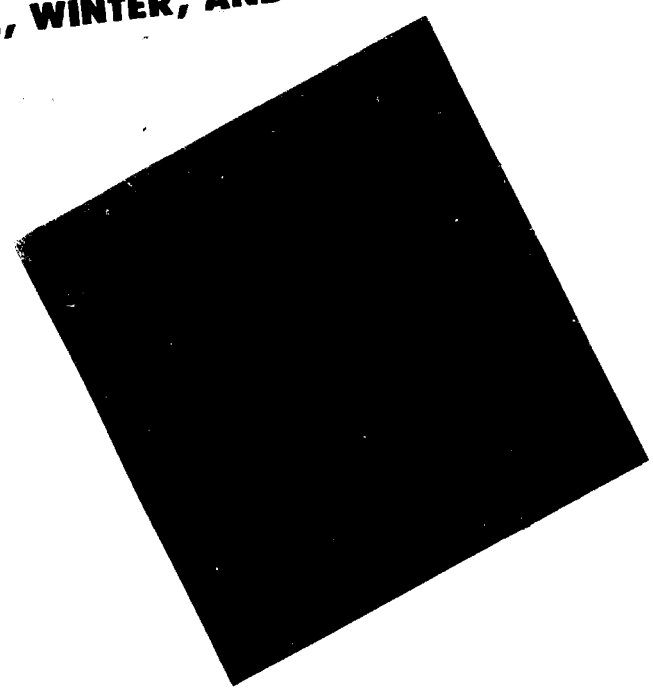
GENERAL CATALOG: FALL, WINTER, AND SPRING QUARTERS



UNIVERSITY OF CALIFORNIA, SAN DIEGO

UCSD

1971-72

GENERAL CATALOG: FALL, WINTER, AND SPRING QUARTERS

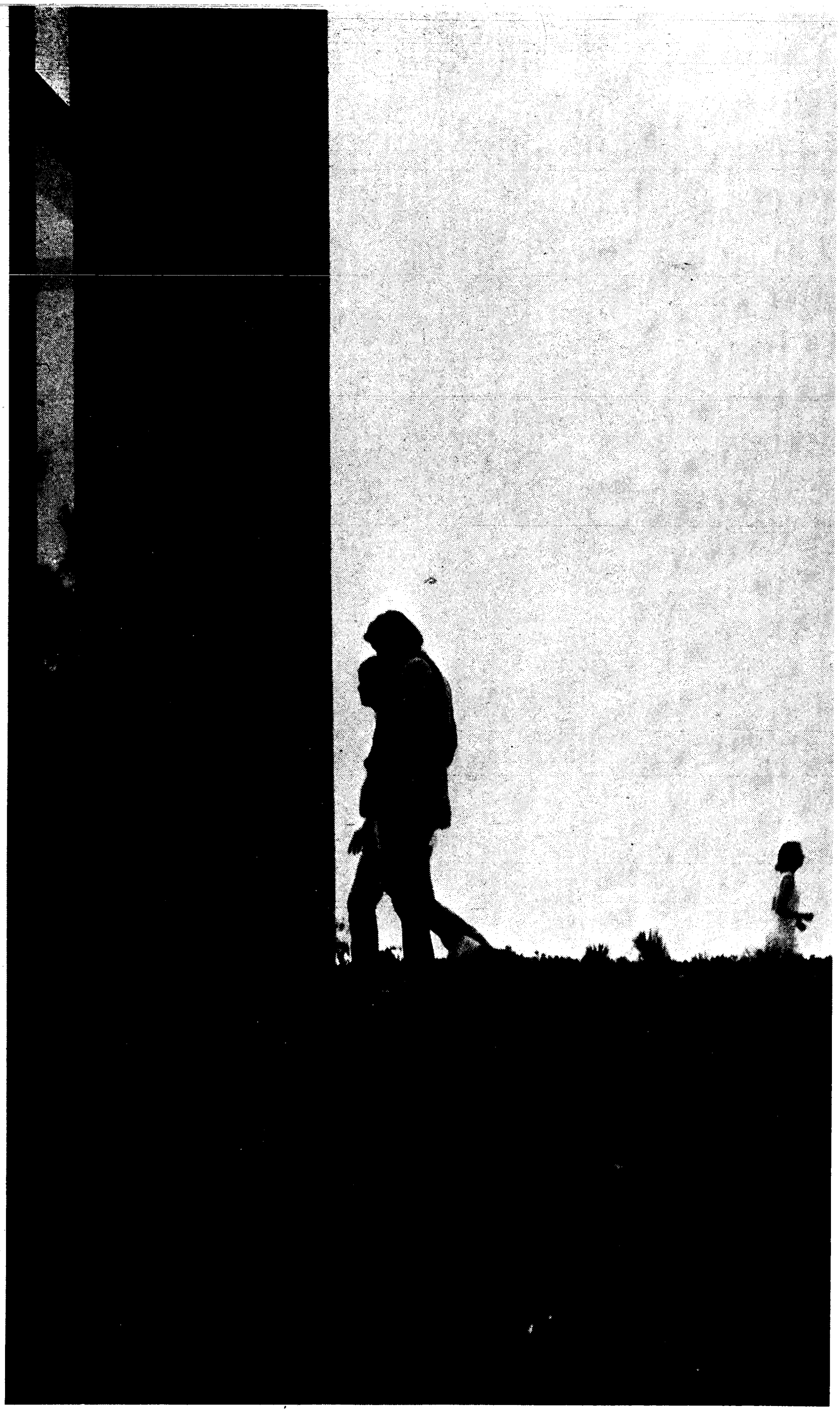
PRICE: $1 (by mail: $1.25)

UCSD Published at San Diego, California
Volume 4, Number 3; August 1971

A series of administrative publications of the University of California, San Diego
P.O. Box 109, La Jolla, CA 92037

Second class postage paid at La Jolla, CA
Five issues a year: one in April, two in August, and two in September.

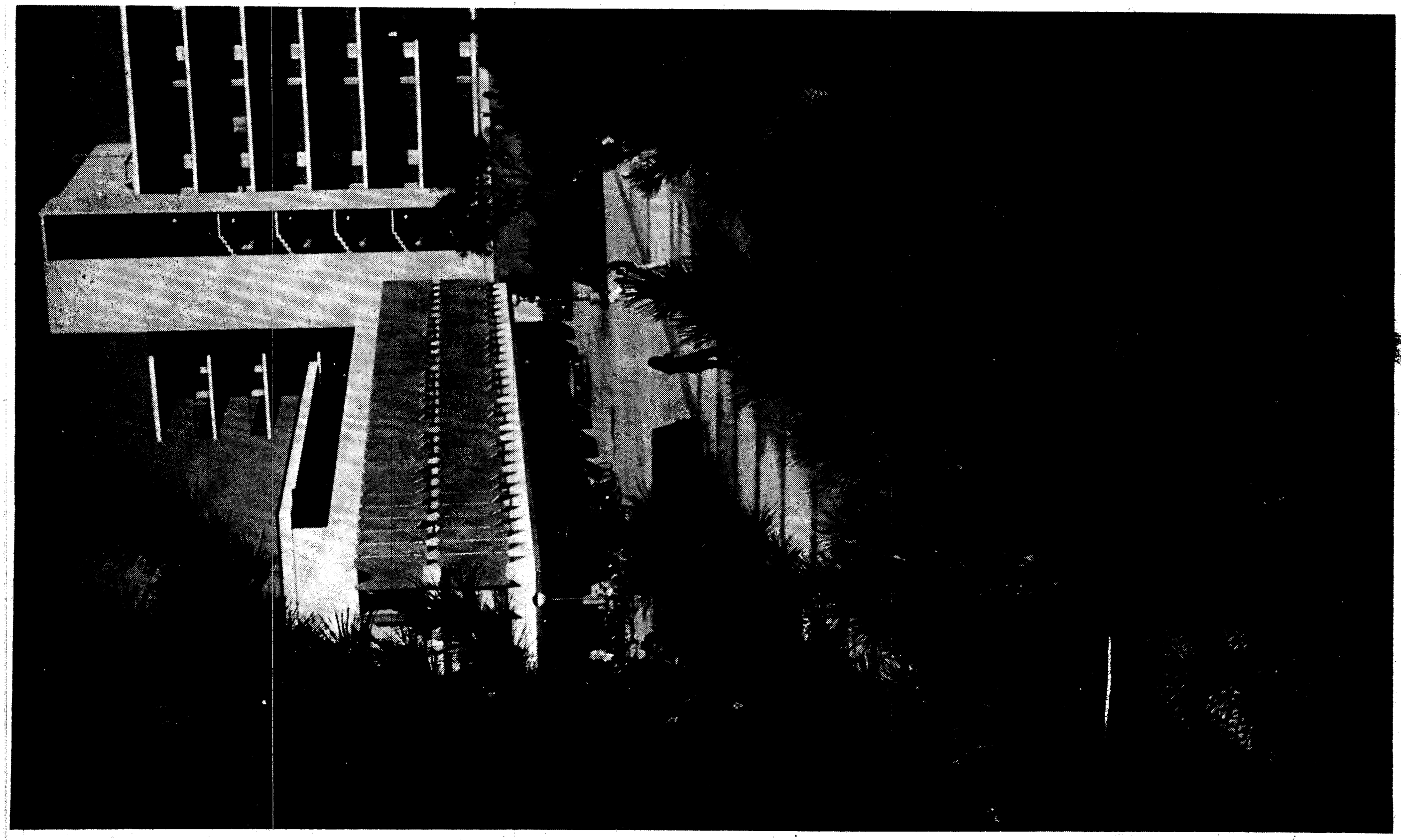
All announcements herein are subject to revision. Changes in listings of curriculum, faculty, and administrative personnel may occur subsequent to the date of publication.



	Fall 1971	Winter 1972	Spring 1972
Opening dates for filing applications for admission to undergraduate standing in regular, limited, or special status, including applications for second bachelor's degree (file with Admissions Office).	Nov. 2—Mon. (1970)	July 1—Thurs. (1971)	Oct. 1—Fri. (1971)
Graduates: Final dates for filing application materials for graduate admission including transcripts, letters of recommendation, scores on the Graduate Record Examination, etc.:			
Foreign Students	June 1—Tues.	Sept. 1—Wed. (1971)	Dec. 1—Wed. (1971)
Domestic Students	Aug. 1—Sun.	Nov. 1—Mon. (1971)	Feb. 1—Tues.
Final dates for filing applications for intercampus transfer (file with Registrar).	Mar. 1—Mon.	Nov. 1—Mon. (1971)	Feb. 1—Tues.
Final dates for final applications for readmission to undergraduate standing (file with Admissions Office.)	Aug. 2—Mon.	Nov. 1—Mon. (1971)	Feb. 1—Tues.
Administrative Holiday	—	Dec. 31—Fri.	—
Graduates: Application for Intercampus Exchange.	Sept. 7—Tues.	Dec. 13—Mon.	Mar. 6—Mon.
Quarter begins	**Sept. 27—Mon.**	**Jan. 3—Mon.**	**Mar. 27—Mon.**
Instruction begins	**Sept. 28—Tues.**	**Jan. 3—Mon.**	**Mar. 27—Mon.**
Final dates for paying fees without penalty. $25 late-registration fee will be assessed after this date.	Sept. 28—Tues.	Jan. 4—Tues.	Mar. 28—Tues.
Final dates for continuing students to enroll without penalty. A $10 late filing fee will be assessed after this date.	Sept. 28—Tues.	Jan. 4—Tues.	Mar. 28—Tues.
Undergraduates: Final dates for adding courses. Final dates for dropping courses without late fee. Final dates for paying fees without reapplication for admission.	Oct. 8 — Fri.	Jan. 14 — Fri.	Apr. 7 — Fri.
Graduates: Any graduate student actions/changes after the 1st two weeks of the quarter must be approved by petition.			
Final dates for filing applications for advancement to candidacy for the Master's degree to be conferred at the end of the quarter (at least one quarter must intervene between advancement to candidacy and conferring of the degree).	Oct. 11—Mon.	Jan. 14—Fri.	Apr. 7—Fri.
Final dates for filing applications for advancement to candidacy for the quarter to count toward the time interval for the Ph.D. degree (at least three quarters must intervene between advancement to candidacy and conferring of the degree).	Oct. 11—Mon.	Jan. 14—Fri.	Apr. 7—Fri.
Final dates for paying fees (with penalty) without petition. Students who do not register by this date will be dropped as a graduate student.	Oct. 11—Mon.	Jan. 14—Fri.	Apr. 7—Fri.
Final dates for adding or dropping courses without late fee and petition. Any changes to study lists after this date requires payment of a $3 fee and the filing of a petition. Final dates for filing approved Leave of Absence.	Oct. 11 — Mon.	Jan. 14—Fri.	Apr. 7—Fri.
Undergraduates: Final dates for filing notice of candidacy for the bachelor's degree to be conferred at end of quarter (file in Provost's Office).	Nov. 1—Mon.	Feb. 4—Fri.	May 3—Wed.
Graduates: Final dates for filing with the doctoral committee an appropriate draft of dissertation for a Ph.D. degree to be conferred at end of quarter.	Nov. 5 — Fri.	Feb. 4 — Fri.	May 1 — Mon.
Final dates for undergraduates to drop courses without penalty of F grades or to file notice of withdrawal without penalty of F grades. $3 fee, each petition.	Nov. 5—Fri.	Feb. 11—Fri.	May 5—Fri.
Graduates: Final date for filing applications for graduate fellowships (Office of Graduate Studies and Research).	—	Feb. 1—Tues.	—
Academic and administrative holidays.	Nov. 25-26 Thurs. - Fri.	Feb. 21—Mon.	May 29—Mon.

	Fall 1971	Winter 1972	Spring 1972
Graduates: Final date for satisfying all requirements for advanced degrees to be conferred at Commencement and to have name appear in commencement exercise.	–	–	May 31 – Wed.
Instruction ends	**Dec. 4 – Sat.**	**Mar. 11 – Sat.**	**Jun. 3 – Sat.**
"Free" Day. No student or faculty-sponsored events are to be scheduled for this day.	Dec. 6 – Mon.	Mar. 13 – Mon.	Jun. 5 – Mon.
Final examinations	Dec. 7-11 Tues.-Sat.	Mar. 14-18 Tues.-Sat.	Jun. 6-10 Tues.-Sat.
Graduates: Final dates for satisfying all requirements for advanced degrees to be conferred at end of quarter.	Dec. 18 – Sat.	Mar. 18 – Sat.	Jun. 13 – Tues.
Graduates: Final dates for removing incomplete Grade (E) assigned in previous quarter.	Dec. 18 – Sat.	Mar. 18 – Sat.	Jun. 13 – Tues.
Quarter ends	**Dec. 18 – Sat.**	**Mar. 18 – Sat.**	**Jun. 13 – Tues.**
Administrative holidays	Dec. 24 – Fri. Dec. 31 – Fri.	Mar. 24 – Fri.	–

CONTENTS



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 Oberservatory, 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 recently completed 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 new 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 nineteenth 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

The San Diego campus is expected to reach maximum growth by 1995, with a student enrollment of 27,500. By that time twelve interrelated colleges, grouped in clusters of three or four colleges each, will have been 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. Two colleges, Revelle and Muir, have been in operation for several years and The Third College opened last fall. 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 Library. The Library contains more than 800,000 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 underseas technology, and also specializes in geology, geophysics and zoology publications.

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

The Computer Center

During the 1971-72 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 B6500 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, Aerospace and Mechanical Engineering Sciences, Physics, Applied Physics and Information Science, and Mathematics.

Institute for Information Systems

The Institute for Informations 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 which come from the sea, such as the minerals, fish, and seawater itself, but also the capacities of the sea for transportation, recreation, waste disposal, and production of energy. 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 a great 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, Aerospace and Mechanical 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 educational needs of the community at large. In San Diego County it serves some 21,000 persons yearly.

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 fourth Freshman Class will be enrolled in September, 1971, and the Charter Class will graduate 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 will open early in 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 from the present class size of 48 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 Career-Education Planning Center, Building 250, Matthews Campus.

The Faculty of the School of Medicine

Name	Title	Department
Akeson, Wayne H., M.D.	Professor	Surgery
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, Norman A., Ph.D.	Professor	Radiology
Barondes, Samuel H., M.D.	Professor	Psychiatry
Barrett-Conner, Elizabeth L., M.D.	Assistant Professor	Community Medicine/ Medicine
Bendixen, Henrik H., M.D.	Professor	Surgery
Benirschke, Kurt, M.D.	Professor	Ob-Gyn/Pathology
Berger, Bennett M., Ph.D.	Professor	Sociology
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
Braunwald, Eugene, M.D.	Professor	Medicine
Braunwald, Nina, M.D.	Associate Professor	Surgery
Brown, Kenneth R., M.D.	Assistant 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
Covell, James W., M.D.	Associate Professor	Medicine
Davies, I. John, M.D.	Assistant Professor	Ob-Gyn
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	Chemistry
Doppman, John L., M.D.	Professor	Radiology
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
Fantino, Edmund J., Ph.D.	Associate Professor	Psychology
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
Garren, Leonard D., M.D., D.M.D.	Professor	Medicine
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
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
Harris, Seymour E., Ph.D.	Professor Emeritus	Economics
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
Kaplan, Nathan, Ph.D.	Professor	Chemistry
Karno, Marvin, M.D.	Assistant Professor	Psychiatry
Kisch, Arnold, M.D.	Associate Professor	Community Medicine
Kniazeff, Alexis J., D.V.M., Ph.D.	Professor	Medicine
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
Leventhal, Howard, Ph.D.	Professor	Psychology
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
Mendelsohn, John, M.D.	Assistant Professor	Medicine
Mendoza, Stanley A., M.D.	Assistant Professor	Pediatrics
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
Nelson, James R., M.D.	Associate Professor	Neurosciences

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
Pool, Peter E., M.D.	Assistant Professor	Medicine
Reuter, Stewart R., M.D.	Associate Professor	Radiology
Robb, James A., M.D.	Assistant Professor	Pathology
Robinson, Arthur B., Ph.D.	Assistant Professor	Biology
Rosenberg, Roger N., M.D.	Assistant 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.	Associate 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
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.	Associate Professor	Biology
Vatner, Stephen F., M.D.	Assistant Professor-in-Residence	Medicine
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
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 seven research vessels 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 groupsbiological oceanography, physical oceanography, marine biology, marine geology, 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 Projectand 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.

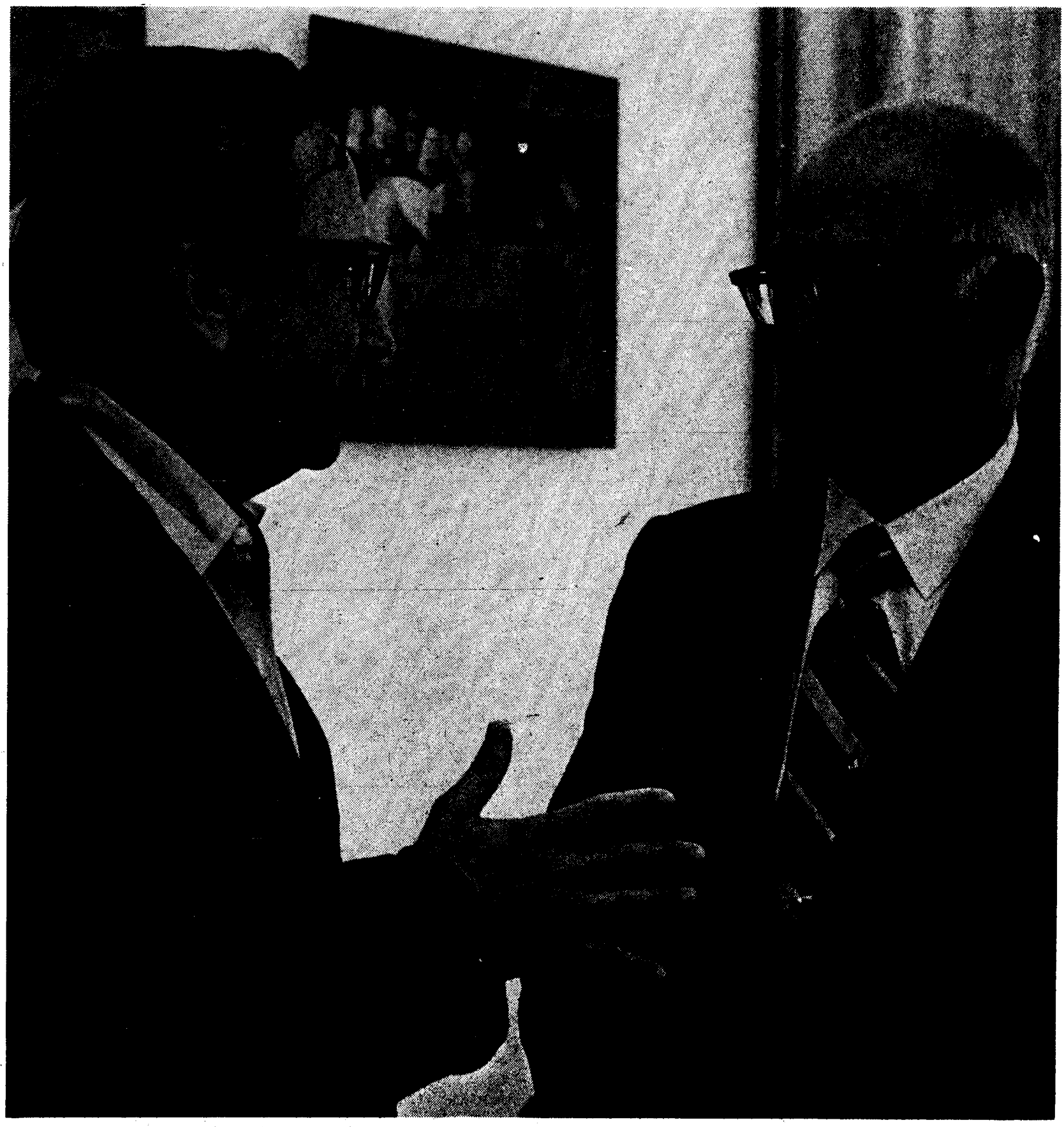
Organizationally separate, but sharing close affiliation with and proximity to Scripps, are the University of California's Institute of Geophysics and Planetary Physics and Institute of Marine Resources. The Fishery-Oceanography Center, located on the San Diego campus, is one of 30 major laboratories and centers operated by the National Marine Fisheries Service, a component of the newly created Oceanic and Atmospheric Administration of the U.S. Department of Commerce. FOC 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
Bradner, Hugh, Ph.D.	Professor	AMES
Bramlette, Milton N., Ph.D.	Professor Emeritus	SIO
Brune, James N., Ph.D.	Professor	SIO
Bullard, Edward, Ph.D.	Professor	SIO
Bullock, Theodore H., Ph.D.	Professor	Neurosciences
Cox, Charles S., Ph.D.	Professor	SIO
Craig, Harmon, Ph.D.	Professor	SIO
Curray, Joseph R., Ph.D.	Professor	SIO
Davis, Russ E., Ph.D.	Assistant Professor	SIO
Dayton, Paul, 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	SIO
Enright, James T., Ph.D.	Associate Professor	SIO
Epel, David, Ph.D.	Associate Professor	SIO
Fager, E. W., Ph.D., D. Phil.	Professor	SIO
Faulkner, D. J., Ph.D.	Assistant Professor	SIO
Fox, Denis L., Ph.D.	Professor Emeritus	SIO
Garrels, Robert M., Ph.D.	Professor	SIO
Gibson, Carl H., Ph.D.	Associate Professor	AMES/SIO
Gieskes, Joris M. T. M., Ph.D.	Assistant Professor	SIO
Gilbert, J. Freeman, Ph.D.	Professor	SIO
Goldberg, Edward D., Ph.D.	Professor	SIO
Hammel, Harold T., Ph.D.	Professor	SIO/Medical
Haubrich, Richard A., Ph.D.	Professor	SIO
Hawkins, James W., Jr., Ph.D.	Associate Professor	SIO
Haxo, F. T., Ph.D.	Professor	SIO
Hendershott, Myrl C., Ph.D.	Assistant Professor	SIO
Hessler, Robert R., Ph.D.	Associate Professor	SIO

Holland, Nicholas D., Ph.D.	Assistant Professor	SIO
Hubbs, Carl L., Ph.D.	Professor Emeritus	SIO
Inman, Douglas L., Ph.D.	Professor	SIO
Isaacs, John D., B.S.	Professor	SIO
Johnson, Martin W., Ph.D.	Professor Emeritus	SIO
Keeling, Charles D., Ph.D.	Professor	SIO
Lal, Devendra, Ph.D.	Professor	SIO
Lewin, Ralph A., Ph.D.	Professor	SIO
McEwen, George F., Ph.D.	Professor Emeritus	SIO
McGowan, John A., Ph.D.	Associate Professor	SIO
Menard, Henry W., Jr., Ph.D.	Professor	SIO
Mudie, John D., Ph.D.	Assistant Professor	SIO
Mullin, Michael M., Ph.D.	Associate Professor	SIO
Munk, Walter H., Ph.D.	Professor	SIO
Newman, Willaim A., Ph.D.	Associate Professor	SIO
Nierenberg, William A., Ph.D.	Professor, Dean of the Institution	Physics
Parker, Robert L., Ph.D.	Assistant Professor	SIO
Peterson, Melvin N., Ph.D.	Associate Professor	SIO
Phleger, Fred B, Ph.D.	Professor	SIO
Raitt, Russell W., Ph.D.	Professor	SIO
Rakestraw, Norris W., Ph.D.	Professor Emeritus	SIO
Revelle, Roger R., Ph.D.	Professor Emeritus, Director Emeritus	SIO
Rosenblatt, Richard H., Ph.D.	Associate Professor	SIO
Scholander, P. F., M.D., Ph.D.	Professor	SIO
Shepard, Francis P., Ph.D.	Professor Emeritus	SIO
Shor, George G., Jr., Ph.D.	Professor	SIO
Somero, George N., Ph.D.	Assistant Professor	SIO
Spiess, Fred N., Ph.D.	Professor	SIO
Taft, Bruce A., Ph.D.	Assistant Professor	SIO
Vacquier, Victor, M.A.	Professor	SIO
Van Atta, Charles W., Ph.D.	Associate Professor	AMES/SIO
Volcani, Benjamin E., Ph.D.	Professor	SIO
Wheelock, Charles D., M.S.	Professor Emeritus	SIO
Winterer, Edward L., Ph.D.	Professor	SIO
Wooster, Warren S., Ph.D.	Professor	SIO
ZoBell, Claude E., Ph.D.	Professor	SIO



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 sequencean 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 1A, 1B, 1C, or 1D or 2A, 2B or 2C 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 contemporary works, then goes back to the 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 *Interdisciplinary Courses: 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.

FRESHMAN YEAR

Fall	Winter	Spring
Humanities 1	Humanities 2	Humanities 3
Language	Language	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 4	Humanities 5	Humanities 6
Natural Science 1C or 2C	Nat. Sci. 1D or 2D	Nat. Sci. 1E or 2E
Social Science	Social Science	Social Science
Elective/Language	Elective/Language	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, as well as any later changes in it, 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 as well as any later changes in it 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 divison).

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.

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

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 rigorously only for those subjects that are directly related to the student's 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. Some departments may require a transfer student with senior standing to satisfy a residence

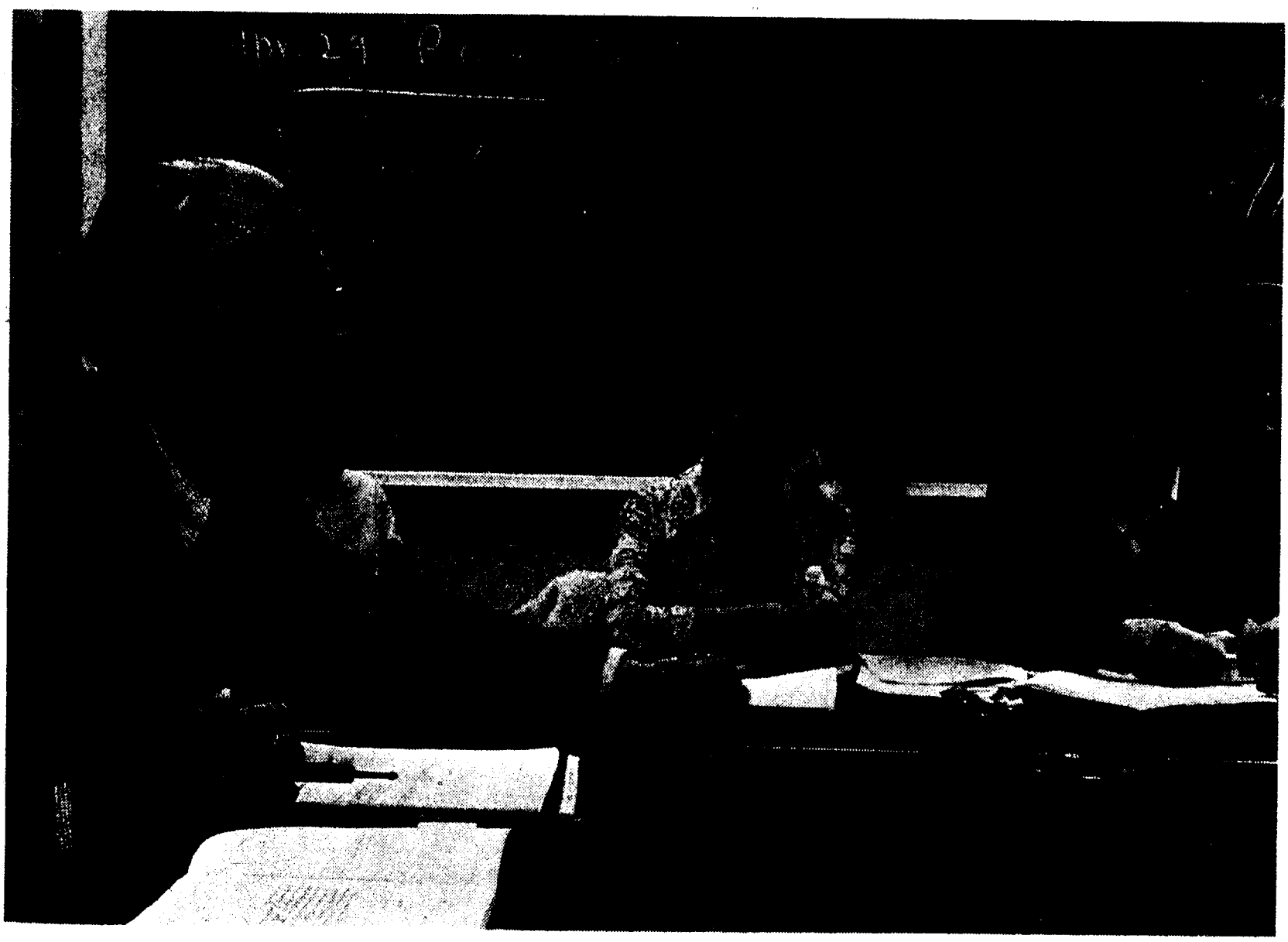
requirement within the major department. Students should consult their major advisers about the minimum number of courses required for this purpose.

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



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 livingif 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, which is charged with overseeing the curriculum. 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 by involving the students directly with research and creative work. Thus, for example, the fine arts courses include periods of studio work or its equivalent. All first-year students are required to complete a course in contemporary issues. There is a special reading room where they can find periodicals and newspapers from all over the world, maps, charts, pictures, and other visual aids on exhibit, and books especially chosen for their relevance to the issues under discussion. Most important of all, the students work among faculty members, postdoctoral fellows, and graduate students who are themselves actively engaged in creation and discovery.

Active learning necessitates self-education and opportunities for independent study. Subject to certain restrictions, a student may substitute reading courses for regular courses, permitting him to investigate in more than usual depth the topics of special interest to him. The major programs provide many forms of independent study. 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. Finally those students who choose not to pursue a major (see below) will be expected to complete projects that demand much independent investigation.

In John Muir College no new theory, no new discovery, no new work of art will long go unexamined or undiscussed. It will not be a comfortable place for those whose minds are made up.

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*.) This requirement asks that the student demonstrate an ability to write English without gross errors in spelling, grammar, diction, sentence structure, and punctuation. Satisfaction of the requirement in Subject A is a prerequisite to taking any further course in which the writing of themes or papers forms a substantial part of the student's work.
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. To receive a degree from John Muir College, a student must satisfy the residency requirement by passing nine out of his last eleven courses enrolled as a Muir College student.
5. Fulfill the general education requirements described below. Appropriate work done at other institutions may be used to satisfy these requirements. (Exemption does not reduce to less than 45 the number of courses required for graduation.)
6. Show in some form a concentration and focus of studies as part of his preparation for the bachelor of arts degree. This requirement may be fulfilled by a departmental or interdisciplinary major, but a major itself is not required. (For discussion of major programs, see below.) Normally a student who is affiliated with John Muir College and wishes to undertake a major program as his form of concentration would choose one offered in the College. (The opportunity to engage in the program would be an important reason for choosing Muir College.) However, the student may fulfill this requirement by completing any major program offered at UCSD to which he can gain admission.

A student who does not choose to meet this requirement by means of a major must complete a special project, normally undertaken in the senior year, having such scope and significance that it integrates and summarizes much of the student's learning. Some appropriate projects might be, for example, a thesis-length essay in literature, history, or anthropology; field research on a social problem of the San Diego area; composing a three-movement work for a string quartet; painting a mural. (See *Regulations and Guidelines regarding Muir College Special Projects*.)

