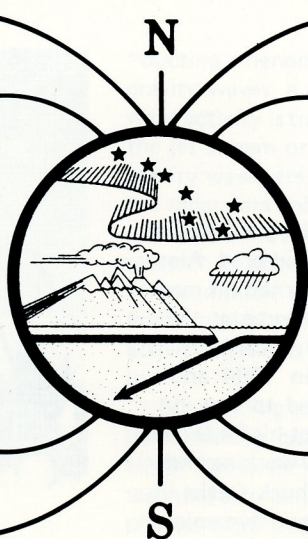




The Geophysical Institute QUARTERLY

Editors: Carla Helfferich
Sue Keller
(907)474-7798

Vol. 5, No. 3

University of Alaska-Fairbanks

April 1987

STUDENTS—OUR MOST IMPORTANT PRODUCT

The process of educating graduate students is one of the most important functions of the Geophysical Institute. Over the past 32 years, 67 Ph.D. and 112 master's degrees have been granted to students in the Geophysical Institute. Those degree recipients now have jobs here and abroad, in federal and state agencies, private industry, public and private schools, and universities, with several in charge of major research programs.

Faculty members of the Institute actively recruit students for the graduate program from all over the world, and top-notch students continue to be attracted into the various fields of research. While the competition for graduate stipends and teaching assistantships is stiff, the real work starts after a student is admitted. In addition to the required course work, a Ph.D. graduate student must study for and pass comprehensive examinations, and produce a dissertation based on original research. Each graduate student works under a faculty advisor and a faculty committee, and the committee members approve the final dissertation. A majority of the master's students at the Geophysical Institute do research and write a thesis, even though there is a no-thesis option. Most of the graduate students here have such busy schedules that they feel they have little time for outside activities, yet many have managed also to become involved in demanding avocations, from mountaineering to modern dance. Their self-chosen heavy load often prepares them for the busy schedules they will have as professional scientists.

The research projects for seven of the fifty students presently working toward graduate degrees here are briefly described on the following pages. Please note that these young scientists are not being presented as "typical" students; at the Geophysical Institute there really is no such creature. The truth is that—between field work and study hours—these are the ones we could catch.



Going out with a grin: Wolfgang Raatz leaves behind his days as a Geophysical Institute graduate student as he receives a doctoral hood from his smiling major professor Glenn Shaw (left) with some help from UAF Chancellor Patrick O'Rourke (right). The final visible smile (below the Chancellor's hand) belongs to Director of Admissions Ann Tremarelo. (Photo by Sabra McCracken.)

GEOPHYSICAL INSTITUTE GRADUATE STUDENTS



Rodney Viereck, a born-and-bred Alaskan, earned his master's degree at the Geophysical Institute in 1984 and decided to stay on and get his Ph.D. He is now working under

Dr. Chuck Deeher in the area of upper atmospheric dynamics, and hopes to finish the degree late this fall.

Rodney has been studying the effects of gravity waves on the upper mesospheric airglow which lies between 80 and 100 km. To do this, he has used spectrometers, optical instruments that divide light into its spectrum. Airglow, a dim light in the night sky, is produced at high altitudes when molecules such as ozone and hydrogen react to produce oxygen, hydroxyl, and photons. Based on the intensity ratios of several light wavelengths, Rodney has been able to observe the temperature in the upper mesosphere which varies from -50 to -100°C . Since many researchers have already made single-point observations of the mesosphere, Rodney expanded the technique to include scanning; thus he has been able to study horizontal wave movements. Much of his information gathering has been at Poker Flat, but Rodney also has had the opportunity to take data at the Longyearbyen Northern Lights Observatory on Svalbard during three extended visits there. In addition to adding to the general body of knowledge about our environment, studies like this help our understanding of the energy balance of the atmosphere and of phenomena in the mesosphere that are known to buffet the space shuttle about during re-entry.

