UC San Diego NEWS RELEASE University Archives. RSS 6020

Research Grant of more than 3/4 million dollars has been go received for the support of the Institute for the Study of Matter at UCSD

April 23, 1964

A research grant of more than three quarters of a million dollars has been received for the support of the Institute for the Study of Matter at the San Diego campus of the University of California, it was announced today by University President Clark Kerr and San Diego Chancellor Herbert York.

The grant, totalling $789,978, was provided by the United States Air Force Office of Scientific Research to support the program for three years. Established on the San Diego campus last year, the Institute is under the direction of Dr. Bernd T. Matthias, Professor of Physics at UCSD.

The Air Force grant will provide for research equipment and pay the salaries of technical personnel, postdoctoral research associates, and graduate student assistants. More than half of the grant over the three years will go toward salaries. The University will bear a large part of the cost by providing laboratory space and faculty salaries. In addition, the work of some of the University's professors and research assistants who will contribute to research in the Institute is currently supported through other research grants.

Much of the work of the Institute will be carried on in the Solid State Laboratory which, until recently, was located in Sverdrup Hall at Scripps Institution of Oceanography. The laboratory has n6w partly moved into new and larger quarters in the newly completed Building C on the University's upper campus.

According to Dr. Matthias, the Air Force grant will mainly support the research and graduate teaching program in low temperature physics now existing on the campus. The Institute is designed to study the behavior of extremely pure metals at all temperatures, but particularly very low ones.

Of particular interest at the Institute will be the study of superconductivity in metals, Dr. Matthias said. This is the ability of some metals to conduct electric current with no resistive or "frictional" losses.

Temperatures approaching "absolute zero," or approximately 459.6 degrees below zero on the Fahrenheit scale, are necessary. On the Fahrenheit scale, 32 degrees above zero is freezing for water.

A good example of superconductivity is aluminum. A good conductor at higher temperatures, aluminum increases its conductivity by a factor of at least ten billion when cooled to extremely low temperatures.

Recent research done by Dr. Matthias has indicated that most metals will become superconducting at sufficiently low temperatures. However, some metals will not become superconductors at temperatures which can now be achieved, he said.

A critical temperature or "transition temperature" must be reached before a metal will become superconducting. This extremely low temperature differs for each metal. The material with the highest transition temperature known to date (18 degrees on the Kelvin scale or approximately -431 degrees Fahrenheit) is a compound (Nb_3 Sn) discovered by Dr. Matthias about 10 years ago.

If a material with a transition temperature considerably higher than -431 degrees Fahrenheit can be found, superconductivity might some day make possible the transmission of electric current without loss through refrigerated power lines. The possibility of this, however, is pure fantasy for the present, according to Dr. Matthias.

A more practical application of superconductivity at present is in the building of electromagnets in which a powerful magnetic field can be maintained with no loss. In an ordinary electromagnet, power is dissipated as heat in the coils of the magnet. Superconducting electromagnets are commercially produced by a number of companies today and are used in hundreds of laboratories as well as in various military applications. Such magnets have been suggested as space shields to protect astronauts from charged particles in space.

Dr. Matthias, director of the Institute, became an authority of superconductivity through his work as a member of the technical staff of the Bell Telephone Laboratories. He was appointed Professor of Physics on the San Diego campus in 1961 after 13 years with the Bell Laboratories. He was given the Research Corporation Award of 1962 for his contributions to the knowledge of superconductive materials.

The difficult task of collecting statistics and measurements at the extremely low temperatures is part of the work now being conducted by two UCSD physics professors, Dr. Marshal F. Merriam and Dr. John M. Goodkind, and their staffs. Dr. Merriam works in the higher areas of extreme cold while Dr. Goodkind is concentrating on the areas approaching absolute zero.

For his research, Dr. Goodkind has constructed a very low temperature Cryostat, an apparatus which is capable of maintaining temperatures very near absolute zero.

According to Dr. Matthias, the Institute will allow for a great deal of cooperative effort across University departmental lines. Faculty members from the departments of Chemistry and Earth Sciences, as well as Physics, work in areas similar to those of interest to the Institute.

A determination of the structure of metals and an analysis of them is done by Professor Gustaf O. S. Arrhenius, Department of Earth Sciences, and his staff.

A great deal of work in the theoretical interpretation of test results has been done by Professor Joseph E. Mayer, Chairman of the Department of Chemistry, and Professor Harry Suhl, of the Department of Physics. Dr. Mayer's theoretical research is toward the development of a statistical mechanical treatment of the various phenomena found through research.

Dr. Suhl was recently awarded a three-year grant of over $200,000 by the Air Force to continue his work in the theory of solids. The grant, which began February 11 followed a similar three-year Air Force grant which allowed Dr. Suhl to begin his initial studies at the UCSD campus.

Dr. Suhl, and his small staff of associates, including Physics Professor Donald R. Fredkin, working with him, are concerned with simplified theoretical models of superconductive and magnetic phenomena. At present, the power of these models to predict which actual alloys or compounds will be superconducting or magnetic is small.

"In order to make any progress at all, a theorist sometimes has to be quite brutal in simplifying reality to a 'stripped down' model," Dr. Suhl said. "Such models may be of limited practical value; they do, however, produce some clues which scientists study in order to build models of greater predictive power."

The aim is to gradually increase the complexity of the models until they resemble more or less what goes on in actual materials.

The theoretical work on superconductivity by Dr. Suhl and Dr. Mayer will provide a strong direct counterpart to the experimental program of the Institute carried on by Dr. Matthias and others.

For further information, call Paul West 459-2388, extension 1382, or 223-7748.