The General Education Requirements

Each Muir student is expected to:

1. Complete a three-term sequence of courses in a cultural tradition.
2. Complete a three-term sequence of courses in one of the humanities or fine arts.
3. Complete a three-term sequence in mathematics. *This requirement must be completed before the end of the sophomore year.*
4. Complete three courses in the sciences. A list of courses suitable for fulfilling this requirement will be provided at the time of enrollment.
5. Complete a course on contemporary issues. *This requirement must be met during the first year.*
6. Demonstrate foreign language proficiency.

All of the above requirements can be taken pass/not pass with the exception of language.

Introduction to a Cultural Tradition. Students select one from among several three-term sequences which inquire into the nature of particular cultures by way of their literary, artistic, historical, philosophical, and socio-anthropological aspects. Among the cultures studied in recent years have been Asian, Indian, Latin American, Chinese, Graeco-Roman, and West African.

The Humanities and Fine Arts Sequences. Students select one from among several three-term sequences which provide either (*a*) an introduction to one of the humanities or (*b*) an introduction to an artistic medium intended to develop sensitivity and standards of critical judgment. In addition to the ordinary lectures and discussion meetings, the courses in the arts include some studio or creative work and, where appropriate, attendance at performances and exhibitions.

Course sequences being offered at present which will satisfy the humanities and fine arts requirements are: Drama 11A-11B-11C History 30A-30B-30C; Literature 1A-1B-1C; Music 1A-1B-1C; Visual Arts 15A-15B-15C. (See *Departments of Instruction*.)

The Mathematics Sequences. With the help of the Mathematics Department the student will select from among three sequences the one which best fits his diverse interests, training, and educational goals. Students who will not use mathematics as a tool in further work can select a sequence which deals with fundamental concepts of mathematics without insisting upon technical proficiency. Students planning to take advanced courses or major in the sciences and psychology can select a more traditional sequence in calculus and analytic geometry. Certain well-prepared and well-motivated students will be encouraged to take three courses on special topics, such as probability and statistics, or the theory of games. During each term at least one such topics course will be offered. Students initially enrolled in another sequence will be allowed to transfer to a topics course if they show sufficient aptitude. Students who have had college-level mathematics for which UCSD grants credit will be considered to have satisfied part or all of the mathematics requirement.

Departments may designate particular mathematics sequences as prerequesites for advanced work in their fields. (For further information on this point see the discussion of major programs below.)

For courses offered in satisfaction of the mathematics requirement, see *Departments of Instruction: Mathematics*.

The Science Sequence. The science requirement is intended to inculcate general literacy with respect to the basic assumptions, ideas, and methodologies underlying scientific inquiry, together with some understanding of the role of science itself as a social institution whose dynamism profoundly affects modern cultures. Each student is expected to take not less than three courses from a list which is approved by the faculty. Students who do not plan to major in a science may take any three on the list; however, certain courses especially designed for them are offered at the junior-senior level. Therefore, students who do not plan to major in science may enroll in science courses in the freshman and sophomore years or wait to take the junior and senior courses.

The various science departments may specify up to five courses on the list which must be taken *before the junior year* by students who wish to pursue advanced work in the sciences. Students planning to major in applied physics and information science should take the courses numbered 2A through 2E. Students planning to major in biology should take the courses numbered 3A,B,C and 103A,B. The courses in these two sequences also serve to fulfill the science requirement of the College. For non-science majors, the Biology 6,7,8 sequence is offered.

The Contemporary Issues Courses. The Contemporary Issues requirement is met by freshmen enrolling in Contemporary Issues I a lecture series. Discussion sections are formed to consider various contemporary topics.

The discussion sections are held weekly with 10-20 freshmen in a group. The discussion sections are under the supervision of the Director. There will be selected readings, discussions, projects and papers required of the students. The Contemporary Issues class will be held Fall and Winter quarters and must be taken both quarters. The students will receive 2 units each quarter but they will not be given the credits until the end of the winter quarter. The course will make use of the facilities of a special reading room in which students may study at leisure books, periodicals, newspapers, pictures and other visual aids accumulated from all parts of the globe and arranged to supplement the discussions then under way. (It is possible that the requirements may be met by enrolling in a seminar 2 but one must check the *Schedule of Classes* to see if a seminar is being offered that particular quarter. This requirement is waived for transfer students entering with 40 units or more.)

Language Proficiency. Students will be expected to demonstrate their proficiency in one of the following ways:

a. One quarter of Literature 10;

b. Any foreign literature course numbered 11 or above;

c. Proof of equivalent study abroad;

d. Transfer students entering the University with 40 or more units may satisfy requirement by Literature 10 or passing a language proficiency examination.

Further details concerning the language requirement may be found under Language in the course section.

Transfer Students

Transfer students accepted by Muir 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 student's 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. A transfer student at the junior or senior level may be admitted to a major even though he has not completed the lower-division general education requirements. In such cases, the general requirements must be completed before graduation. (See *Admission to the University: Advanced Standing*.)

REGULATIONS AND GUIDELINES REGARDING MUIR COLLEGE SPECIAL PROJECTS

The degree requirements of John Muir College stipulate that a student show a concentration and focus of studies as part of his qualifications for the bachelor of arts degree. Most students meet this requirement by completing an established departmental major. However, in keeping with the college policy that Muir students be encouraged to select programs especially suited to their individual interests and needs and that they be given opportunities for independent study there exists the option of meeting this requirement by means of a special study project overseen by a qualified advisor and approved by the Provost or his designated agent.

Special projects are of two kinds. First is the project consisting of a unique combination of approximately fifteen (and not less than twelve) upper division courses, which may if desired be spread across several departments. The combination must have some rationale, some organizing theme, topic, or other principle by means of which the various courses take their place within some entity comparable to the ordinary departmental major. A student choosing a special project of this kind must write during his final term a thesis setting forth the relationship among the courses and the academic significance of what has been learned through their relatedness.

The second form of project embodies a considerable amount of independent research or creative work outside the framework of established courses.

Such independent work may require as much time and effort as would be devoted to two or more ordinary courses. Therefore a properly qualified student may enroll for Muir 199 bearing 4, 8, 12, or even 16 units for a term (equivalent to the credit earned in two, three or four conventional courses. He may use other 199's if appropriate, but *only* Muir 199's can be used for more than 4 units of credit at a time).

Two things need to be kept in mind by anyone thinking of undertaking a project:

a. Because a project of either kind requires considerable knowledge, educational experience, and maturity, a student is well advised to complete his general education requirements and to have tried a number of electives before setting out upon a project. It is probably best to defer beginning a project until the junior year, though one can certainly start planning for it sooner.

b. At the same time one does not have to design a project and start in upon it at the beginning of the junior year in order to finish it in time to graduate on schedule. Some students may start a departmental major, do a year's work on it, and shift to a special project in the senior year. In such instances, the course work done for the major can be incorporated into the design of the special project.

THE FOLLOWING CONSIDERATIONS GOVERN A PROJECT:

1. In order to ensure successful completion of a project in time for graduation, a student wishing to undertake one should find a member of the UCSD faculty (not a visiting professor) who is interested and qualified in the field and able to act as advisor for the project.

2. In designing his project a student may include as an element in it any upper division course that he has previously taken, provided that it is truly a functional part of the project. The critical thing is proving to the satisfaction of a faculty advisor and the Provost or his agent that one has indeed achieved a concentration and focus of studies and satisfied the degree requirement. An occasional student might start later than most and still manage to do this.

3. As a first step toward being formally recognized as engaged upon a special project undertaken to satisfy the degree requirement, a student should submit to the faculty member whom he would like to have as his advisor a written description of his project. It should explain how the project has academic significance, how it should result in a concentration and focus of upper division studies, and how it is of sufficient scope to fulfill the requirement. (Here one should take equivalence to 15 ordinary upper division courses as a guide.)

4. If the prospective advisor is then willing to serve, he should sign the last page of the proposal. The signed proposal should then be turned in to the Provost's office for a decision regarding its acceptability for the degree.

5. If a student is hoping to start his special project during the junior year, he should select those courses that make up its early stages so that he could shift to a conventional major if he loses interest or fails to demonstrate a capacity for sustained, satisfactory work on the project. Any student who elects to not take such a precaution, does so at his own risk.

6. Students wishing to obtain multi-unit credit for independent study done in the library, studio, laboratory, or field, must ordinarily first undertake one term of such independent study for four units (equivalent to the credit earned in one ordinary course) and demonstrate to the satisfaction of his advisor and the Provost his ability to maintain a satisfactory level of effort and achievement. It would be advantageous if the preliminary independent study involving four units were done in connection with the special project. Moreover, multi-unit credit for work on the project under the 199 designation will be limited to seniors in all but exceptional cases.

(NOTE: Students are reminded that under the rules of the UCSD Division of the Academic Senate they may not register for more than 16 units of independent study (199 courses) per academic year unless they are formally recognized as Muir students working on an approved special project. Moreover, in any given term a student may not take more than 4 units of independent study with one professor. Again an exception is made for the Muir students engaged on an approved project.)

7. Regardless of the number of units of credit sought, a student desiring to enroll in a Muir 199 course to work on his project must first be recognized as engaged in a special project. Then he must submit to his advisor and the Provost a detailed outline of the work he plans to do and a statement showing how this work relates to the total project. This outline is due two weeks in advance of the start of the quarter in which the work will be done. Such an outline must be submitted *for each term and for each four units* of Muir 199 study undertaken. If the outline is unsatisfactory, the student will not be permitted to sign up for Muir 199. (Work done on a departmental 199 course comes under the usual rules for such courses. Students should check these rules with the departments involved.)

8. As noted in the introduction, a student engaged on a special project that is essentially a unique combination of courses which constitute an interdepartmental major must submit to the Provost a senior thesis that has been approved by his advisor. Under proper conditions he may also obtain 199 course credit for his work in writing this thesis.

9. All students engaged on a Muir special project of whatever kind are expected to produce some piece of original work that grows out of the project. In the case of those engaged in creative activity in the arts, this will be some corpus of literary writing, some piece of music, some visual object or event, or their equivalent. In the case of those engaged in library or laboratory research, this will be a report on their findings and interpretations of them. In the case of those undertaking an interdepartmental majora unique combination of courses

that make up a viable entitythis will be the thesis that establishes the relatedness of the courses and their content. Whatever the form of original work resulting from the project, *it must be approved by the project advisor, the Provost (or his agent) and two members of the faculty before the student can be considered to have completed the project, regardless of the other work he has finished.*

10. Evidence that the student has completed his project and fulfilled the degree requirement is of two kinds. First there is the record of the passing grades in the courses, including Muir and other 199's, to establish that course credit was earned. Second, there is the *written* approval by the advisor, the Provost (or his agent), and two faculty members that the original work involved in the project is satisfactory.

When all the evidence is in, the Provost signs a statement that the *total* project has been completed. This is equivalent to the statement by a departmental chairman that an ordinary major has been completed. Outstanding work in the courses that make up the project (including the 199's) entitles one to honors ratings in the same way that work toward an ordinary major does.

11. Students interested in teaching at some future time should keep in mind that a Muir Special Project will not necessarily satisfy the California requirement that a student have a concentration of upper division courses in order to receive a teaching certificate.

Major Programs

A student in John Muir College may pursue any major program offered at UCSD for which he is prepared, though normally he would undertake one offered in the college. He may begin the major whenever he is judged ready for it. However, all programs can be completed by students who start them at the beginning of the junior year, and it is likely that most students will wait until then to begin.

Below is a list of subjects in which major programs are available in the college. Interdisciplinary programs are being developed.

Anthropology
Applied Physics and Information Science*†
Biology*†
Drama
History
Linguistics
Literature
Mathematics*
Music
Psychology*
Sociology
Visual Arts†

*Requires a particular mathematics sequence.

†Requires a particualr sequence of preparatory courses to be completed by the end of the second year.

Reading Courses and Examinations

Subject to certain restrictions, a student in John Muir College can substitute reading courses for regular courses. To help him to comprehend a reading course as a whole and to understand how it relates to the content of his regular courses, he will be allowed a suitable period of reflection (not to exceed two terms after the end of the reading course) and then to be required to take an examination of the reading.

A student may use reading courses during a particular term only if he has had his program approved by an appropriate faculty member *at least one term in advance of his entering the program.* Arrangements for the examinations on the reading must be made and approved at the same time. Proposals for reading that necessitates an inordinate amount of special faculty work will have to be denied.

The First Year

John Muir College offers the incoming student considerable freedom in choosing the courses for his first year. This freedom should be wisely used to fit a program to the student's particular training and interests, leaving some scope for exploration of new areas of learning while attending to the requirements for graduation which are best fulfilled during the first two years.

To help incoming students with the planning of the first year's program, four possible combinations are described below.

The first combination is suited to students with the usual preparatory training in language and mathematics *who do not expect to take advanced work in the sciences.*

Fall	Winter	Spring
Mathematics 1A or 5A	Mathematics 1B or 5B	Mathematics 1C or 5C
Language	Language	Language
Literature 1A	Literature 1B	Literature 1C
Elective	Elective	Elective
Contemporary Issues 1	Contemporary Issues 1	

Comment: The mathematics requirement must be met before the end of the sophomore year. Thus the student is not compelled to begin it immediately. However, many students will not wish to have an interval of a year between finishing high school and beginning their mathematics courses, and as a consequence will schedule a sequence that will enable them to meet the mathematics requirement during the first year. Moreover, this combination assumes that the student needs a full year of language preparation in order to fulfill the language requirement. It also assumes that the student wants to meet the humanities and fine arts requirement in the freshman year and has chosen a sequence of three literature courses for that purpose. Finally, the Contemporary Issues course of lectures, required of all freshmen except those admitted to a freshman seminar, is spread across two terms.

The second combination is appropriate to students who are interested in majoring in applied physics and information science or biology or in taking other advanced courses in the physical sciences.

Fall	Winter	Spring
Elective	Science	Science
Science or Mathematics 1A or 2A	Mathematics 1B or 2B	Mathematics 1C or 2C
Language	Language	Language
Music 1A	Music 1B	Music 1C
Contemporary Issues 1	Contemporary Issues 1	

Comment: The science sequence for students planning more work in the physical sciences should not be started until the students have completed either Mathematics 1A or 2A. Therefore their science is undertaken in the winter term. Those planning to do advanced work in Biology may begin their science sequence in the fall term. This example assumes that the student using its needs a full year of language work and that he has decided to fulfill his humanities and fine arts requirement in the first year by studying music for three terms. The student may have a free elective in the first term, which can be used to explore subjects (such as psychology and sociology) which he has not encountered before coming to college. Or, he might use this elective to gain admission to a freshman seminar, in which case he would not need to take the Contemporary Issues lecture sequence (although he would be welcome to attend the lectures).

The third combination would be an appropriate one for students who do not plan to use mathematics as a tool for further work and who are qualified to begin a major program in the freshman year. (Students may begin a major as soon as they are judged ready for it. On the other hand, those who wish may wait until the first term of the junior year before undertaking it.) In this example we assume that the major is in music.

Fall	Winter	Spring
Mathematics 5A	Mathematics 5B	Mathematics 5C
Language	Language	Language
Music 1A	Music 1B	Music 1C
Elective	Elective	Elective
Contemporary Issues 1	Contemporary Issues 1	

Comment: Only an unusually well-prepared student should think of attempting to begin a major in the first year. Here, the student, after demonstrating a great skill and solid prior training, is admitted to Music 2A. It should be noted that the music courses listed here do not satisfy the humanities and fine arts requirement. Therefore the student following this program will need to take a three-course sequence in one of the humanities, such as literature, or one of the other arts, such as drama sometime before graduation.

The fourth combination is appropriate to those students who are far better prepared in language and mathematics than most students entering American colleges and universities. As a consequence of their training such students have more free electives and can do more advanced work from the outset.

Fall	Winter	Spring
Elective	Science	Science
Cultural Traditions	Cultural Traditions	Cultural Traditions
Mathematics 2C	Elective	Elective
Visual Arts 15A	Visual Arts 15B	Visual Arts 15C
Contemporary Issues 1	Contemporary Issues 1	

Comment: In this example, the student plans to do advanced work in biology or the physical sciences and selects the appropriate science sequence. His training in mathematics is so excellent that he gains admission to Mathematics 2C and demonstrates such understanding of the subject that he is considered to have fulfilled the mathematics requirement. As a consequence, he has at least three electives in his first year. He may wish to use them for more mathematics courses, since one of the advantages of good prior training is the greater freedom to concentrate on those subjects that most interest one. Or, he may use the time to sample subjects which are new to him. This same student is so well prepared in a foreign language that he can move on toward courses normally taken in the second year or even later. In this example, the student is shown enrolled in a Cultural Tradition Sequence, which freshmen ordinarily do not take.

There are, of course, many other possible combinations. In seeking the one which best suits him, an entering student should keep several things in mind.

1. Students who will major in a science must complete at least five preparatory courses which are begun in the freshman year. Other students may take any three courses approved for the science requirement including special upper-division courses which are being designed for them.

2. The mathematics requirement must be fulfilled by the end of the second year, and it is usually good practice to complete it during the freshman year, so that skills acquired in high school will not decline. Students majoring in a science will need to take Mathematics 1A or 2A in the fall quarter of the freshman year.

3. Those students who need to take more language training should ordinarily begin it promptly.

The Faculty of Muir College

Name	Title	Department
Alazraki, Jaime, Ph.D.	Professor	Literature
Alfven, Hannes, Ph.D.	Professor-in-Residence	Physics
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
Baron, Samuel H., Ph.D.	Professor	History
Benamou, Michel, Ph.D.	Professor	Literature
Berman, Ronald S., 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
Campbell, James L., M.S.	Assistant Professor	Music
Campbell, Laughlin A., Ph.D.	Assistant Professor	Mathematics
Chapin, Paul G., Ph.D.	Assistant Professor	Linguistics
Chrispeels, Maarten J., Ph.D.	Assistant Professor	Biology
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
De Moss, John A., Ph.D.	Professor	Biology
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
Eckart, Carl, Ph.D.	Professor Emeritus	Physics
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
Fejer, Jules A., D.Sc.	Professor	APIS
Fillmore, Jay P., Ph.D.	Assistant Professor	Mathematics
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
Kaplan, Nathan, Ph.D.	Professor	Chemistry
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.	Assistant 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
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
Penhoet, Edward E., Ph.D.	Assistant Professor-in-Residence	Biology
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
Soule, 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
Tureck, Rosalyn	Professor	Music
Turetzky, Bertram J., M.A.	Assistant Professor	Music
Van Fleet, Ellen, M.A.	Assistant Professor	Visual Arts
Warschawski, Stefan E., Ph.D.	Professor	Mathematics
Wavrik, John J., Ph.D.	Assistant Professor	Mathematics
Wesling, Donald T., Ph.D.	Associate Professor	Literature
Wilde, William A., Ph.D.	Assistant Professor	Sociology
Wilden, Anthony G., Ph.D.	Assistant Professor	Literature
Wilhelmy, Roland, Ph.D.	Assistant Professor	Psychology
Yip, Wai-lim, Ph.D.	Assistant Professor	Literature
York, Herbert F., Ph.D.	Professor	Physics

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Honorary Fellows of the College

Hannes Alfven, *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*

The 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 imput 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 through its Board of Directors. The Board consists of three elected student representatives, two elected faculty representatives, and the Provost. This unique level of student responsibility is one of the most exciting innovations in the Third College development.

THE CORE COURSES AND INTERDEPARTMENTAL MAJORS

The Third College core courses, as well as the interdepartmental majors, consist of the disciplines shown below. For individual course descriptions refer to these titles under course listings.

1. SCIENCE AND TECHNOLOGY. The purpose of the lower division sequence in this area is to give students insight into the nature of science and its relevance to their lives. No extensive mathematical background will be assumed. Instead of using an abstract logical approach, the course will start from objects or ideas which are familiar to the students and lead to investigations of processes and principles on which they are based. There will be special concentration on the health sciences, especially pre-medical studies. The Medical School on the San Diego campus is cooperating closely with Third College in developing a pre-med major and in devising programs to introduce students to the health sciences.
2. URBAN AND RURAL DEVELOPMENT. This area seeks to acquaint students with the dimensions of the urban crisis and its relation to migration from rural regions and to provide them with the intellectual tools necessary for coping with specific problem areas.
3. THIRD WORLD STUDIES. The sequence of Third World Studies will seek to provide students with both information about and understanding of non-western cultures and nations. This sequence will play a role in Third College comparable with that of the humanities sequence in Revelle College.
4. COMMUNICATIONS. This program is intended to improve effectiveness of students by providing them with the opportunity to develop an understanding of the sociological, psychological, philosophical, and economic aspects of communication in order to intensify all of their talents in the use of language art and media forms.
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 advance academic setting and to acquaint students with the important role which mathematics plays in present-day society. (Courses included in the mathematics requirement are Mathematics 4A, 4B, 10A and 10D. See Course Descriptions: Mathematics.)

In addition, innovative programs in Computer Instruction are presently being developed. Also, a Composition Program is planned to fulfill the University requirement in Subject A.

The student will also have a wide range of departmental majors available. In general, these majors will differ from those offered in the other colleges by emphasizing applications to contemporary social problems. For example, the proposed major in Urban and Rural Development will emphasize the alleviation of the socialization problems related to urbanization processes.

Community service programs will be a vital part of the activities of Third College students. For example, participation of pre-medical students in the operation of community health centers will allow the student to observe the medical needs of the community and will help to strengthen his commitment to meeting those needs.

THE GENERAL EDUCATION REQUIREMENTS

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

1. Four quarters (16 units) in Science and Technology
2. A three-quarter (12 unit) sequence in Urban and Rural Development
3. A three-quarter (12 unit) sequence in Third World Studies
4. A three-quarter (12 unit) sequence in Communications
5. Two quarters (8 units) in Mathematics

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 penality 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 GRADUATION REQUIREMENTS

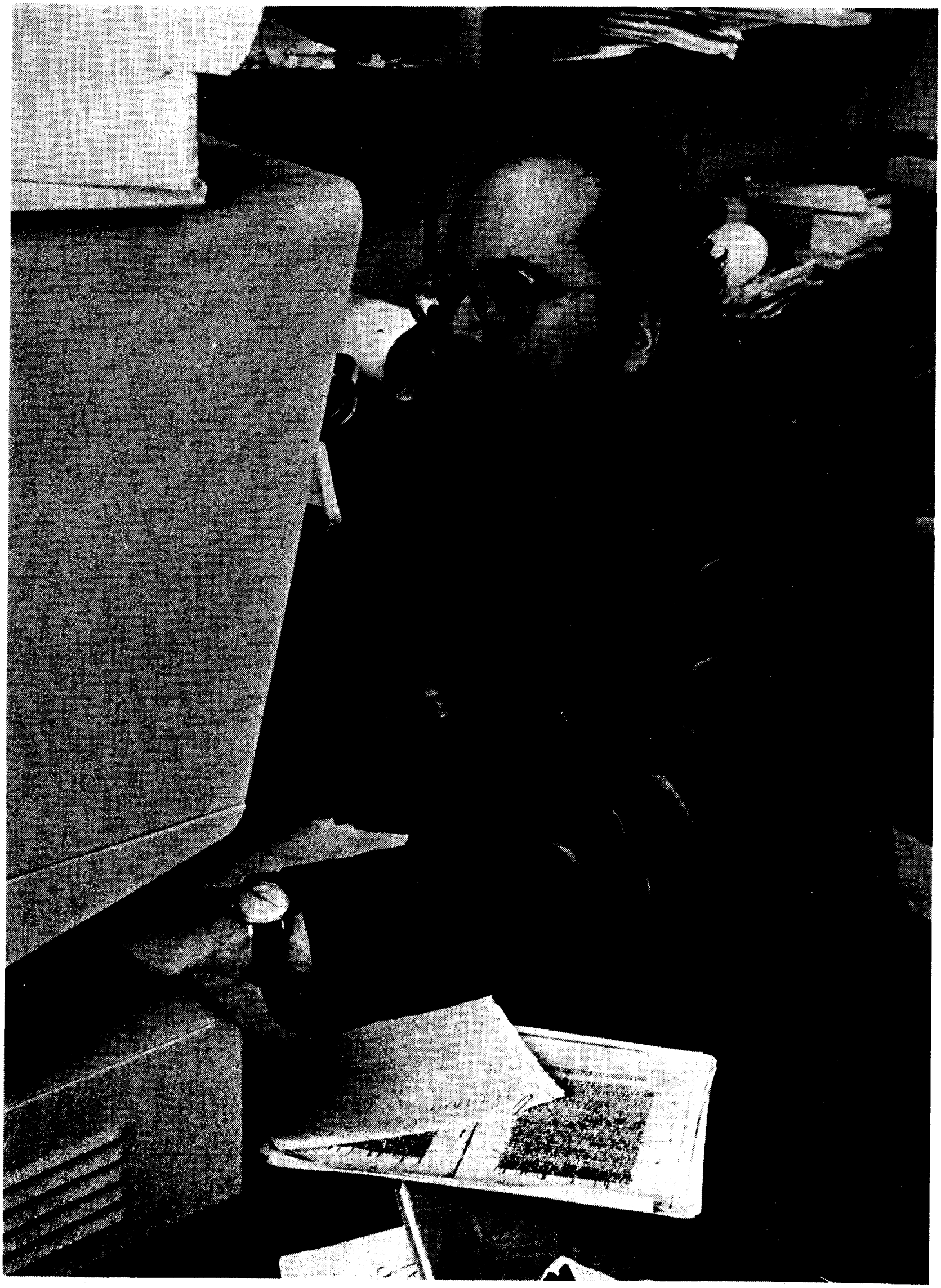
To receive a bachelor's degree from Third College a student must

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
Frazer, William R., Ph.D.	Professor	Physics

Justus, Joyce, M.A.	Assistant Professor	Anthropology
Khan, Ismith M., M.A.	Assistant Professor	Literature
Madrid, Arturo, Ph.D.	Assistant Professor	Literature
Penn, Nolan E., Ph.D.	Professor	Psychiatry
Raskin, Jeffrey, M.S.	Assistant Professor	Visual Arts
Schiller, Herbert I., Ph.D.	Professor	**Interdisciplinary Program Communications**
Simon, Melvin I., Ph.D.	Associate Professor	Biology
Solis, Faustina, M.S.W.	Associate Professor-in-Residence	Community Medicine
Thiess, Frank B., Ph.D.	Assistant Professor	Mathematics
Varon, Silvio, M.D.	Associate Professor	Biology
Watson, Joseph W., Ph.D.	Associate Professor, Provost of the College	Chemistry



The Graduate Division

GRADUATE DEGREES OFFERED AS OF 1971-72

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		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	

* Approval pending.

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 participate;
3. As independent reading or study under faculty supervision;
4. As research projects carried on 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 the Graduate Division 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 contact 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 on 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. A comprehensive master's examination adminstered 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 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.

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 reason 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 admissable 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.

AEROSPACE AND MECHANICAL ENGINEERING SCIENCES (INCLUDING BIOENGINEERING)

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†On leave fall 1971

*On leave winter and spring 1971-72

**On leave 1971-72

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

The Undergraduate Program

The Department of Aerospace and Mechanical Engineering Sciences offers programs of study at the upper-division level, each program leading to the degree Bachelor of Arts (Applied Science). The curricula of the AMES undergraduate programs are designed to train future leaders in aerospace engineering, mechanical engineering, systems dynamics and control, bioengineering, and other, new branches of engineering, with emphasis on the engineering sciences and their application for human welfare. The educational objective is to provide the student with a basic program in those physical and mathematical sciences that are universally recognized as essential to creative engineering. It expected that the majority of AMES graduates will pursue further studies in a graduate school.

There are three basic programs. The *applied mechanics program* prepares the student for graduate studies in areas of engineering related to fluid and solid mechanics; the *systems-dynamics-and-control program* does the same in those areas related to guidance, control and systems analysis; the *bioengineering program* prepares the student either for graduate studies in bioengineering or for professional training in medical school. The student interested in undertaking graduate work in *applied ocean science* is encouraged to take the AMES undergraduate program in the specialty that best fits his general interests.

All students who expect to major in AMES are strongly advised to take Mathematics 2D and 2E in their sophomore year. Students considering taking programs in fluid mechanics and gas dynamics or in bioengineering, are also advised to take Natural Science 2F in their sophomore year.

All AMES undergraduates are required to develop a basic capability 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, or (*d*) self-study.

In their junior year, all students in AMES are required to take courses in continuum mechanics, solid and fluid mechanics, dynamics, linear systems analysis, thermodynamics, and laboratory; these subjects are taught, respectively, in AMES 100, 130A, 101A, 120A, 120B, 110, and 170. All students are required to complete either APIS 105A,B,C or Mathematics 120 and 110A,B. Students who have not already completed Mathematics 2D (or transfer students who have not obtained credit for its equivalent) are required to complete Mathematics 2D in the first quarter of the junior year.

An AMES undergraduate program will have additional required courses to be taken in the senior year. Except for the *Bioengineering: Premedical* program (see listing below), all programs have common required courses in the junior year so that a student may delay his final choice of a program until the end of the junior year. The required courses for the programs are generally to be supplemented with electives chosen in consultation with the AMES faculty adviser.

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 the AMES faculty advisor. 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 advisor. 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 is 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 advisor. 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 continue his studies of fluid mechanics with AMES 101B and AMES 101C and of solid mechanics with AMES 130B.

There are two specialty areas in applied mechanics, and a student particularly interested in one of these is advised to follow one of the two programs listed below.

The student interested in *fluid mechanics and gas dynamics* is required to continue his studies of thermodynamics with AMES 111 in the senior year. Electives necessary to fulfil minimum graduation requirements then may be chosen from among the approved list of courses in AMES, Physics, Chemistry, Applied Physics and Information Sciences or Mathematics.

The student interested in *solid mechanics and structures* is required for the senior year to take a course in structures, AMES 130C. Electives for this program may be chosen from the approved list of courses in AMES, Applied Physics and Information Science or Mathematics.

Electives are to be chosen in consultation with the AMES faculty adviser. Superior students are encouraged to supplement a minimum program with additional technical electives. In special cases, the faculty adviser may recommend a program which differs from those listed below.

The required courses in applied mechanics may be combined with the required courses in systems dynamics and control to give a program of thorough preparation in the basic areas of engineering science related to aerospace or mechanical engineering. The required courses in this combined program will, by themselves, satisfy the course requirements for an AMES major.

Systems-Dynamics-And-Control Program

A student following the systems-dynamics-and-control program is required, during his senior year, to complete his studies of dynamics with AMES 156 and to complete a sequence of courses devoted to control theory — AMES 140A, B, C. Electives necessary to fulfill minimum graduation requirements may be chosen from the approved list in Mathematics, Physics, Economics, or Applied Physics and Information Science. Electives are to be selected in consultation with the AMES faculty adviser. In special cases the faculty adviser may recommend a program which differs from that listed below.

The required courses in this program may be combined with the required courses in an applied mechanics program to give a program of thorough preparation in the basic areas of engineering science related to aerospace or mechanical engineering. The required courses in such a combined program will, by themselves, satisfy the course requirements for an AMES major.

Bioengineering Program

A student electing bioengineering may follow one of the two programs listed below. A student's individual, elective program should In special cases, a faculty advisor may recommend a program which differs from those listed below.

Required courses and approved technical electives for AMES undergraduate programs are listed in the following recommended schedules. It is recommended that students in Revelle College complete the noncontiguous minor during their senior year.

APPLIED MECHANICS: FLUID MECHANICS AND GAS DYNAMICS

		Fall	Winter	Spring
Junior Year		AMES 100	AMES 130A	AMES 101A
		AMES 120B	AMES 120A	AMES 110
		AMES 170	†	†
	either	APIS 105A	APIS 105B	APIS 105C
	or	Math 120 *	Math 110A	Math 110B
Senior Year		AMES 101B	AMES 101C	AMES 130B
		AMES 111		
Technical Electives		AMES 140A	AMES 140B	AMES 140C
			AMES 156	AMES 160
		AMES 199	AMES 199	AMES 199
		APIS 101A	APIS 101B	APIS 101C
		APIS 103B	APIS 112	APIS 103A
		APIS 161A	APIS 161B	APIS 161C
		Chem. 100A	Chem. 100B	Chem. 100C
		Math. 2E	Math. 2E	Math. 2E
		Math. 131A	Math. 131B	Math. 131C
		Math. 180A	Math. 180B	Math. 180C
		Phys. 100A	Phys. 100B	Phys. 100C
		Phys. 130A	Phys. 130B	Phys. 130C

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

†Recommended electives are AMES 171A (Winter) and AMES 171B (Spring); each is a half course, 2 units.

APPLIES MECHANICS: SOLID MECHANICS AND STRUCTURES

		Fall	Winter	Spring
Junior Year		AMES 100	AMES 130A	AMES 101A
		AMES 120B	AMES 120A	AMES 110
		AMES 170	†	†
	either	APIS 105A	APIS 105B	APIS 105C
	or	Math 120 *	Math 110A	Math 110B
Senior Year		AMES 101B	AMES 101C	
		AMES 130C		AMES 130B
Technical Electives		AMES 111	AMEs 156	AMES 160
		AMES 140A	AMES 140B	AMES 140C
		AMES 180A	AMES 180B	AMES 180C
		AMES 199	AMES 199	AMES 199
			APIS 119A	APIS 119B
		APIS 161A	APIS 161B	APIS 161C
		Math. 2E	Math. 2E	Math. 2E
		Math. 131A	Math. 131B	Math. 131C
		Math. 180A	Math. 181A	Math. 151
		Math. 170A	Math. 170B	

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

†Recommended electives are AMES 171A (Winter and AMES 171B (Spring); each is a half course, 2 units.