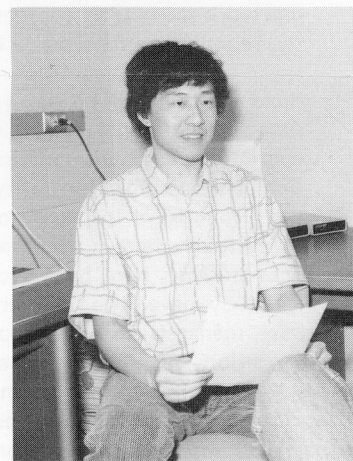
April 15 is the latest possible date in the spring for collecting airglow data at Poker Flat because of increasing day length, so Rodney now must be content with working up his data on the computer and writing his dissertation. Once this project is concluded, he hopes to be able to find employment that will take him to Antarctica to do research on the "hole" in the ozone layer. (Timed photo by Rodney Viereck.)



—specifically salt in the freezing process of his field work. Vic Gruol and Grant Li, shown in the photo above, recording data and temperature. He says one of the most exciting— finding the annual freezing of the ice cause rapid infiltration of salt through the ice.

During the past year, others have conducted both spring and summer work out onto the ice. They and took data. Even though hard work, they return each evening to the Hotel where some cooking and the

Grant was recognized as Outstanding Student in 1986-1987. He is currently a resident in Alaska and is being interviewed by Tom Osterkamp.



Normal University helped him a lot in learning English.

Li, shown in the photo above, working with Dr. Deeher in the wave research project.

Grant Baker, a student of Dr. Tom Osterkamp, is currently writing his Ph.D. dissertation. A research assistant on National Science Foundation funds, Grant has been studying frozen soils distribution during the summer. He has done most of his field work in Prudhoe Bay, where (right) are pictured Grant and his research assistant. The subsea permafrost is the most significant—and his research is that the permafrost bed appears to be made of large amounts of ice.

For years, Grant and his research assistant have been doing field work, in which they hauled equipment and drilled holes. Although this was very hard work, it was lucky enough to be in Prudhoe Bay where else did all the work supply was endless. Grant was selected as the research assistant in Geophysics for the summer to find employment for the graduates. (Photo

“ducting phenomenon” of atmospheric gravity waves, a phenomenon in which wave activity is trapped at certain levels by the jet stream or air temperature. Since gravity waves are not visible, he relies on the radar data collected at Poker Flat to reveal the motion field. Most of the research Li does involves sitting in front of a computer screen, where he creates mathematical models based on jet stream activity that occurs 30,000 ft or so above us.

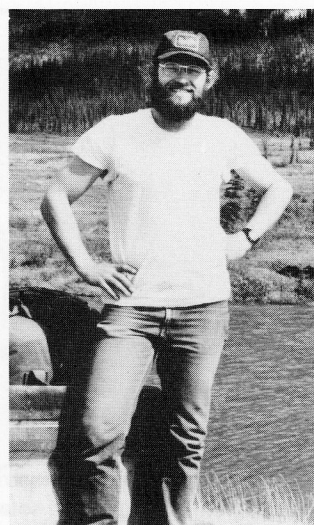
Li's funding as a graduate student has been through grants from the Office of Naval Research. He plans to have a teaching assistantship this summer in the physics department, a fulfillment of the requirement that all master's students in physics do some teaching. Li wants to earn a Ph.D. degree after his master's, and he will eventually return to Shanghai. (Photo by Jim Coccia.)



Pat Moore, one of Dr. Gene Wescott's graduate students, recently passed the comprehensive examinations for her master's degree, which she hopes to finish by December. Her area of

research is controlled-source audio magnetotelluric (CSAMT) surveys. She is analyzing data taken near Mt. Spurr, an active volcano about 100 miles west of Anchorage, to model possible geothermal reservoirs. The data were taken by Gene Wescott, Don Turner, and others in 1985, using a generator and a receiver placed up to ten kilometers away. The current is sent down into the earth and the resulting electric and magnetic fields are recorded at the receiver sites. From the ratio of the electric to magnetic components at a wide range of frequencies the electrical resistivity vs. depth can be calculated. Since hot geothermal water or steam drastically lowers the resistivity of the rock reservoir, very low calculated resistivity can indicate the presence of a resource.

Pat will spend the next several months doing a mathematical analysis of the Mt. Spurr data to refine preliminary conclusions about thermal sources in the area. She is thankful that the computer programs she is using have already been written and refined—writing such lengthy programs themselves could take a year. (Photo by Don Turner.)



