

THE DIRECTOR'S STATEMENT

1. Goals of the Unit

The ICS was approved by the UC Regents in May 1987. The mission of the ICS is to achieve an increased understanding of the crust and lithosphere of the earth, both on the continents and under the oceans, by utilizing the approaches of many disciplines and the expertise of scientists in academia, government, and industry.

The function of the ICS is to provide the research leadership, organizational structure and facilities to promote the cooperation of scientists from various research groups and organizations on problems concerning the earth's crust which are on a scale greater than those which can be studied by one investigator, or one group of investigators.

At present the research agenda of the ICS comprises the study of crustal structure and tectonics, how the crust is put together and deformed; crustal materials, what the crust is made of and what are its physical properties; earthquakes, how, when and where they occur in the crust and how strong they are; and, hazardous waste disposal, how industrial and nuclear materials can be safely disposed of in the crust.

2. Integration of university educational and research functions

Graduate students and postdoctorals are heavily involved in research activities of the ICS. At the ICS/Hollister Research Center, seven graduate students and two postdoctoral scholars have offices. For 1990/91, support was requested for over 30 graduate research assistants on grant applications submitted through ICS. For 1990/91, 15 research assistants were being supported on ICS projects. The Vadose Zone Monitoring Lab activity includes 3 of these students.

For 1990/91, 10 undergraduate students were employed as lab assistants on ICS projects. These positions range from routine assistance to conducting independent research.

Our unit has continued our seminar series where both on campus and off campus scientists lecture. During the past year we held 10 seminars at ICS. All seminars were well attended by graduate students, faculty, researchers, staff, and the community. In June the Institute for Theoretical Physics (ITP) and ICS jointly sponsored a three day workshop on earthquake dynamics. This workshop is part of our collaborative efforts on the Southern California Earthquake Center (SCEC), described below.

3. Role of ICS in Responding to Needs of the Public

The research agenda of the ICS impacts directly three areas of social concern: energy and mineral resources, public safety, and environmental quality.

Studies in crustal structure and materials concern the makeup of the crust which is the reservoir for oil, gas and mineral deposits. One ICS project is focusing on the deep structure at the south end of the San Joaquin Valley which is a rich petroleum province. Two ICS projects are studying the deposition of minerals and ores in fault zones. Research in earthquakes concerns both earthquake prediction and ground motion from earthquakes. We have a prediction project on the San Andreas fault near Parkfield, California, which is cooperative with the U.S. Geological Survey. Expected strong ground motion is being studied at several locations in California, in a project sponsored by the Nuclear Regulatory Commission and the USGS. The movement of hydrocarbons in soils and sediments is being studied in our Vadose Zone Monitoring Lab. This project is attempting to define controlling parameters on the migration of liquid and gas hydrocarbons in the soil above the water table (vadose zone). This is applicable to the mitigation of the problems from leaking underground gasoline storage tanks. The project is funded by the Environmental Protection Agency.

During 1988/89, we organized an Earthquake Advisory Group (EAG) within ICS. This is a group of Principal Investigators who can interface with the public and media on earthquake related issues. We are also preparing maps and displays for use in media interviews. Within the campus phone directory are listed the names and phone numbers of the EAG under the heading "Earthquakes." On June 28, 1991 the Sierra Madre earthquake struck the Los Angeles area early in the morning. The EAG organized a public response. That afternoon we held a news conference for the three local television stations. We displayed maps, seismograms, and a computer display of earthquake activity in southern California.

The ICS cooperated in an initiative to form an NSF Science and Technology Center. This center is named the "Southern California Earthquake Center". It was proposed to NSF in August 1989 through the University of Southern California. ICS is a major partner along with 6 other universities, and the U.S. Geological Survey. This project proposes studies by ICS in the areas of regional seismicity, subsurface imaging of earthquake zones, fault zone geology, seismic hazards analysis, and geologic (tectonic) history.

4. Goals of the ICS for the next 3 year period

We have three broad categories of goals for our research agenda: to increase the multidisciplinary character of our research programs; to build and strengthen research ties with departments, other universities, industry and government agencies; and to strengthen the ICS infrastructure.