SYSTEMS DYNAMICS AND CONTROL

		Fall	Winter	Spring
Junior Year		AMES 120B	AMES 120A	AMES 110
		AMES 100	AMES 130A	AMES 101A
	either	APIS 105A	APIS 105B	APIS 105C
	or	Math. 120 *	Math. 110A	Math. 110B
Senior Year		AMES 140A	AMES 140B AMES 156	AMES 140C
Technical Electives		AMES 101B	AMES 101C	AMES 130B
		AMES 146A	AMES 146B	AMES 146C
		AMES 199	AMES 199	AMES 199
		APIS 161A	APIS 161B	APIS 161C
		APIS 162A	APIS 162B	APIS 162C
		APIS 165	APIS 166	APIS 167
		Econ. 100A	Econ. 100B	Econ. 100C
		Econ. 110A	Econ. 110B	Econ. 110C
		Econ. 120A	Econ. 120B	Econ. 120C
		Math. 180A	Math. 180B	Math. 180C
		Math. 170A	Math. 142B	Math. 142C
			Math. 133A	Math. 133B
		Math. 171A	Math. 171B	

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

BIOENGINEERING: ENGINEERING MAJOR

		Fall	Winter	Spring
Junior Year		AMES 100	AMES 130A	AMES 101A
		AMES 120B	AMES 120A	AMES 110
	either	APIS 105A	APIS 105B	APIS 105C
	or	Math. 120	Math. 110A	Math. 110B
		AMES 170 *	†	†
Senior Year		Chem. 100A	Chem. 100B	Chem. 100C
		AMES 101B	AMES 101C	AMES 130C
Technical Electives		AMES 111		
		AMES 180A	AMES 180B	AMES 180C
		AMES 199	AMES 199	AMES 199
		AMES 271A	AMES 271B	AMES 271C
		APIS 161A	APIS 161B	APIS 161C
		APIS 164A	APIS 164B	APIS 164C
			APIS 166	APIS 167
		Biol. 101A	Biol. 101B	Biol. 101C
			Biol. 121	
		Chem. 141A	Chem. 141B	Chem. 141C
			Chem. 160A	Chem. 160B
		Phys. 100A	Phys. 100B	Phys. 100C
		Phys. 171	Phys. 172	

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

†Recommended electives are AMES 180A, B.

BIOENGINEERING: PREMEDICAL†

		Fall	Winter	Spring
Junior Year		AMES 100	AMES 130A	AMES 101A
		Biol. 101A		Chem. 100C
		Chem. 100A	Chem. 100B	Math. 110B
	either	APIS 105A	APIS 105B	APIS 105C
	or	Math. 120	Math. 110A	
		AMES 120B*		
Senior Year		AMES 271A	AMES 271B	AMES 271C
			Biol. 101B	Biol. 101C
Technical Electives		AMES 111		
		AMES 180A	AMES 180B	AMES 180C
		APIS 161A	APIS 161B	APIS 161C
		APIS 164A	APIS 164B	APIS 164C
			APIS 166	APIS 167
			Biol. 101B	
			Biol. 121	
		Chem. 141A	Chem. 141B	Chem. 141C
			Chem. 160A	Chem. 160B
		Phys. 100A	Phys. 100B	Phys. 100C
		Phys. 171	Phys. 172.	

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

†There are no fixed course requirements on a nationwide basis for admission to medical school. As a minimum, premedical students are required to have had 1½ years of Biology (Biol. 101A, 101B, AMES 271A, 271B). 1½ years of Chemistry (Chem. 100A, B, C, Biol. 101C), one year of Physics, and one year of Mathematics. Students are advised to consult with their advisers concerning the special requirements that individual medical schools may have. For example UCSD Medical School requires two years of Chemistry, including organic. This requirement may be met by Chem. 100A, B, C, Chem. 140A, B, C.

The Graduate Program

Admission will be 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, especially if seeking financial aid, submit scores from the Graduate Record Examination.

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

In addition, 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 who enroll will receive the degree of Ph.D. in Oceanography upon compietion of normal departmental requirements and certain others stipulated by an interdepartmental faculty committee. AMES 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).

Regardless of the discipline of specialization within AMES, graduate students are encouraged to acquire some background in each of those engineering sciences offered by the department in which their previous background is deficient. Suitable introductory courses for this purpose are AMES 101A, 130A, 140A, and any one of the following: 217A, 272, 273. The advisor may recommend other ways of satisfying this breadth requirement.

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.

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 in any of the engineering sciences.

Course requirements are left flexible in order to permit the student and his adviser to develop the most beneficial program. The Department will accept 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 studen'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 to be reviewed by a thesis adviser and two other faculty members appointed by the Department Chairman. The review is normally an oral defense of the thesis.
4. The comprehensive examination under Plan II will be conducted by the adviser and at least two other faculty members appointed by the Department Chairman. The examination committee will normally conduct an oral or written examination in the candidate's discipline of specialization. Students working toward their Ph.D. degree who have successfully passed one area of the department's Ph.D. examination need not take the comprehensive examination for the M.S. degree.

Successful candidates will 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 careers in basic research and teaching. As such, research is initiated as soon as possible commensurate with the student's background and ability. While there are no formal course requirements for the Ph.D., most students, in consultation with their advisers, develop a course program which will prepare them for the AMES departmental examination.

A departmental examination will be given to all Ph.D. candidates prior to the formal Ph.D. qualifying examination. This departmental examination will normally be taken after the completion of three quarters of full-time graduate work and will seek to examine the student's academic and research ability. It will be 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 will normally examine the student in four areas of specialization within engineering science.

Students who transfer to AMES from another department, and who have passed unconditionally a departmental examination administered by that department, will not be required to pass a departmental examination administered by AMES. However, these transfer students must obtain certification from their advisers that they possess professional knowledge of fluid mechanics, solid mechanics, bioengineering, or vehicle guidance and control before taking the Ph.D. qualifying examination.

After satisfactory completion of the departmental examination, graduate students 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. Students are expected to master whatever is needed for the pursuit of their own research.

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

Candidate in Philosophy Degree

AMES Ph.D. students who have passed their Ph.D. qualifying examination and have advanced to candidacy will be given 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 Discussion of common foundations of fluid and solid mechanics; stress; instantaneous motion (rates of rotation and deformation); stress rate; constitutive equations (Newtonian fluid, elastic solid); conservation of mass; momentum and energy theorems. Four hours lecture. Prerequisite or co-registration: Mathematics 2D.

101A. Fluid Mechanics S 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 F Compressible-flow theory, including generalized one-dimensional flow and wave phenomena; theory of inviscid reacting flows. Four

hours lecture. Prerequisites: AMES 101A, 110, Mathematics 220A. (Not offered every year.)

101C. Fluid Mechanics W Continuation of 101B. Viscous-flow theory, including boundary-layer theory; transport phenomena; applications in biophysics and in combustion and propulsion theory. Four hours lecture. Prerequisites: AMES 101B, Mathematics 110B.

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

111. Thermodynamics F 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. Three hours lecture. Prerequisite: AMES 110, and prerequisite or co-registration in AMES 101A.

120A. Dynamics W 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.

130A Solid Mechanics W Discussion of elastic, plastic, viscoelastic and viscoplastic solids in connection with simple static and dynamic problems concerning structural elements and structures (rods, beams, rings, and frames). Four hours lecture. Prerequisite: AMES 100.

130B. Solid Mechanics S Discussion of simple problems in two- and three-dimensional elasticity (torsion, flexure, stress concentration at circular holes; plane waves, Rayleigh waves, thermoelasticity). Simple illustrative problems in viscoelasticity and plasticity. Four hours lecture. Prerequisite: AMES 130A.

130C. Beams, Plates and Shells F An introductory treatment of a one- and two-dimensional approach to problems of curved rings, flat plates and curved shells. The emphasis will be on circular rings and plates and on shells of revolution. Four hours lecture. Prerequisite: AMES 100 or consent of instructor.

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 locos 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 104B.

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.

156. Rigid Body Dynamics W 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. Prerequisites: AMES 120A, Mathematics 2E or equivalent.

160. Quantitive 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. (Same as Frontiers of Science 102.)

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 171A, 171B. 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.

173. Bioengineering 3: Transport Phenomena S 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 compatability. Special devices. Bio-telemetry. Four hours lectrue. 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 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) 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) 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) 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) 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) Solid- and liquid-propellant rocket engines, combustion processes, motor design and performance; rocket configurations; mission analyses; optimization calculations. Prerequisites: AMES 211A, undergraduate fluid mechanics and thermodynamics, or consent of instructor.

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) 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) 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 210A- 210B-210C, 220A, Physics 130A-130B, Mathematics 110A-110B, 120, or consent of instructor.

220C. Physical Gas Dynamics (3) 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. Prerequisites: AMES 210A- 210B-210C, 220A-220B, Physics 130A-130B, Mathematics 110A-110B, 120, or consent of instructor.

221A. Opacity Calculations I (3) 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) 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) 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. Prerequisites: AMES 221A-221B, or consent of instructor.

222A-222B-222C. Advanced Fluid Mechanics (3-3-3) 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) 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) 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) 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) 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) 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) 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.

250A. Astrodynamics and Rocket Navigation (3) 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: basic mechanics, spherical trigonometry, vector and matrix methods, AMES 120A-120B, 156, or consent of instructor.

251A. Guidance of Aerospace Vehicles (3) 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 140A-140B-140C, AMES 250A, or consent of instructor.

251B. Gyrodynamics and Inertial Navigation Systems (3) 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. Prerequisite: AMES 251A, or 256A.

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.

255A. Theory of Optimal Control (3) Bounded controls. Sets of reachable states. Necessary and sufficient conditions for optimality. Calculus of variations. Pontryagin's maximum principle. Dynamic programming. Existence and uniqueness. Applications to minimum-time and minimum-fuel problems; design of optimal systems using switching curves and surfaces. Optimal linear regulators and tracking systems with quadratic performance criteria. Prerequisite: AMES 253A.

255B. Theory of Optimal Control (3) Computational techniques for determining optimal control policies. First-order gradient and steepest-descent methods. Second-order gradient and Newton-Raphson algorithms. Invariant imbedding and dynamic programming. Neighboring extremals. Conjugate gradients. Topics on optimal stochastic control theory. Linear stochastic systems and the separation principle. Prerequisite: AMES 255A.

256A. Advanced Rotational Dynamics (3) Topic chosen independently each year. Examples are advanced computer-oriented dynamical formalisms, classical and modern problems of rotating bodies, stability of rotation, gyrodynamical applications. Student may register for the course more than once. Prerequisite: AMES 156.

256B. Spacecraft Attitude Control (3) 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. Prerequisite: AMES 156.

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. Bioengineering 1. structure and Function of Tissues (3) A general survey will include examples of relationships between structure and function 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. Bioengineering 1. Circulatory System (3) Morphology and physics of heart, large blood vessels, vascular beds in major organs, and the microcirculation. Indluded 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 trough nervous and humoral controls will be analyzed. Prerequisite: consent of instructor.

271C. Bioengineering 1. Respiration and Cardio-pulmonary Reflexes (3) General concepts and principles of morphology of lung 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 2. 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, neutophiles, 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) 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) 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 monimum at the level of AMES 100, 101A-101B-101C, 130A-130B, Mathematics 110A-110B, 120.

294A. Methods in Applied Mechanics (3) Probability distribution functions; statistical independence; functions of random variables; characteristis functions; correlation functions; time averages; sampling; the central limit theorem; spectral analysis; the Gaussian random processs; 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) 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) 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)

297. Research Techniques (1-6,1-6,1-6) 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) 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) (Satisfactory/Unsatisfactory grades permitted.)

ANTHROPOLOGY

Office: Eighth Floor, 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*

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

(Chairman of the Department)

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

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*

* * *

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 substantive 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 almost all aspects of social (including 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). Students are strongly urged to take work with no fewer than four different faculty members during this year.

At the end of the first year the student will stand for a written *General Examination* covering the materials presented in the Systems sequence and any other work taken during that year. The examination will be prepared by the instructors of the Systems 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 adademic 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 the student will continue his course work, including the Research sequence (Anthropology 208,209,210). Normally some time during the second year the student in consultation with the Chairman, will form his Departmental Comittee. (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 have a Departmental Adviser. During the second year (or at another time if the Student's Adviser and the student agree that this is desirable) the student will choose a Departmental Committee in consultation with the Department Chairman, 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 Muir College Cultural Traditions Program and 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 Cultural Traditions requirement, and provide elective Lower-Division courses in anthropology. When a Cultural Traditions course is taken as an anthropology elective, it is not necessary to register for the entire Cultural Traditions sequence.

7. The Individual and Culture W 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. Two hour lecture, one hour discussion.

12. Chinese Society and Culture S A description and interpretation of the major institutions and culture patterns of traditional China. (Same as Cultural Traditions 1A — China. Students selecting this course as an elective, rather than as a Cultural Traditions requirement, need not take the entire sequence.) Two hour lecture, one hour discussion.

15. Society and Culture in West Africa F 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. (Same as Cultural Traditions 1A — Africa. Students selecting this course as an elective, rather than as a Cultural Traditions requirement, need not take the entire sequence.) Two hour lecture, one hour discussion.

17. African Cultural Traditions S An examination of the cultures of a number of East, Central, and Southern African societies with emphasis on the distinctive characteristics and integration of each society and attention drawn to what is pan-African and pan-human in each. (Same as Cultural Traditions 1C — Africa. Students selecting this course as an elective, rather than a Cultural Traditions requirement, need not take the entire sequence.) Two hour lecture, one hour discussion. (Not offered 1971-72.)

20. Introduction to Anthropology F 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.

UPPER DIVISION

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. Prerequisites: Anthropology 20, upper-division standing.

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 or equivalent or consent of the 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, 105 and 106; and upper-division standing.

109. Political Anthropology S 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. (Not offered 1971-72.)

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, upper-division standing. (Not offered 1971-72.)

112. Mathematical Anthropology 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. Prerequisites: Anthropology 20, upper-division standing.

116. Urban Anthropology F 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.

119. Social and Cultural Change W 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 W 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. (Not offered 1971-72.)

121. Introduction to the Analysis of Kinship F 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; upper-division standing. (Not offered 1971-72.)

125. Language and Culture W This course explores language acquisition, idolects, 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 F 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.

132. People of Japan S Ethnological treatment of historic and modern Japanese culture. Emphasis on rural-urban differences and on the effects of "modernization." (Not offered 1971-72.)

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. (Not offered 1971-72.)

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 W 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 S Transformations in Chinese society in the present century, with emphasis on continuity and disjuncture between traditional and communist China. (Not offered 1971-72.)

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 W A study of some of the social, cultural and psychological characteristics of Polynesian peoples. Prerequisite: upper-division standing. (Not offered 1971-72.)

141. Religion and Society W 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, 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 consent of instructor. (Not offered 1971-71.)

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 the 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.

161. Comparison of Cultures A dialectical introduction to the problems of comparative studies in social and cultural anthropology. Selected case studies from different cultural and civilizational areas. (Not offered 1971-72.)

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 or W 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. Prerequisite: graduate standing.

205. Analysis of Social Systems (6) 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 Cultural Systems (6) The course will intensively survey theories of the nature of culture, its forms and transformations and the analysis of culture in behavior. Prerequisites: Anthropology 205, and graduate standing.

207. Personality Systems in Anthropological Theory (6) 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, graduate standing.

208. Methodological Foundations of Anthropological Research (3) 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. Prerequisite: graduate standing in anthropology.

209. Research in Psychological Anthropology (4) 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. Prerequisites: graduate standing and permission of instructor.

210. Research Seminar (3) 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. Prerequisite: graduate standing in anthropology. (Satisfactory/Unsatisfactory grades only.)

211. Development Anthropology (3) An anthropological perspective on 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 crisis are also examined. An evolutionary and systems approach to planned and unplanned change. Prerequisite: graduate standing in social science or humanities.

212. Mathematical Anthropology (3) 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. Prerequisite: graduate standing in anthropology or consent of instructor.

214. Family, Childhood and Society (3) A comparative and analytic study of the relationship between family structure and childhood experience, and their effects on social and cultural systems. Prerequisite: Anthropology 207 or equivalent.

216. Theory and Methods in Urban Anthropology (3) 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. Prerequisite: graduate standing.

217. The Primitive Mind (3) 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) 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. Prerequisite: graduate standing in anthropology or consent of instructor.

230A-230B-230C. Departmental Colloquium (1-4) Prerequisites: graduate standing in anthropology and consent of instructor. (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.

241. Religion and Society (3) 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) 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, and graduate standing.

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. Prerequisite: graduate standing.

261. Comparison of Cultures (3) A dialectical introduction to the problems of comparative studies in social and cultural anthropology. Selected case studies from different cultural and civilizational areas.

297. Research Practicum (1-4) Supervised advanced research studies with individual topics to be selected according to the student's special interests. Prerequisite: (Satisfactory/Unsatisfactory grades only.)

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

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

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 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*

†Irwin M. Jacobs, *Sc.D., Professor of Information and Computer Science*

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*

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

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

Huey-Lin Luo, *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*

Y. Ichioka, *Ph.D., Visiting Associate Professor of Applied Physics*

Devamitta Mendis, *Ph.D., Lecturer in Applied Physics*

M. Granger Morgan, *Ph.D., Lecturer in Applied Physics*

Barnaby J. Rickett, *Ph.D., Lecturer in Applied Physics*

Vern N. Smiley, *Ph.D., Lecturer in Applied Physics*

R. Viswanathan, *Ph.D., Lecturer in Applied Physics*

*On leave Winter, Spring 1971/72

†On leave 1971/72

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 both science and the humanities. 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 20, a non-mathematical course on the nature of the universe, and APIS 21, a course on special relativity as an example of the scientific viewpoint and deductive reasoning, are intended to give both the intended science major and the undecided or non-science major a flavor of modern science.

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. The information and computer science major prepares the student to apply digital computers to the handling of information and the execution of large-scale computation in science and business. The information processing majors provide an entry to modern electronics, communications, optics, and acoustics.

Recommended schedules for the options in applied physics and in information science are shown in Tables I and IIA-IID. Tables I and II make time available for six courses which may be used to complete college requirements or used for electives. No student is required to take more than eighteen upper-division courses in Applied Physics, Information Science, Physics, and Mathematics.

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 2A-2B-2C-2D-2E sequence and Natural Science 2D. Information Science majors in Muir College are required to take Science 2A- 2B-2C. Revelle College students may take Natural Science 2A-2B-2C-2D-2E. All AP and IS majors are required to take Math 2D and Math 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 164 A-B-C.

The undergraduate major is arranged to permit interested students realistically to obtain a Ph.D. degree in seven years from entry as a freshman undergraduate. This is achieved by arranging for considerable parallelism between the senior-year undergraduate program and the first-year graduate program. An unusually well qualified stduent can be permitted to take first-year graduate work in his senior undergraduate year. Such a student should petition to take in his senior year a program similar to one of the Graduate I programs in Tables III - IV, with required College courses replacing APIS 200 and 299. He is then in a good position to take the Graduate II program in his first graduate year and is likely to obtain his Ph.D. degree one year early.

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 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 relate to planetary atomspheres, ionospheres, magnetospheres, the nature of the solar wind and solar corona, 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; digital computer structure and applications, including programming languages, automata theory, artificial intelligence, and the theory of computation; the analysis and synthesis of complex systems with emphasis on reliability and the man-machine interface; and acoustical, electronic, and optical signal processing.

Areas of current research interest include information theory and coding, programming languages and translators with emphasis on laboratory satellite computers, and related problems in formal languages. Future work will be directed towards game theory, optimization theory and resource allocation, information management and retrieval, design and engineering of hybrid (analog-digital, hardware-software) systems, computer graphics and man-machine interaction, and systems modeling and simulation.

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, thee Department of Aerospace and Mechanical 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, uundergraduate courses required to make up deficiencies.

Language Requirements

Entering graduate students who have satisfied the equivalent of the undergraduate foreign language requirements of Revelle or Muir Colleges, or who have studied a foreign language in college beyond an introductory program, or who have learned a foreign language as the result of residence abroad, will normally be considered to have satisfied the foreign language requirements. Other students will be required to take a departmental examination that lasts about one hour and involves translation of a technical paper.

Department Graduate Examination

A student entering without a master's degree should, before he has completed twenty-four units, acquire a faculty research adviser under whom he will write a predoctoral thesis for presentation to the Department. Such a thesis will involve at least six units of work and should be of the kind required in Plan I for the master's degree. This thesis must be presented at a departmental graduate oral examination before the student has completed fifty-four graduate units; it may be used for the M.S. degree or may serve as a starting point for the Ph.D. thesis.

A student entering with a master's degree should consult the chairman of the Department in order to obtain a faculty research adviser immediately. He must present a predoctoral thesis at a departmental oral examination to be held before he has completed twenty-seven graduate units. An entering student who has recently written a master's thesis may elect to use it as his predoctoral thesis. If he does so, the departmental graduate examination must be held before the end of his first quarter of residence.

The predoctoral thesis will be presented at a departmental graudate oral examination conducted by three faculty members who will also inquire into the student's general knowledge. The examiners may require a written examination in addition to the thesis.

Dissertation

In order to be admitted to the qualifying examination a student must have passed 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.

Programs of Study

All graduate students are expected to take part in the teaching, research, and seminar programs of the department. In particular, graduate students are expected to join in the teaching of the following courses such as APIS 10, 11, 12, 150, 161A-161B-161C, and Science 2A-2B-2C-2D-2E.

A graduate student normally devotes about three-quarters of his program to regular course work in the first two years. (An exception may occur for a student aiming at a seven-year Ph.D. degree; see above.) A graduate student should devote at least half his time to research in the third year, and almost all his time to research in the fourth year.

Graduate students may arrange their programs to concentrate on applied physics, to concentrate on information science, or to combine the two. Programs are available that are mainly theoretical or that combine theoretical study with experimental research. Seven programs for the first two graduate years are suggested in Tables III - IV. Each graduate student is encouraged to devise his own program in consultation with his adviser. Graduate students who have not studied electronics and are intending to do experimental research in any of these programs are advised to take APIS 164A-B-C.

Students who have passed their departmental graduate examination may register for any APIS course on a Satisfactory/Unsatisfactory basis.

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 employement 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.

I. Upper-Division Program in Applied Physics

	Fall	Winter	Spring
Junior Year	APIS 101A	APIS 101B	APIS 101C
	Phys 110A	Phys 110B	*
	APIS 105A	APIS 105B	APIS 105C
	†	†	†
Senior Year	Phys 130A	Phys 130B	†
	Phys 140	†	†
	APIS 164A	APIS 164B	APIS 164C
Add any one of the following sequences:			
Electromagnetics	*	APIS 112	APIS 113B
Optics	APIS 114A	APIS 114B	APIS 114C
Acoustics	*	APIS 119A	APIS 119B
Signal Processing	APIS 162A	APIS 162B	APIS 162C
***Major Electives**	Phys 131A (1/2)	APIS 112	Phys 152
	APIS 114A	APIS 114B	APIS 114C
	APIS 162A	APIS 162B	APIS 162C
	APIS 163A	APIS 163B	APIS 163C
	AMES 100	AMES 101A	AMES 101B
	APIS 113A		APIS 113B
		APIS 119A	APIS 119B
		APIS 120	

II. Upper-Division Program in Information Science

A. Information and Computer Science

	Fall	Winter	Spring
Junior Year	APIS 105A	APIS 105B	APIS 105C
	or	or	or
	Math 120	Math 110A	Math 110B
	APIS 161A	APIS 161B	APIS 161C
	APIS 163A	APIS 163B	APIS 163C
	†	†	†
Senior Year	APIS 162A	APIS 162B	APIS 162C
	APIS 150A	APIS 165	APIS 167
	*	*	*
	†	†	†
***Major Electives**	APIS 114A	APIS 114B	APIS 114C
	APIS 164A	APIS 164B	APIS 164C
	Math 171A	Math 171B	
	Math 101A	Math 101B	Math 101C
	Math 170A	Math 170B	Math 170C
	Psych 101	Ling 101A	Ling 101B
	Math 180A	Math 181A	Math 181B
	AMES 140A	AMES 140B	AMES 140C

B. Information and Communication Theory

	Fall	Winter	Spring
Junior Year	APIS 161A	APIS 161B	APIS 161C
	APIS 163A	APIS 163B	APIS 163C
	APIS 105A	APIS 105B	APIS 105C
	or	or	or
	Math 120	Math 110A	Math 110B
	†	†	†
Senior Year	APIS 162A	APIS 162B	APIS 162C
	APIS 164A	APIS 164B	APIS 164C
	*	*	*
	†	†	†
***Major Electives**	Math 171A	Math 171B	
	Math 101A	Math 101B	Math 101C
	Math 180A	Math 181A	Math 181B
	Math 170A	Math 170B	Math 170C
	AMES 140A	AMES 140B	AMES 140C
	APIS 101A	APIS 101B	APIS 101C

C. Optical Information Processing

	Fall	Winter	Spring
Junior Year	APIS 101A	APIS 101B	APIS 101C
	APIS 163A	APIS 163B	APIS 163C
	APIS 105A	APIS 105B	APIS 105C
	†	†	†
Senior Year	APIS 164A	APIS 164B	APIS 164C
	APIS 114A	APIS 114B	APIS 114C
	*	*	*
	†	†	†
***Major Electives**	Phys 131A (1/2)	Phys 101A (1/2)	Phys 101B (1/2)
	APIS 162A	APIS 162B	APIS 162C
			APIS 113B
		APIS 119A	APIS 119B

D. Acoustic Signal Processing

	Fall	Winter	Spring
Junior Year	APIS 163A	APIS 163B	APIS 163C
	APIS 105A	APIS 105B	APIS 105C
	AMES 100	AMES 101A	Elective
Senior Year	APIS 162A	APIS 162B	APIS 162C
	*	APIS 119A	APIS 119B
	*	*	*
	†	†	†
***Major Electives**	APIS 161A	APIS 161B	APIS 161C
	APIS 164A	APIS 164B	APIS 164C
	Math 170A	Math 170B	Math 170C
	Math 171A	Math 171B	AMES 101B
	APIS 114A	APIS 114B	APIS 114C

†General Electives

III. Suggested Graduate Program in Applied Physics

A. Theoretical Plasma Physics and Space Science

	Fall	Winter	Spring
Graduate I	Phys 203A AMES 294A or Math 212A APIS 224 APIS 200/299	APIS 201B AMES 294B or Math 212B APIS 200/299	APIS 201C AMES 294C or Math 212C APIS 200/299

B. Radio Astronomy and Experimental Space Science

	Fall	Winter	Spring
Graduate II	APIS 212A Phys 210A APIS 200/299	APIS 228 Phys 210B Phys 232A APIS 200/299	APIS 212B/C Phys 232B APIS 200/299

B. Radio Astronomy and Experimental Space Science

	Fall	Winter	Spring
Graduate I	APIS 224 AMES 294A or Math 212A APIS 162A APIS 200/299	APIS 201B AMES 294B or Math 212B APIS 162B APIS 200/299	APIS 201C AMES 294C or Math 212C APIS 162C APIS 200/299
Graduate II	APIS 260A APIS 262A APIS 263A APIS 200/299	APIS 260B APIS 262B APIS 263B APIS 200/299	APIS 260C APIS 262C APIS 263C APIS 200/299

C. Solid State Physics

	Fall	Winter	Spring
Graduate I	Phys 203A AMES 294A or Math 212A APIS 200/299	APIS 201B AMES 294B or Math 212B APIS 200/299	APIS 201C AMES 294C or Math 212C APIS 200/299
Graduate II	APIS 205A Phys 210A APIS 200/299	APIS 205B Phys 210B APIS 230 APIS 200/299	APIS 205C Phys 211 APIS 200/299

IV. Suggested Graduate Program in Information Science

A. Information and Computer Science

	Fall	Winter	Spring
Graduate I	APIS 263A APIS 265A Math 212A APIS 200/299	APIS 263B APIS 265B Math 212B APIS 200/299	APIS 263C APIS 265C Math 212C APIS 200/299
Graduate II	APIS 264A APIS 266 APIS 260A Math 260A	APIS 264B APIS 267 APIS 260B Math 260B	APIS 264C APIS 200/299 APIS 260C Math 260C

B. Information and Communication Theory

	Fall	Winter	Spring
Graduate I	APIS 162A APIS 224 Math 212A APIS 200/299	APIS 162B APIS 225 Math 212B APIS 200/299	APIS 162C APIS 226 Math 212C APIS 200/299
Graduate II	APIS 260A APIS 262A	APIS 260B APIS 262B	APIS 260C APIS 262C
	APIS 263A APIS 200/299	APIS 263B APIS 200/299	APIS 263C APIS 200/299

C. Optical Information Processing

	Fall	Winter	Spring
Graduate I	APIS 205A Phys 130A APIS 162A APIS 200/299	APIS 205B Phys 212A or Phys 130B APIS 162B APIS 200/299	APIS 205C Phys 212B or Phys 130C APIS 162C APIS 200/299
Graduate II	APIS 224 APIS 262A APIS 263A APIS 200/299	APIS 203A APIS 262B APIS 263B APIS 200/299	APIS 203B APIS 262C APIS 263C APIS 200/299

D. Acoustic Signal Processing

	Fall	Winter	Spring
Graduate I	SIO 210A APIS 162A AMES 210A APIS 200/299	APIS 204A APIS 162B AMES 210B APIS 200/299	APIS 204B APIS 162C AMES 210C APIS 200/299
Graduate II	APIS 204C APIS 260A APIS 262A APIS 200/299	SIO 211A APIS 260B APIS 262B APIS 200/299	SIO 224 APIS 260C APIS 262C APIS 200/299

COURSES

LOWER DIVISION

The Department of Applied Physics and Information Science cooperates in the teaching and administration of the Science 2 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 only by 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 only by 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/DIGOL. (Upper-division students only by consent of instructor.)

20. The Nature of the Universe S-Su A non-mathematical 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 system. Basic cosmology. (Offering in 1971/72 depends on availability of staff.)

21. Space-Time Physics W-Su 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. (Offering in 1971/72 depends on availability of staff.)

UPPER DIVISION

101A. Electromagnetism I F Coulomb's law, electrostatic fields, capacitance, electric polarization, molecular theory of dielectrics. Uniqueness theorem, images, solutions of Laplace's equation. Magnetic effects of steady currents, Bio-Savart law, magnetic vector potential, Ampere's law, magnetic scalar potential. Ohm's law, DC circuits. Prerequisites: Science 2E (or Natural Science 2B) and Mathematics 101.

101B. Electromagnetism II W Faraday's induction law, inductance and induced electromotance. AC circuit theory. Magnetic polarization, magnetic field intensity, hysteresis, magnetic field calculations. Maxwell's equations, plane electromagnetic waves in free space, Poynting vector. Propagation of plane waves in conductors, non-conductors and ionized gases. Prerequisite: APIS 101A.

101C. Electromagnetism III S Reflection and refraction of electromagnetic waves, Fresnel's equations, radiation pressure. Guided waves, guage invariance, retarded potentials, dipole and quadrupole radiation, reciprocity theorem. Radiation

from a moving charge, Lienard-Wiechert potentials. Special relativity, Lorentz transformation. Prerequisite: APIS 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: Science 2A-2B-2C or equivalent and Mathematics 2D or equivalent.

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 2 sequence and Mathematics 2D or consent of instructor. (Offering in 1971/72 depends on availability of staff.)

112. Electromagnetism IV; Introductory Plasma Physic W Magnetohydrodynamic equations. Stress tensor. Solutions of static and steady flow problems. Waves, shocks, stability. Occurrence of plasmas in nature. Motion of charged particles in electromagnetic fields. Particle drifts. Elementary kinetic theory — Vlasov equation, Boltzmann equation. Plasma oscillations, wave-particle interaction. Prerequisite: APIS 101C.

113A. Electromagnetism V; Elementary Plasma Waves F Linear theory of waves in magnetoplasmas, especially cold magnetoplasmas; propagation at any angle to magnetic field; quasi-longitudinal and quasi-transverse approximations; hydromagnetic, whistler, and radio waves; dispersion and group phenomena; applications to the ionosphere and magnetosphere. Prerequisite: APIS 101C.

113B. Electromagnetism VI; Radiation S Reciprocity theorems, Huygens' principle, equivalence and uniqueness theorems. Frequency independent antennas. Periodic and log-periodic radiating structures. Field energy in dispersive media. Kramers-Kronig formula. Ray tracing in isotropic and anisotropic media. Radiation by moving charges. Synchrotron radiation. Cerenkov radiation. Prerequisite: APIS 101C.

114A. Optics I: Waves F Wave equation. Fresnel diffraction. Fraunhofer diffraction. Coherent image formation with lenses and holograms. Prerequisites: APIS 101C and 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-119B. Fundamental Accoustics W-S Theory and laboratory problems in strings, bars, membranes and plates. Radiation, transmission and scattering of plane and spherical acoustic waves. Prerequisites: Science 2 sequence and Mathematics 2D or consent of instructor.

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.

150A. Computer Laboratory F Hands-on exposure to a small computer in a real-time laboratory environment. Design of computer interfaces and special purpose hardware utilizing integrated circuits. Overall design of hardware, firmware, and software for control, monitoring, analysis, and display. Prerequisite: APIS 161A or APIS 164A or consent of instructor.

