information into programs, techniques for program analysis and evaluation. Prerequisite: consent of instructor.

106. Analysis of Urban and Rural Studies S Urbanization will be analyzed as a complex system of human interactions. Housing, health, social welfare and alternative strategies for change will be major areas of concern in the course. Methodology for urban and rural studies will be considered. Students taking URS 106 will not be given credit for URS 6C. Prerequisites: 6A, 6B, and a major in Urban and Rural Studies.

110. Systems Approach to Urban Studies S Systems theory is combined with Sociology as a tool for the analysis of man-environment interfaces involving ghetto residents and the environments which affect their lives. Education, transportation, mass communication, mental health, and police-community relations constitute specimen areas of concern. Prerequisite: junior standing.

120. American Criminal Justice S Police, prosecution, and court practices and procedures from arrest to trial and conviction of criminal offenses in Federal and State Courts of the United States. Current thinking and problems in the area of police practices and constitutional guarantees and safeguards of the accused. Problems of and necessity for court reform.

121. Legal Appraisal of American Institutions W Appraisal of traditional governmental institutions and non-traditional institutions such as poverty, racism, and crime. Evaluation of these institutions as possible products of an American life-style which was the result of an historical commitment to economic abundance and territorial expansion. Prerequisites: URS 6A, 6B, and consent of instructor.

125. Systems Approach to Community Mental Health F Systems theory

is combined with concepts in preventive mental health as a tool for analyzing man-environment interfaces involving various culture groups, and environments affecting their lives. Comprehensive health, education, police-community relations are specimen areas of concern. Prerequisites: URS 6A-6B-6C and consent of instructor.

126. Case studies in Medical Care Delivery Course will explore specific issues in the organization and delivery of medical care using the case study method. Students will be assigned sufficient readings to become totally familiar with a specific situation and will be expected to analyze it sufficiently well to make practical suggestions for future action. Cases will include Federal Health Policy, hospital planning, development of a physicians assistants program, a community based health center, and a nursing education program among others. Prerequisites: URS major, senior standing, and consent of instructor.

131. The Black Ghetto F Examination of the Black ghetto from about 1880 to the present. Trends in migration, the patterns of economic and social adjustment, shifts in ideology and protest, and the demand for community control are referenced themes. Prerequisites: consent of instructor.

135. Introduction to Research Methods W Introduction to methods of studying human phenomena in urban and rural settings. Lectures will give critical expositions of the uses of observation, personal/official documents, problem identification, hypothesis generation, sampling procedures, and research design. Familiarity with statistical techniques unnecessary. Prerequisite: consent of instructor.

141. Social Policy and Social Planning S Focus on defining social well-being, developing alternative means or strategies for the prevention and compensation of social inequities arising from the process of economic development, allocating resources to meet human needs and evaluating performances toward meeting those ends. Prerequisites: URS 6 or 106 and consent of instructor.

142. Ethnic Perspective in Urban and Rural Studies S Ethnicity is examined as it is conceived and used by Third World Peoples from the basis of individual or group identity which leads to social competence. Social roles are analyzed and illustrated with intra-ethnic materials. Prerequisites: URS 6 or 106 and one other course in the social sciences.

143. Community Development and Organization W Analyze effects of conflicts of institutions, social mobility, individuation, anomie, and ethnocentrism on community dynamics. Examine positive interactions between delivery systems and ethnocentrism. Linkages or frames of reference built upon aspects of systems theory applicable to the social sciences. Prerequisites: URS 6 or 106 and consent of instructor.

144. Social Impact of Urbanization S Focus on distribution of social costs and benefits of the urbanization-industrialization process. Through comparative analysis, will identify forces generating various forms of urbanization, and evaluate human consequences of that process. Prerequisites: URS 6 or 106 and consent of instructor.

145. The Planning Profession in the USA S Analyzes the origins and development of urban and regional planning in the U.S.A., its changing societal function, its contemporary performance in the San Diego region, and strategies for its reform. Prerequisite: upper-division or permission of instructor.

