INTERNATIONAL COOPERATIVE VENTURES
at the University of Alaska-Fairbanks

The United States is increasingly dependent on cooperation, trade and political alliances with other countries, and the future of our nation will depend more and more on international competence at all levels in our society. Universities have an important role in developing such competence. In recognition of this, UAF Chancellor O'Rourke in his convocation address at the beginning of the 1984-85 academic year called for increasing international competence at UAF.

What is international competence? It is the ability to communicate with other peoples. It is to recognize, understand and respect the differences between our customs and idiosyncrasies and those of other peoples. It is the willingness to work with and learn from other nations and peoples.

In what ways can a university like ours improve its international perspective and increase its international competence? First, it can emphasize knowledge about the rest of the world, not just in history or geography courses, but in the sciences, in engineering, economics, and all subjects in which we normally focus on domestic issues and needs. Second, the university can require capability in at least one other language for all its students. Third, the university can recruit students from other lands, especially at the graduate level; participate in exchange programs; organize study terms for our own students in foreign countries; and hold international courses, seminars and meetings on campus. And, fourth, the university can promote projects of international cooperation in the sciences, arts, and humanities.

Let me dwell in more detail on this last point, focusing on international cooperative projects in science. Some scientific disciplines demand international cooperation because of their intrinsic nature. This is why scientific cooperation is a very old concept. In ancient times travellers exchanged information needed to develop maps. In astronomy, exact measurements at different locations on the earth of astronomical events like the transit of Venus were conducted in tightly coordinated fashion as early as the eighteenth century. Cooperation is indeed necessary whenever simultaneity of measurements at different places is required. That is why geophysics is a science for which international cooperation is essential and is most developed, as illustrated by such major international cooperative enterprises as the International Geophysical Year, the International Geophysical Year, the International Geophysical Year, the International Geophysical Year, the International Geophysical Year, the International Geophysical Year, the International Geophysical Year, the International Geophysical Year, the International Geophysical Year, the International Geophysical Year.

The Geophysical Institute is strongly involved in international cooperative programs. For instance, we have a scientific personnel exchange agreement with the National Institute of Polar Research in Tokyo, Japan, and formal cooperative research agreements with the Technical Research Center of Finland and with the Polar Geophysical Institute of the Soviet Academy of Sciences in Apatity and Murmansk. We also have formal and informal agreements with institutions in many countries for specific, more narrowly defined research projects, involving scientific equipment, field stations and observatories. Finally, many of our faculty are members or leaders of international commissions, such as the various scientific bodies affiliated with the international Council of Scientific Unions.

What benefits do we obtain from these international ventures, and what benefits will Alaska get from increased international competence at its public university? First and foremost, international competence brings the world to our students. It broadens their minds and sharpens the skills they will need in dealing with people in their future professional lives in a world that will be more internationalized than ever. Second, international competence brings Alaska to the world. As foreign students return home; as our faculty go out to teach in foreign lands; as our scientists work in, or work with, other countries; as we participate in science policy planning in international organizations, we all convey facts about the opportunities and the concerns of Alaska to the world.

Alaska Governor Sheffield, and Fairbanks North Star Borough Mayor Allen, leaders of our community, businesses and cultural organizations all are keenly interested in the development of commercial and cultural ties with Pacific Rim nations. The economic future of interior Alaska and perhaps of the state as a whole may depend on this. It will take far more than colorful brochures and convincing speeches—it will require person-to-person contacts. To succeed, we must develop our international competence. And it behoves our public university to play a leading role in this endeavor.
Cooperation in Science

WHAT ARE THE MAJOR SCIENTIFIC PROBLEMS IN ALASKA?

The above question is not easily answered if one includes the physical, biological and social sciences as well as engineering. A group of scientists and engineers under the auspices of the National Academy of Sciences did try to answer it recently in response to the new Arctic Research and Policy Act, signed by President Reagan in July of last year (see Quarterly, Vol. 3 No. 2). They actively considered the Arctic as a whole; the table (right) shows their simplified answer for Alaska only.

Issues important in Alaska are identified along the top of the table and include resources, pollution, health and Native culture, among others. Along the left are listed the various scientific disciplines in which research might be conducted to address these issues. Each square marked on the table represents an area in which additional research is needed.

The table cannot give the details of needed research, of course. These are contained in the National Academy Report. An example may illustrate the scope: in Alaska the issue of energy and minerals must include oil and gas, coal, hydropower, wind and solar energy, as well as minerals. Research needed in this area includes improving exploration methods for the resources, studying natural hazards such as sea ice and permafrost, and finding designs for extraction structures that best protect the environment for the least cost. This comprehensive research effort involves the disciplines of oceanography, glaciology (snow, ice and permafrost), geology, engineering, biology and economics, as well as others in a less direct manner.

![Table showing research topics and issues in Alaska](image)

WHAT IS INTERDISCIPLINARY SCIENCE OR “BIG SCIENCE”?

The previous paragraph makes it clear that many different disciplines must be involved to study any one of the important issues in Alaska. When scientists in these disciplines work jointly on a predetermined plan of research, conducting field studies together, sharing data, and analyzing the results together, we have an interdisciplinary or “big science” cooperative project. Since each discipline brings a different viewpoint to the study, most important aspects will get attention and the research results will be much more useful than those from individual studies. Not all problems require “big science” research, however; often “little science” projects are adequate for solving problems.