150B-150C. Computer Laboratory Project W-S Individual and small group projects will be undertaken by students based on work in APIS 150A. Students must supply a project proposal prior to enrolling. Prerequisites: APIS 150A and consent of instructor. (Not offered in 1971/72.)

161A. Introduction to Computer Science F Boolean algebra, combinational circuits, Karnaugh maps, sequential and pulse-sequential circuits. Prerequisite: APIS 10 or consent of instructor.

161B. Introduction to Computer Science W Computer architecture, machine language, symbolic addressing, programming in assembly language, writing of assemblers, macro assemblers, data structures. Prerequisite: APIS 10 or consent of instructor.

161C. Introduction to Computer Science S String processsing 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 150A-150B-150C 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. Prerequisite: APIS 163C or Physics 101B or consent of instructor.

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, hierarchal 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. (Not offered in 1971/72.)

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.

181. Topics in Technology and Modern Social Problems S Possible technological solutions to a number of modern social problems are explored. Particular emphasis is placed upon power utilization, generation, and distribution; traffic control, particularly in air and surface rail transportation; and the application of computers to selected problems in education. Prerequisites: Science 2A-2B-2C and APIS 10 or their equivalent and consent of instructor. (Offering in 1971/72 depends on availability of staff.)

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/Fail 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

201B. Introductory Plasma Physics (3) Magnetohydrodynamic equations. Stress tensor. Solutions of static and steady-flow problems. Waves, shocks, stability. Occurrence of plasmas in nature. Motion of charged particles in electromagnetic fields. Particle drifts. Elementary kinetic theory — Vlasov equation, Boltzmann equation. Plasma oscillations, wave-particle interaction. Term paper required. Prerequisite: APIS 101C.

201C. Electromagnetic Radiation (3) Reciprocity theorems, Huygens' principle, equivalence and uniqueness theorems. Frequency independent antennas. Periodic and log-periodic radiating structures. Field energy in dispersive media. Kramers-Kronig formula. Ray tracing in isotropic and anisotropic media. Radiation by moving charges. Synchrotron radiation. Cerenkov radiation. Term paper required. Prerequisite: APIS 101C.

203A-203B. Optical Systems (3-3) 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-204B. Acoustics (3-3) Theory and laboratory problems in vibrating systems, wave propagation in strings, bars, membranes and plates. Radiation, transmission and scattering of plane and spherical acoustic waves. Prerequisite: consent of instructor.

204C. Acoustic Signal Processing (3) Lecture and laboratory in analog and digital beamforming methods, correlation techniques, and background and signal statistics as applied to underwater acoustics. Prerequisite: consent of instructor.

205A. Optics I: Waves (3) 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) 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) The space-bandwidth product. Information theory in optics. Superresolution. Spatial filtering. Optical analog computers. Hologram generation by computer. Prerequisite: APIS 205B.

211. Elementary Plasma Waves (3) Linear theory of waves in magnetoplasmas, especially cold magnetoplasmas; propagation at any angle to magnetic field; quasi-longitudinal and quasi-transverse approximations; hydromagnetic, whistler, and radio waves; dispersion and group phenomena; applications to the ionosphere and magnetosphere. Term paper required. Prerequisite: APIS 101C. (Offering in 1971/72 depends on availability of staff.)

212A. Advanced Plasma Physics I (3) 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) 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) 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) 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) 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) 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) 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) The orbits of planets and satellites, the small bodies, the resonance structure, spin and tides, post-accretional 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) 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) Probability theory and its application to signal processingan 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) 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) 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) Organization of computers and information-handling systems; resource allocation; aspects of switching and automata theory; comptutational 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) Regular sets and finite state machines; context free languages and pushdown automata, ambiguo languages, deterministic languages, normal form theorems; Turing and registor type machines, the halting problem, time and storage requirements; Blum axioms for computational complexity. Prerequisite: consent of instructor.

266. Applications of Graph Theory (3) 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 intructor.

267. Game Theory (3) 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) 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) 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) Methods of measurement, observation, and sampling 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) Weekly discussion of current research literature. (Satisfactory/Unsatisfactory grades only.)

292. Graduate Seminar in Solar System and Space Physics (1-1-1) Research topics in radio astronomy and solar system physics. (Satisfactory/Unsatisfactory grades only.)

293. Graduate Seminar in Information and Computer Science (1-1-1) Research topics in information and computer science. (Satisfactory/Unsatisfactory grades only.)

294A. Graduate Seminar in Applied Solid State Physics (1) Research topics in applied solid state physics and quantum electronics. (Satisfactory/Unsatisfactory grades only.)

294B. Graduate Seminar in Optical Signal Processing (1) Research topics of current interest in holography. (Satisfactory/Unsatisfactory grades only.)

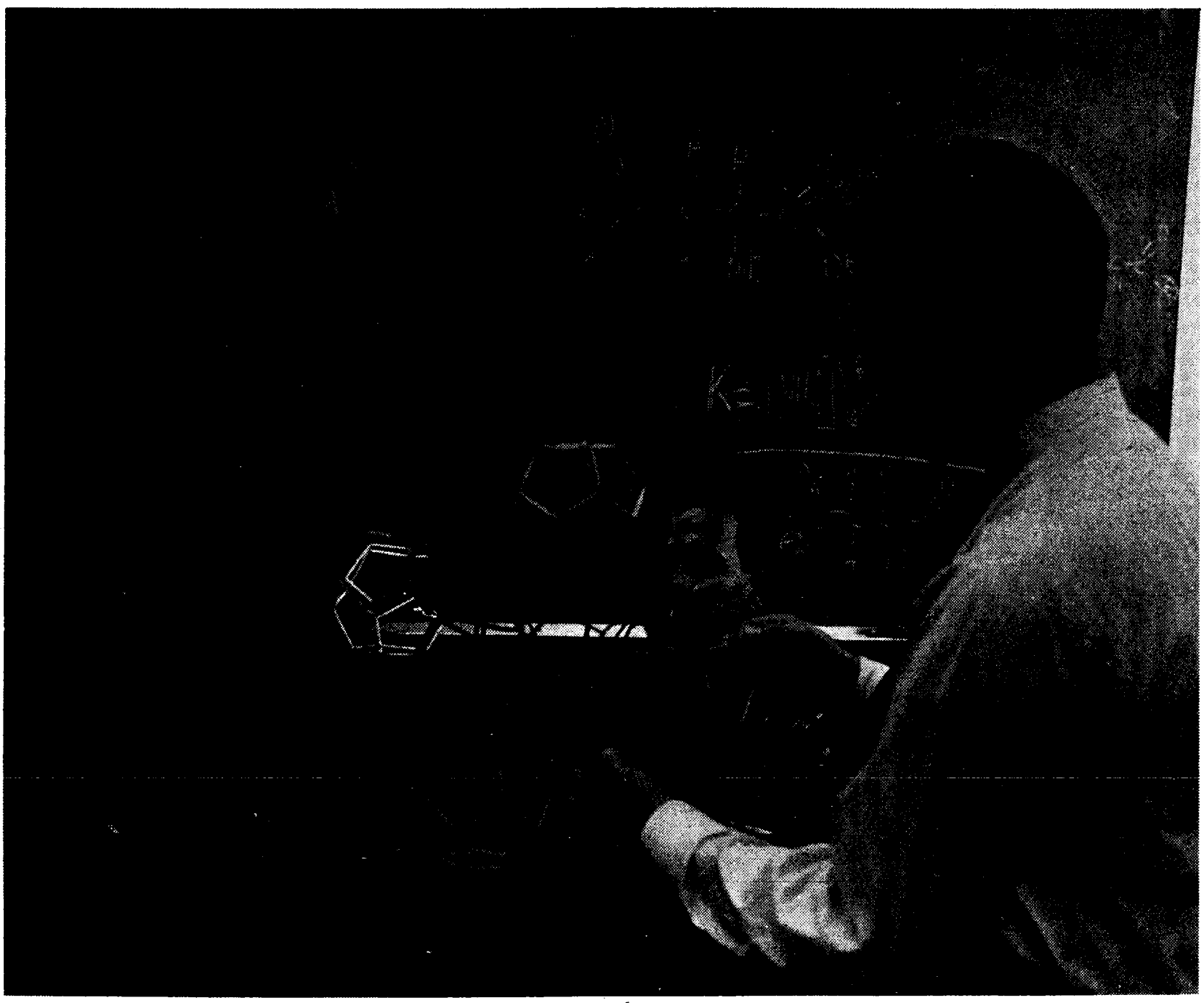
295. Graduate Seminar on the Evolution of the Solar System (1) Survey of different theories. Importance of plasma physics and celestial mechanics. Changes in the solar system since the time it originated. Tidal effects, resonances. Interaction between a rotating body and a surrounding plasma. Formation of planets, asteroids, and satellites. (Satisfactory/Unsatisfactory grades only.)

297. Seminar in Applied Ocean Science (1-1-1) Topics in applied ocean science. (Satisfactory/Unsatisfactory grades only.)

298. Independent Study (1-12, 1-12, 1-12, 1-12) 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) (Satisfactory/Unsatisfactory grades permitted.)

501. Teaching (1-4, 1-4, 1-4) 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

(or Chemistry 110A Fall of Senior year)

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. 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.

John Abelson, *Assistant Professor of Chemistry; Structure and function of nucleic acids; biochemical genetics.*

William Allison, *Assistant Professor of Chemistry: Comparative sequences of enzymes; mechanism of enzyme action: active sites of enzymes.*

Andrew A. Benson, *Professor of Marine Biology; Associate Director of Scripps Institution of Oceanography: Photosynthesis; plant biochemistry; lipid metabolism, membrane structure.*

Stuart Brody, *Assistant Professor of Biology: Genetics and biochemistry of development in fungi.*

Willie C. Brown, *Assistant Professor of Biology: Physiology and biochemistry of bacterial cell wall modifications by autolytic enzymes.*

Warren L. Butler, *Professor of Biology: Photobiology of plant tissues; photosynthesis and effects on plant growth and development.*

Maarten J. Chrispeels, *Assistant Professor of Biology: Biochemistry of plant development.*

Melvin Cohn, *Adjunct Professor of Biology; Fellow, Salk Institute for Biological Studies: Induced enzyme and antibody synthesis.*

John A. Demoss, *Professor of Biology: Biochemistry and genetics of organized cellular elements; regulation of RNA synthesis.*

Edward A. Dennis, *Assistant Professor of Chemistry: Detailed mechanism of enzyme catalysis; NMR studies of phospholipid enzymes and membrane structure; phopholipid biosynthesis.*

Russell F. Doolittle, *Associate Professor of Chemistry: Structure and function of protein molecules; evolution of proteins.*

Renato Dulbecco, *Adjunct Professor of Biology; Fellow, Salk Institute for Biological Studies: Virology; study of carcinogenesis by viruses in animal cells.*

Richard W. Dutton, *Professor of Biology: Cellular immunology; molecular basis of antigen stimulation.*

John Elovson, *Assistant Professor of Biology: Lipid metabolism and membrane biogenesis.*

David J. Faulkner, *Assistant Professor of Marine Chemistry — Scripps Institution of Oceanography; Elucidation of the structure of natural products from the marine environment and the study of their chemical syntheses.*

Morris E. Friedkin, *Professor of Biology: Enzymology; folic acid antagonists; regulatory factors in DNA synthesis; properties of microtubules; molecular basis of memory; cancer chemotherapy.*

Leonard D. Garren, *Professor of Medicine: Enzyme regulation; action of hormones, protein synthesis.*

Peter Geiduschek, *Professor of Biology: Nucleic acid synthesis and function; control of gene action, especially in virus development.*

Murray Goodman, *Professor of Chemistry: Biopolymer model systems and optically active compounds; peptide chemistry; stereoregular synthetic polymerizations. Topochemical phenomena in biological reactions and biomedical polymers.*

Mehran Goulian, *Professor of Medicine: Enzyme of nucleic acid metabolism; mechanisms of DNA synthesis; abnormalities of DNA replication in tumor cells.*

Melvin H. Green, *Associate Professor of Biology: Regulation of bacteriphage development; DNA replication and transcription.*

Francis T. Haxo, *Professor of Marine BiologyScripps Institution of Oceanography: Photosynthesis; nature and distribution of algal pigments.*

Masaki Hayashi, *Associate Professor of Biology: Transcription and translation of genetic information.*

Donald R. Helinski, *Professor of Biology: Genetics and biochemistry of extrachromasomal genetic elements in bacteria.*

John J. Holland, *Professor of Biology: Normal and virus-directed synthesis in mammalian cells.*

Robert Holley, *Adjunct Professor of Chemistry; Fellow, Salk Institute for Biological Studies: Animal cell growth regulators; chemistry of nucleic acids.*

Yasuo Hotta, *Associate Research Biologist: Molecular basis of chromosome replication.*

Stephen H. Howell, *Assistant Professor of Biology: DNA metabolism in synchronous mitosis and meiosis of Chlamydomonas.*

Frank M. Huennekens, *Adjunct Professor of Biology: Chairman, Department of BiochemistryScripps Clinic and Research Foundation: Enzyme mechanisms; folate B-12 and flavin coenzymes; biochemical basis of leukemia.*

Harvey Itano, *Professor of Pathology: Genetic control of structure and biosynthesis of hemoglobin; chemical modification and analysis of amino acids, peptides, proteins.*

Oliver W. Jones, *Associate Professor of Medicine and Pediatrics: Biochemical genetics; biochemistry of gene transcription; regulation of DNA replication in mammalian cells; role of DNA nucleases in mammalian chromosome replication.*

Martin D. Kamen, *Professor of Chemistry: Electron transport; oxidation-reduction; photosynthesis and protein structure and function with particular reference to heme proteins.*

Nathan O. Kaplan, *Professor of Chemistry: Mechanism and function of enzymes as related to structure; enzyme genetics and evolution; molecular basis of differentiation; coenzyme chemistry and function; cancer chemotherapy.*

Joseph Kraut, *Professor of Chemistry: Molecular structure of proteins and other biologically important molecules; x-ray diffraction crystallography.*

William F. Loomis, Jr., *Assistant Professor of Biology: Genetics and biochemistry of development in the cellular slime molds.*

Steven E. Mayer, *Professor of Medicine: Biochemical pharmacology; adrenergic receptor mechanisms; biochemical basis of drug actions; hormone-enzyme relationships.*

Stanley L. Miller, *Professor of Chemistry: Biochemistry; synthesis of organic compounds under primitive earth conditions; mechanism of action of gaseous anesthetics.*

Stanley E. Mills, *Professor of Biology: Immunochemistry of enzymes; metabolism and differentiation in plant tissue culture cells.*

William L. Nyhan, *Professor of Pediatrics; Amino acid and purine metabolism; inborn errors of metabolism; developmental pharmacology and biochemistry.*

John O'Brien, *Professor of Neurosciences: Lipid neurochemistry; membrane biochemistry; enzyme deffects in lipidoses.*

Leslie E. Orgel, *Adjunct Professor of Chemistry: Fellow, Salk Institute for Biological Studies: Prebiotic chemistry.*

Paul A. Price, *Assistant Professor of Biology: Physical organic studies of enzyme mechanisms; identification of functional groups at the active sites.*

Arthur E. Robinson, *Assistant Professor of Biology: Biochemistry of mental disease; solid phase peptide and protein syntheses.*

Percy J. Russell, *Associate Professor of Biology: Isoenzymes of abenylate kinase in various tissues; antienzymes and differentiation.*

Paul D. Saltman, *Professor of Biology and ProvostRevelle College: Trace metal metabolism; carbon dioxide fixation in higher plants; transport mechanisms in biological systems; carbohydrate metabolism.*

Gordon Sato, *Professor of Biology: Culture of animal cells; regulation of endocrine tumor cells in culture; biochemistry of differentiation.*

Immo Scheffler, *Assistant Professor of Biology: Molecular biology.*

Gerhard N. Schrauzer, *Professor of Chemistry: Inorganic chemistry; catalysis and coordination chemistry pi-complexes of transition metals; complexes of sulfur containing ligands; vitamin B-12 model studies.*

J. Edwin Seegmiller, *Professor of Medicine: Biochemical genetics; mammalian cell genetics; regulation of purine synthesis; biochemistry of amniotic cells culture in vitro.*

Melvin I. Simon, *Associate Professor of Biology: Regulation of biosynthesis of subcellular organelles.*

S. Jonathan Singer, *Professor of Biology: Structure and function of antibody molecules; physical and organic molecules; molecular approaches to cell ultrastructure function.*

Douglas W. Smith, *Assistant Professor of Biology: Structure and function of nucleic acids; DNA replication; biochemical genetics.*

John Spizizen, *Adjunct Professor of Biology; Chairman, Department of Microbiology — Scripps Clinic and Research Foundation: Genetics control of sporulation and DNA transformation.*

Daniel Steinberg, *Professor of Medicine: Biochemistry of lipids; intermediary metabolism; genetic errors; lipid proteins.*

Herbert Stern, *Chairman of the Department and Professor of Biology: Enzymology of meiosis; biochemical aspects of plant development.*

Teddy G. Traylor, *Professor of Chemistry: Mechanism of biological nitrogen fixation; synthetic studies of enzyme sites; biological oxygen transport.*

Silvio S. Varon, *Associate Professor of Biology: Neurobiology; development of neural systems in vitro.*

Benjamin Volcani, *Professor of Marine MicrobiologyScripps Institution of Oceanography: Microbial metabolism; structure and function with special reference to biological mineralization.*

Nguyen-Huu Xuong, *Associate Professor of Biology: Biophysics.*

Bruno H. Zimm, *Professor of Chemistry: Macromolecular physical chemistry; solution behavior of synthetic and biological macromolecules; statistical mechanics of chain molecules.*

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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 and B or 144A and B.

110A. Biochemistry F General biochemistry. Required core course for Muir biology majors. Prerequisite: Organic Chemistry (Science 3D, 3E or equivalent).

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.

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) 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. Prerequisties: One year of graduate study.

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. Prerequisites: Physical and organic chemistry.

213. Chemistry of Biological Macromolecules (3) 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. Prerequisites: 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. Prerequisites: Organic Chemistry.

217. Human Biochemistry (2) An advanced course in biochemistry which will primarily deal with the molecular basis of human disorders. Prerequisites: 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 (3,3,3) Recent topics have included: Techniques in Experimental Biochemical Dynamics, Topics in Biophysics.

299. Research in Biochemistry (1-12, 1-12, 1-12)

BIOLOGY

Office: 2130 Bonner Hall

Warren L. Butler, *Ph.D., Professor of Biology*
John A. DeMoss, *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*
Stanley E. Mills, *Ph.D., Professor of Biology*
Paul D. Saltman, *Ph.D., Professor of Biology*
(Provost of Revelle College)
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)
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*
Silvio S. Varon, *M.D., Associate Professor of Biology*
Nguyen-Huu Xuong, *Ph.D., Associate Professor of Biology*
Stuart Brody, *Ph.D., Assistant Professor of Biology*
Willie C. Brown, *Ph.D., Assistant Professor of Biology*
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*
Tom D. Humphreys, II, *Ph.D., Assistant Professor of Biology*
William F. Loomis, Jr., *Ph.D., Assistant Professor of Biology*
Paul A. Price, *Ph.D., Assistant Professor of Biology*
Arthur B. Robinson, *Ph.D., Assistant Professor of Biology*
Thomas F. Roth, *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*
Meredith G. Somero, *Ph.D., Assistant Research Biologist*
Doris B. Wilson, *Ph.D., Assistant Research Biologist*

Melvin Cohn, *Ph.D., Adjunct Professor*
Renato Dulbecco, *M.D., Adjunct Professor*
Frank M. HuennekensPh.D., Adjunct Professor
Edwin Lennox, *Ph.D., Adjunct Professor*
John Spizizen, *Ph.D., Adjunct Professor*
William O. Weigle, *Ph.D., Adjunct Professor*

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 also 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 7-quarter sequence of courses in human biology and 2 additional courses in the 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	Biology 101A Biology 013 Chemistry 140A Chemistry 143A	Biology 101B Chemistry 100A Chemistry 140B Chemistry 105A	Biology 101C Biology 102 Chemistry 100B
Senior Year	Biology 111A	Biology 111B Biology 112	Biology 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 and Mathematics 40 or 100 as electives in their lower-division program and Natural Science 2DL in place of Natural Science 2D.

Biology majors are required to take the courses listed in the recommended schedule for the upper-division years. Chemistry 100A, 100B, 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 3A, 3B, 3C, 103A, 103B: Math 2A, B, C or Math 1A, B, C. All of these prerequisites should be taken in the first two years. (Science 2A, 2B, 2C 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 and App. Math 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

During his first two years, the student may take any of the formal courses listed in the Biology and Chemistry Departments, or other departments of the University. Although no formal course requirements exist, a program of study will be arranged through consultation with the faculty, according to the background and interests of the individual student. In the first year, students will participate in a laboratory rotation program in which independent research projects are carried out by each student in various faculty members' laboratories. 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 (Formerly Biology 9A) 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. Human Biology (Formerly part of Biology 9B) W 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. Plant Biology (Formerly part of Biology 9B) S Plants as primary producers in the ecosystem; principles of plant growth; plant breeding and the Green Revolution; agricultural chemicals. Not open to biology majors.

10. Plant Biology F Principles of plant anatomy, morphology, physiology, growth and development. Prerequisite: freshman chemistry. For biology majors only.

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. Prerequisite: Natural Science 1A 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).

103A. Organic Chemistry W The properties and reactions of alkanes, alkenes, cycloalkanes, arenes, alkyl halides and alcohols. The mechanism of S_n1, S_n2, E1, and E2 reactions. Prerequisites: Science 3C. Three hours lecture, one hour discussion, six hours of outside preparation.

103B. Organic Chemistry S Continuation of Biology 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. Prerequisites: Biology 103A. One hour discussion and eight hours of outside preparation.

103BL. Organic Chemistry Laboratory S 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. Prerequisites: Biology 103B concurrent. Six hours laboratory, two hours outside preparation.

110A. Biochemistry F General biochemistry. Required core course for Muir biology majors. Prerequisite: Organic Chemistry (Science 3D, 3E or equivalent). Three hours lecture.

110B. Molecular Biology W Molecular mechanisms of cellular processes. Emphasis on structure and function of nucleic acids and other biological macromolecules, protein function of nucleic acids and other biological macromolecules, protein biosynthesis, the genetic code, regulatory phenomena. Required core course for Muir biology majors. Prerequisites: Biology 110A and 110X.

110C. Molecular and 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. Three hours lecture. 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. Prerequisites: Biology 111A.

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).

115A. Biochemistry Laboratory 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 S Required core course for Muir Biology majors to be taken concurrently with Biology 110C. Six hours laboratory. Prerequisite: Biology 110B.

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 W A review of the principals of chromosome structure and behavior. The topics covered change yearly over a three-year cycle and the course may be taken for credit three times: (*a*) chromosome structure and function, (*b*) chromosome pairing and segregation, and (*c*) chromosome recombination. Three hours lecture. 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 AMES 271. 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.

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 Ditran programming.

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 the 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 the instructor.

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. Prerequisite: Chemistry 100A-100B or consent of the instructor.

143L. Laboratory in Neurobiology (4) S 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.)

145. Endrocrinology 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 interreactions, immune response, immunological unresponsiveness, *in vivo* and *in vitro* consequences of antigen-antibody interreactions, delayed hypersensitivity, control of the immune response and transplantation immunities. Prerequisite: Biology 101C.

151. Biochemistry of Plant Development W An alalysis of those aspects of development of higher plants which can be understood in biochemical and cellular terms. Three hours lecture. Prerequisites: Biology 10 or equivalent; 110A or 101C; 110B or 111A and senior standing.

157. General Microbiology S A discussion of the structure, growth and physiology of microorganisms with emphasis on their diverse activities and on their interaction with their environment. Three house lecture. 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 S Evolutionary processes are discussed in the genetic and ecological contexts. Emphasis on recent literature. Prerequisite: Biology 101A or 110B.

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 COURSES

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. 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 Mechanism (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 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 tthe 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.

220. Seminar in Genetics (1) Seminars presented by 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. 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 biochemistry 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 interreactions, immune response, immunological unresponsiveness, *in vivo* and *in vitro* consequences of antigen-antibody interreactions, delayed hypersensitivity, control of the immune response and transplantation immunities. Prerequisite: Biology 101C.

243. Neurobiology II (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.)

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.)

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, 1-12, 1-12)

500. Apprentice Teaching (1-4, 1-4, 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.)

CHEMISTRY

Office: 2112 Urey Hall

James R. Arnold, *PH.D., Professor of Chemistry*
Murray Goodman, *Ph.D., Professor of Chemistry*
Martin D. Kamen, *Ph.D., Professor of Chemistry*
(Chairman of the Department)
Nathan O. Kaplan, *Ph.D., Professor of Chemistry*
Joseph Kraut, *Ph.D., Professor of Chemistry*
Joseph E. Mayer, *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*
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., 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*
Leigh B. Clark, *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*
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 2D or 2DL 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 or 2FL, usually approximated by quantitative analysis.

The departmental course requirements for the Bachelor of Arts degree in Chemistry are: Chemistry 100A, 100B, 100C; 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: Chemistry 120B is not required for the curriculum in biochemistry; instead the upper-division electives include Chemistry 101C, 113, 116, 118 and Biology 111A, plus one additional upper-division or graduate course in chemistry or related fields.

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 100D, 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* in the course listings.

Graduate Program in Chemical Physics

The Department of Chemistry, in collaboration with the Departments of Physics and AMES (Aerospace and Mechanical 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 College

The Department of Chemistry at UCSD cooperates with the Department of Chemistry in the Division of the Physical Sciences, San Diego State College, 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

100A-100B-100-C. Physical Chemistry F,W,S Behavior of ideal and real gases, thermodynamics, statistical mechanics, properties of solutions, electrochemistry, nuclear chemistry, atomic structure, elementary quantum theory, special topics in modern physical chemistry. Three lectures, one recitation. Prerequisites: Natural Science 2D, Mathematics 2C, or consent of instructor; for Chemistry 100C additional prerequisites: Mathematics 2D. At the level of *Physical Chemistry*, W. J. Moore, Prentice-hall (3rd edition).

100d. Elementary Statistical Thermodynamics F Equilibrium Distribution Functions; Development of Partition Functions; Derivation of Thermodynamic Properties of Simple Systems from Partition Functions. Prerequisites: Chemistry 100A-100B-100C.

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 102B.

102B. Thermodynamics W Problems in Thermodynamics. Further application of the principles presented in 102A. Prerequisite: Chemistry 102A.

105A. Physical Chemistry Laboratory (2) F,W Laboratory course in experimental physical chemistry. Prerequisite: 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. (Not offered 1971-1972.)

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.

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.

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.

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 properites 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.

150A-150B-150C. Advanced Projects Laboratory F,W 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 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) 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.

202A. Thermodynamics (3) 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.

202B. Thermodynamics (3) Problems in Thermodynamics. Further application of the principles presented in 202A. Prerequisite: Chemistry 202A.

203. Molecular Spectroscopy (4) 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 200A-200B, or equivalent.

204A. Statistical Mechanics of Chemical Systems (4) 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.

204B. Statistical Mechanics of Chemical Systems (4) Applications and special topics in statistical mechanics selected from the following: density matrix formulation or quantum statistics; nonequilibrium problems, transport, viscosity diffusion etc., magnetic and electrical field effects; negative temperature; superfluids, liquid helium and superconductors, etc. Prerequisite: Chemistry 204A.

205. Advanced Chemical Kinetics (3) Discussion of modern theories of chemical rate processes and energy transfer. Microscopic and macroscopic aspects will be developed and applied. Prerequisites: Chemistry 100A-100B-100C.

206. Topics in Biophysics and Physical Biochemistry (3) Application of physical methods to biochemistry, e.g., x-ray diffraction, optical rotatory dispersion amd circular dichroism, magnetic resonance. Same as Physics 206. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades permitted.)

209. Special Topics in Physical Chemistry (1-3) Topics of special interest will be presented.

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 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 (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 Biology 211. Prerequisites: physical and organic chemistry.

213. Chemistry of Macromolecules (3) 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) 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 primarily

dealing with the molecular basis of human disorders. Prerequisite: Chemistry 211 or 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 (3,3,3) Recent topics have included: Techniques in Experimental Biochemical Dynamics, Topics in Biophysics.

220. Advanced Inorganic Chemistry (3) Introduction to theoretical inorganic chemistry. Chemistry of typical main group and transition elements; coordination compounds; organometallic chemistry; experimental techniques. Given in two parts every other year. Part II, W 1970: Main Group Element Chemistry. Prerequisites: Chemistry 100B, 120B and 141C.

229. Special Topics in Inorganic Chemistry (1-3)

245. Structure and Properties of Organic Molecules (3) 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) 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) 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. Topics emphasized will vary from year to year.

249. Special Topics in Organic Chemistry (1-3)

250. Seminar in Chemistry (1) 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) 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) 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) 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) (Satisfactory/Unsatisfactory grades permitted.)

500. Teaching in Chemistry (4) 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.)

COMMUNICATIONS

Office: Building 411, Matthews Campus

COURSES

1A, 1B, 1C. Communications F,W,S The Communications 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.

100A, 100B, 100C. Communications F,W,S This course is to take care of the declared interest of upper-division students in the communications processes of speaking, reading, and writing especially.

101A. Television Production and Analysis 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 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.

180. The Political Economy of Mass Communications W 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 S 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 W,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. Prerequisite: Communications 1A, 1B, 1C, advanced standing, or consent of instructor.

183. Syntactics of Communication W Formal and theoretical aspects of human and biological communication systems. Prerequisites: Communications 1A, 1B, 1C, advanced standing, or consent of instructor.

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.

185. Mass Communications and Public Opinion 1 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 fillms, 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.

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*

COURSES

Either Contemporary Issues 1 or Contemporary Issues 2 may be used to fulfill the Muir College Contemporary Issues requirement.

1. Contemporary Issues A lecture-discussion group course for freshmen of John Muir College treating problems in public affairs. A 2 quarter course. Students will earn 2 units in the fall and 2 units in the winter, but they will not be given the grade until the end of the winter quarter.

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 An examination of woman's role in history and today, with attention both to psychological and to political aspects of her situation (e.g., contraception/abortion related both to personal freedom and questions of population control).

195. Discussion Leading for Contemporary Issues Students (after preparation

and training in Contemporary Issues Workshop 196) will lead groups of 10-20 freshmen in discussions of contemporary concern. Students will meet with the director to plan and prepare discussions 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.

196. Contemporary Issues Workshop (2) 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. Prerequisite: consent of the instructor.

199. Special Studies in Contemporary Issues (2 or 4) F,W,S Individual reading and projects in the areas of contemporary concern. Prerequisites: permission of Provost of Muir College. (May be repeated for credit.)

CULTURAL TRADITIONS

Office: 2105 Humanities and Social Sciences Building
Lola R. Schwartz, *Ph.D., Director*

Each year four or five quite 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, and West African.

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 spring pre-enrollment. Inquiries about the program or projected sequences should be addressed to the Provost.

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 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, etc. Prerequisite: consent of director. (May be repeated for credit.)

DRAMA

Office: UCSD Theatre, Matthews Campus
John L. Stewart, *Ph.D., Professor of American Literature and Acting Chairman (Provost of John Muir College)*
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*
Thomas McCorry, M.A., *Lecturer*

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The Drama Department will offer a major beginning in the Fall of 1971. It will have 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

1a, 1B, 1C. The Nature of Drama (Beginning) F,W,S A sequence of integrated courses on the fundamentals of drama. Study of the physical aspects of the theatre and dramatic action, and how they shape dramatic content; literary study of dramatic texts, culminating in their performance. May be repeated for credit. Prerequisite: consent of instructor. (This course may be used to fulfill the Muir College Humanities and Fine Arts requirement).

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. (This course may be used to fulfill the Muir College Humanities and Fine Arts requirement).

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.

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

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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, two laboratories; occasional field trips.

102. Introductory Geochemistry W 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 terrestial abundances of elements; neucleosynthesis; 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 S 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 Mineralogy 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 Independent reading or research on a problem by special arrangement with a faculty member.

Note: Also see course listings: SIO

SIO 253A. Igneous and Metamorphic Petrology

SIO 245. Sedimentary Petrology

SIO 256A, 256B, 256C. Field Geology

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*
(Director of Undergraduate Studies in Economics)
Richard Emmerson, *Ph.D., Associate Professor of Economics*
Ramachandra Ramanathan, *Ph.D., Assistant Professor of Economics*
Wolfhard Ramm, *Ph.D., Assistant Professor of Economics*
Larry E. Ruff, *Ph.D., Assistant Professor of Economics*
Richard Schmalensee, *Ph.D., Assistant Professor of Economics*
Dennis Smallwood, *Assistant Professor of Economics*

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The Major Program

Each student majoring in economics will be required to take either Economics 2A and 2B *or* 1A and 1B, plus 1C and at least twelve upper-division courses. Unless special permission is granted by the Director of Undergraduate Studies, these courses must include Economics 100A, 100B, 110A, 110B, and 190A *or* 190B. A 2.0 (C) grade point average in economics courses is required of students majoring in economics.

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.

With regard to elective courses, the economics major is encouraged to take courses in related fields such as political science, history, and mathematics. Because mathematics and mathematical statistics are important in advanced economic study and in economic research, the student should consider the need for adequate background in these subjects. The courses most appropriate for this purpose are Mathematics 2D, 2E, and depending on the student's interests, certain upper-division courses.