146. Technology and Future Settlements S Examine the role of technology as a planning tool for societal change and adaptation, the effects of technological innovations on the structure of human settlements, and cybernation, or the implementation of technological advances in society. Prerequisites: URS 6 or 106 and consent of instructor.

150. Political Change in the United States W An analysis of the political structure of the present-day United States, and a review of proposed strategies for producing change in that structure. Particular attention will be given to the topic as it relates to Third World peoples within the United States. Prerequisite: sophomore standing or higher.

190. Senior Field Seminar S Analysis of applied field experience supported by academic materials related to the subject area of the field work. This course requires preparation of a senior essay on a specified subject area and presentation of the report to the seminar group. Prerequisites: URS 100A, senior standing, and consent of instructor.

191. Senior Team Study Seminar W A research seminar on special topics of interest to available staff; provides majors and minors in Urban and Rural Studies with research experience in close cooperation with faculty. Designed for students interested in graduate study. Prerequisites: senior standing, URS major, and consent of instructor.

192. Senior Seminar in Community Affairs W An attempt to understand institutional behaviors focusing on uncovering their roles in the complex ecological network that characterizes the community. Visits made to homegrounds of groups whose place in San Diego is significant in terms of community structure or function. Prerequisites: URS 6A-6B-6C, senior standing, and consent of instructor.

196. Field Work in Urban and Rural Studies F-W-S In an attempt to define and study some unique process of community life, students will develop and implement projects requiring their participatory-involvement in some community. Projects may cover areas such as health (medical and psycho-social), education, housing, and welfare. Prerequisites: junior standing, URS major, and consent of faculty field-work supervisor. Required course for Urban and Rural Studies majors. May be repeated for credit.

197. Directed Individual Field Study F-W-S Intended for individually arranged field study. Provides the opportunity for students to expand their academic

training with practical experience in the community. The student will plan a field study program with an individual faculty member. Prerequisites: upper-division standing and consent of instructor. May be repeated for credit.

198. Directed Group Study F-W-S Directed group study on a topic or in a field not included in the regular departmental curriculum by special arrangement with a faculty member. Prerequisites: upper-division standing and consent of instructor. May be repeated for credit.

199. Independent Study F-W-S Reading and research programs, and field study projects to be arranged between student and instructor, depending on the student's needs and the instructor's advice in terms of these needs. Prerequisites: upper-division standing and approval of instructor.

VISUAL ARTS

Office: Building 402, Matthews Campus

Harold Cohen, *Diploma of Fine Arts, Professor of Visual Arts*

Manny Farber, *Professor of Visual Arts*

David Antin, *M.A., Associate Professor of Visual Arts*

(Acting Chairman of the Department)

Newton Harrison, *M.F.A., Associate Professor of Visual Arts*

Gary Hudson, *M.F.A., Assistant Professor of Visual Arts*

Jeffrey Raskin, *M.S., Assistant Professor of Visual Arts*

Jehanne Teilhet, *M.A., Assistant Professor of Visual Arts*

Michael Todd, *M.F.A., Assistant Professor of Visual Arts*

Ellen Van Fleet, *M.F.A., Assistant Professor of Visual Arts*

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Philip Steinmetz, *Lecturer in Visual Arts*

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Traditionally, the visual arts have been associated with those esthetic activities resulting in the production of primarily visual esthetic objects such as paintings and sculpture. The domain of the visual arts has since its original definition been subject to constant redefinition in accordance with the demands of art production and consumption in contemporary society and in accordance with continuing re-evaluations of art production in the light of the constantly increasing available information concerning other societies. By its composition, the Visual Arts Department is biased in the direction of actively producing artists and critics whose presence at the center of the contemporary art world necessitates reconsideration and re-evaluation of esthetic productions, their information structure and significance. Consequently, a flexible introductory program of historically based courses, Visual Arts 15A, 15B, and 15C, has been devised mainly to provide the student with an opportunity to concentrate on areas involving significantly different esthetic and communication structures. A series of studio courses, in which Painting and Sculpture are included, are presented to bring the student into direct contact with the real contingencies compelling redistribution of esthetic attitudes and reinterpretation of genres. Because of the explorational nature of our program, the department is prepared to emphasize new media that would traditionally be considered to have scant relation to the Visual Arts. Thus courses in the computer science for the arts, theatrical events, linguistic structures, etc. are provided. In this context also, theoretical courses with a media orientation as in Film or Photography will also be offered.