WHAT IS ORGANIZED RESEARCH?

Obviously universities, where most of the basic research effort is being carried out, must be able to address important issues such as those raised above. This is done through full-time, “organized” units whose prime function is to conduct such research. The largest organized research unit of the University of Alaska is at Fairbanks where several major research institutes are located. These institutes came about because there were needs for specialized research. Some of them were created by the State Legislature, and one, the Geophysical Institute, by an Act of Congress. Together they constitute an impressive interdisciplinary scientific asset for the state and they rank high on the list of the nation’s research institutions.
Examples of Science Cooperation in Alaska

ROCK DATING IN ALASKA

Alaska is a storehouse of energy and minerals. The known resources are impressive in terms of both energy (Prudhoe Bay and associated oilfields, Arctic Slope coal deposits and Aleutian geothermal systems) and minerals (notably in the western Brooks Range). The as yet undiscovered energy and mineral resources of Alaska may be even more impressive, but are still unknown because less than ten percent of Alaska's geology has been mapped in detail. Earlier reconnaissance mapping missed such world-class ore deposits as the Red Dog deposit in the Brooks Range.

In order to piece together a picture of these resources, much more must be known of the structure of the earth's interior, including the age and location of its layers, folds and plate boundaries. A number of geophysical methods are used to determine these. One is age-dating rocks by the potassium-argon method: by measuring small quantities of argon gas that builds up in rocks from the radioactive decay of potassium, their age can be determined back billions of years (see Quarterly, Vol. 2 No. 3).

The potassium-argon geochronology (rock-dating) laboratory at the Geophysical Institute is a cooperative venture between the Institute and the state's Division of Geological and Geophysical Surveys (DGGS). The laboratory is now in its third year of cooperative operation. Under the agreement, DGGS provides funds for supplies and maintenance and for all the laboratory technicians, and the Geophysical Institute provides the salary of the laboratory supervisor, Professor Don Turner. Recently ARCO Alaska, Inc. and the United States Geological Survey joined the cooperative program, and share the more than 200 age determinations made annually.

EARTHQUAKES IN ALASKA

Over ten percent of the world's most severe earthquakes occur in Alaska—more than in any other state, including California. Studies of earthquakes help in identifying zones where seismic risks are high, in designing earthquake-resistant structures, and eventually in forecasting when and where the earthquakes will occur.

A unique cooperative network of seismic stations is operating in Alaska (see map). Compared with California where there is one seismometer for every 246 square miles, Alaska has only one seismometer for every 4,767 square miles. Because of financial constraints it has proven very effective to operate this limited network in a cooperative fashion. Data from seismometers of the United States Geological Survey and the National Oceanic and Atmospheric Administration are freely exchanged with the data from the Geophysical Institute. The State of Alaska, through its Division of Geological and Geophysical Surveys, supports most of the Geophysical Institute's network. Over 90,000 Alaskan earthquakes ranging from Richter -1 to 9.2 have been catalogued at the Geophysical Institute, and over 10 earthquakes per day are recorded by the seismic stations.

The agreement between state and federal agencies and the University of Alaska is an excellent example of cooperation in science in Alaska.

ALASKA TUNDRA STUDIES

How will energy development affect the arctic tundra? Recognizing the importance of this question, the U.S. Department of Energy is sponsoring a long-term research program with the goal of understanding and predicting the response of the tundra. Known as the R4D Program (response, resistance, resilience, recovery, and development), the complexity of this study makes it an imperative for the interdisciplinary or "big science" approach. The Woods Hole Oceanographic Institution and seven different universities are involved in R4D; the Geophysical Institute and five other research units on campus are contributing to UAF participation. Dr. John Kelley, of the UAF Institute of Marine Science, is the Program Coordinator.

Studies will be conducted year-round. A watershed on the north slope of Alaska in the foothills of the Brooks Range was chosen as the site for the initial experiments. These experiments will then be extended to other arctic areas. It is hoped that within the next five years information on the effects of altered drainage, nutrient balance, plant production and population dynamics, etc. will be available for use in energy-related development.
STRANDLINE LAKE OUTBURST FLOOD

The Triumvirate Glacier, about 100 miles west of Anchorage, is a natural ice dam on Strandline Lake. When the lake fills to the top, the water partially lifts the ice and the entire lake drains rapidly through a huge tunnel ripped out of the ice by the water masses. About ten billion cubic feet of water and ice blocks are discharged into Beluga Lake and the Beluga River, threatening power transmission lines and any persons in the area. This outburst flood has been observed eight times during the past 40 years and has been studied in detail by Professor Carl Benson twice, in 1982 and 1984. The latter was a cooperative study funded by the Alaska Division of Geological and Geophysical Surveys, the Chugach Electric Association and the Flood Forecast Center of the National Weather Service.

STREAM ICINGS IN ALASKA

Stream icings, also known as aufeis or naleds, occur throughout Alaska in winter, when water under pressure overflows the ice cover of streams and rivers, and freezes. This often poses hazards to roads, bridges, and homes in low-lying areas. Ken Dean of the Geophysical Institute used satellite images to map the occurrence of these icings, which are most frequent in the Brooks Range and the Alaska Range. The study was funded by the Alaska Division of Geological and Geophysical Surveys.

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