In planning his upper-division program, the prospective economics major should consult with the Director of Undergraduate Studies during the year in which she or he takes the Economics 1 or 2 sequence. It is often convenient to commence with the 100 or 110 sequences, or both.

The Honors Program

Students electing the honors program in economics must have a 3.5 average in their upper-division economics courses (including seminars) and may take three quarters of the seminar (190A, 190B, 190C). Any two of these quarters may be devoted to an extended study of the student's choosing.

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 24-course program 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)
	Elective	Elective	Elective
Year II	Economics 209 (applied micro)	Economics 269 (seminar)	Economics 269 (seminar)
	Economics 219 (applied macro)	Elective	Elective
	Elective	Elective	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. Part (iii) is usually taken in January of his second year; the 220 sequence and 209 and 219 are prepatory. Part (iv) is usually taken at the end of his second year; elective courses are preparatory. 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 F,W,S 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 F,W,S 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.

UPPER DIVISION

100A, 100B, 100C. Microeconomics F,W,S 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.

101. International Trade S 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.

103. International Monetary Relations 1 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 and 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 and 100B.

110A, 110B, 110C. Macroeconomics F,W,S 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.

111A, 111B. Financial Institutions and Monetary Policy W,S 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, 110C.

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.

116. Economic Development W Analysis of current economic problems of "underdeveloped" areas and conditions for increasing income and employment. Prerequisites: Economics 1A, 1B, 1C.

117. Size Distribution of Income An analysis of inequality in the size distribution of income, education, and wealth in an economy. Prerequisites: Economics 1A, 1B, 1C.

120A, 120B. Problems of Statistical Estimation F,W Statistical methods of special application to economic problems, and special statistical problems encountered in testing economic hypotheses with nonexperimental data. Correlation and regression analysis with applications to time series and cross section data, estimation of simultaneous equation models. Prerequisites: Economics 1A, 1B, 1C and Mathematics 1C or their equivalents.

121. Games, Decisions and Programming S An introduction to activity analysis, the theory of games, statistical decision theory, and linear progamming. Utility theory, expected utility maximization, and other decision criteria. The Duality and min-max theorems. The simplex method. Leontief systems. Prerequisites: Economics 100A and 100B.

122. Management Science Application of formal modeling techniques to allocation problems in business and government. Prerequisite: Economics 121.

130A, 130B, 130C. Public Policy F,W,S 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 for 130A; 110A, 110B for 130B; and 100A for 130C.

132. 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.

135. Urban and Regional Economics The economics of location: transport demand in relation to the layout of the city; the detrminannts of interregional economic specialization; central-place theory; industrial complex analysis. Prerequisite: Economics 100A.

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. Income Distribution F An analysis of inequality in the size distribution of income, education, and wealth in an economy. Prerequisites: Economics 1A, 1B, 1C.

138. Economics of Health W The application of economic analysis to the health field; the role of health in income, production, and poverty; supply, demand and price determinationn in the public and private health sectors.

140A. Economic History W 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 an approved set of courses in European or American History.

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. Prerequisite: Economics 140A.

160. Economic Planning A development and evaluation of techniques for indicative planning (France) and central direction of the economy (Eastern Europe). Prerequistie: Economics 121.

161. Comparative Economics Systems S 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 Scientific method and the role of falsification in economics. Prospects for a positive science. The individualistic basis of market allocation. Alternative tenets (Marxian, Fabian, technocratic) and the theoretical precepts and institutional structures drawn therefrom. Current research in "political economy." Prerequisites: Economics 1A, 1B, 1C or 2A, 2B, 2C.

190A, 190B, 190C. Seminars and Independent Work F,W,S Seminars which will encourage the student to work on a particular problem intensively, culminating in at least one major paper. Prerequisite: consent of instructor.

199. Independent Study F,W,S Individual study. After consulation with the faculty, the student will write a substantial paper. Prerequisites: consent of staff; to be arranged with department chairman and instructor.

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 (3) Intensive examination of selected empirical studies in microeconomics. Prerequisites: Economics 200A, 200B, 200C and Economics 220A, 220B, 220C.

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.

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 (3) Intensive examination of selected empirical studies in macroeconomics. Prerequisites: Economics 210A, 210B, 210C and Economics 220A, 220B, 220C.

220A, 220B, 220C. Econometrics (3-3-3) The construction and application of stochastic models in economics. This includes both single and simultaneous equation models. Prerequisite: for 220B, 220C, Mathematics 180A or equivalent.

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.

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.)

298. Cost Crisis, Expenditures, Distribution and Control of Medicine in the United States Input of professionals: hospitals; drugs, nursing homes; expenditures and competing services; determinants of the demand for medicine; Income, inflation, population, insurance, government; level of utilization; distribution and organization of medical care and income of providers; costs of illness and therapy. Prerequisites: enrollment in Graduate Division or in School of Medicine. Others by arrangement. (Satisfactory/Unsatisfactory grades only.)

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 1971-72 academic year, courses in Frontiers of Chemistry ("Tracing a Tracer Experiment"), Biology ("Biological Implications of Environmental Variables") and Medicine are planned for Fall, Winter, and Spring. 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

101. Contemporary Problems in Cosmology The origin of the universe, quasars, radio astronomy, and other frontiers in astronomy and astrophysics.

102. Quantitative Studies of Environmental and Social Problems A course of lectures designed to acquaint undergraduates with factual information on important contemporary issues.

103. New Frontiers in Oceanography and the Earth Sciences Series of lectures by leading experts in oceanography and the earth sciences. Designed to acquaint non-science majors with the most exciting contemporary achievements in these fields.

104. Arms and Arms Control The scientific and technological problems engendered by the increasing stockpiling of nuclear arms has created the need for an understanding of a mechanism to achieve disarmament. Both the technological and political problems will be discussed in historical perspective and new proposals for future solutions will be examined.

105. Human Population Problems A survey of the causes and results of the explosive growth in the human population. Major areas of emphasis are (1) Human biology, (2) physical environment of the earth, (3) food production, (4) sociology and anthropology of developing countries, and population control.

106. The Chemistry/Biology Interface Recent advances in chemical biology with particular attention to the structure and function of macro-molecules, chemical mechanisms of disease and new therapeutic agents. The medical and social impact of these contemporary scientific findings will be discussed.

107. The Earth Science: Adventures in Earth and Life History A course on the origin and evolution of the earth, and its life, culminating in a discussion of man's impact on the earth with predictions of the future and interrelations of both.

108. Biochemical Anthropology and Individuality 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.

109. Tracing a Tracer Experiment F The continuity of research in the natural sciences is viewed in terms of the interplay of concepts from physics and chemistry as applied to biology. The basis for discussion is the history of a single experiment in intermediary metabolism using isotopic tracer methods to answer a question about the mechanism of a chemical transformation accomplished by a thermophilic bacterium. The lectures have as their ultimate aim, clarification of the role of modern science as a cultural force basically informed by the humanist tradition.

110. Biological Implications of Environmental Variables F Interactions between the genetic and environmental components contributing to the development, function and behavior of man: foods, pollutants, radiation, stress, space, microbes/ mutation selection, immunity, transplants, genetic engineering.

HISTORY

Office: Room 5016, Humanities-Social Sciences Building, Muir Campus

*Samuel H. Baron, *Ph.D., Professor of History*
**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*
Roger A. deLaix, *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*

* * *

Frances T. Makkreel, *B.A., Lecturer in History*
John M. McCulloh, *M.A., Acting Assistant Professor of History*
Edward Reynolds, *M.A., Acting Assistant Professor of History*
Robert C. Ritchie, *M.A., Lecturer in History*

*Leave of absence, fall quarter, 1971/72.

**Leave of absence in residence.

†Leave of absence, 1971/72.

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 two-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 adviser, 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 adviser. 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, 1972.

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 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.)

10. Introduction to History F 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.

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

102A. Historiography F,W,S The critical analysis of historical literature in a field of restricted scope. Several sections will be offered, each dealing with a particular area of historical research. Required of seniors majoring in history. Prerequisite: senior and history major. (May be repeated for credit.)

102B. Research in the Sources F,W,S Historical research dealing with a problem of limited scope, and involving critical analysis of historical sources. Several sections will be offered, each dealing with a particular area of historical research. Required of seniors majoring in history. Prerequisite: senior and history major. (May be repeated for credit.)

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. (Not offered 1971-72.)

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 the instructor. (Not offered 1971-72.)

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.) (Not offered 1971-72.)

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 the instructor. (Not offered 1971-72.)

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. (Not offered 1971-72.)

114. Early Modern Europe, 1517-1688 W The religious crisis, the decline of the Holy Roman Empire and the rise of national states. Intellectual developments, political theory, and problems of government and citizenship in the 17th century. Prerequisite: humanities sequence or its equivalent. (Not offered 1971-72.)

115. History and Theory of Nonviolent Action S Theory and practice of nonviolence, the history of experiments in nonviolence in the 20th century and their relevance to current issues in American society. Discussion of nonviolent alternatives to violent conflict at the personal, community, and international levels. (Not offered 1971-72.)

131A-131B-131C. The British Empire Since 1783 F,W,S The political and economic development of the British Empire, including the evolution of colonial nationalism. The development of the Commonwealth idea, a survey of Canada, and changes in British colonial policy. Prerequisite: humanities sequence or its equivalent. (Not offered 1971-72.)

132. Tudor-Stuart England, 1485-1688 S 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. (Not offered 1971-72.)

135A-135B. Germany, 1815-1919 F,W Emphasis on the political unification and cultural flowering of 19th century Germany; the era of Bismarck, or William II, and the "catastrophe" of 1914-1918. Prerequisite: humanities sequence or equivalent. (Not offered 1971-72.)

140. The Expansion of Europe, 15th-17th Centuries S 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. (Not offered 1971-72.)

141. The Era of the French Revolution S France and Europe from the late Old Regime to the advent of Bonaparte. Emphasis falls upon intellectual and social forces. (Not offered 1971-72.)

145A. Russia: 1613-1800 W A survey of the development of Russian society and thought from Ivan the Terrible to Alexander I. Emphasis will be placed on the Westernization of Russia. Three hours discussion. Prerequisite: upper-division standing or permission of instructor.

145B. Russia: 1800-1914 W An examination of Imperial Russia's last century, with special emphasis on currents of social thought and the revolutionary movement. Three hours discussion. Prerequisite: humanities sequence or its equivalent.

145C. Russia: 1914-Present S The Russian Revolution and the transformation of Russia under the Soviet Regime. Domestic and foreign policies will be considered. Three hours discussion. Prerequisite: humanities sequence or its equivalent.

150A-150B. Europe: 1750-1870 W,S 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. Three hours lecture. Prerequisite: humanities sequence or its equivalent. (150A not offered 1971-72.)

152A-152B. Europe Since 1880 W,S Lecture and discussion course on the political, social, economic, intellectual, and diplomatic history of Europe from 1880 to the present, with emphasis on national economy, the two great wars, Fascism, and Communism. Prerequisite: upper-division standing; Humanities Sequence or equivalent.

153A-153B. The French Revolution and Its Cultural Impact on England and Germany F,W 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 to 1795; second quarter will cover to 1815. (NOTE: Cross listed as Literature 125A-125B.) Prerequisite: upper-division standing or permission of instructor. (Not offered 1971-72.)

155A-155B-155C. History of Science F,W,S Selected topics in the history of science down to 1900, including the development of planetary theory, mechanics, the atomic hypothesis and structural chemistry, energetics, field theory of biological evolution.

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.

159. Social History of the Far West Su The course will discuss migrations and the re-establishment of society in the far west, emphasizing the divergence between them. It will also deal with the idea of the west, as both land and opportunity. Prerequisite: upper-division standing or permission of instructor. (Not offered 1971-72.)

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.

162A-162B. The Civil War and Reconstruction F,W A lecture and discussion course on the social and political history of the United States from Jackson to Hayes with emphasis upon antebellum reform, and institution of slavery, the coming of the Civil War and Reconstruction. Prerequisite: upper-division standing or permission of instructor. Satisfies American History and Institutions requirement. (Not offered 1971-72.)

164A. 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.

164B. 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 Instutions requirement. (Formerly History 165.)

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.

168. American Social History W This course deals with American social theory and institutions in the nineteenth and twentieth centuries. Emphasis will fall upon the evolution of the social welfare system; specifically, attitudes toward poverty and dependency, the reform process, the role of public and voluntary institutions in social action and social work. (Not offered 1971-72.)

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. (Not offered 1971-72.)

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. (Not offered in 1971-72.)

171A-171B. A History of Mexico W,S A consideration of the historical development of Mexicopolitical, social, economic, intellectual, and institutional with special emphasis in the second quarter on a comparison of the revolutions in the twentieth century in Mexico and in Cuba. Prerequisite: upper-division standing. (Not offered 1971-72.)

172A-172B-172C. History of Latin America F,W,S A survey of the evolution of Latin America, covering aboriginal civilizations, Iberian colonizations and development of the modern nations, from prehistory to the present. Emphasis on demographic, economic and social problems. Three hours lecture. Prerequisite: humanities sequence or its equivalent.

175A. History of India: 1500-1765 F 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.

175B. History of India: 1765-1905 W 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.

175C. History of India: 1905-Present S The growth of Indian nationalism and Muslim separatism. Political and economic development since independence. Prerequisite: upper-division standing or permission of instructor.

176. Social and Cultural History of India W The transformation of Indian society and culture in the nineteenth and twentieth centuries examined through case studies of institutions, groups, and individuals. Prerequisite: upper-division standing. (Not offered 1971-72.)

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. (Not offered 1971-72.)

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. (Not offered 1971-72.)

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-180B-180C. The History of Imperial China (1000B.C.-1800A.D.) F,W,S Chronological survey in the first quarter. Second quarter more detail on the history of Imperial China's society (the class structure, the bureaucracy, and economic institutions). The third quarter will concentrate on intellectual history, particularly political thought. Prerequisite: upper-division standing or permission of instructor.

181. History of South Africa The history of South Africa from 1652 to present. Prerequisite: upper-division standing. (Not offered 1971-72.)

182. Black History The course deals fundamentally with the black segment of the population as it interrelates to the broader American social petterns. Legal, sociological, psychological, and economic factors are taken under consideration. While there is attention to African origins, primary interest centers on the period since the Civil War, especially 20th century. Prerequisite: upper-division standing. (Not offered 1971-72.)

183A-183B. Modern Chinese History (1800-1966) W,S Focus will be on the heritage of traditional ways; the Western impact; imperialism; early efforts to modernize; the rise of nationalism; revolution and war in the twentieth century; the emergence of a Communist state; the Communist mainland and Taiwan as modernizing societies. Prrerequisite: upper-division standing or permission of instructor.

191. Race Relations Since Reconstruction in the U.S. The course will discuss racial stereotypes and the role of the Federal Government in race relations. It will emphasize Negro response to this, and will trace the movements led by such men as Washington, DuBois, Garvey, King and Cleaver. Prerequisite: upper-division standing or permission of instructor. (Not offered 1971-72.)

192. America's Urban Experience (1870-1920) The course will revolve around the social experiences of the different ethnic and class groups in relation to the developing American city. Foreign immigration as well as internal rural-urban movements will be discussed. Prerequisite

upper-division standing or permission of instructor. (Not offered 1971-72.)

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

201. The Literature of the Several Fields of History (4) A reading and discussion course for graduate students in different fields of history. Prerequisite: graduate standing or permission of instructor. (Satisfactory/Unsatisfactory grades permitted.) (Precise descriptions of the courses below will be provided at the beginning of each quarter.)

201A. Literature of Greece (4)

201B. Topics In Roman History (4)

201D. Topics in Medieval History (4) This class will study the Investiture Contest concentrating on the personalities involved in the ideas developed on both sides of the dispute. Prerequisite: knowledge (reading) of French or German.

201E. Western Europe, 1250-1648 (4) 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.

201F. Western Europe, 1648-1815 (4) 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.

201G. West Europe, 1815-Present (4)

201H. Readings in Russian History, 1700-1861 (4)

201I. British Empire (4) A comparative study of the problems of colonial rule in the dependent Empire. The course would be of interest to those who wanted to study imperialism, world history, or an area of Africa or Asia.

201J. United States, Colonial Period (4)

201K. United States, National Period (4)

201L. Latin America, Pre-Colonial (4) Readings and discussions 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.

201O. Readings in the Intellectual History of the Renaissance (4) The course will be primarily concerned with changes in attitude toward the philosophy of nature during the 15th and 16th centuries in Europe. Political and religious thought will also be dealt with as they relate to the central topic.

201P. Aspects of European Thought, 1660-1715 (4) Topics include political and theological thought and the new natural philosophies of Descartes and Newton as they relate to political and theological questions.

201Q. Jewish Intellectual History of the 18th Century (4) Isaac DePinto and Moses Mendelsson.

201S. 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. Prerequisite: reading knowledge of Spanish or one other European language.

201T. Literature of the Spanish Civil War F The Southworth Collection will be used extensively.

201X. Readings in the History of Technology to 1830 W A survey of the growing literature in this field, with selected readings that focus on the relation between technics, social organization, and social change.

202. Research in the Several Fields of History (4) Provides graduate students with training in research techniques, in the critical evaluation of sources, and in the composition of an historical narrative. Prerequisite: graduate standing or permission of instructor. (Satisfactory/Unsatisfactory grades permitted.) (Precise descriptions of the courses below will be provided at the beginning of each quarter.)

202A. Greece (4) 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.

202B. Rome (4) 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.

202C. Byzantium and Eastern Europe, 330-1250 (4) 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.

202D. Western Europe, 325-1250 (4)

202E. Western Europe, 1250-1648 (4)

202F. Western Europe, 1648-1815 (4)

202G. Western Europe, 1815-Present (4)

202H. Russia and Eastern Europe Since 1613 (4)

202I. British Empire (4)

202J. United States, Colonial Period (4)

202K. Topics in U.S. Diplomatic History (4) 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.

202L. Latin America, Pre-Colonial (4) 202M. Topics in Latin American History (4) 202R. The City and Social Change in America (4) A two-quarter research seminar focusing upon the causes and consequences of urbanization in the United States with primary emphasis on the ante-bellum period. During the first quarter students will explore the various methodological and bibliographical resources of urban history. In the second quarter they will complete a research project utilizing materials in the San Diego area.

202W. American Economic History F,W 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.

203. Historiography (4) An inquiry to historical concepts, methods, and problems. Required of all first year graduate students.

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.)

HUMANITIES

Office: 1512 Humanities-Library Building

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.

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. (Note: For the academic year 1971-72 Humanities 1 will be scheduled in its chronological time sequence. Thus it will be organized for sophomores who have completed Humanities 1-5 or the equivalent.)

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 F 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

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 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.

In the academic year 1971-72, it is anticipated that one of the following four courses in religious studies will be given in the Winter and one in the Spring Quarter.

40. The Future of Faith The course in religious studies will examine and discuss questions concerning religious experience and the relevance of faith. It will include a study of men who have made important contributions as well as critical projections about the relevance and future of religion. (Formerly Interdisciplinary 10.)

41. Contemporary Approaches to the Transcendent Exploration and study of various approaches to the transcendent, from the traditional religious experiences such as Eastern and Western mysticism to the contemporary and secular such as LSD,

Marxism, and Commune. The focus will be on trying to discover common and different underlying concepts. (Formerly Interdisciplinary 11.)

42. Religion and Racism in the United States An explorationn and study of the interaction and relationship between religious ideas and institutions and racism in the United States. The focus will be on the modern experience, with an examination of the historical roots as a tool for understanding and for action. (Formerly Interdisciplinary 20.)

43. Emerging Theologies of Social Change Students will be introduced to the recent efforts by innovative theologians to recast theological thought in the light of problems posed by underdevelopment and other social changes. The aim is to present new frontiers of theological thought as studied by economists, political scientists, sociologists, demographers, and planners. (Formerly Interdisciplinary 21.)

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,W,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 the Revelle Provost and the instructor.

199. Independent Studies F,W,S Individual readings and projects in areas covered by the interdisciplinary courses. Prerequisite: permission of the Provost of Revelle College.

LANGUAGE

Office: Language Center, 2125 Building 2C

Language proficiency requirements are established for undergraduate students by the Colleges and for graduate students by the Graduate Council. John Muir College students demonstrate foreign language proficiency by using it in their studies. Normally this requirement is satisfied by successful completion of a Literature 10 course. Alternatives are: 1. Literature 10.

2. Two quarters of a Cultural Traditions sequence taught in a foreign language.

3. A literature 11 course.

4. Proof of equivalent study abroad.

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	PREREQUISITIES	
	Placement Score	OR Previous Course
Lang 1 (formerly 1A)	none	none
Lang 2 (formerly 1B)	0-399	Lang 1 (1A)
Lang 3 (formerly 1C)	400-449	Lang 2 (1B)
Lang 4 (formerly 1D, 2A)	450-499	Lang 3 (1C)
Lang 5 (formerly 2B)		Lang 4 (2A)
Lang 6 (formerly 2C)		Lang 5 (2B)
Lit. 10	500-599	See below
Lit. 11	600 plus (560 for German)	

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.

2. Satisfactory performance in a language proficiency test conducted by the Department of Linguistics.

3. Language 3 *or* 4 *or* 5, with a grade of B or better.

4. Language 4 *and* 5 *and* 6, with a grade of C or better in Language 6.

Courses numbered Language 11 or 12 are intended for students whose primary concern is to learn to read a languageprincipally, 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

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/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.

LINGUISTICS

Office: 5237 Building 2C
Edward Klima, *Ph.D., Professor of Linguistics*
(Acting 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*
Margaret H. Langdon, *Ph.D., Assistant Professor of Linguistics*
Timothy S. Smith, *Assistant Professor of Linguistics*
Benjamin K. T'sou, *Acting Assistant Professor of Linguistics*

* * *

* On sabbatical leave 1971-72

** On leave of absence 1971-72

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 courses in the Department of Linguistics. Linguistics 100, 101, and 102 are required. One of the remaining courses must be Linguistics 151 or 164. Linguistics 100 may be taken by lower-division students.

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 classifcation 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.

Major Program in Linguistics (Recommended Schedule)

	FALL	WINTER	SPRING
Junior Year	Linguistics 100 Language — — — —	Linguistics 101 Language — — — —	Linguistics 102 Language — — — —
Senior Year	Linguistics 151 or 199 * — — — — — —	Linguistics 164 or 199 * — — — — — —	Linguistics 199 — — — — — —

*Courses relevant to the study of language selected from Linguistics or other departments.

The Minor Program

The Linguistics minor consists of six courses, of which at least three must be upper division. The only required course is Linguistics 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 in conjunction with Linguistics 100. 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 anthropoligal linguistics.

Language Requirements

A candidate for the M.A. degree must demonstrate (1) his ability to read French, German, or Russian by acheiving 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 languageFrench, 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

UPPER DIVISION

100. General Linguistics F,W,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 relationship to general linguistics. Three hours lecture, nine hours reading and exercises. (Open to lower-division students.)

101. Introduction to Syntax W or S 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. Prerequisite: Linguistics 100.

102. Introduction to Phonology W or S Examination of the phonological structures of natural languages. Phonetics. Exercises in phonological description. The empirical justification of phonological analyses. Phonological theory and universals. Prerequisite: Linguistics 100.

151. Introduction to Historical Linguistics F Language change. Genetic and areal relationships. The comparative method. Internal reconstruction. Prerequistie: Linguistics 100.

164. Language Structures W Detailed investigation of the structure of one or several non-Indo-European languages. Prerequisites: Linguistics 101 and 102.

198. Directed Group Study in Language and Linguistics (2 or 4) 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) 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-201B-201C. Linguistic Theory (3-3-3) 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-202B-202C. Phonology (3-3-3) General problems in phonological analysis. Articulatory and acoustic phonetics; the relationship between the various phonetic parameters and their role in phonological theory. Distinctive features and notational conventions; types of phonological processes and universal constraints.

211A-211B-211C. Linguistic Analysis (3-3-3) 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.

221A-221B. History and Structure of English (3-3) The phonological, morphological, syntactic, and lexical evolution of the English language. (Not offered 1971-72.)

224A-224B. Modern English (3-3) 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.

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) Parsing algorithms for formalized grammars. Approaches to natural-language processing. The computer as a linguist's tool.

241. Romance Linguistics (3-3-3) 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.

251. Historical Linguistics 3-3-3) 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.

264. Language Structures (3-3-3) 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.

271. Anthropological Linguistics (3-3) 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.

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.

281-282-283. Psycholinguistics (3-3-3) The study of models of language and of language acquisition from the point of view of modern linguistics and psychology.

285. Seminar in Foreign Language Acquisition (3) 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.

290. Issues in Contemporary Linguistics (3-3-3) Discussion of a selected topic drawn from the history of linguistics and general linguistics. Prerequisites: Linguistics 100, 101 and 102. (Satisfactory/Unsatisfactory grades permitted.)

296. Directed Research (1-6, 1-6, 1-6) Individual research (Satisfactory/Unsatisfactory grades permitted.)

298. Special Studies (2-6, 2-6, 2-6) Advanced seminars. (Satisfactory/Unsatisfactory grades permitted.)

299. Doctoral Research (1-12, 1-12, 1-12) (Satisfactory/Unsatisfactory grades permitted.)

500. Apprentice Teaching in Linguistics (1-4, 1-4, 1-4) Teaching practicum. (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*
Bernhard Blume, *Ph.D., Professor of German Literature, Emeritus*
Diego Catalan, *Ph.D., Professor of Spanish Literature*
Robert M. Durling, *Ph.D., Visiting Professor of Italian and Comparative Literature*
Robert C. Elliott, *Ph.D., Professor of English Literature (Chairman of the Department)*
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*
* Jack Behar, *Ph.D., Associate Professor of American Literature*
Benito Brancaforte, *Ph.D., Visiting Associate Professor of Spanish and Comparative 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*
Jeffrey Barnouw, *Ph.D., Assistant Professor of English and Comparative Literature*
Alain J. J. Cohen, *Ph.D., Assistant Professor of French Literature*
Abraham J. Dijkstra, *Ph.D., Assistant Professor of American and Comparative Literature*
Edwin F. Dolin, *Ph.D., Assistant Professor of Classical 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 German and Comparative Literature*
Terence K. Thayer, *Ph.D., Visiting Assistant Professor of German Literature*
Anthony G. Wilden, *Ph.D., Assistant Professor of French Literature*
Wai-Lim Yip, *Ph.D., Assistant Professor of Chinese and Comparative Literature*
Leonard Barkan, *M.A., Acting Assistant Professor of English Literature*
Dagmar BarnouW, *Ph.D., Lecturer in German Literature*
Susan Kirkpatrick, *M.A., Acting Assistant Professor of Spanish and Comparative Literature*
* On Leave 1971-72

* * *

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 comminications.

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

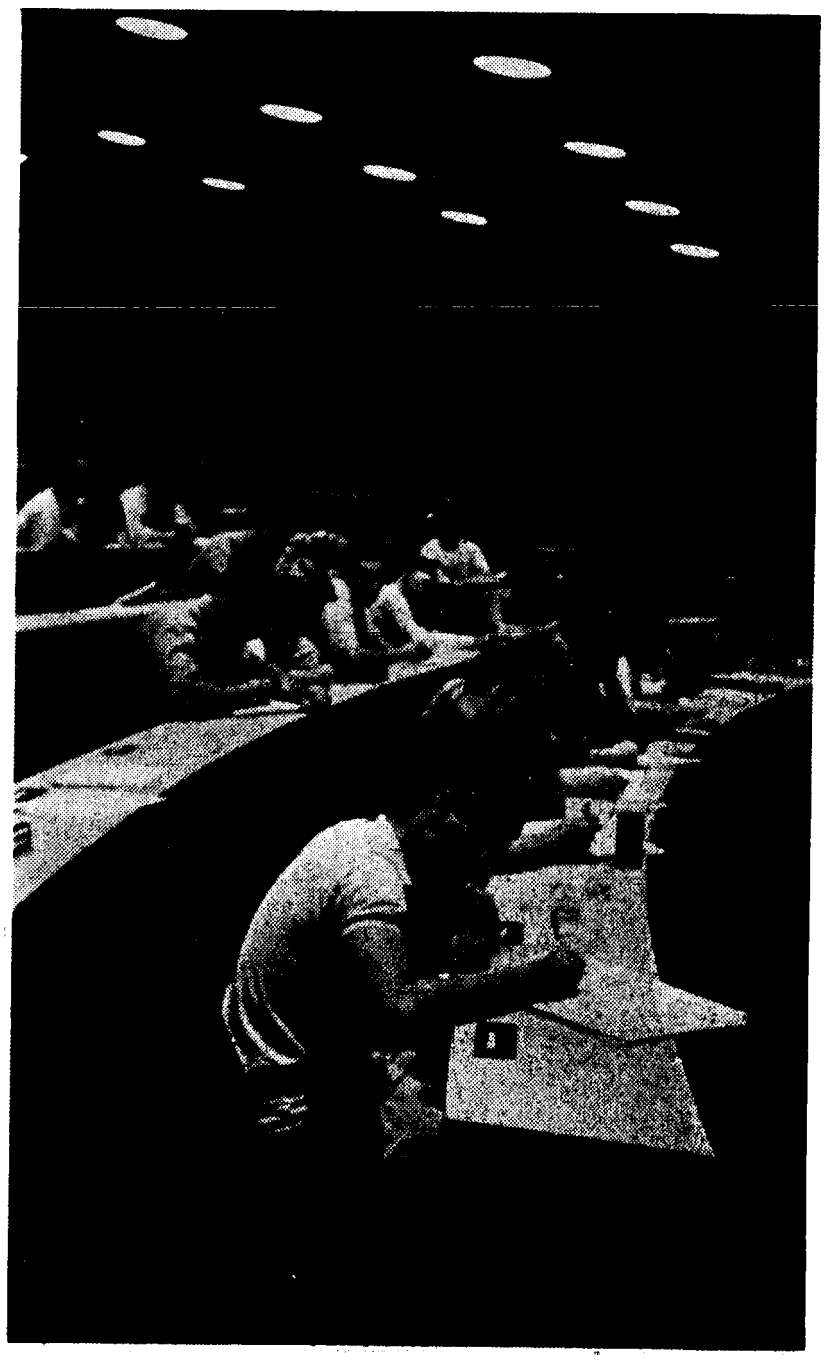
Five programs are open to those majoring in literature: English-American, French, German, Spanish, and General Literature. In each case, whatever his primary field of concentration, a student is expected to study a second literature. The range of second literatures includes Chinese, Classical Greek, 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 192 in the literature of their specialization. In this case, Literature 192 will center on writing a long paper, planning for which will begin in Literature 191. Moreover, students who intend to take this sequence will be required to have mastered a reading list in the literature of their specialization by the time they take Literature 191. The list is available from advisors and in the departmental Revelle and Muir College offices.



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 interdepartmental 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 German Literature, in Spanish Literature, and in Comparative Literature. The Department expects soon to offer Ph.D. Programs in French, and Classical 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 sutdies. 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

The Ph.D. program for English and American Literature requires either (*a*) demonstrated fluency in reading, writing, and speaking one language in addition to English, or (*b*) a working knowledge of two languages in addition to English. Students are expected to take at least two courses in philology or linguistics or otherwise acquire and equivalent background in these fields.

The P.h.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 studies in another literature rather than a specific language. English or American Literature counts as another literature for this purpose. 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

In both lower and upper-division General Literature courses, texts may be read in English translation when necessary, and lectures and discussions are conducted in English.

LOWER DIVISION

Lit/1A,1B,1C. The Interpretation of Literature (Muir College) 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.

UPPER DIVISION

Lit/109A,109B,109C. The Greco-Roman World In 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.

111. Fiction
112. Expository Writing
113. Drama
114. Verse

Prerequisites: submission of original work already completed and consent of instructor.

Lit/120. The Classical Tradition 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 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 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 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/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 One or more aspects of Russian literature. Texts may be read in English. Topic varies from year to year. May be taken for repeat credit. Two hours lecture and two hours discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/152. Men, Literature, and Ideas 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/161. The Forms of Folklore 1 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.

Lit182. Pragmatics of Human Communication This course analyzes human social and psychological behavior from the standpoint of communication and general systems theory with a view to providing the student with the tools to analyze and comprehend his own status in the world of communication. Prerequisite: Communications 1, or Third College advanced standing, or consent of instructor.

Lit/183. Syntactics of Communication 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 *synactics* (the articulation of codes and messages) of goal-seeking open systems. Prerequisite: Communications 1, or Third College advanced standing, or consent of instructor.

Lit/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") of the relation between "organism" and "environment." Prequisite: Communications 1, or Third College advanced standing, or consent of instructor.

Lit/190. Seminars 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 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.

GRADUATE

Lit/500. Apprentice Teaching in Literature (1-4) Consideration of pedagogical methods appropriate to the teaching of literary texts at the undergraduate level. Pedagogical aids for the teaching of composition. Supervised teaching in undergraduate literature courses. Prerequisite: student must be a Teaching Assistant. (Satisfactory/Unsatisfactory grades only.)

Lit/501. Apprentice Teaching in 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. Prerequisite: student must be a teaching Assistant. (Satisfactory/Unsatisfactory grades only.)

Lit/502. Apprentice Teaching in Subject A (1-4) 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.)

CHINESE LANGUAGE AND LITERATURE

UPPER DIVISION

Lit/Ch 198. Directed Group Study 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 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 206. Romance Philology (4) A historical introduction to Romance Philology.

Lit/CL 207. Germanic Philology (4) A historical introduction to Germanic Philology, with particular emphasis on German and English.