Muir College General Education Requirement

Muir students choosing to complete the Visual Arts fine arts sequence may take three courses from the following list:

- 15A. The Art Course - The Ancient World
- 15B. The Art Course - The European Esthetic from the Renaissance to the end of the 19th Century.
- 15C. The Art Course - Modern Art
- 15X. The Art Course - Pre-Sculpture

88. First Look at Movies As an alternative, the Muir student may choose one course from the following to constitute one quarter of the fine arts requirement.

Beginning Drawing

Beginning Painting

Beginning Sculpture

Beginning Photography

Revelle Fine Arts Requirement

Students can fulfill this requirement by taking any quarter of 15A-15B-15C or 17. In addition he may take Visual Arts 88 (First Look at Movies).

Art Minors

Three art history courses, of which it is recommended that two quarters of the Art Course be included, and three studio courses are recommended for a minor in Visual Arts. The student has the option of making all his courses art history courses. Individual minors can be worked out in consultation with the minor advisor.

Art Majors

Majors are required to take three introductory art history courses, Beginning Painting and Beginning Sculpture. A total of 18 courses will be required for the major. Courses to be completed before graduation are:

- 3 Introductory art courses
 - Beginning Painting
 - Beginning Sculpture
 - Intermediate Painting or Intermediate Sculpture
 - Beginning Computer Programming or Photography
- 6 quarters of upper-division Art History
- 5 Advanced level studio art courses

All prospective majors are urged to keep in touch with the Department office for meetings, etc. pertaining to them.

The Master of Fine Arts Program

The M.F.A. is a terminal degree in the Visual Arts. It consists of a two-year program aimed primarily at students who are already on their way to becoming artists and at certain students from other disciplines with specially relevant backgrounds who wish to participate productively in the reevaluation of art through criticism or art making. The program emphasizes the continual reevaluation of the meaning and nature of art making, stressing the strategies and roles of the artist in the art situation. It allows for the exploration of various genres and media, including painting, sculpture, photography, event making, computer media and conceptual work; but no genre, however hallowed, is considered either inevitable or intrinsically necessary, and, consequently, techniques are stressed only to the degree that they are requisite to the accomplishment of a valued aim of a particular artist.

The Graduate Program

A two-year Master of Fine Arts program in studio work is offered in visual arts. Please contact the department directly for further information.

COURSES

LOWER DIVISION

15A-15B-15C. The Art Course F-W-S An introductory sequence aimed at exposing the student to a great variety of modes of esthetic appreciation. Each course will focus on a period. 15A: The Ancient World, 15B: The European Esthetic from the Renaissance to the end of the 19th Century, and 15C: Modern Art. The courses are selected not so much to present the illusion of thorough chronological coverage, but to emphasize fundamental differing esthetic and cultural strategies in the history of art.

54. Art/Customs of West Africa A study of the traditional arts of West Africa. Oral tradition, music and dance will be emphasized as they relate to the art forms.

55. Art of Cloisonne Instruction will include the making of two cloisonne jewels and their settings covering the 6th to the 13th century. Each an important example of the cloisonne jewelers art and craft; selected also to teach certain aspects of cloisonne enameling in increasingly difficult wirework, coloring and goldsmithing. Prerequisite: consent of department.

88. First Look at Movies F An introductory course, examines the formal structure as well as surface detailing in commercial films from Keaton to Goddard, offering a syntactic system for separating the various contributions of actor, editor, scriptwriter, director.

UPPER DIVISION

110. Semiotics A structural analysis of art as seen in the context of cultural communication.

112. 19th Century Art History A survey of 19th century art in Europe and America, stressing stylistic developments from Neo-Classicism to Post-Impressionism. Three hours lecture. Prerequisites: Visual Arts 15A-15B or equivalent.