Increasing the multidisciplinary character of our research will require more people and projects which cross traditional academic department boundaries. Projects involving Geological Sciences, Geography, Engineering, Materials Science, Environmental Studies and the Institute for Theoretical Physics are specifically targeted. ICS is hoping to attract new members and new research in cross-disciplinary fields. Remote sensing and geology is one of our current research activities which we plan to build upon. Also our program in Vadose Zone monitoring is expected to grow significantly. The SCEC project is providing multiple opportunities for multidisciplinary research. Joint research is underway between ICS and the ITP at UCSB, and between ICS researchers and those at other southern California institutions.

In the next few year ICS will focus its efforts in two major areas; earthquakes and hazardous waste disposal. Once the UCSB portion of the SCEC is functioning there is a good chance that we will be a top candidate for the next PASSCAL Instrument Center (PIC). This center would comprise about 25 portable seismic stations as part of a national facility. The other PIC is at Lamont-Doherty Geological Observatory of Columbia University. The role of the UCSB PIC would be rapid response to significant earthquakes, such as Loma Prieta. With the SCEC and PIC we would be expanding our professional staff of seismologists. ICS will become a major center for earthquake research. In the area of hazardous waste disposal, we are poised to begin major new projects with EPA sponsorship. These include a passive remediation research project, and development of nine new national monitoring standards. In addition, we are in discussions with EPA to be named as a National Center of Excellence. Such a step would mean a significant expansion of activity at our Vadose Zone Monitoring Laboratory (VZML), and increased international visibility. Beginning 1990/91 the VZML is involved in an exchange research program with scientists from the Soviet Union. The first soviet scientist arrived at UCSB in April 1991.

A continuing goal at ICS is for us to develop refined abilities for crustal imaging. This means the ability to handle multiple map view data sets, such as in a Geographic Information System (GIS), and also 3 dimensional subsurface crustal data. Three-D viewing has been developed by the petroleum industry for seismic reflection data. However, other types of 3-D data are also of interest. Also, merging of map and subsurface data is only beginning to be achieved. Our goal is to obtain a hardware/software system which can perform state-of-the-art image construction, and also permit novel applications such as animations.

Current problems which the VZML faces include an insufficient number of qualified personnel to pursue continually emerging research opportunities, and inadequate laboratory and office space. Even with additional space and furniture supplied at the expense of other ICS research efforts, the VZML still faces a productivity-limiting space restriction on a day to day basis. Relief of space limitations of the VZML is an important ICS goal.

ICS is rapidly becoming too thinly staffed (see next section). To date we have been functioning with temporary and student help. Fortunately, this assistance has been of the highest quality. However, the unit needs a career Senior Typist Clerk to function at its highest efficiency.