Lit/CL 208. Textual Criticism (4) The establishment of literary texts in various periods and national literatures from both manuscript and printed sources.

Lit/CL 210. Classical Studies (4) Analysis of significant works of the Greek and Roman tradition, with attention to their interest for later European literature.

Lit/CL 215. Medieval Studies (4) A study of styles and forms of narrative poetry in medieval English French, German and Latin.

Lit/CL 231. Eighteenth Century Studies (4) One or more major writers, texts or trends of eighteenth century European literature.

Lit/CL 241. Romanticism (4) 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 eighteenth to the twentieth 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 253. The New Literatures (4) A study of styles and forms of prose and poetry — the literature — in various languages being developed in "emerging nations."

Lit/CL 261. Comparative Literature: History and Theory (4) An introduction to the intellectual origins, the tools of research, and the principal aims of Comparative Literature.

Lit/CL 262. Comparative Prosody (4) An investigation of the essentials of "universals" of versification on the basis of examples chosen from various literatures, including and Oriental one, as well as the methodological problems that such investigation raises.

Lit/CL 263. Theory and Practice of Translation (4) Examination of different theories of translation in order to arrive at a perspectivism from which an objective basis for the art of translation may be formed.

Lit/CL 271. Critical Theory (4) Problems of literary analysis; competing schools and major figures in literary criticism.

Lit/CL 273. Art and Literature (4) An investigation into themes and styles common to literature and visual arts.

Lit/CL 274. Genre Studies (4) A consideration of a representative selection of works relating to a theme, form, or literary genre.

Lit/CL 276. The Modern Theatre (4) A study of plays and dramatic theory from the eighteenth century to the present.

Lit/CL 279. Literary Studies and Linguisitcs (4) 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) Guided and supervised reading in a broad area of literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/CL 298. Special Projects (4) Treatment of a special topic in comparative literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/CL 299. Thesis (1-12) Research for the dissertation. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

DUTCH LANGUAGE AND LITERATURE

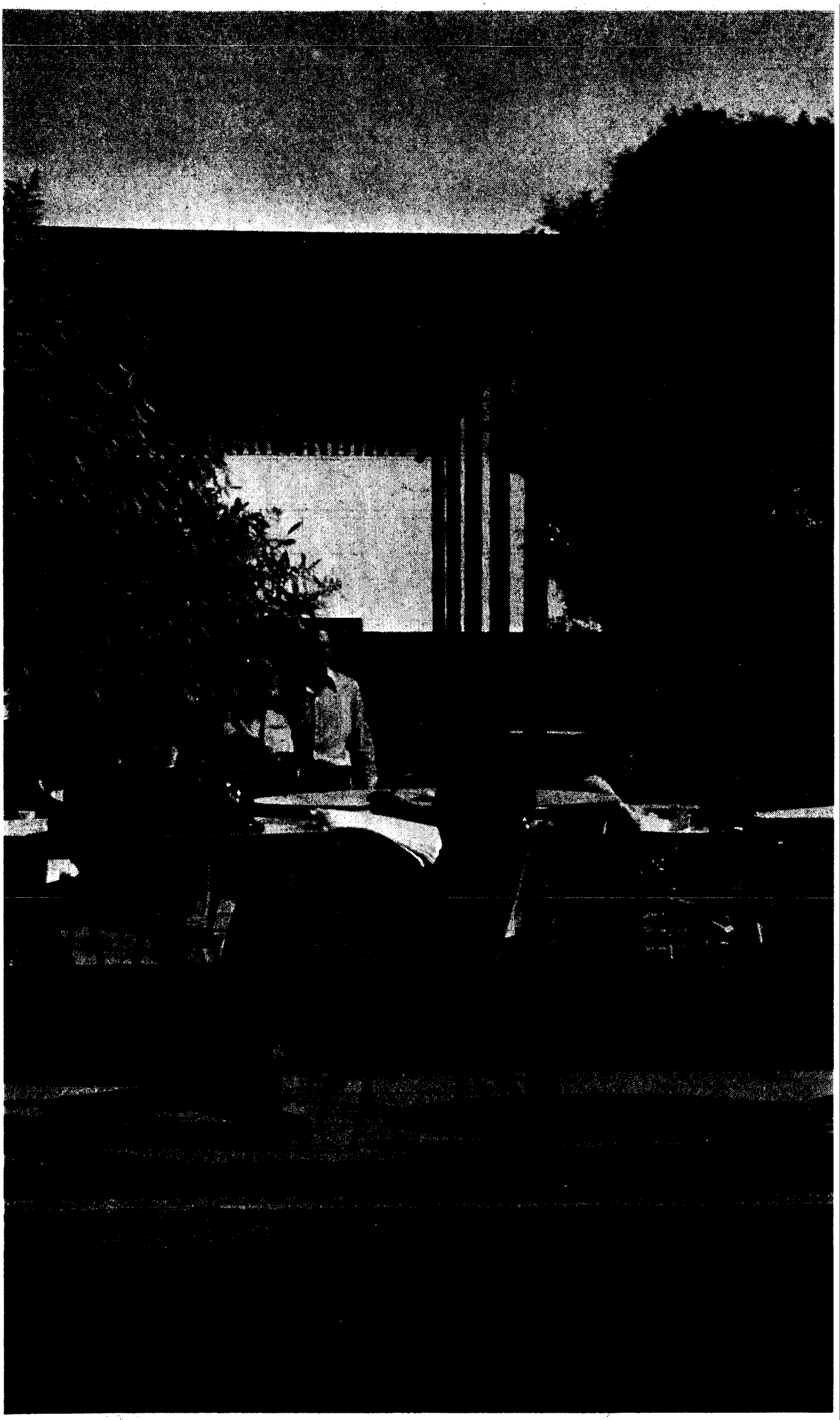
UPPER DIVISION

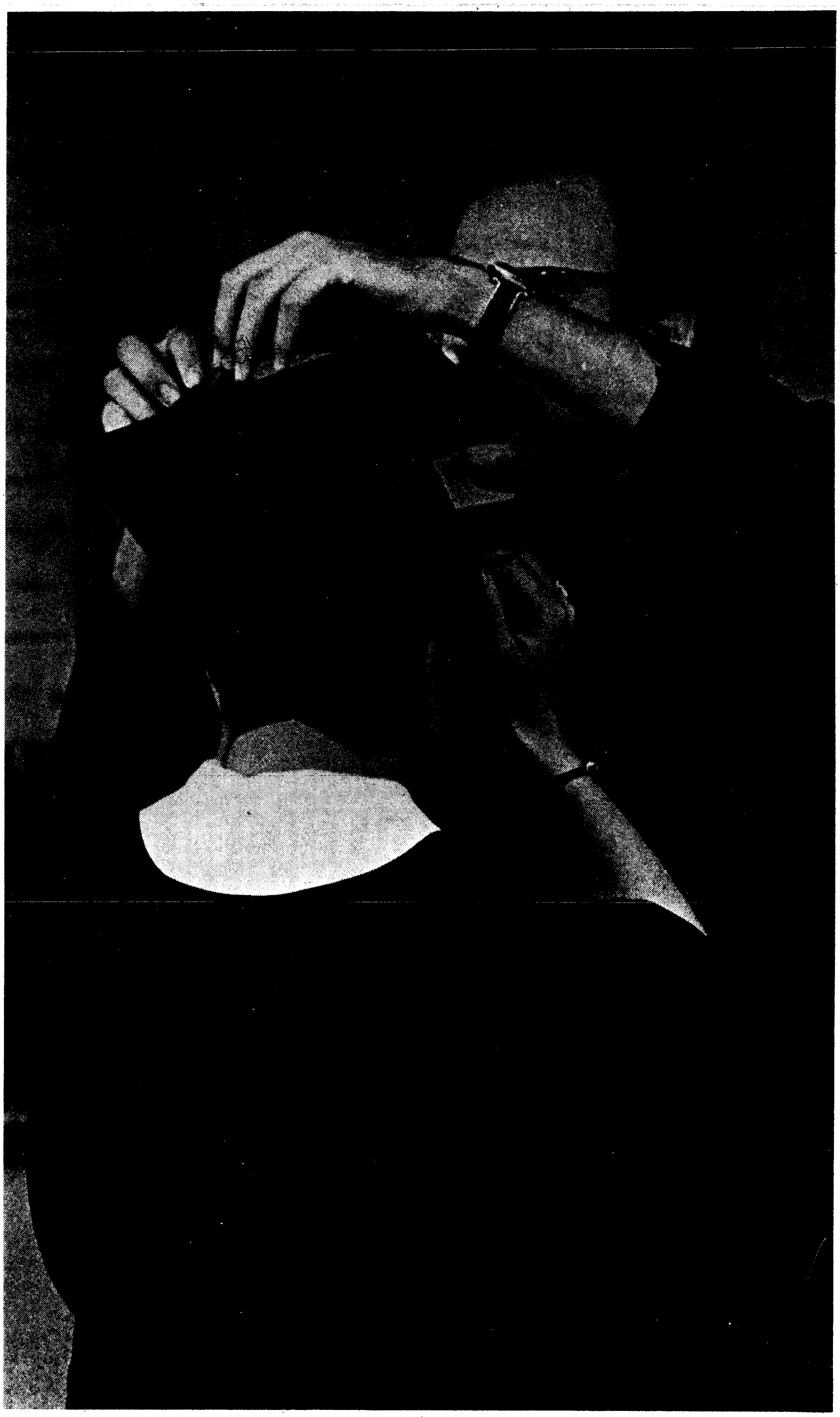
Lit/Du 199. Special Studies 1 Tutorial; individual guided reading in an area not normally covered in courses. Prerequisite: Permission of Department.

ENGLISH AND AMERICAL LITERATURE

LOWER DIVISION

Lit/En 21,22,23. The English and American Literary Imagination 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 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 The development of the drama in English. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lt/En 103. English Poetry The development of major forms and modes of English verse. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/En 121. The Medieval Period 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 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 Eighteenth Century Major literary works of the eighteenth century. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/En 124. The Nineteenth Century 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 Nineteenth Century A critical study of major American writers of the nineteenth century. Two hours lecture and one hour discussion. Prerequisite: upper-division standing or consent of instructor.

Lit/En 126. The Modern Period 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 151. Shakespeare Consideration of one or more aspects of Shakespeare's poetry and drama. The topic varies from quarter to quarter. Required of majors in literature whose primary literature is English. Prerequisite: upper-division standing or permission of Department.

Lit/En 190. Seminars 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 crticism, 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 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 English and American literature. Central to the course is the writing of a long paper, the senior essay. Recommended for students who intend to go to graduate school. Three hours seminar. Prerequisite: Lit/ General 191.

Lt/En 198. Directed Group Study 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 Tutorial; individual guided reading in an area not normally covered in courses. May be repeated for credit. Prerequisite: upper-division standing and permission of the Department.

GRADUATE

Lit/En 202. Bibliography and Methods of Research (4) Tools, methods, and standards of scholarly research in literature, including establishment of texts and bibliographical description.

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) Consideration of one or more major figures, texts, or trends in Middle English Literature.

Lit/En 221. Sixteenth Century English Literature (4) Critical study of one or major figures, texts, or literary trends in Tudor England.

Lit/En 224. Seventeenth Century English Literature (4) Consideration of one or more major figures, texts, or trends in seventeenth century English literature, including the metaphysical poets and Jacobean Drama. Topic varies from year to year.

Lit/En 226. Shakespeare (4) Shakespeare's plays in relation to the Elizabethan background; selected major texts.

Lit/En 231. Restoration and Eighteenth Century English Literature (4) Consideration of one or more figures, texts, or trends in Restoration and eighteenth century English literature, including Dryden, Pope, Swift, the early novel, satire. Topic varies from year to year.

Lit/En 236. Later Eighteenth Century English Literature (4) Consideration of one or more major figures, texts, or trends in later eighteenth century English literature. Topic varies from year to year.

Lit/En 241. English Literature of the Romantic Period (4) A study of the major poetry and related prose of early nineteenth century literature.

Lit/En 244. Colonial American Studies (4) Studies, in their socio-cultural and intellectual contexts, in the origins of the American literary imagination in the seventeenth and eighteenth centuries.

Lit/En 245. Nineteenth Century American Studies (4) Consideration of some of the principal writers and movements in nineteenth century American literature. Topic varies from year to year.

Lit/En 246. Victorian Literature (4) Consideration of one or more major figures, texts, or trends in the Victorian period.

Lit/En 251. Twentieth Century English Literature (4) Consideration of one or more major figures, texts, or trends in twentieth century English literature.

Lit/En 252. Studies in Modern American Literature and Culture (4) Consideration of one or more major figures, texts, or trends in American literature, in particular the relationship between literature and culture.

Lit/En 297. Directed Studies (1-12) 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) Treatment of a special topic in English and American literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/En 299. Thesis (1-12) Research for the dissertation. Offered for repeated registration. Prerequisite: advancement to candidacy for the Ph.D. degree. (Satisfactory/Unsatisfactory grades only.)

FRENCH LANGUAGE AND LITERATURE

LOWER DIVISION

Lit/Fr 110. Readings and Interpretations 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 500 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.

or

3. Language 3*or* 4*or* 5, with a grade of B or better.

or

4. Language 4*and* 5 *and* 6, with a grade of C or better in Language 6.

Lit/Fr 11. Readings in French Literature and Culture 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: completion of Revelle or Muir College requirement of proficiency in a foreign language.

Lit/Fr 25. Composition and Conversation A course designed for students who wish to improve their ability to speak and write French. Prerequisite: French 10 or equivalent.

UPPER DIVISION

Lit/Fr 121. The Middle Ages and the Renaissance Major French literary works of the Middle Ages and Renaissance as seen against the historical and intellectual background of the period. Medieval texts in modern French translation. Prerequisite: upper-division standing or consent of instructor.

Lit/Fr 122. The Seventeenth and Eighteenth 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 124. The Nineteenth and Twentieth Centuries Major French literary works of the period as seen against the historical and intellectual background of their time. Prerequisite: upper-division standing or the permission of the Department.

Lit/Fr 130A,130B,130C. Themes in French Intellectual and Literary History 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 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 A study in depth of the works of a major French writer. Recommended for students whose primary literature is French.

Lit/Fr 190. Seminars 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 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/Fr 199. Special Studies 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 203. History of the French Language (4) History of the French language from the origin through the sixteenth century. Prerequisite; knowledge of French.

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. Sixteenth Century French Literature (4) Critical study of one or more major figures, texts, or literary trends of French Renaissance.

Lit/Fr 224. Seventeenth Century French Literature (4) Consideration of one or more major figures, texts, or trends in the seventeenth century French literature.

Lit/Fr 23I. Eighteenth Century French Literature (4) Consideration of one or more major figures, texts, or trends in the eighteenth century French literature.

Lit?Fr 241. Nineteenth Century French Literature (4) Consideration of one or more major figures, texts, or trends in nineteenth century French literature.

Lit/Fr 251. Twentieth Century French Literature (4) Selected topics in modern French literature and thought.

Lit/Fr 297. Directed Studies (1-12) 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) Treatment of a special topic in French literature. Offered for repeated registration. (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 LANGUAGE AND LITERATURE

LOWER DIVISION

Lit/Ge 10. Readings and Interpretations 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 disciplineshumanities, 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 500 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.

or

3. Language 3*or* 4 *or* 5, with a grade of B or better.

or

4. Language 4 *and* 5 *and* 6, with a grade of C or better in Language 6.

Lit/Ge 11. Readings in German Literature and Culture 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. Prerequisites: completion of Revelle or Muir College requirement of proficiency in a foreign language.

Lit/Ge 25. Composition and Conversation A course designed for students who wish to improve their ability to speak and write German. Prerequisite: Lit/German 10 or equivalent.

UPPER DIVISION

Lit/Ge 101. German Literary Prose 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 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 The development of major forms and modes of German verse. Prerequisite: upper-division standing or consent of instructor.

Lit/Ge 123. Eighteenth 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 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 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 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. Problems in Interpretation 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 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/General 191.

Lit/Ge 198. Directed Group Study 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 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 203. Cultural History of the German Language (4) Philological survey of the German language with particular attention to historical, cultural, and social interrelations.

Lit/Ge 210A. Middle High German 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 221. Middle High German Classicism (4) Medieval epics (heroic and Arthurian) and courtly poetry. Analysis; methods of interpretation and recent research.

Lit/Ge 241. German Romantic Prose (4) A study of the critical and poetic works of major romantic writers with special attention to romantic poetology.

Lit/Ge 251. The Twentieth Century (4) A study of the structural, philosophical and social aspects of twentieth 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) Guided and supervised reading in a broad area of German Literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/Ge 298. Special Projects Treatment of a special topic in German literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/Ge 299. Thesis (1-12) Research for the dissertation. Prerequisite: student must be advanced to candidacy for the Ph.D. degree.

GREEK LANGUAGE AND LITERATURE

LOWER DIVISION

Lit/Gr 1. Beginning Greek Fundamentals of Greek grammar, exercises in vocabularly 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 Tutorial; individual guided reading in areas of Greek literature not normally covered in courses. Prequisite: 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) Guided and supervised reading in a broad area of Greek literature. (Satisfactory/Unsatisfactory grades only.)

Lit/Gr 298. Special Projects (4) Treatment of a special topic in Greek literature. (Satisfactory/ Unsatisfactory grades only.)

HEBREW LANGUAGE AND LITERATURE

Lit/He 199. Special Studies Tutorial; individual guided reading in areas of Hebrew literature not normally covered in courses. Prerequisite: upper-division standing or permission of Department.

ITALIAN LANGUAGE AND LITERATURE

LOWER DIVISION

Lit/It 10. Readings and Interpretations 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 500 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.

or

3. Language 3 *or* 4 *or* 5, with a grade of B or better.

or

4. Language 4 *and* 5 *and* 6, with a grade of C or better in Language 6.

Lit/It 11. Readings in Italian Literature and Culture 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: completion of Revelle or Muir College requirement of proficiency in a foreign language.

UPPER DIVISION

Lit/It 199. Special Studies 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.

Lit/It 297. Directed Studies (1-12) Guided and supervised reading in a broad area of Italian literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/It 298. Special Projexts (4) The treatment of a special topic in Italian literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

LATIN LANGUAGE AND LITERATURE

LOWER DIVISION

Lit/La 1. Beginning Latin Fundamentals of Latin grammar, exercises in vocabulary and accidence and in reading. Two hours lecture and one hour discussion.

Lit/La 2. Intermediate Latin 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 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) Guided and supervised reading in a broad area of Latin literature. (Satisfactory/ Unsatisfactory grades only.)

Lit/La 298. Special Projects (4) Treatment of a special topic in Latin literature. (Satisfactory/ Unsatisfactory grades only.)

PORTUGUESE LANGUAGE AND LITERATURE

UPPER DIVISION

Lit/Por 199. Special Studies Tutorial; individual guided reading in an area not normally covered in courses. Prerequisite: permission of the Department.

RUSSIAN LANGUAGE AND LITERATURE

LOWER DIVISION

Lit/Ru 10. Readings and Interpreations 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 500 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.

or

3. Language 3 *or* 4 *or* 5, with a grade of B or better.

or

4. Language 4 *and* 5 *and* 6, with a grade of C or better in Language 6.

Lit/Ru 11. Readings in Russian Literature and Culture An introduction to Russian literature. May be taken for three quarters, starting with any quarter. Prerequisite: completion of Revelle or Muir College requirement of 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. Nineteenth Century Russian Literature D Consideration of one or more major figures, texts or trends in nineteenth century Russian literature.

Lit/Ru 126. The Modern Period Consideration of one or more major figures, texts or trends in the modern period of Russian literature.

Lit/Ru 198. Directed Study Group Directed group study in areas of Russian literature not normally covered in courses. Prerequisites: upper-division standing and permission of the Department.

Lit/Ru 199. Special Studies Tutorial; individual guided reading in areas of Russian literature not normally covered in courses. Prerequisite: upper-division standing or permission of the Department.

SPANISH LANGUAGE AND LITERATURE

LOWER DIVISION

Lit/Sp 10. Readings and Interpretations 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 fron nonliterary disciplineshumanities, 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 500 or higher in the Language Placement Examination adminsitered by the UCSD Testing Office.

or

2. Satisfactory performance in a language proficiency test conducted by the Department of Linguistics.

or

3. Language 3 *or* 4 *or* 5, with a grade of B or better.

or

4. Language 4 *and* 5 *and* 6, with a grade of C or better in Language 6.

Lit/SP11. Readings in Spanish Literature and Culture 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: completion of Revelle or Muir College requirement of proficiency in a foreign language.

Lit/Sp 25. Composition and Conversation A course designed for students who wish to improve their ability to speak and write Spanish. Prerequisite: Lit/Sp 10 or equivalent.

UPPER DIVISION

Lit/Sp 101. Spanish Literary Prose 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 Studies in selected topics in sixteenth and seventeenth century Spanish literature. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 124. The nineteenth Century Consideration of one or more major figures, texts, or trends in nineteenth 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 Selected topics in Modern Spanish Literature. Prerequisite: upper-division standing or consent of instructor.

Lit/Sp 140. Composition and Stylistics Analysis of classical and modern Spanish literary texts to increase the student's sensitivity to style and improve his ability to write and speak Spanish. Strongly recommended for students who take Spanish as their primary literature.

Lit/Sp 151. Cervantes A critical reading of the "Quijote". Required of literature majors whose primary literature is Spanish.

Lit/Sp 190. Seminars 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 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 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 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) Consideration of one or more major figures, texts, trends or problems in medieval Spanish literature.

Lit/Sp 216. Fifteenth Century Spanish Literature and Culture (4) Consideration of one or more major figures, texts, trends or problems in fifteenth century Spanish literature.

Lit/Sp 224. Golden Age Studies 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. EIGHTEENTH Century Spanish Literature (4) Consideration of one or more major figures, texts, trends or problems in eighteenth century Spanish literature.

Lit/Sp 241. Romanticsm in Spain (4) A historical review of Spanish Romanticism, with special attention to certain basic works. Offered for repeated registration. Topic varies from year to year. Prerequisite: knowledge of Spanish.

Lit/Sp 248. Nineteenth Centure Theatre (4) A study of the nineteenth century dramatic vision, with emphasis on new characters, new environment, and new elements in the structure of society.

Lit/Sp 252. Studies in Modern Hispanic Literature and Culture (4) Major trends and figures considered in the context of late nineteenth and twentieth century Hispanic culture.

Lit/Sp 254. Modern Spanish Poetry (4) A historical approach to modern Spanish poetry.

Lit/Sp 255. The Modern Spanish Novel (4) A historical approach to the modern Spanish novel.

Lit/Sp 258. Spanish-American Prose (4) Consideration of one or more major figures, texts, trends or problems in Spanish-American prose.

Lit/Sp 259. Spanish-American Poetry (4) Consideration of one or more major figures, tests, trends or problems in Spanish-American poetry.

Lit/Sp 271. Literary Theory (4) Problems and approaches in literary theory in the context of Spanish and Spanish-American literature.

Lit/Sp 297. Directed Studies (1-12) 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) Treatment of a special topic in Spanish literature. Offered for repeated registration. (Satisfactory/Unsatisfactory grades only.)

Lit/Sp 299. Thesis (1-12) 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*
William B. Gragg, Jr., *Ph.D., Associate Professor of Mathematics*
Alfred B. Manaster, *Ph.D., Associate Professor of Mathematics*
*Burton Rodin, *Ph.D., Associate Professor of Mathematics*
Lance W. Small, *Ph.D., Associate Professor of Mathematics*
Stanley G. Williamson, *Ph.D., Associate Professor of Mathematics*
*Allen B. Altman, *Ph.D., Assistant Professor of Mathematics*
Stephen A. Andrea, *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*
Carl H. Fitzgerald, *Ph.D., Assistant Professor of Mathematics*
Francis J. Flanigan, *Ph.D., Assistant Professor of Mathematics*
David Golber, *Ph.D., Assistant Professor of Mathematics*
John A.R.Holbrook, *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*
xx Frank B. Thiess, *Ph.D., Assistant Professor of Mathematics*
John J. Wavrik, *Ph.D., Assistant Professor of Mathematics*
A. W. Goldie, *M.A., Visiting Professor of Mathematics*
Leon W. Green, *Ph.D., Visiting Professor of Mathematics*
James M. Ortega, *Ph.D., Visiting Professor of Mathematics*
Shih-Tong Tu, *Ph.D., Visiting Professor of Mathematics*
Arthur Sard, *Ph.D., Research Associate in Mathematics*

* * *

*On leave winter and spring 1972

**On leave 1971-72

xxOn leave fall 1971 and winter 1972

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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 at the end of their freshman year expect to major in mathematics should take Mathematics 2D and 2E in 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. They will be able to accelerate their work by independent study and special seminars and to demonstrate their progress by proficiency examinations in place of taking courses.

In Revelle College, in accordance with the general requirements for the B.A. degree, the student will take six one-quarter courses in a noncontiguous minor field. Students who do not decide on a major until their junior year may satisfy one-half the requirements for the noncontiguous minor (Revelle College) by a proper choice of electives in the sophomore year. In this way they can complete all of the above requirements for the B. A. degree in the normal period of four years.

The mathematics major in John Muir College must fulfill his science requirements with Science 2A-2B-2C.

Mathematics 10 is a series of one-quarter courses on various areas of mathematics. It is designed for students with a strong background in high school mathematics. It offers them am alternative for satisfying the Muir College lower-division mathematics requirement. No prior college mathematics is required. Three lectures, one recitation. Prerequisite: four units of high school mathematics or consent of instructor. (Three "Topics" courses will fulfill the Muir College lower-division mathematics requirement.)

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. desgres.

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 undergradute 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 lists:

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.

The departmental examination must be passed before the student may take the qualifying examination.

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 exaiminations, 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

LOWER DIVISION

As part of the general program of the lower-division in Revelle and Muir Colleges, all students take a one-year sequence of courses in Mathematics.

Students who receive a grade of D or F may, subject to certain University regulations, repeat the course to replace the grade with a higher one. If such a change is desired in a course in Mathematics 1A-1B-1C or 2A-2B-2C sequence, the course must be repeated before the student takes further courses in the sequence.

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 4O. Three lectures, two recitations. Prerequisite: Mathematics 1B.

2A. Calculus and Analytic Geoemtry F Differential and integral calculus of fuctions 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 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.

4A. Discrete Structures and Processes W Elementary theory of graphs

with applications to probability, determined games, coloring and labrinth 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.

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. (Mathematics 5A,5B,5C may be used in fulfilling the Muir College mathematics requirement.)

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 the Department or four units of high school mathematics.

10C. Elementary Number Theory F Division algorithm, greatest common divisor, least common multiple, primes, fundamental theorem, congurences 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 x 2* games and *2 x 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 wood 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, subscripped 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.

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. (Not offered 1971-71.)

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 methematical 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. Prerequisite: 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,2F, or consent of instructor.

112. Vector Analysis S Vector algebra and calculus. Applications to geometry and mechanics. Curvilinear motion. Kelper'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.

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. Prerequisites: Mathematics 110A. (Not offered 1971-71.)

131B. Elements of Partial Differential Equations and Integral Equations W Relation between differential and integral equations, some classical integral equations, Volterra integral equations, intefral equations of the second kind, degenerate kernels, Fredholm alternative, Neumann-Liouville series, the resolvent kernel. Three lectures. Prerequisite: Mathematics 131A. (Not offered 1971-71.)

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. (Not offered 1971-72.)

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-Stieltzes 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. Grassmanians. Three lectures. Prerequisite: Mathematics 100A. (Not offered 1971-71.)

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. (Not offered 1971-71).

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. (Not offered 1971-72.)

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. (Not offered 1971-72.)

180A. Introduction to Probability F Probability spaces, independence and conditional probability, random variables, distributions, expectations, joint distributions, law of large numbers, central limit theorem. Three lectures, one recitation. Prerequisite: Mathematics 2C or 1C.

180B. Introduction to Probability W Random walk, generating functions, runs and recurrent events, discrete fluctation theory; Markov chains with discrete state space. Three lectures. Prerequisite: Mathematics 180A.

180C. Introduction to Probability S Markov chains with continuous state space, simple diffusion-processes, stationary processes, fluctuations and queuing theory. Three lectures. Prerequisite: Mathematics 180B.

181A. Introduction to Statistics W Random samples, linear regression, least squares, testing hypotheses and estimation. Neyman-Pearson lemma, liklihood 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. Applied Complex Analysis and Special Functions (3-3) F,W 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 (r) 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. Prerequisites: 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; asympotitic 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.

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, Weirstrass 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 the instructor. (Satisfactory/Unsatisfactory grades permitted.)

228. Seminar in Complex Analysis (3) (Satisfactory/Unsatisfactory grades permitted.)

230A-230B-230C. Ordinary Differentail 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 differentail 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; Stieltljes 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.

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 Szego 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) 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 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/ Usatisfactory 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/Unsatiwtory grades permitted.)

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 sescription of the project. Prerequisites: upper-division status, approval by adviser for project and by Provost. (See *Muir College: Regulations and Guidelines Regarding* Muir College Special Projects.)

MUSIC

Office: Building 407, Matthews Campus
Robert Erickson, *M.A., Professor of Music*
Kenneth Gaburo, *D.M.A., Professor of Music*
Wilbur Ogdon, *Ph.D., Professor of Music*
(Chairman of the Department)
John Silber, *Ph.D., Professor of Music*
Rosalyn Tureck, *Professor of Music*
Keith Humble, *Dip.Mus., Associate Professor of Music*
Thomas Nee, *M.A., Associate Professor of Music*
Roger Reynolds, *M.M., Associate Professor of Music*
James L. Campbell, *M.S., Assistant Professor of Music*
Pauline Oliveros, *B.A., Assistant Professor of Music*
Bertram J. Turetzki, *M.A., Assistant Professor of Music*

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The music department, as a part of John Muir College and the University of California, is dedicated to liberal education in the exact sense of that expression, to individual freedom and to invention. The faculty is committed to:

Active, inventive music-making, including intermedia.

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.

We intend to send out from our peculiar educational, musical and artistic environment persons whose increased range of creative experiences, whose struggle with ideas, materials and relationships, whose constant trafficking in a whole and vital reality will have committed them to artistic and social independence, concern and action.

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.

Other current experimental research areas include Psychoacoustics, Socio-Musical Studies, Time and Motion.

Upper-Division Courses:

Music 106A-106B-106C. Experimental Studies Seminars. F,W,S

Music 108A-108B-108C. 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 296. Graduate Teaching Seminar.

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 and Technology — Performers are obligated to learn new as well as old skills, and to exercise them in all media. In addition to developing his instrumental capability, a performer is expected to develop a practical ability to use electro-acoustic devices, and to conduct, manage, and take part in complex productions, whether in a musical or theatrical capacity.

Upper-Division Courses:

Music 104B. Projects in Electroacoustic Transmission of Music Information. F

Music 120A-120B. Audio Circuitry for Musicians. F,W

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 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 202. Problems and Projects in the Specialized Use of Electronics in Performance.

Music 204. Projects Seminar in Electroacoustic Transmission of Music Information.

Music 230. Advanced Seminar in Performance of Music for Small Ensemble.

Music 299. Advanced Research Projects and Independent Study.

IV.

Theoretical Studies — Seminars and studies in analytic theory and systematic musicology, concerned with fields of knowledge representing formed systems or 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 101A-101B-101C. Music Theory and Practice. F,W,S

Music 102A-102B-102C. Advanced Music Theory and Practice. F,W,S

Music 104A. Principles of Electroacoustic Transmission of Music Information. f

Music 105A. Electronics in Music W

Music 105B. Advanced Use of Electronics in Music. S

Music 299. Advanced Research Projects and Independent Study.

V.

Literature and Special Studies — Analytical, critical and interpretative studies of the music of selected historical periods, cultures and media.

Upper-Division Courses:

Music 112. Studies in Vocal and Choral Literature. F

Music 113. Studies in Opera. F

Music 114. Music of the Twentieth Century. F

Music 115. Seminar in Bach Studies W

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 197. Comprehensive Seminar for Senior Majors. f,w,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 Twentieth-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.

Vi.

*Complementary Disciplines*se 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 begin 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 requirements of both Muir and Revelle Colleges.
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 demonstrated level of reasonable competence in the reading and hearing of pitch and rhythmic relations. Music 2A- 2B are courses in music fundamentals designed to prepare for that ability. If the entering student already possesses a sufficient level of music musicianship, he may begin his major courses, upon demonstration of such abilities.

Courses required for the B.A. in music include the following:

1. Basic Musicianship sequence, Music 100A-100B-100C-100D.
2. The six-course sequence, Music Theory and Practice (101A-101B- 101C, 102A-102B-102C).
3. Three selected music literature lecture courses (Music 112, 114, 115, etc.), each supplemented by an appropriate weekly seminar.
4. One three-quarter seminar sequence in either chamber music or composition, equivalent to one course.
5. A continuing departmental seminar that includes concerts, lectures, and departmental discussions.
6. A senior comprehensive seminar, taken in the final quarter prior to graduation, equivalent to one course.
7. Elected music courses and independent study units equivalent to at least three courses or a number determined by the needs of the student.

Music courses taken as electives may or may not require prerequisite muical abilities. If they do, the student will be asked to request the consent of the instructor prior to enrollment. Other opportunities for musical performance include participation in the University-Civic Orchestra and Chorus, the University Reading Orchestra, the Revelle and Muir Chamber Choruses, and other vocal or instrumental ensembles.