113. History of Primitive Art A survey of northwest coast American Indian, Oceanic and African art. Including both the visual and oral traditions. Prerequisites: Visual Arts 15A-15B-15C or equivalent.

115. Seminar in Contemporary Art A seminar dealing with the problems in 20th century; including paintings, sculpture and art criticism. Prerequisites: Visual Arts 10 or equivalent and preferably other courses in art history.

116. Renaissance and Baroque Art History A general survey of the painting and sculpture of the Renaissance and Baroque periods.

117. 18th Century Art History A general survey of the painting, sculpture and architecture of the 18th century in Europe and America. Prerequisites: Visual Arts 15A-15B-15C or equivalent.

118. Words and Pictures Ranging from the hieroglyphs in Egyptian bas-reliefs to the contemporary use of language in Conceptual Art, this course investigates the interaction of words and images. Book and manuscript illustration, scientific illustration, titles, labels and concrete poetry will also be discussed. Prerequisites: Visual Arts 15A-15B-15C or equivalent.

119. Meaning/Medieval Art An introductory course exploring the meaning of

its art-making by interrelation of genres normally treated as distinct disciplines; architecture and manuscript illumination treated as forms of "concrete poetry"; architecture and sculpture treated in relation to medieval theater; the whole against the background of philosophical and political propaganda.

120. Advanced Problems of Art Criticism A seminar for advanced students in art criticism to explore the meaning of art criticism and art history in relation to the problems set by the real phenomena of art production. Prerequisite: introductory survey of art history.

121. A Critical History of Photography A critical examination of photographs and photographers. Attention will be focused on the ideas and arguments of major movements and important individual artists. The importance of historical ideas in their relation to contemporary photographic issues will be stressed as well as the problems of the medium as an art form.

125. Intermediate Drawing A continuation of beginning drawing. The student will be exposed to a wider variety of means in representation. The connotational range of different sorts of "marks" and represented "spaces" will be explored. An attempt will be made to compare drawing with the different but adjacent representational mode of photography. Prerequisite: Visual Arts 129.

129. Beginning Drawing The course covers line, value, texture, gestures, form and composition. These concepts will be introduced by the use of models, still life and landscapes. The different media that will be used include: charcoal, pencil, ink and conte. Prerequisites: Visual Arts 15A-15B-15C.

130. Advanced Painting A studio course in painting, stressing individual creative problems. May be repeated for credit. Six hour studio. Prerequisites: Visual Arts 15A-15B-15C, 139, 149, 159.

135. Drawing to Anti-Drawing An inquiry into the problem of alternative modes. Is "painting without drawing" a tenable concept, and if not, what kind of activity may drawing become? A wide range of possibilities is examined, including various automatic and "accidental" modes. Satisfies Advanced Painting requirement. May be repeated for credit. Prerequisite: consent of department.

136. Advanced Drawing For students who have had elementary and intermediate drawing. The students will be given the opportunity to explore the relation between their own energy and idiosyncrasy as draftsmen artists and the quasi-objective demands of representing various types of real and virtual space. Prerequisites: beginning and intermediate drawing or equivalent.

139. Beginning Painting A studio course focusing on the problems involved in transferring information and ideas onto a two-dimensional surface. Specific assignments to be determined by the professor. May be repeated for credit. Prerequisites: Visual Arts 15A-15B-15C; 15B and/or 15C may be taken concurrently or equivalent.

140. Advanced Sculpture A studio course in sculpture stressing individual creative problems. May be repeated for credit. Six hours studio. Prerequisites: Visual Arts 15A-15B, 139, 149, 169.

147. Landscape Architecture F This course presents a basic study of landscape architecture of the past, as represented in European, Japanese and Persian gardens, as well as their contemporary equivalents. There will be practical experience in designing and executing landscape situations. Prerequisite: consent of department.