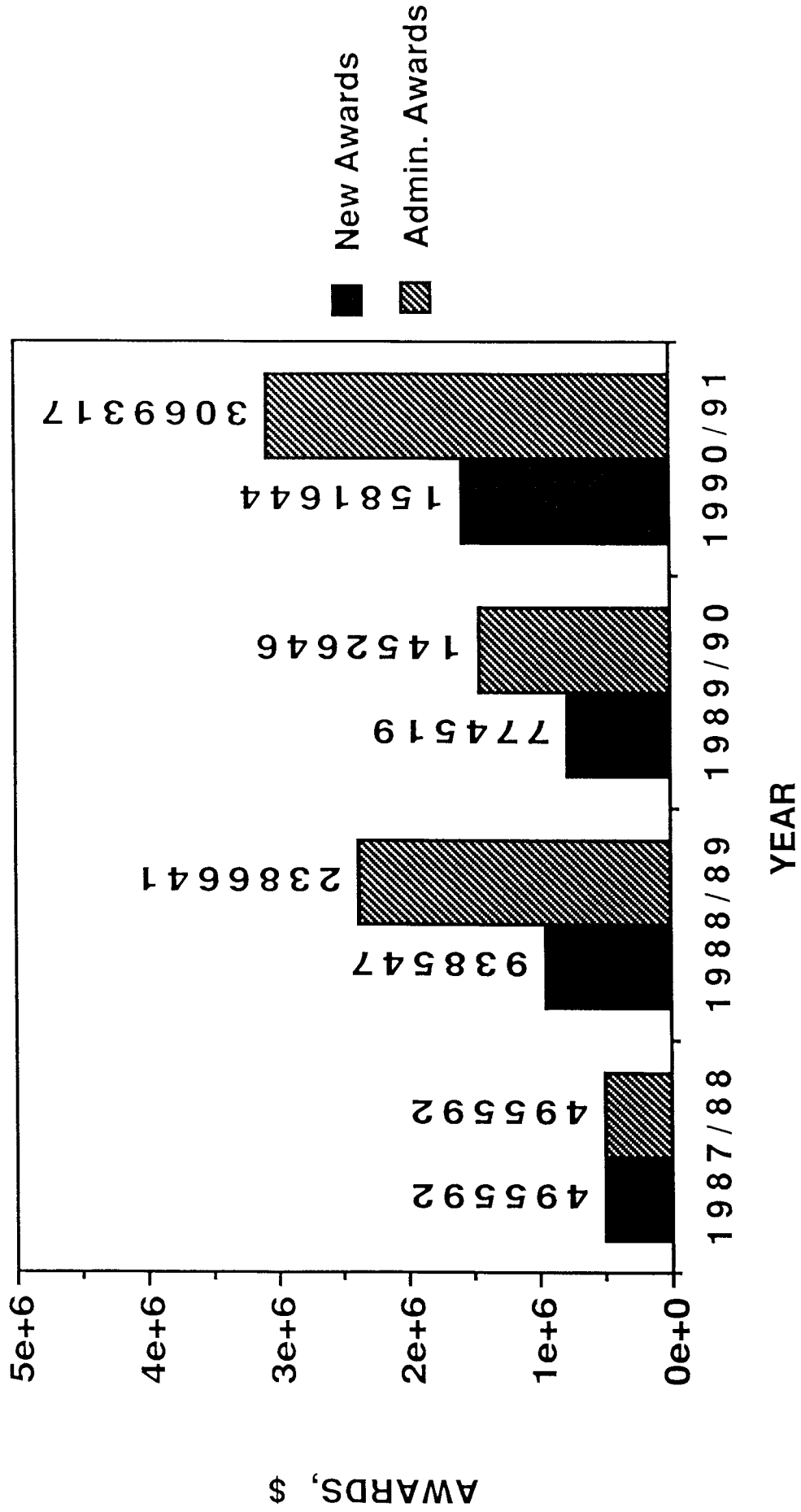
5. Concluding Remarks

The ICS is a recent UC initiative. The rationale for its formation is to provide a multidisciplinary research unit which can bring together scientists from academia, government and industry to work on several pressing problems in earth sciences. The ICS has focused its research agenda on the earth's crust for several simple reasons. The crust contains our oil and mineral resources, it holds our water supply, mankind disposes its industrial and nuclear waste in the crust, most of the world's earthquakes occur within the crust, and the crust contains our most tangible record of earth's history. Given the intellectual and social importance of these issues, it is imperative that UC seriously partake in this research enterprise.