Students who wish to go on to graduate work in music but have not had extensive training before undertaking the major may be obliged to elect music courses beyond the number required for a liberal arts major in order to be adequately prepared for graduate study.

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 status, 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 an advisory examination.

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 six categories of study: Experimental Studies, Composition, Performance and Technology, Theoretical Studies, Literature and Special Studies, and Complementary Disciplines approved by the department. 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-2B. Music Fundamentals F,W An introduction to music symbols and their meaning. Practice in elementary pitch recognition, simple rhythmic relationships, intensity, timbre, and density discriminations. Prerequisites: 2A for 2B; or proficiency certified by course committee.

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.

30A-30B-30C. Seminar in Chamber Music Performance I (2-2-2) F,W,S Performance of representative chamber music literature. Prerequisite: proficiency on a musical instrument and consent of instructor through audition. (Course may be repeated for credit.)

UPPER DIVISION

100A-100B-100C-100D. Basic Musicianship S,F,W,S An integrated four-course sequence in music skills including aural discrimination, music reading, basic conducting, music acoustics and rudimentary harmonic theory. Prerequisites: Music 2A and 2B, or proficiency by examination.

101A-101B-101C. Music Theory and Practice F,W,S (Theoretical Studies) Integrated studies in music theory, composition and styles study through analysis and performance. Must be taken in sequence. Prerequisite: Music 3 or consent of instructor.

102A-102B-102C. Advanced Music Theory and Practice F,W,S (Theoretical Studies) Advanced integrated studies in music theory, composition and styles study through analysis and performance. Must be taken in sequence. Prerequisite: Music 101C or equivalent certified proficiency.

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 Information F (Theoretical Studies) 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. Prerequisite: consent of instructor.

104B. Projects in Electroacoustic Transmission of Music Information W (Performance and Technology) An investigation into the experimental use of electronic instruments relating to the storing and retrieving of aural information and applied to the multi-varying conditions caused by complex sound events. Three meetings. Prerequisite: Music 104A.

105A. Electronics in Music W (Theoretical Studies) Exercises in electronic-sound generation and processing, with emphasis on voltage-controlled systems. Prerequisite: Music 104A.

105B. Projects Seminar in Electronics in Music Performance S (Theoretical Studies) Three meetings per week. Prerequisite: Music 105A.

106A-106B-106C. Experimental Studies Seminars F,W,S (Experimental Studies) Tndividual 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.

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.

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. Music of the Twentieth Century F (Literature and Special Studies) An exploration of materials and methods used in the music of our time. Music majors required to take an additional projects seminar session for course credit. (May be reapeated 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 cour 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 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.

135. Concert Orchestra (2-2-2) 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 (2-2-2) 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 (2-2-2) 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 (2-2- 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.

197. Comprehensive Seminar for Senior Majors (0-0-4) F,W,S (Literature and Special Studies) A one-hour seminar during which undergraduate learning experiences within the major are reviewed and correlated.

198. Departmental Seminar for Music Majors (0) F,W,S (No Category) A departmental requirement for all music majors, this course provides a forum for visiting lecturers and faculty to share current research and new ideas with the undergraduate major. This course also provides for an exchange of ideas and accomplishments within the departmental student body. One meeting per week.

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)

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) Prerequisite: Music 104A.

205. Advanced Use of Electronics in Music (3) (Theoretical Studies) Seminar in advanced theoretical and applied research in the generation and processing of sound by means of voltage- controlled systems for the composition of electronic music. Prerequisites: Music 104A, 105A or equivalent.

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.

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 Twentieth-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 thirteenth, fourteenth, and fifteenth 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.)

296. Graduate Teaching Seminar (1-1-1) (Experimental Studies) Discussion and demonstration of course content and methods for graduate student teachers in undergraduate courses given or participated in by the Department of Music. May be repeated for credit.

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.)

298. Departmental Seminar (1-1-1) (No Category) A departmental requirement for all music graduate fellows, this course provides a forum for visiting lecturers and faculty to share current research and new ideas with the graduate fellow. It also provides for an exchange of ideas and accomplishments within the departmental student body. (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 (1-14) (No Category) Participation in the undergraduate teaching program is required of all graduate students in partial fulfillment of the requirement for an advanced degree. A minimum teaching requirement of three quarters at 25% time is set and assigned at the discretion of the department. (Satisfactory/Unsatisfactory grades only.)

NATURAL SCIENCES

Office: Provost, Revelle College

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.

Students who intend to major or minor in science or engineering are strongly advised to enroll in the sequence numbered 2. The more extensive use of mathematics and the deductive presentation enable the student to progress efficiently and in a natural manner to advanced work in science.

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 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 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. Prerequisites: 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.

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 S This course bears the same relation to 2F as 2DL does to 2D. 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. Two three-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*
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 Professor of Neurosciences*
Charles E. Spooner, *Ph.D., Associate Professor of Neurosciences*
Silvio Varon, *M.D., Associate Professor of Biology*
G. David Lange, *Ph.D., Assistant Professor of Neurosciences*
Roger N. Rosenberg, *M.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 nervous systems function 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 aggreement 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 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 chairmen.

GRADUATE

221. Computer Applications in the Study of the Nervous System (3) 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) 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) 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) 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) 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 Phsyiology, and Pharmacology SM206. (Satisfactory/Unsatisfactory grades only.)

227. Neurosciences Concepts (1) 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) 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. Central Control of Sensory Transmission (1) 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) 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.)

231. Molecular Neuropathology (2) Discussions on cerebral degenerative diseases with emphasis on understanding their pathogenesis at the molecular level. Prerequisites: Basic Neurology SM205; molecular biology and biochemistry, or undergraduate biochemistry. (Satisfactory/Unsatisfactory grades only.)

232. Basic Mechanisms in Clinical Neurology (1) 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) 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) 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) 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 An introduction to the principles of pharmacology and a survey of the neuropharmacological agents utilized in the neuroscience research areas. Prerequisite: consent of the instructor (Satisfactory/Unsatisfactory grades only.)

237. Moral and Ethical Aspects of Medicine 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, fillms and tapes. Intended for medical students, residents, and resident staff.

296. Neurosciences Independent Research (1-12) Independent study. (Satisfactory/Unsatisfactory grades only.)

299. Neurosciences Thesis Research (1-12) Independent study. (Satisfactory/Unsatisfactory grades only.)

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*
Frederic T. Sommers, *Ph.D., Professor of Philosophy*
Avrum Stroll, *Ph.D., Professor of Philosophy*
(Chairman of the Department)
Edward N. Lee, *Ph.D. Associate Professor of Philosophy*
David Fate Norton, *Ph.D., Associate Professor of Philosophy*
(Graduate Adviser)
Giorgios H. Anagnostopoulos, *Ph.D., Assistant Professor of Philosophy*
Piero Ariotti, *Ph.D., Assistant Professor of Philosophy*
John Holbrook, *Ph.D., Assistant Professor of Philosophy*
Rudolf A. Makkreel, *Ph.D., Assistant Professor of Philosophy*
Stanley Malinovich, *Ph.D., Assistant Professor of Philosophy*
(Undergraduate Adviser)
Thomas C. Mark, *Ph.D., Assistant Professor of Philosophy*
Ronald D. Scales, *Ph.D., Assistant Professor of Philosophy*
Helen E. Longino, *M.A., Acting Assistant Professor*

* * *

Herbert Marcuse, *Ph.D., Honorar Professor*
Roger S. Ruffen, *LL.B., Senior Lecturer*

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 sudies 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 104	Philosophy 102 Additional Phil. Course (Sect. 4) * — — — — Philosophy 105	Philosophy 103 Additional Phil. Course (Sect. 4) * — — — — Philosophy 106
Senior Year	Sequence Course (Sect. 3) or Additional Phil. Course (Sect. 4) — —	Sequence Course (Sect.) or Sequence Course (Sect. 3) — —	Additional Phil. Course (Sect. 4) or Sequence Course (Sect. 3) — —

*Upper-Division course in related fields.

The Graduate Program

The Department of Philosophy offers programs leading to the M.A. and PhD. 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 thee 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 equivalentt 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 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 An introduction to value theory, dealing with questions about morality, politics, religion and art. Two hours lecture, one hour discussion.

12. Introduction to Logic An inquiry into the nature of argument, inference and proof, fallacies, etc. Two hours lecture, one hour discussion.

20, 21, 22. Theories of Society 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.)

UPPER DIVISION

101. History of Philosophy: Greek Philosophy 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 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 Medieval and Renaissance Philosophy. Examination of materials in Medieval and Rennaissance 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 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 18th century philosophy. 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 19th century philosophy. Examination of original materials of 19th century, including Kant and Hegel. Two hours lecture, one-hour discussion. Prerequisite: Philosophy 105.

110. Symbolic Logic Introduction to mathematical logic.

112A. Philosophy of Science An introductory examination of the nature, import and procedures of science in the light of its historical development.

112B. Philosophy of Science An examination of the nature and historical development of some of the major conceptions of science such as time, space, motion, causalty, determinism. Three hours lecture-discussion. Prerequisite: Philosophy 112A.

120A. Political Philosophy 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 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 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 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 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 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 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 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.

160. Philosophy of Religion An examination of the nature of religious experience, the nature of faith, and the role of reason in religion.

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.

199. Individual Study Prerequisite: permission of departmental adviser.

200. Topics in the History of Philosophy A course of studies designed to prepare students for advanced work in seminars.

201. Topics in the History of Philosophy: Greek Philosophy. A course of studies designed to prepare students for advanced work in seminars in pre-Socratic and Platonic philosophy.

202. Topics in the History of Philosophy: Hellenistic and Roman Philosophy. An examination of typical problems and philosophical found in the Greek and Roman philosophers: e.g., the origin and development of Greek philosophical concepts; the philosophic schools from the beginnings of Stoicism, Epicureanism, Skepticism down through Neo-Platonism.

203. Topics in the History of Philosophy: Medieval Philosophy. The medieval development of the Western philosophical tradition. Representative writings of Greek Gnosticism and the rise of the Latin Western Christian tradition: Clement of Alexandria and others.

204. Topics in the History of Philosophy: Early Modern Philosophy. 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: Seventeenth and Eighteenth Century Philosophy. 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.)

206. Topics in the History of Philosophy: Nineteenth Century Philosophy. A study of representative philosophical movements of the nineteenth century, as found in the writings of Hegel, Schopenhauer, Comte, Mill, Nietzche, etc.

210. Topics in Philosophy of Logic. A study of major topics included in logical theory, together with a close examination of contributions by different philosophical schools to the analysis of central issues in philosophy of logic. Prerequisite: Philosophy 110 or equivalent.

211. Advanced Symbolic Logic. An intensive examination of propositional and quantificational logic as a basis for further deductive development. Prerequisite: Philosophy 110 or equivalent.

212. Seminar in Philosophy of Science. An examination of such problems as concept formation, the explanation of law, the role of logic and mathematics in the sciences.

220. Topics in Moral and Political Philosophy. A course of studies designed to prepare students for advanced work in seminars.

223. Seminar in Ethics. An examination of the nature of moral problems, judgements and principles, with emphasis on recent developments in moral philosophy and classic formulations of ethical theories.

224. Seminar in Social and Political Philosophy. An analysis of social philosophies and ideologies as they emerge from basic types of social structure.

230. Seminar in Contemporary Analytic Philosophy. 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. An analysis of some important problems in recent and contemporary Continental philosophy as illustrative of major movements of thought.

250. Seminar in Aesthetics. An exploration of problems in philosophy of art, aesthetic experience and aesthetic judgment within the context of a critical survey of some current aesthetic theories and their illustrative application in various fields of art.

260. Seminar in Philosophy of Religion. A study of the philosophical foundations of religious experience, including the nature of belief and knowledge, faith and reason, and the character and meaning of religious commitment.

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. A detailed examination of some fundamental issues in contemporary philosophy, especially those centering about the theories of meaning and reference.

272. Seminar in Theory of Knowledge. An examination and critique of representative theories of mind, reality, knowledge and perception.

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. A seminar for examination of a specific philosophical problem. (Satisfactory/Unsatisfactory grades permitted.)

290. Directed Independent Study. Supervised study of individually selected philosophical topics. May be repeated for credit. Prerequisite: consent of instructor. (Satisfactory/Unsatisfactory grades optional.)

295. Research Topics. 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. (Satisfactory/Unsatisfactory grades permitted).

500. Apprentice Teaching 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 to the course. (Satisfactory/Unsatisfactory credit only.)

501. Studies and Teaching in Humanities A coures designed to meet the needs of graduate students who serve as teaching assistants in the Humanities Sequence in Revelle College. Weekly meetings with assigned lectures. (Satisfactory/Unsatisfactory grades permitted.)

PHYSICAL EDUCATION

Office: Gymnasium
Theodore W. Forbes, *Ed.D., Supervisor*
(Chairman of the Department)
Howard F. Hunt, *M.A., Associate Supervisor*
J. Barry Cunningham, *M.A., Assistant Supervisor*
Bert N. Kobayashi, *M.A., Assistant Supervisor*
J. Charles Millenbah, *B.S., Assistant Supervisor*
Andrew Skief, Jr., *B.S., Assistant Supervisor*
James R. White, *M.A., Assistant Supervisor*
Frank N. Vitale, *M.A., Assistant Supervisor*
John W. Cates, *M.A., Junior Supervisor*

* * *

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, twenty 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 F,W,S Designed for advanced swimmers. Fundamentals in individual and group water ballet. Opportunity for public presentations.

5. Skin Diving, Basic F,S Skin diving techniques, pool and ocean. Underwater skills, knowledge through exploration of the underwater world. The course is designed to provide an opportunity for students to learn a new set of nature's rules and laws which are not encountered on the surface.

6. Lifesaving F,W 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 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.

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 and intermediate 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.

12. Gymnastics (Men) S Designed for the student of beginning and intermediate ability. The fundamentalss of gymnastics, including instruction in the use of apparatus and in simple tumbling routines.

13. Rhythmic Gymnastics F Exercise routines to music with an emphasis on body control, skill and preceision of execution.

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.

16. Handball F,S Instruction in fundamentals of the serve, volley and court strategy. Opportunity for singles and doubles competition.

17. Karate F,W,S Instruction and training in the fundamentals of Sho-to-kan 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.

18. Wrestling F,W Fundamentals of wrestling, with emphasis on takedowns and counters, escapes, and pinning combinations. Students will learn timing and execution of a limited number of holds and maneuvers.

19. Techniques of Officiating F,W,S 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.

21. Squash 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.

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 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

33. Volleyball 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 W,S

46. Beginning Fencing (Foil) 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" 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 kinesthenic balance.

48. Intermediate Fencing (Foil) Designed for the intermediate student of fencing to continue his training in the classical French style. Prerequisite: Physical Education 46.

49. Intermediate Fencing (Sabre) 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) 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 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 F,W,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.

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*
Maria Goeppert Mayer, *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*
Robert A. Swanson, *Ph.D., Professor of Physics*
William B. Thompson, *Ph.D., Professor of Physics*
(Chairman of the Department)
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*
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*
Shang-Keng Ma, *Ph.D., Assistant 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*

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 expect to major in physics are strongly advised to take Mathematics 2D and Mathematics 2E in the lower division. Also, if they plan to do graduate study in physics, they should choose German, Russian, or French (preferably German or Russian) for meeting the language requirement.

Restricted Electives. The restricted electives in mathematics are discussed below. The other 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.

Chemistry. The Department of Physics considers that a knowledge of the fundamentals of chemistry is essential for the study and practice of physics. Consequently, Natural Science 2DL and 2F, or equivalent, or an upper-division chemistry course with associated laboratory, is required for the B.A. degree in physics.

Mathematics. For the restricted elective in mathematics in the junior year, Mathematics 120 is strongly recommended.

Students entering the upper division with a deficient mathematics background will have to make up this deficiency in the junior year. For example, a student who failed to take Mathematics 2D and 2E 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.

Required courses for physics majors are the following:

1 Physics: 100A, 100B, 100C, 101A, 101B, 110A, 110B, 130A, 130B, 130C, 140, 141

Two of the following laboratory courses:

a 131

b 132 or 171

c 170

d 199 (with departmental approval)

2 Chemistry; Natural Science 2DL and 2F, or an upper-division chemistry course with laboratory.

3 Mathematics: 2D, 2E, 110A

4 Restricted Electives:
a One Mathematics course (120 recommended)
b Two courses in sciences or mathematics

A PHYSICS MAJOR WITH SPECIALIZATION IN EARTH SCIENCES is also available for undergraduates. 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, 101A-101B

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 7 advanced courses selected from the following groups, provided that they obtain at a 3.0 average in 6 out of the 7. The selection must include all of Group I and at one course from each of Groups II and III.

Second Year Graduate Courses

Group I:(4)
Physics 212C (Quantum Mechanics) Fall
Physics 212D (Quantum Mechanics) Winter
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.*)

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. Prerequisites: Physics 100A; prerequisite or co-registration, Mathematics 2E; co-registration, Physics 101A.

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. Prerequisites: Physics 100B; co-registration, Physics 101B.

101A. Electricity and Magnetism Laboratory (2) W Experiments with AC and DC circuits and electromagnetic phenomena in general; magnetism. Four hours. Co-registration: Physics 100B.

101B. Electricity and Magnetism Laboratory (2) S Microwaves, electrodynamics; electrical and electronic measurements and test equipment; construction and testing of active curcuits. Four hours. Prerequisites: Physics 101A; co-registration, Physics 100C.

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. Prerequisites: 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.

130A. Quantum Physics F Atomic physics in the nineteenth century; radioactivity, Rutherford experiments; Bohr model, optical spectra, X-ray spectra, electron spin, vector model. Three hours lecture. Prerequisites: Mathematics 110A, Physics 110A; co-registration, Physics 131.

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. Three hours lecture. Prerequisites: Physics 130A; co-registration, Physics 132.

130C. Quantum Physics S Elementary nuclear physics; quantum mechanics of radiation; elementary particles and scattering. Four hours lecture. Prerequisites: Physics 100C, 130B.

131. Modern Physics Laboratory (2) F Experiments in radioactivity, x-rays, atomic physics, resonance physics, solid state physics, etc. Four hours. Co-registration, Physics 130A.

132. Modern Physics Laboratory (2) W Experiments in atomic physics, optics, physical electronics, fluid dynamics, surface physics, etc. Four hours. Prerequisite: Physics 130A; co-registration: Physics 130B.

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 101A-101B, 131 or 132, and consent of instructor.

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.

172. Computer Laboratory Computer solution of practical problems in science and engineering; mathematics of approximation methods, computer programming. Students will use the University computer to solve specific problems. Four hours. Prerequisite: Mathematics 110A. (Not offered 1971-72.)

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. Prerequisites: consent of instructor.

GRADUATE

200A. Theoretical Mechanics (4) Lagrangian mechanics with applications to linear and non-linear motion in inertial and non-inertial frames.

200B. Theoretical Mechanics (3) Variational principles, Hamilton's equations, and Hamilton-Jacobi theory. Special relativity. Rigid body and continuum mechanics. Prerequisite: Physics 200A.

203A. Advanced Classical Electrodynamics (3) 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) 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) 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) 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 (4) Discussion of experiments and current theories in the following areas: Lattice dynamics, including point defects; Fermi surface and elementary excitations in normal metals; superconductivity; cooperative magnetic phenomena. Prerequisite: Physics 152 or equivalent.

212A. Quantum Mechanics (3) Physical basis of quantum mechanics, the Schroedinger 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 (3) Translational and rotational invariance, angular momentum and spin, the formal theory of scattering. Prerequisite: Physics 212A.

212C. Quantum Mechanics (3) 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.

212D. Quantum Mechanics (3) Relativistic one-particle theory, quantization of the electromagnetic field and particle fields, nonrelativistic interaction of the quantized electromagnetic field with atomic system. Prerequisite: Physics 212C.

213. Theoretical Nuclear Physics (3) Nuclear forces, two-nucleon system, interaction of nucleons with the electromagnetic field, beta transformation of nucleons; nuclear systematics, models of nuclear structure, nuclear transformations and reactions. Prerequisites: Physics 130C or equivalent, Physics 212C; co-registration Physics 212D.

215. High Energy Nuclear Physics (3) An introduction to the elementary particles with particular emphasis on the invariance principles by which they are classified. Prerequisites: Physics 212D and 213.

216. Atomic and Molecular Physics (3) 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) 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) 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) 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) Advanced topics such as general relativity, hydrodynamics and shock waves, elasticity. Prerequisite: Physics 200B.

222. Advanced Nuclear Physics (3) Nuclear structure; the collective model; radiation theory; beta decay; introduction to the many-body problem. Prerequisite: Physics 213.

223A. Advanced Astrophysics (3) 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) 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) Covariant perturbation theory, mass and charge renormalization of quantum electrodynamics, radiative corrections to scattering and atomic energy levels, introduction to dispersion theory. Prerequisite: Physics 212D.

230. Advanced Solid State Physics (4) A selection of advanced topics such as electrical and thermal transport phenomena, cooperative magnetic phenomena, nuclear and electron magnetic resonance, superconductivity. Prerequisite: Physics 210C.

231. Collision Theory (3) 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) 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 200C, 203B, 210B.

233. Elementary Particle Theory (4) Current problems in elementary particle theory, especially the theory of strong interactions. Prerequisite: Physics 215.

234. High Energy Experimental Physics (4) Current elementary particles research. Techniques used in experiments with high energy accelerators. Prerequisite: Physics 215.

235. Numerical Methods in Theoretical Physics (3) Approximation of functions, interpolation and smoothing of data, numerical solution of ordinary and partial differential equations, and integral and integro-differential equations of particular interest to physicists. Prerequisite: consent of instructor.

236. Many-Body Theory (4) 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 210C and 212D.

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 (1,1,1) Discussions of current research in solid state physics. (Satisfactory/Unsatisfactory grades only.)

251. High Energy Physics Seminar (1,1,1) Discussions of current research in nuclear physics, principally in the field of elementary particles. (Satisfactory/Unsatisfactory grades only.)

252. Plasma Physics Seminar (1,1,1) Discussions of recent research in plasma physics. (Satisfactory/Unsatisfactory grades only.)

253. Astrophysics and Space Physics Seminar (1,1,1) Discussions of recent research in astrophysics and space physics. (Satisfactory/Unsatisfactory grades only.)

254. Atomic and Molecular Physics Seminar (1) Discussions of current research in atomic and molecular structures and collisions. (Satisfactory/Unsatisfactory grades only.)

299. Research in Physics (1-12, 1-12, 1-12) (Satisfactory/Unsatisfactory grades permitted.)

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 1971-72.

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.

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-divison 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.

199. Independent Study for Undergraduates 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*
Howard Leventhal, *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*
Roland A. Wilhelmy, *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*

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 epxerimental 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 101, 102, and 103. Psychology 101 and 102 are lecture-seminar courses which introduce the study of contemporary issues in experimental psychology. Psychology 103 is a laboratory which introduces the experimental techniques necessary to study the issues raised in 101 and 102. The three courses 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 101-102-103 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 101A	Psychology 101B	Psychology 101C
	Psychology 102A	Psychology 102B	Psychology 102C
	Psychology 103A*	Psychology 103B*	Psychology 103C*
Senior Year	Psychology 198	Psychology 198	Psychology 198
	Psychology elective	Psychology elective	Psychology elective
	— —	— —	— —
	— —	— —	— —

*Note that each quarter of 103 carries 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

101A-101B-101C.* Introduction to Experimental Psychology F-W-S Introduction to experimental work in psychology. Prerequisites: Mathematics 1C; co-registration in Psychology 102A-102B-102C and Psychology 103A-103B-103C.

102A-102B-102C.* Experimental Method of Quantitative Techniques F-W-S Introduction to the experimental method in psychology and to mathematical techniques necessary for experimental research. Three hour lecture. Prerequisites: Mathematics 1C; co-registration in Psychology 101A-101B-101C and Psychology 103A-103B-103C.

103A-103B-103C.* Laboratory in Psychology F-W-S Laboratory work in psychology to accompany the 101 and 102 sequences. Prerequisites: Mathematics 1C; co-registration in Psychology 101A-101B-101C and Psychology 102A-102B-102C.

*Psychology 101A-101B-101C, 102A-102B-102C, and 103A-103B-103C must be taken as a unit. Registration for single courses in not permitted.

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 the instructor.

135. Memory and Attention F Survey of current research and theory in human memory and attention. Prerequisite: Psychology 103.

137. Developmental Psychology W Intensive survey of current knowledge of cognitive and intellective factors in human development.

138. Introduction to Mathematical Psychology W An introduction to mathematical models in learning, perception, memory, and sensory processes. Prerequisite: Psychology 103.

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 101-103.

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.

142. Experimental Social Psychology F Introduction to the experimental investigation of social behavior. Three hours lecture. Prerequisite: major in psychology.

143. Emotion S Introduction to current theories and research in emotion. Three hours lecture. Prerequisite: three courses in psychology.

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.)

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 psychology. Each student will be responsible for a class section in one of the lower-division psychology courses. Limited to seniors majoring in psychology, who must secure advance permission of the instructor of the course at least one quarter before the start of the course.

198. Research in Psychology F-W-S Research seminars and research, under the direction of a member of the staff. Prerequisites: Psychology 101, 102, and 103.

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. Memory and Attention (3) Contemporary theories of human attention and memory. Seminar.

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.

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.

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 (1,1,1) (Satisfactory/Unsatisfactory grades permitted.)

296. Research Practicum (1-12, 1-12, 1-12) Research in psychology under supervision of individual staff members. (Satisfactory/Unsatifactory grades permitted.)

298. Library Research (1-12, 1-12, 1-12) Reports and surveys of the literature on selected topics. Prerequisite: graduate student in psychology.

299. Independent Study and Thesis Research (1-12, 1-12, 1-12) (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 Social Sciences Bldg.

These courses are to be used by Muir College students in fulfilling the science requirement of the college.

Students who do not plan to major in a science may take any three courses from the biology sequence for non-science majors (see listing under *Biology*). Listed below are the courses intended for students planning to major in applied physics and information science, biology, or other sciences. Though special in nature, they may appeal to some students who are not planning advanced work in the sciences.

COURSES

2A. Science: 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 and Science 2A-R.

2A-R. Science: The Physics of Equilibrium and Motion - Recitation F Recitation section for Science 2A above. Prerequisite: concurrent registration in Science 2A.

2B. Science: 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. Prerequisites: concurrent registration in Mathematics 1B or 2B and Science 2B-R; Science 2A and 2A-R or equivalent.

2B-R: Science: Waves Energy and Properties of Matter - Recitation W Recitation section for Science 2B above. Prerequisite: concurrent registration in Science 2B.

2C. Science: Electromagnetism F Magnetic field and flux. Cyclotron, mass spectrometer, TV tube, law of induction. Inductance, magnetic energy, oscillary circuit. Measuring instruments, motors, dynamics. Transmission lines, energy flow. Elementary introduction to electromagnetic waves. Prerequisites: Open only to students who took Science 2B in the Spring 1971 Quarter of Physical Science 2A; Mathematics 1C or 2C. (Offered in Fall Quarter 1971 only.)

2C. Science: 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 and Science 2C-R and Science 2A students from the Fall 1971 Quarter or equivalent. (To be offered in Spring Quarter 1972 and thereafter.)

2C-R. Science: Electromagnetic Theory - Recitation S Recitation section for Science 2C above. Prerequisites: concurrent registration in Science 2C.

2D. Science: 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 2A-2B-2C sequence or equivalent and Mathematics 1C or 2C.

2E. Science: Laboratory S Introduction to experimental physics and electronics. Wave experiments in microwaves, optics, and acoustics. Magnetic field measurements. Properties of materials. Three hours laboratory, one hour lecture. Prerequisite: Science 2A-2C sequence or consent of instructor.

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, two 3 hour laboratories.

3B. General Chemistry A continuation of General Chemistry 3A. Three hours lecture, two 3 hour laboratories. Prerequisite: Science 3A.

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.

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) 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: Science 103B, concurrent.

Note: (Transfer students who have completed equivalent lower-division courses in organic chemistry have met this requirement.)

SCIENCE AND TECHNOLOGY

Office: Provost, Third College

COURSES

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 soliving 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.

2A. Chemistry F This course is the second part of the two-part introductory chemistry sequence. Lecture material includes electrochemistry, kinetics and thermodynamics while the laboratory stresses the use of analytical instruments. Prerequisite: Science and Technology 1A or consent of instructor.

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.

90. Graphic Approach to Math/Science S 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.

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*
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*
Robert M. Garrels, *Ph.D., Professor of Geology*
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 Earth Sciences*
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*
George F. McEwen, *Ph.D., Professor of Oceanography, 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 Aerospace Engineering*
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 Aerospace Engineering*
Jeffrey L. Bada, *Ph.D., 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*

* * *

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*

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 and evolution of marine animals and plants.

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 Aerospace and Mechanical 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.

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 oceanographytwo 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 biologya 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 chemistrymajor in chemistry or biochemistry.

Geological Sciencesmajor 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.

Geophysicsmajor in physics or mathematics, or equivalent training.

Physical oceanographymajor in a physical science, including three years of physics and mathematics.

Applied Ocean Sciencesmajor 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 Dpartment 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, 240, 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 280. 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 candiates 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 the intructor.

GRADUATE

207A-207B. Problems in General and Physical Oceanography (2-2) 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) 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) 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) 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 (3) Mechanics of fluids on a rotating earth; Navier-Stokes equations, boundary-layer phenomena, turbulent flow, and wave motion with oceanographic applications. Prerequisites: SIO 210A and consent of instructor.

211A-211B. Ocean Waves (3-3) 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 (3) Dynamics of ocean currents; transport phemomena; turbulent processes and the air-sea boundary layer. Prerequisites: differential equations and consent of instructor.

212B. Dynamical Oceanography (3) Wind currents, theories of ocean circulation, boundary currents. Prerequisites: SIO 212A and consent of instructor.

213A-213B. Radiative Transfer in the Sea (2-3) Geometrical radiometry; radiant energy measurements; eample 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) 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) 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.

219. Special Topics in Physical Oceanography (1-4)

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 homogenous medium. Prerequisites: differential and integral calculus, differential equations, linear algebra.

221. Topics in Geophysical Fluid Dynamics (3) Effects of viscosity, density gradients, and gravitational and electromagnetic fields on fluid motion. Topics include forced and free convection and percolation, Alfven 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) 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 (3) Kepler's laws, tide-generating potentials, static and dynamic theory of ocean tides; atmospheric tides; Love numbers and bodily tides; tidal friction and the length of day. Chandler wobble, historical variations, figure of the Earth. Prerequisites: SIO 220 and 221, and Physics 200A-200B-200C.

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, aeolotropic and heterogeneous media, dissipation, interpretation problems. Prerequisite: consent of instructor.

228. Gravity and Geomagnetism (3) Measurement and analysis of gravitational and magnetic fields of the Earth, with emphasis on applications to geologic problems and prospecting. Prerequisites: differential and integral calculus.

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.

240. Marine Geology (3) Introduction to the geomorphology, sedimentation, stratigraphy, vulcanism, 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) 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) 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) 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) 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) Characteristics and origin of sediments and sedimentary rocks. Prerequisite: consent of instructor.

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) An advanced discussion of the geomorphology, sedimentation, stratigraphy, vulcanism, 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)

250. Geochemistry (3) 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) 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 atomspheric 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 2D or equivalent, SIO 210A.

252B. Nuclear Geophysics (3) 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) 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) 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) 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) 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) 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) 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) Discussions of current research and special topics in geology not treated in the general courses.

259. Seminar in Geochemistry (3) 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) 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) 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) 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) 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 and optical properties of solids, with particular consideration of geological systems. Prerequisite: consent of instructor.

265. Chemistry of Natural Products (3) 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) 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).

269. Special Topics in Marine Chemistry (1-4)

270. Biological Oceanography: Processes and Events (3) 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) 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) 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) 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) 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) 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. Prerequisites: SIO 275A-275B or 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) Presentation of reports, review of literature, and discussion of current research in biological oceanography. Seminar.

279. Special Topics in Biological Oceanography (1-4)

280. Marine Communities and Environments (3) 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) 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) 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) 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) Research techniques and problems in selected areas of environmental physiology.

283. Isotope Tracer Techniques and Related Topics in Physiology (3) 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) 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 miscroscopy, cytochemistry and autoradiography. Prerequisites: basic courses in biology and chemistry; consent of instructor.

285. Marine and Comparative Biochemistry (3) 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) 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 (3) Ecology, biochemical activities, and methods of studying bacteria and allied microorganisms in the sea, with particular reference to their effects on other organisms and as geochemical agents. Prerequisites: preparation in general microbiology, bacterial physiology, and biochemistry. SIO 210A, 260, 280 are recommended.

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) An introduction to marine plants and the roles they play in the ecology of the seas. Prerequisite: consent of instructor.

291. Physiology of Marine Algae (3) 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) 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) The natural history, zoogeography, taxonomy and phylogeny of the arthropods, with emphasis on marine forms. Prerequisite: consent of instructor.

294A. Biology of Fishes (4) 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) 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)

297. Marine Biology Seminar (1) 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) 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) (Satisfactory/Unsatisfactory grades permitted.)

SOCIOLOGY

Office: Humanities and Social Sciences Bldg., John Muir College

Aaron Cicourel, *Ph.D., Professor of Sociology*
Joseph R. Gusfield, *Ph.D., Professor of Sociology*
(Chairman of the Department)
Jack D. Douglas, *Ph.D., Associate Professor of Sociology*
Stanford M. Lyman, *Ph.D., Associate Professor of Sociology*
Randall Collins, *Ph.D., 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*
Will Wright, *M.A., Acting Assistant Professor of Sociology*
Lola Schwartz, *Ph.D., Lecturer in Sociology*

The Major Program for Undergraduates

Beginning Fall Quarter, 1971, 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 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-divison 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 111, 112
   b) Social Interaction
   c) Social Change and Control
   d) Social Issues

e) Social Methods

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.