149. Beginning Sculpture A studio course focusing on the problems involved in transferring information into three dimensional objects. Specific problems to be investigated will be determined by the individual professors. Prerequisite: consent of department.

155. Advanced Cloisonne Jewels and settings of increasing complexity of design and technique will be taught. Additional enameling techniques used in conjunction with enameling will be offered (repousse and plique a jour). Accomplished students may begin to design and carry out their own motifs. Prerequisite: consent of instructor.

159. Intermediate Painting A studio course in painting, stressing individual creative problems. Specific problems to be investigated will be determined by the individual professors. May be repeated for credit. Prerequisites: Visual Arts 15A-15B-15C or equivalent; 15C may be taken concurrently.

169. Intermediate Sculpture A studio course in sculpture, stressing individual creative problems. Specific problems to be investigated to be determined by individual professors. May be repeated for credit. Prerequisites: Visual Arts 15A-15B-15C; 15C may be taken concurrently or equivalent.

170. Computer Media I Requiring no mathematical or scientific training, this is an introduction to programming in a higher level language. Exercise dealing with specific problems of the arts are emphasized.

171. Computer Media II Application techniques in the fine arts and humanities. Prerequisite: Computer Media I or programming knowledge.

172. Heuristic and Synergistics Using computers in an environment — emphasizing interactive programming and use of heuristics. A humanistic approach. Prerequisites: knowledge of programming, Communications 170 or Visual Arts 170 or APIS 10 and 11.

174. Drawing with Computers An intermediate course in graphic programming of a non-technical nature; intended primarily for work in the arts. Prerequisites: at least one programming course preferably Visual Arts 170, and consent of instructor.

182. Advanced Photography For students who have mastered the fundamentals of black and white photography. The course will explore artistic needs of the

individual students, with emphasis given to the art strategies of photography and the particular techniques necessary to accomplish these goals. Prerequisite: consent of instructor.

183. Strategies for Shooting: Workshop Concerned with working out scenarios for getting ideas on film. Relates to the problems of defining precisely the images needed to make ideas work and the strategies for getting those images. Class will involve photography and discussions as well as relevant reading.

187. The Genre Series A group of related courses exploring the conventions within such generic and mythic forms as the cowboy, shamus, chorus girls, and vampire films.

188. Hard Look at Movies S Using a choice of films that show an admitted bias towards the spare films of movie history, the course involves a rigorous attention to what actually comes off the screen. May be repeated once for credit.

189. The Director Series A course that describes the experience, looks, and structure of director-dominated films. A different director will be studied each quarter.

190. Beginning Photography A general course, largely technical in its orientation, aimed at a working knowledge of a range of cameras, lighting equipment and photographic materials, and at competence in darkroom techniques. Prerequisite: consent of department.

191. Intermediate Photography Darkroom practice, camera techniques related to specific photography problems. Prerequisite: Visual Arts 190.

192. Tactics and Strategies A workshop-laboratory class involving a game theory approach to the making of art in which attempts will be made to define a domain of interaction between a variety of possible players — the simplest of which is a two person game involving art-audience. Prerequisite: consent of department.

193. Advanced Projects in Art A course specifically designed to investigate the many areas existing outside the more formal fields of painting and sculpture, as self charting and subject matter, a seminar in conceptual art. May be repeated for credit.

194. Advanced Film Seminar This seminar is designed to deal with a wide variety of practical aspects of the film, including direction, script writing, criticism and photography. Prerequisite: consent of department.

195. Teaching in Visual Arts Each student will meet with a section once a week under the direction of the instructor. The student will be required to attend the lecture in the course and to meet with the instructor at least one time each week. Prerequisite: consent of instructor. May be repeated for credit three times.

198. Directed Group Study (2-4) Directed group study on a topic or in a group field not included in regular department curriculum by special arrangement with a faculty member. Prerequisite: consent of department.

199. Special Studies in the Visual Arts Independent reading, research or creative work under direction of a faculty member. Prerequisite: consent of instructor.