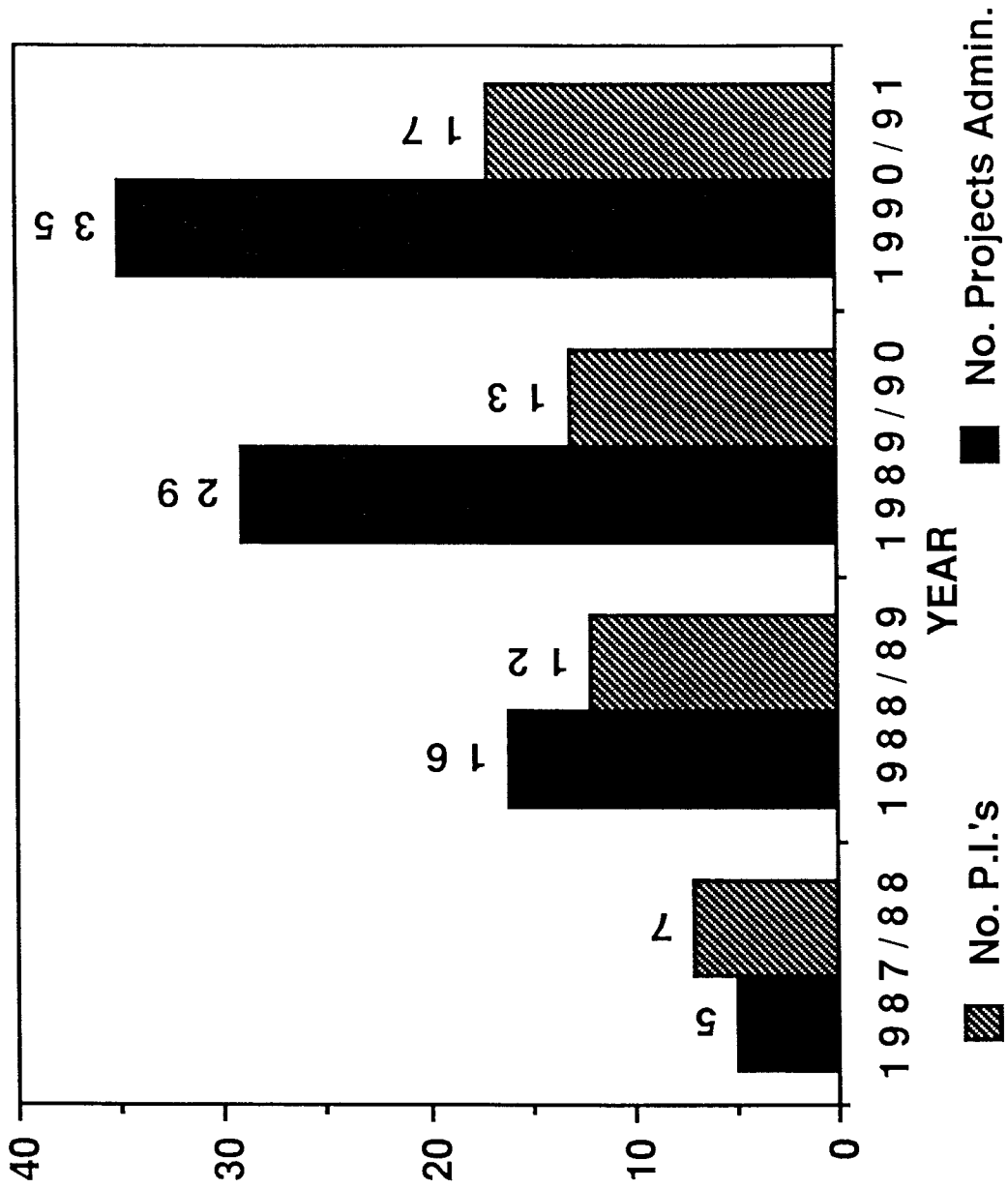
Our current funding level of administered projects for our research agenda is roughly three million dollars; we expect to easily double this over the next 3 years. ICS has a strong record of growth since its inception in 1987/88 (see Figure). At that time total awards administered amounted to \$496K. This past year we administered \$3,091K and with total new awards of \$1,582K. Over the past four years the number of administered projects has increased from 5 to 35, or seven-fold, and the number of Principal Investigators has increased by a little over a factor of two, from 7 to 17 (see Figure). This is in the face of an unchanging number of ICS staff. Not only have the PI's been more productive, but obviously the staff has worked harder and more effectively. Our publications in the ICS contributions inventory increased to a total of 86 submitted and published papers since inception of the unit.

ICS is well on its way in achieving its goals on several fronts. We have built strong ties between off-campus research agencies and the petroleum industry. We have a cooperative research agreement with the EPA where they have ranked us third out of 100 programs in quality. One of our research projects involves collaboration with the Jet Propulsion Laboratory, Pasadena. Our San Andreas fault experiment at Parkfield includes close cooperation with the US Geological Survey. The San Joaquin Valley project includes the exchange of information and data with the oil industry, and also graduate student support. Companies we have strong ties with include ARCO, AMOCO, Chevron, and Unocal. This year we initiated a project in the COSO geothermal area of Eastern California; this research involves close cooperation with the California Energy Group, an industry consortium. A project in Antarctica is cooperative with faculty at San Diego State University. The SCEC activity is developing ties with researcher from across the nation and the world. Currently visiting ICS are earthquake researchers from the U.S.G.S., M.I.T. and the U.S.S.R. Academy of Sciences.

ICS FUNDING HISTORY



ICS: NUMBER OF PRINCIPAL INVESTIGATORS AND ADMINISTERED PROJECTS



NUMBER