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 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, law and social control; social stratification; socio-linguistics; comparative race and ethnic relations; sociology of everyday life; modernization and new nations; family; sociology of law.

During the intial year, the student will be expected to complete examinations based on the content of the core curriculum and, in addition, complete the 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 from previous work, filed with the committee by the candidate. 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

1A - 1B. Sociological Analysis F and 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 1A - 1B or consent of instructor. Additional prerequisites may be specified below.

100. Sociology of Everyday Life F A general introduction to the objective observation, description and analysis of everday 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 S 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 W 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 F 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 F 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 S 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: 100, 101 or consent of instructor.

107. Advanced Sociolinguisitcs 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.

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 F 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 F or W Determinants or 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 F or 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 synamics of social mobility; the effects of stratification life styles, culture and deviance.

113. Occupations and Professions F 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. (Not offered in 1971-72.)

116. The Social Organization of Education S The daily social organization of the classroom is contrasted with various official versions of its structure and theories of its members' competence.

117. Comparative Educational Systems W 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-divison status. (Not offered 1971-72.)

120. Urban Social Problems W 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 S 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 W Functions of law in society; social source of legal change; social conditions affecting the administration of justice; role of social science in jurisprudence.

130. Modernizing Societies and New Nations S 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 F The impact of technology 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. (Not offered 1971-71.)

132. Societies and Cultures in the Modern World W 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 F 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.

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.

140. Social Protest F or W 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 S 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.

150. History of Social Thought W 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 S An analysis of leading theories of sociology with an emphasis on contemporary perspectives. Theoretical issues include functionalsim, ethnological bases of sociology, Marxism, systems analysis and the problem of objectivity. Prerequisite: senior standing or three sociology courses.

180. Designs of Sociological Research W or 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. (Not offered 1971-72.)

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.

190. Senior Seminar F 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. During 1970-71 Senior Seminars were held on the following topics: Educational Theory, Sociology of Science, Medical Sociology, and the City.

191. Youth in American Society S 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.

(Additional courses or deletions may be announced during Spring, 1971. For a more accurate list of current departmental offering please consult the Department of Sociology.)

GRADUATE

200. Analyzing Everyday Life F 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. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

206. Introduction to Sociolinguistics 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. Prerequisite: graduate standing in sociology. (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. Prerequisite: graduate standing in sociology. (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. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

212. Social Stratification S (Variable) 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. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

215. Seminar in Political Sociology W 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. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

223. Social Problems and Social Solutions S This is a seminar concerned with the facts and theories about social problems and the possible solutions to those problems. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

235. Comparative Race and Ethnic Relations W 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. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

251. Sociological Theories S (Variable) 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. Prerequisite: graduate standing in sociology. (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. Prerequisite: graduate standing in sociology.

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. Prerequisite: graduate standing in sociology. (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. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

255. Seminar in Sociological Theory S The analysis of a specific issue of theorist with opportunities for supervised research of students in problems of sociological theory. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

256. Practicum in Empirical Research I F or W 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. Prerequisite: graduate standing in sociology. (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. Prerequisite: graduate standing in sociology. (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. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

290. Graduate Seminar F (Variable) 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. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

291. Youth in American Society S 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: graduate standing in sociology. (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. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

299. Thesis Research F,W,S Open to graduate students engaged in thesis research. Prerequisite: graduate standing in sociology. (Satisfactory/Unsatisfactory grades permitted.)

500. Apprentice Teaching F,W,S Supervised teaching in lower divisional contact classes, supplemented by seminar on methods in teaching sociology. Prerequisite: graduate standing in 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 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.

THIRD COLLEGE

Office: Provost, Third College, Matthews Campus

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COURSE

198. Special Studies in College Planning and Administration 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, approval of provost.

THIRD WORLD STUDIES

Office: Provost, Third College, Matthews Campus

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COURSES

1A. Introduction to Third World Studies F Third World Studies will provide information and understanding of non-western cultures and nations.

1B. Introduction to Third World Studies W The Pre-colonial Third World. An examination of the cultures of a number of African, Asian and Meso-American societies in the period immediately preceding the contact with Western European nations with emphasis on what is pan-human in each.

1C. Introduction to Third World Studies S Colonialism, Imperialism and its impact upon the Third World. An examination of Western Europe expansion into Africa, Asia and Latin America; its effects on the institutions of Third World society with emphasis on continuity and disjuncture between pre-contact society and the successor nation states.

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.

142. Political Philosophies of Third World Leaders W 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-S 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.

URBAN AND RURAL DEVELOPMENT

Office: Provost, Third College, Matthews Campus

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COURSES

100A-100B-100C. Strategies for Community Involvement 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 and welfare. Prerequisites: junior standing and consent of instructor.

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 speciment 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.

199. Independent Study 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 (Chairman of the Department)*
David Antin, *M.A., Associate Professor of Visual Arts (Vice-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*

* * *

Manny Farber, *Lecturer in Visual Arts*
Nathan Silver, *M.A., Lecturer in Visual Arts*
Ellen Van Fleet, *M.A., Acting Assistant Professor of Visual Arts*
*On leave fall and winter quarters 1971-72

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 HUMANITIES ELECTIVE

Muir students choosing to complete the Visual Arts Humanities 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

88. First Look at Movies As an alternative, the Muir student may choose one course from the following to complete the third quarter of the Humanities requirement:

129. Beginning Drawing

139. Beginning Painting

149. Beginning Sculpture

190. Beginning Photography

The only exception to the above is one may not take both First Look at Movies and Beginning Photography to fulfill the Humanities sequence.

REVELLE FINE ARTS REQUIREMENT

Students can fulfill this requirement by taking any quarter of 15A, 15B, or 15C. In addition he may take Visual Arts 50 Architecture of the Future or 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.

ART MAJORS

Majors are required to take three introductory art history courses, Beginning Painting and Beginning Sculpture. At about this point in the prospective major's career, he should present a portfolio of his work to the Department in order to be accepted as a major. 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 Art History

5 Advanced level art courses

All prospective majors are urged to keep in touch with the Department office for meetings, etc. pertaining to them.

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

10. Introduction to Art Fundamental aspects of the visual arts. Introduction to problems in art history, aesthetics, and other conceptual material relevant to the visual experience.

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.

50. Future of Architecture F An examination of the factors influencing modern urban design and architecture leading to a speculative investigation of the future of the cities and of architecture generally.

55. Art of Cloisonne Instruction will include the making of two cloisonne jewels and their settings covering the sixth to the thirteenth 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 Godard, offering a syntactic system for separating the various contributions of actor, editor, scriptwriter, director.

UPPER DIVISION

104. Experimental Structures The course deals with the practical issues involved in the design and construction of a medium-sized shell structure, from the initial problem analysis through to the evaluation and handling of new materials and new fabrication techniques. May be repeated for credit. Prerequisite: consent of department.

105. Experimental Architecture F A survey of contemporary structural materials and techniques, with particular stress upon the application of new materials to new forms. Prerequisite: consent of department.

111. History of Sculpture A history of sculpture from ancient times through the present. Three hours lecture. Prerequisites: Visual Arts 15A-15B or equivalent.

112. Nineteenth 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 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.

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; may be taken concurrently with 15B.

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, 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.

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 ennameling techniques used in conjunction with ennameling will be offered (repousse and plique a jour). Accomplished students may begin to design and carry out their own motifs. Prerequisite: consent of instructor.

158. 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.

180. Materials A studio-based 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.

185. Feeding and Feedback An examination in depth of the learning process, particularly in relation to the development of art attitudes in the individual. Prerequisite: consent of department.

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.

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.

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. 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.

198. Directed Group Study Directed group study on a topic or in a group field not included in regualr 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 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.)

204. Experimental Structures The course deals with the practical issues involved in the design and construction of a medium-sized experimental building. The graduate students supervise work crews, and meet in seminar each week with the instructor to discuss organizational problems. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

205. Experimental Architecture F A survey of contemporary structural materials and techniques, with particular stress upon the application of new materials to new forms. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

213. History of Primitive Art 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.)

216. Renaissance and Baroque Art History 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 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 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 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.)

230. Advanced Problems in Painting 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 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.)

240. Advanced Problems in Sculpture A graduate level studio course in sculpture, stressing indivudal problems. May be repeated for credit. Prerequisite: consent of department. (Satisfactory/Unsatisfactory grades permitted.)

290. Graduate Seminar 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 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 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 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 Individual research for graduate students in preparation for their comprehensive exhibition for the MFA degree.

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

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 enrollement 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, special, limited, second degree 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. A summer quarter is not offered at the present time at San Diego.

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, special, limited, second degree, 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.

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 on 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 adminsitered 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 bulletim *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 determinging 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 whch 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	PENALTY DATES	CLOSING DATES
OCT. 9, 1971 (SAT ONLY IN CALIF. ONLY)	SEPT. 8, 1971	SEPT. 22, 1971
NOV. 6, 1971 (SAT ONLY)	OCT 6, 1971	OCT. 20, 1971
DEC. 4, 1971	NOV. 3, 1971	NOV. 17, 1971
JAN. 8, 1972	DEC. 8, 1971	DEC. 20, 1971
FEB. 1, 1972 (GREEK ACHIEVEMENT ONLY)		
MAR. 4, 1972	FEB. 2, 1972	FEB. 16, 1972
APR. 15, 1972 (SAT ONLY)	MAR. 15, 1972	MAR. 29, 1972
MAY 6, 1972 (Achievement)	APR 5, 1972	APRIL 19, 1972
JULY 8, 1972	JUNE 7, 1972	JUNE 21, 1972

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 Muir or Revelle general education requirements, refer to the catalog section pertaining to the respective college.

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 Calfironia 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.

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, telvision 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 Achivement 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 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, 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.

An applicant who plans to seek financial assistance is required to submit at least three letters of recommendation and scores on the verbal and quantitative tests of the Graduate Record Examination (GRE). 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 fellowshps 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 obtainted 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.

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 adademic background is substantailly 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. 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 550 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, Building 250, Matthews Campus, which can assist them in making a smooth transition from their undergraduate education aborad 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 this category.

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. Upon arrival, postdoctoral scholars should apply at the Office of the Registrar for official evidence which establishes their affiliation with the University and which entitles them to certain special privileges, including reduced charges for some University functions.

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 the Graduate Division. 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 $25 late registration 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.

In addition, a $25 late registration fee will be assessed if the student has not completed his registration (paid hs fees) prior to 3:30 p.m. on the second day after the start of the quarter.

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.

Physical Examinations

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 *prior to their arrival on campus* in order to complete registration.

Completion of the medical history form requires evidence of:

1. A complete physical examination by a licensed physician (M.D.).
2. A blood test for anemia.
3. A urinalysis.
4. A skin test for tuberculosis. (Students with a positive reaction to the tuberculin skin test must also submit evidence of a recent chest x-ray.).
5. A tetanus toxoid booster given within the past six years.

The physical examination and tests must not be older than six months before the first day of classes. (See *Contents* for *Health Service*.). 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 $25 if they have not paid their Registration Fees by the deadline. (See *Academic Calendar* for announced deadlines.)

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. Staffing and scheduling information for graduate courses for the entire year is included in the Fall 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. However, a student may enroll for three courses as long as he maintains an average of four courses for the four years. For purposes of the Registrar's Office and the Selective Service Office, three academic courses are considered the minimum for a full-time student, however, for student's 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 Inforamtion 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 16as, for example, 6 graduate and 8 undergraduatewhen 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.

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 a *Change in Study-List* 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 *Change in Study-List* 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 a *Change in Study-List* 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 a *Change in Study-List* 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 *Changes in Study-List* 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*, undetermined (work of passing quality but incomplete). The designations *P*, passed, and *NP*, not passed, are used in reporting grades on some courses. 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 immedaitely 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, approved by his instructor, and a $5.00 fee paid at the Cashier's Office *before the incomplete grade can be assigned*. The form shall state time and date of examination and/or when assigned course work will be completed. 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 and 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 and *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 *Passes/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 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 majos 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 2-4 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. 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 available in the Registrar's Office. It should be emphasized that course reports filed by instructors at the end of each quarter are final.

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. (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: History 30A, 30B, 30C, 160, 164, 165, 167A, 167B 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.

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.

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.

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, 1972 opens November 1, 1971; for Winter Quarter, 1973, July 1, 1972; and for Spring Quarter, October 1, 1972. 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 the graduate division 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. The host campus will prepare a waiver for registration upon receipt of the approved application.

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 the Registrar, secure the approval of his major department and file the approved request with the Registrar prior to the end of 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 Peace 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 adminsitered by the University.

WITHDRAWAL FROM THE UNIVERSITY:

UNDERGRADUATES

A registered undergraduate student withdrawing from the University must file a *Request for Withdrawal* with the Registrar's Office before leaving the campus.

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 the Office of the Registrar, secure the approval of his major department 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 sutdent 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 $1 fee is charged for each transcript of a student's record. 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 and present his fee receipt to the Registrar.

RULES GOVERNING RESIDENCE

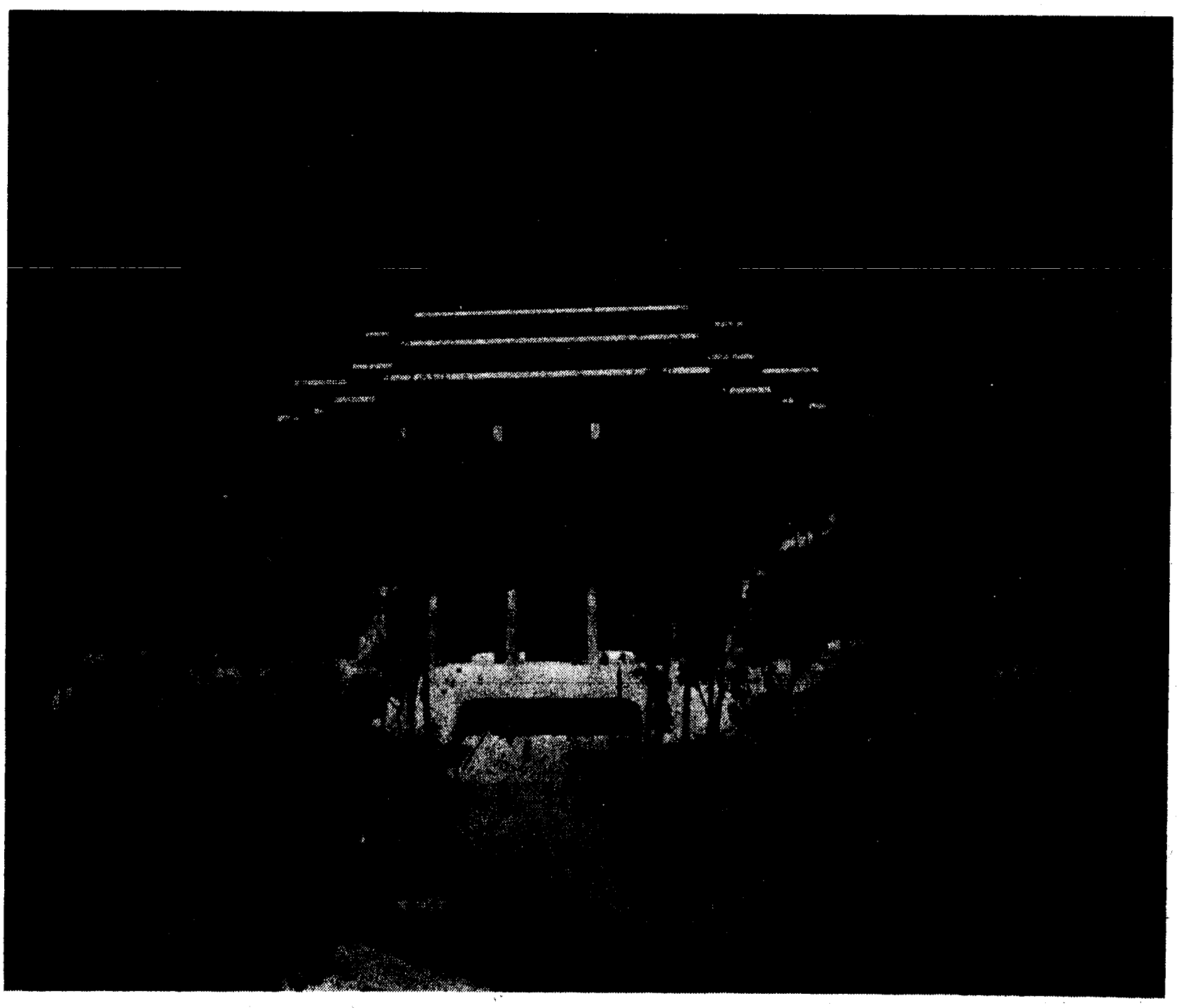
Nonresident Tuition Fee. Students who have not been legal residents of California for more than one year immediately prior to the opening day of the quarter in which they register are charged, along with other fees, a tuition fee of $500 for the quarter. Legal residence is the combination of *physical 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 21 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. (California Government Code Section 244 and Education Code Sections 23054, 23055, 23057, 23058 and 23059.)

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 22 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 Hall, 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.



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	$100.00	$100.00	$100.00	$ 300.00
Educational Fee	100.00	100.00	100.00	300.00
Associated Students	6.00	6.00	6.00	18.00
Student Center Fee	6.00	6.00	6.00	18.00
Board and Room in Residence Halls*	425.00	425.00	425.00	1275.00
Books (Approx.)	75.00	75.00	75.00	225.00
Personal Expenses†	150.00	150.00	150.00	450.00
Total	$862.00	$862.00	$862.00	$2586.00

*Figures given for each quarter are one-third of total; actual payments vary according to the quarter. All new students, add $40.00 deposit.

†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.

For undergraduate students there is an additional Associated Students fee of $6 per quarter. This fee is used for the general student welfare at the discretion of the A.S. Senate and with the approval of the Chancellor. 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 and educational fees 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 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, 1971-72: 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)	$500.00
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	1.00
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 Scholarships), 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 without reference to financial need. 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.

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 new program (beginning 1967-68) 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 $1.60 to $2.42 per hour.

President's Work-Study Program: Undergraduates and Graduates

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, Fianncial 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.

FINANCIAL ASSISTANCE: GRADUATES

The following is a brief description of the kinds of financial assistance available to graduate students at UCSD. Further details about these awards are contained in the *Graduate Division Announcement* which may be obtained from the department offices or from the Office of Graduate Studies and Research. The descriptions in this section deal entirely with appointments administered directly by the University.

There are also numerous fellowships sponsored outside the University for which application must be made directly to the sponsoring agence. The Office of Graduate Studies provides an information and advisory service to graduate students concerning such fellowships. 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.

UCSD administers several kinds of financial aids for graduate students in all departments. These include (1) fellowships and traineeships, (2) assistantships in teaching, language, instruction, and research, (3) loans. These are described in the following sections.

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 $2100 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. National Defense Education Act, Title IV, Graduate Fellowships
3. National Science Foundation Summer Traineeships for teaching assistants
4. Public Health Service Traineeships
5. San Diego Fellowships
6. Dissertation Fellowships

7. 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. Assistantships do not include payment for tuition and fees.

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

UCSDseeks 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.

LOANS: UNDERGRADUATES AND GRADUATES

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 expected to take this Educational Fee loan as part of his award.

Repayment of the Educational Fee shall begin nine months subsequent to the completion of a 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 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 used principally to supplement stipends of scholarship and fellowship recipients but may also be granted to other qualified students. 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 suplement 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 exteoded 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, 1971, for the 1971-72 academic year.

STUDENT PERSONNEL/EMPLOYMENT

The Student Employment Office serves UCSD students, alumni, and students' spouses for employment opportunities. Coordinated through this office are on and off campus positions on the basis of being temporary, intermittant, or regular. Many categories of jobs are listed.

On campus employment is available in many departments. Acceptance of a campus position requires the signature of the State Oath of Allegiance and a patent agreement. Undergraduates taking a full course load may not be employed for more than fifteen hours per week during academic sessions unless an exception is granted. Exceptions are considered by a review of the student's academic status (a 2.5 GPA must be maintained), financial situation, and other financial aids available to him. Employment for twenty hours or more may require a corresponding reduction in course load or must be a position allowing some concurrent study time. Freshmen who must work during their first quarter are asked to confer with the Student Employment Office and possibly the Financial Aids Office.

Off Campus job opportunities are available in a variety of categories. "Live-in" positions, whereby a student can exchange work for room/or board in a private home, are listed when abailable.

Students interested in employment must register by application in the Student Employment Office. Employment will not be arranged by correspondence as the majority of jobs are immediately available and will go to the person also available. Foreign students are required to obtain a work permit from the Office of International Education before applying for work.

Work-Study employment will be arranged following a work-study award granted by the Financial Aids Officer.

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 progessional 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, Bldg. 250, 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 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, Gottingen, 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 Spainthe 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. The programs in Mexico City and in Paris are for the fall and winter quarters or the spring and summer quarters only.

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 1972-73 will be accepted from September 28, 1971, through January 14, 1972. (Applications for the United Kingdom and Ireland must be filed no later than November 15, 1971.)

Further information is available from the Director, Education Abroad Program, 1205 South Hall, University of California, Santa Barbara, or the Dean of International Education, Building 250, 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 Housing Office 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. In addition Muir College offers, for the first time, 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.

The Residence Hall Contract has no provision for food services, though food will be available on a cash basis. Students living in all residence halls should be prepared to find temporary off-campus accommodations during the fall and winter quarter breaks. However, this does not apply to the apartment facilities.

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 accomodations 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 two areas. Any questions related to Selective Service and Veterans' Affairs 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. 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. Questions about the student's eligibility for statuses as diverse as Conscientious Objection and Reserve participation should all be directed to this office.

Veterans' Affairs

Information regarding the Veterans' Readjustment Act, as well as Veterans' Dependents' Educational Benefits may be obtained in the Office of Special Services.

For information about eligibility for educational benefits under any of these programs, contact the appropriate local office near your home, or the campus Office of Special Services. Students already benefiting from any of these programs should contact the Office of Special Services immediately after their initial registration, and every quarter thereafter while registered at the University.

STUDENT HEALTH SERVICE

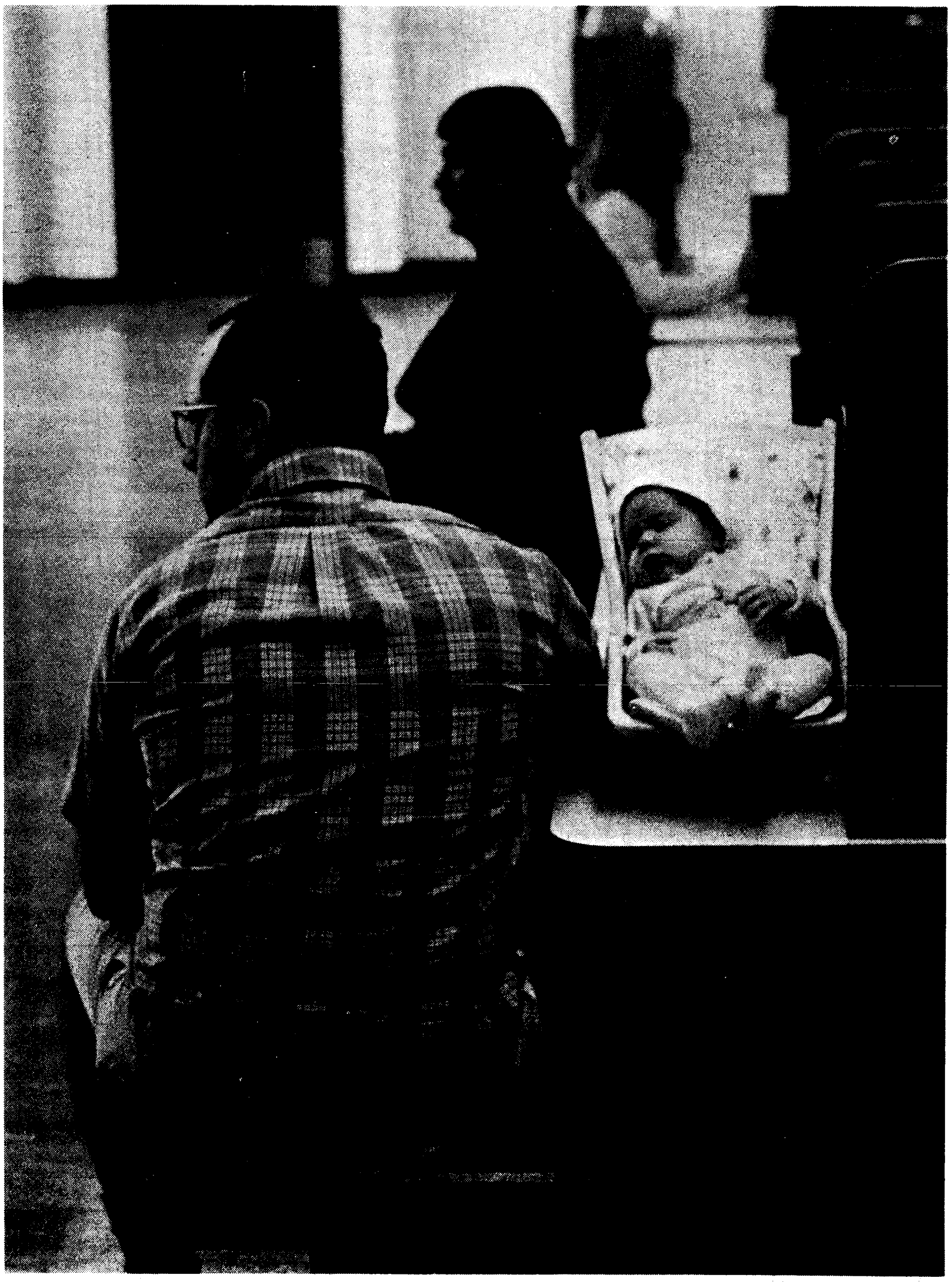
A comprehensive health care program for students is included among the benefits provided by the University Registration Fee.

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 during school hours and 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.

Infirmary 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 and to obtain a physical examination and certain laboratory tests 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 preexisting illnesses are not covered by the Student Health insurance plan.

A comprehensive and economical insurance policy is available for students for any one unrigistered quarter. Students may purchase the same policy for their dependents; it is mandatory for dependents of foreign students. Information may be obtained at the Student Health Center after arrival on campus.



ACADEMIC AND ADMINISTRATIVE OFFICERS OF THE SAN DIEGO CAMPUS

Chancellor (acting)
Herbert F. York, Ph.D.

Vice Chancellor – Educational Programs and Research

Vice Chancellor – Health Sciences
Dean, School of Medicine
Clifford Grobstein, Ph.D.

Vice Chancellor – Business and Finance
Herman D. Johnson, B.S.

Vice Chancellor and Dean of Student Affairs
George S. Murphy, M.S.

Vice Chancellor – Marine Sciences
Director, Scripps Institution of Oceanography
William A. Nierenberg, Ph.D.

Assistant Chancellor – Public Affairs
Dean, University Extension
Martin N. Chamberlain, Ph.D.

Dean of Graduate Studies
Herbert F. York, Ph.D.

Provost, Revelle College
Paul D. Saltman, Ph.D.

Provost, John Muir College
John L. Stewart, Ph.D.

Provost, the Third College
Joseph W. Watson, Ph.D.

University Librarian
Melvin J. Voight, M.S.L.S.

Registrar and Admissions Officer
Harold E. Temmer, M.S.

Associate Director, Relations with Schools
Sam D. Hinton, A.B.

Director, Student Health Service
V. Robert Allen, M.D.

Director, Emeritus, SIO
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The names are arranged in order of original accession to the Board of Regents. The term of office of appointed Regents is sixteen years, and terms expire on March 1 of the year indicated.

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DeWitt A. Higgs (1982)
Glenn Campbell (1984)
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Berkeley, California 94720

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Vice President – Educational Relations

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Vice President – Public Service Programs and University Dean of University Extension

Travis Cross
Vice President – University Relations

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Claude B. Hutchison
Vice President of the University, Emeritus, and Dean of the College of Agriculture, Emeritus

Harry R. Wellman
Vice President of the University, Emeritus

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Vice President, Emeritus

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Ivan H. Hinderaker
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Chancellor at San Diego

Philip R. Lee
Chancellor at San Francisco

Vernon I. Cheadle
Chancellor at Santa Barbara

Dean E. McHenry
Chancellor at Santa Cruz

INDEX

PHOTOGRAPHS

ADJACENT PAGE iii
Together on campus of John Muir College.

ADJACENT PAGE 1
A corner of the plaza at Revelle College.

PAGE 5
Chancellor-designate, William D. McElroy (right), in discussion with Bernd T. Matthias, Professor of Physics.

ADJACENT PAGE 7
"Poland 1931" elucidated by Regents Professor/poet Jerome Rothenberg.

PAGE 10
Professor of American Literature, Roy Pearce, puts it on the line.

PAGE 16
A 20th century microprinter swiftly provides views and records of medieval documents to Diego Catalan, Professor of Spanish Literature.

ADJACENT PAGE 33
A molecular model binds together conversation between graduate students and Stanley Miller, Professor of Chemistry.

PAGE 50
The north shores of La Jolla lie at the foot of the campus.

PAGE 51
Student response stations add new dimension to auditorium in the medical school's Basic Science Building.

PAGE 53A
Third College, UCSD's newest, has successfully completed its first year.

PAGE 53B
"Well, I think it goes on the left . . ."

PAGE 65
A point is made during the UCSD meeting of the American Academy of Arts and Sciences.

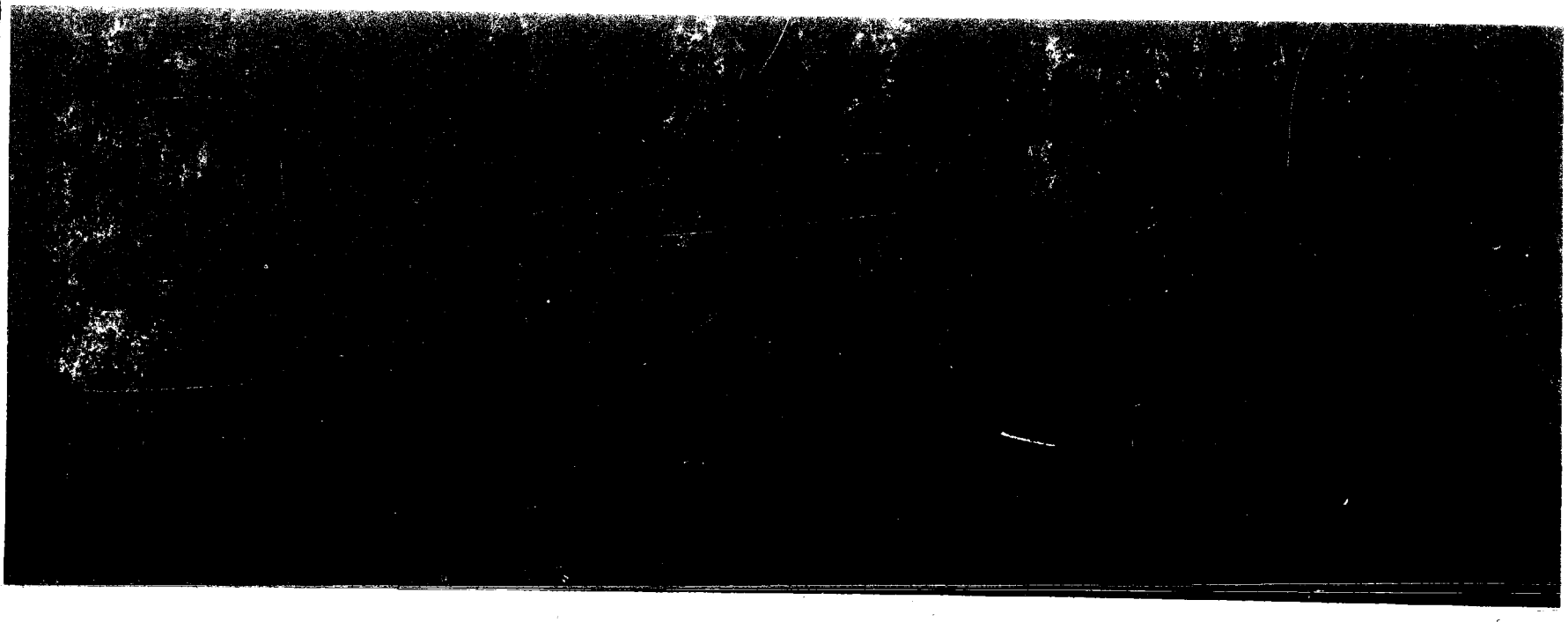
ADJACENT PAGE 67
Scripps Institution of Oceanography operates a fleet of seagoing research vessels which, on an annual average, traverse over 150,000 nautical miles in all oceans.

PAGE 95
UCSD's new central library, while providing a bench mark in American architecture, affords ease of access to a rapidly growing collection.

ADJACENT PAGE 97
The campus occupies nearly one thousand acres sprawling from the Pacific shore to the high tableland of Torrey Pines Mesa.

PAGE 101
Not everybody is turned on at campus building dedications.

NOTES



University of California, San Diego

General Catalogs,

1971/1972