GRADUATE

201. Materials (3) A graduate level course involving the exploration of a wide range of materials, both traditional and new. Its purpose is to give a broad understanding of problems relating to the application of materials to specific aesthetic issues; and to provide students with a technique for dealing with an ever-growing mass of new materials and possibilities. May be repeated for credit. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

210. Semiotics A structural analysis of art as seen in the context of cultural communication. An additional seminar will be held each week with the graduate students.

213. History of Primitive Art (3) A survey of Northwest Coast American Indians, Oceanic and African Art, including both the visual and oral traditions. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

215. Contemporary Art History A seminar dealing with the problems in the 20th century including painting, sculpture, and art criticism. Special attention will be given to graduate students who will do specifically advanced, individual projects.

216. Renaissance and Baroque Art History (3) A graduate level survey of the painting and sculpture of the Renaissance and Baroque periods. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

217. 18th Century Art History (3) A graduate level seminar dealing with the painting, sculpture and architecture of the 18th century in Europe and America. (Satisfactory/Unsatisfactory grades permitted.)

218. Words and Pictures (3) A graduate level course ranging from hieroglyphs in Egyptian bas-reliefs to the contemporary use of language in Conceptual Art, this course investigates the interaction of words and images. Book and manuscript illustration, scientific illustration, titles, labels and concrete poetry will also be discussed. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

219. Meaning/Medieval Art (3) A graduate level course exploring the meaning of its art-making by interrelation of genres normally treated as distinct disciplines; architecture and sculpture treated in relation to medieval theater; the whole against the background of philosophical and political propaganda. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

220. Advanced Problems in Art Criticism Seminars for advanced students in art criticism to explore the meaning of art criticism and art history in relation to the

problems set by the real phenomena of art production. Specifically advanced, individual projects will be required of graduate students.

230. Advanced Problems in Painting (3) A graduate level studio course in painting, stressing individual problems. May be repeated for credit. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

235. Drawing to Anti-Drawing (3) A graduate level drawing course as an inquiry into the problem of alternative modes. Is "painting without drawing" a tenable concept, and if not, what kind of activity may drawing become. The graduate is required to arrange an extra meeting with the professor each week to discuss his work. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

236. Advanced Problems in Drawing The students will be given the opportunity to explore the relation between their own energy and idiosyncrasy as draftsmen artists and the quasi-objective demands of representing various types of real and virtual space. Specifically advanced, individual projects will be required of graduate students.

240. Advanced Problems in Sculpture (3) A graduate level studio course in sculpture, stressing individual problems. May be repeated for credit. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

272. Computer Animation Animation has been a tedious process until recently. A computer, interposed between the filmmaker and the camera — instead of a living chain of animators, can both speed the process and bring immediacy to the production. Each student will produce at least two animated films during the course. Prerequisites: computer programming ability and elementary photographic knowledge.

290. Graduate Seminar (1) This seminar gives special focus to the examination and discussion of students' ongoing studio work, both majors and graduates, as well as faculty. In addition, young artists are among the invited speakers so the

student is kept aware of new developments in the professional field of art. (Satisfactory/Unsatisfactory grades permitted.)

292. Tactics and Strategies (3) At the graduate level, a workshop-laboratory class involving a game theory approach to the making of art in which attempts will be made to define a domain of interaction between a variety of possible players the simplest of which is a two-person game involving art-audience. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

293. Advanced Projects in Art (3) A course specifically designed to investigate the many areas existing outside the more formal fields of painting and sculpture, as Self Charting and Subject Matter, a seminar in conceptual art. The graduate is required to arrange an extra meeting with the professor each week to discuss his work. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

294. Graduate Film Seminar (4) This graduate level seminar is designed to deal with a wide variety of practical aspects of the film, including direction, script-writing, criticism and photography. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

295. Individual Studies for Graduate Students (1-12) Individual research for graduate students in preparation for their comprehensive exhibition for the MFA degree.

298. Directed Group Study Directed group study on specific topics not covered at the present time in the normal curriculum. Used as an experimental testing of courses that may be given regular course numbers if proved successful. Special arrangement with faculty member. Prerequisite: consent of department.