Gerald Walker, a geophysics Ph.D. student of Dr. Koji Kawasaki, will soon finish his dissertation on the use of transient electromagnetic resistivity in detecting permafrost. This method can be used to determine the depth

and thickness of permafrost. Gerald, pictured above, has tested a total of 42 sites along the trans-Alaska pipeline and in Prudhoe Bay. To do this, at each site he set up a generator-operated transmitter, spread a square of insulated wire 500 meters on a side flat on the ground, and placed a receiver coil in the center of the square. As he sends current through the wire, he creates a magnetic field around the wire that penetrates deep into the ground. Abruptly terminating the current produces eddy currents in the earth which are detected by the receiver coil. Since permafrost has a higher resistance to electricity than does unfrozen ground, the amount of electromagnetic radiation he receives back will tell him whether there is permafrost below (the radiation received back is lower with ice below).

Gerald first came to Alaska in the military when he was stationed on Murphy Dome. He returned to the Lower 48 and earned a master's in quantum electronics and finally came back to Fairbanks. After teaching electronics at TVCC for a few years he entered the Ph.D. program here at the Institute. He has been a teaching assistant as well as a research assistant with funding from the National Science Foundation and other sources. He vows to remain in Alaska to work after graduating. (Photo by John Petersen.)

Graduate student Li Yuan has come to the Geophysical Institute from Shanghai, The People's Republic of China, to work on his master's degree. While earning his bachelor's at the East China University, he devoted one year to geophysics studies here. The above photograph, is of Li Yuan and Fritts on a gravity survey. He is studying the

(Continued on next page)



IN 1985 when Changquan Wei was finishing his master's degree at Peking University, his professor there told him about the Geophysical Institute in Alaska. Changquan sent an application and was accepted as a student; he was finally able to make the journey here eight months ago to begin work on his Ph.D. under Dr. Lou Lee.

Changquan, pictured above, has decided to do his dissertation research on FTEs. This is an acronym for flux transfer events, the entry of solar wind into the earth's atmosphere through the "closed field line." (The logo on page one of this *Quarterly* shows the earth's magnetic field; solar wind moves from left to right and causes FTEs on the far left.) For his research Changquan will use ground data, as well as satellite

information from instruments that have detected solar wind particles in the atmosphere on the sun side or "subsolar region" of the earth's magnetic field. But before he becomes a Ph.D. candidate he must pass comprehensive exams, both written and oral. He will take the written exam next May.

Changquan's home is Beijing, The People's Republic of China, a city of over 10 million, so it is not surprising to hear him say that Fairbanks is a quiet town. (Photo by Jim Coccia.)

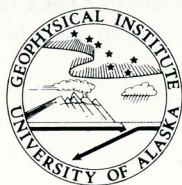


BECKY MCQUEEN is a solid earth geophysics graduate student working with Dr. Gene Wescott. She plans to complete her master's degree this August. For her thesis research she has collected several seasons' worth of gravity data from 350 sites near North Pole, Alaska, for the purpose of mapping the bedrock. Solid bedrock has a greater gravitational pull than more porous rock, and readings on a gravimeter are higher where rock is more dense; thus a "bedrock map" can be made using gravity data. To collect her data Becky worked from her car in some areas, but in other areas she had to pull her gravimeter (which looks like a big silver coffee pot) from site to site on a sled, either by snow-machine or on foot (see Becky's photo above).

She got started on this project because the area has been a center for earthquake swarms, and it is suspected that a seismic fault lies buried there. Becky plans to use the gravimeter data, and data on the magnetic properties of the bedrock, in mathematical models to help her find out whether there is a fault in the area. Such information on earthquake hazard risk might influence construction techniques and overall future development in North Pole.

Becky worked as a graduate teaching assistant when she started the research for her master's, but she is now employed as a photographer in the Rasmuson Library archives. She hopes to be able to combine her talent as a photographer and as a mapper to become a remote sensing scientist.

GEOPHYSICAL INSTITUTE
University of Alaska-Fairbanks
C.T. Elvey Building
Fairbanks, Alaska 99775-0800



Nonprofit
Organization
U.S. Postage
PAID
Permit No. 2
Fairbanks, Alaska
99775