* * *



Folksinger Sam Hinton conducts an outdoor class.

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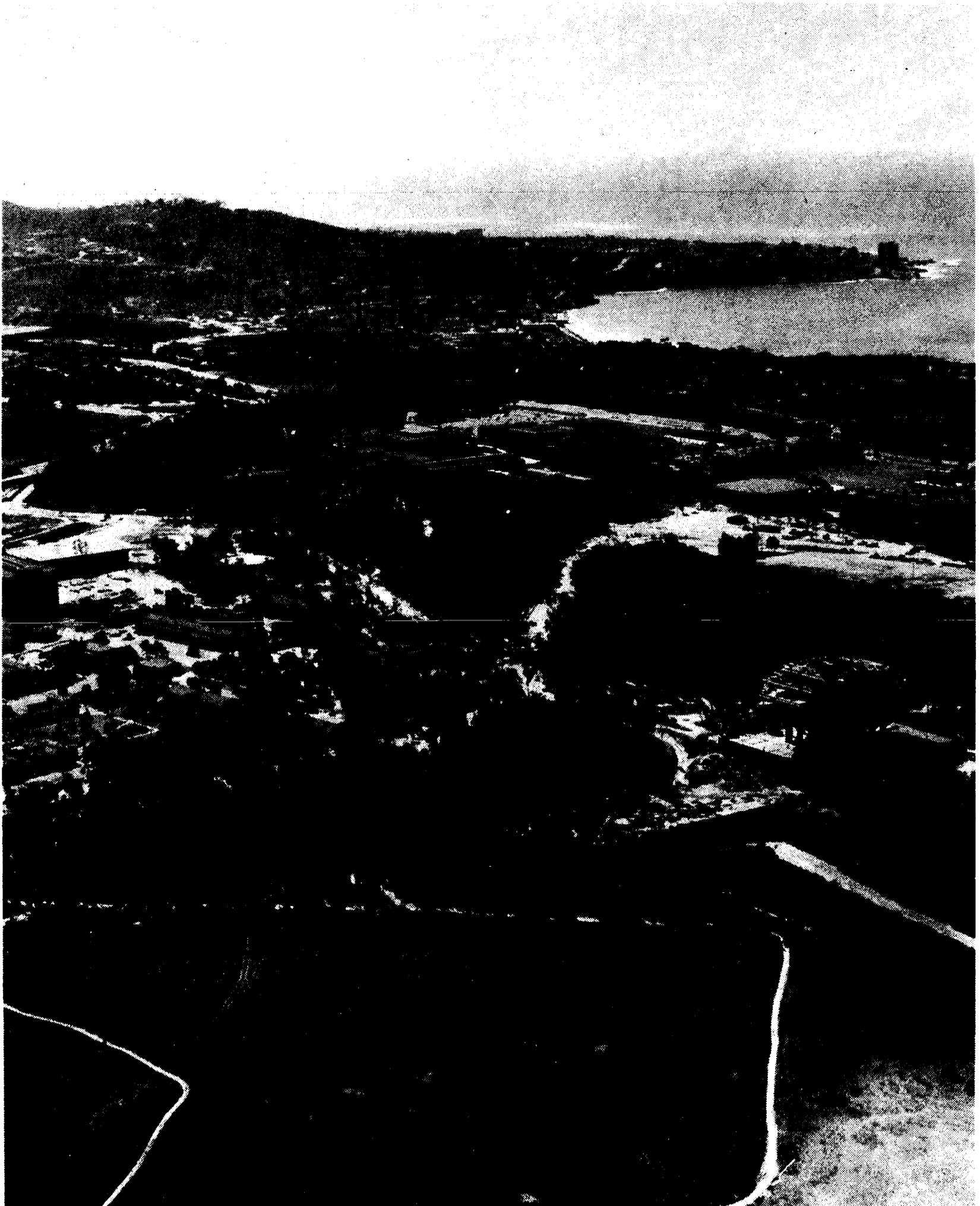
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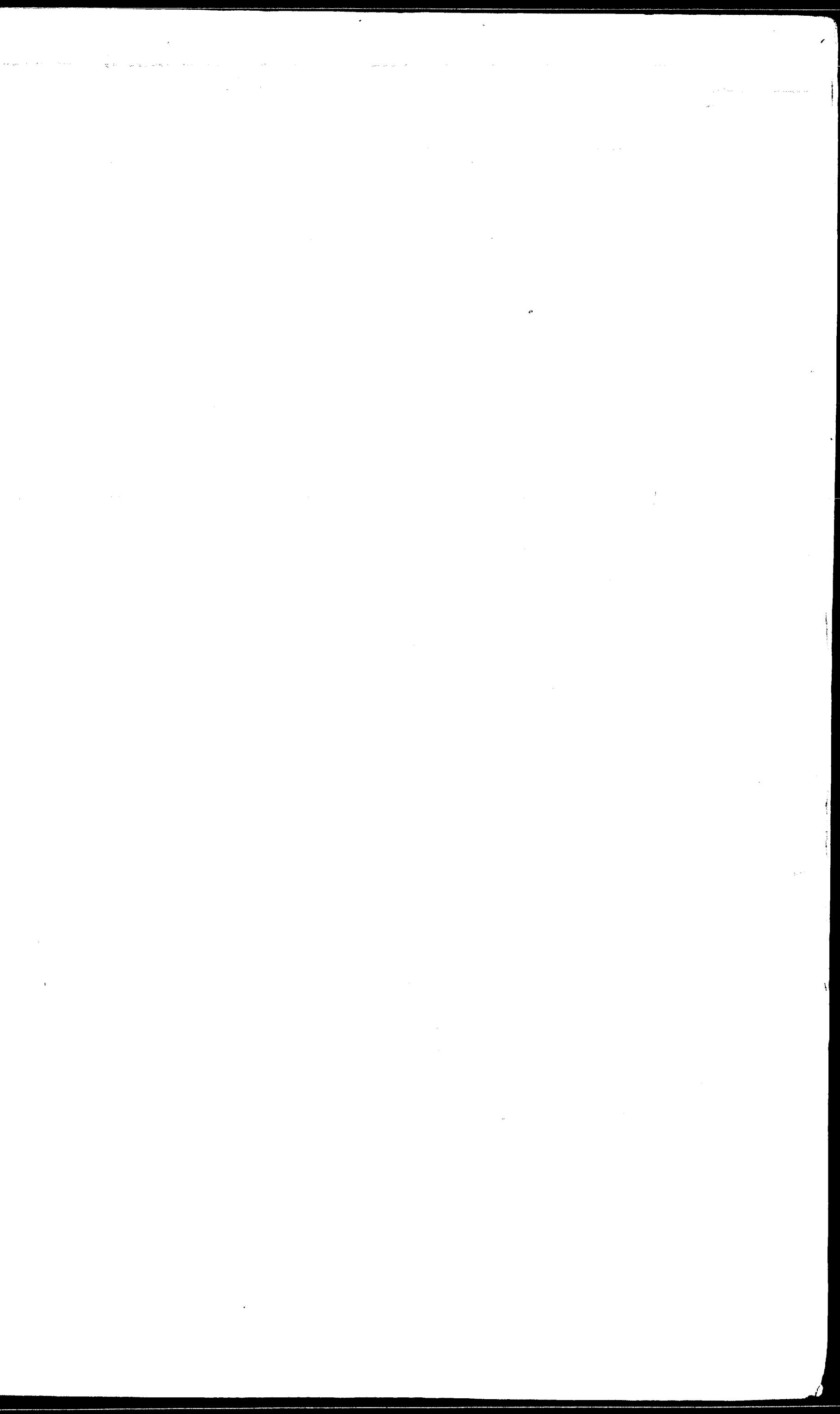
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UCSD from the air with School of Medicine, left, Revelle College, center, John Muir College and Central University Library, right, and La Jolla, background.





**University of California,
San Diego**

General Catalogs,

1972/1973