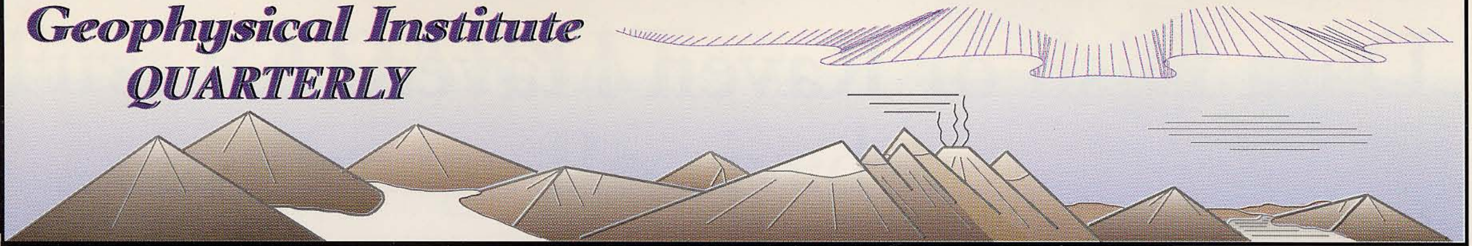
Geophysical Institute
QUARTERLY



Volume 13: No. 2-4, 1995

World's Most Studied Glacier Surges Again

WILL HARRISON

While eating breakfast one morning last summer, institute Professor of Geophysics Will Harrison watched a lake of muddy water form in a gravel depression below Variegated Glacier.

Before lunch, the lake had drained away in a river of black sediment.

These indications of a surge played out against a background of fractured ice on the upper two-thirds of the small glacier in southeast Alaska.

The glacier, which extends for 10 miles from its head in the Saint Elias mountains to its foot in Russell Fjord of Yakutat Bay, moved hundreds of yards by the end of summer.

The 1995 surge of the upper part of Variegated Glacier surprised scientists by starting at least four years ahead of schedule—the surge began only 13 years after a previous one in 1982. The 1982 surge and the surge of the Variegated Glacier preceding it adhered to 17-year cycles. Scientists believe the glacier has surged at least six times since 1905, and that it will follow similar surge-and-rest patterns in the future.

Harrison will return to Variegated Glacier this summer to see if the lower part of the glacier will move, thereby completeing its most recent surge before slumbering again for at least another decade. In 1982, the glacier surged in two distinct stages, taking nearly two years to move two miles.

Although relatively small, Variegated Glacier is undisputably the most studied surging glacier in the world, thanks to Harrison and University of Washington Professor Charlie Raymond.The pair initiated an exhaustive study of the ice field nearly 25 years ago.

Their work, which began in 1971 and continued for more than a decade, set the stage for an international research effort to understand the mechanisms underlying the surging glaciers of the world. During field seasons, scientists from around the globe joined them in performing a battery of tests, which included drilling boreholes to the bed of the glacier and making direct observations of its surface.

Prior to their research, little was known about what makes glaciers surge. The team eventually discovered that bad plumbing, not climate, was the primary cause.

"Surges occur when a glacier's internal plumbing system fails. The failure leads to high water pressure under the glacier, then probably to partial floatation," Harrison said. "The result is a loss of friction, and then movement downhill at a high speed."

Harrison and Raymond chose Variegated Glacier as the site for the intensive international research because it passed all the right tests.

"It is accessible in summer and winter. It's not too big, and it has a documented history of surges," Harrison said.

"Another important consideration was that we could get around the entire thing on skis," he said. ✦

INSIDE THIS ISSUE

Data Dish or Raven Haven?

Ravens trying to woo their mates pecked holes in expensive equipment on the roof of the Geophysical Institute this winter.

In between impressive aerobatics, the birds ripped open a portion of the weather-proof fabric that covers the radome, the white structure that projects out from the center of the blue tracking dish on top of the institute's Elvey building.

The dish, or reflector, receives data from a series of polar-orbiting satellites and relays it to the Alaska Synthetic Aperture Radar Facility on the second floor of the building.

Even one peck through the radome cover, an airtight, pressurized unit designed to prevent water, moisture, or snow from getting into the data-receiving mechanism, can damage sensitive equipment.

FILE PHOTOS BY JIM COCCIA

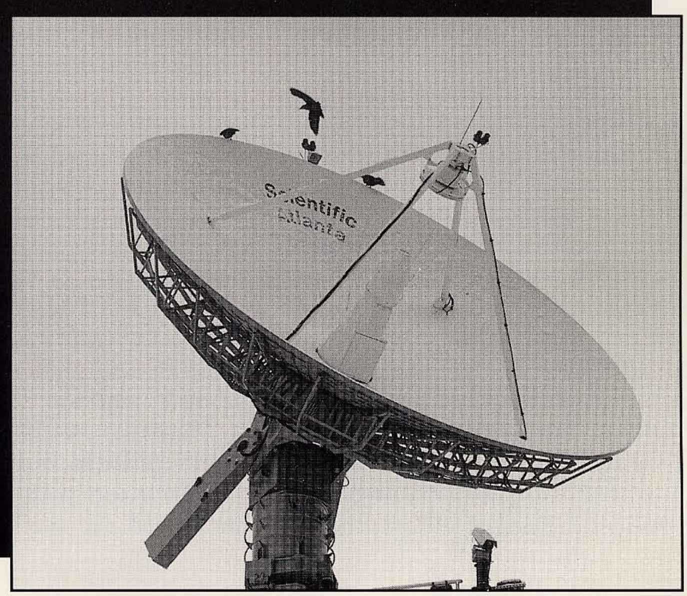
"Even a slight break in the airtight seal can allow moisture from blowing snow to get into the equipment and potentially cause thousands of dollars worth of damage," said ASF Chief Engineer Brett Delana.

"Even a slight break in the airtight seal can allow moisture from blowing snow to get into the equipment and potentially cause thousands of dollars worth of damage," said ASF Chief Engineer Brett Delana.

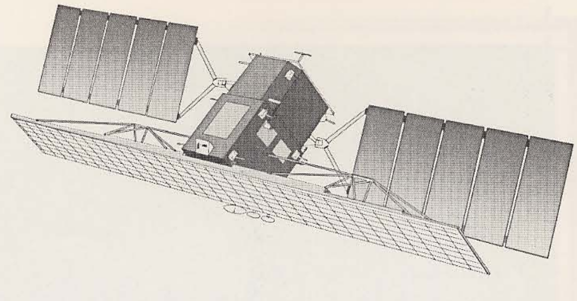
When arm waving and shouting didn't shoo away the ravens, wildlife officials suggested using a 12-gauge shotgun to send modified firecrackers into the air near the reflector to scare the birds.

Research Technician David Sanches, who monitors the dish (and the ravens) on a small screen in the ASF control room, is in charge of firing the gun when the birds get destructive.

"Dave Sanches has been designated as the Geophysical Institute's official ravenator," said Operations Manager Bob Grove. ✦



First RADARSAT Image Received



The Alaska Synthetic Aperture Radar Facility recently received its first test data transmission from the fourth SAR-carrying satellite it supports—RADARSAT.

ASF expects to begin receiving data from RADARSAT, Canada's first earth observation satellite, on a regular basis in late March.

Because the SAR carried by RADARSAT can acquire data about Earth's surface day or night, through clouds or smoke, it is a versatile tool for any field that relies on remote sensing techniques.

SAR data acquired from RADARSAT, which was launched in November 1995, will be used to support scientific work within a variety of research areas, including geology, glaciology, oceanography, volcanology, forestry, agriculture, hydrology, and sea ice studies.

In addition to RADARSAT, which completed its 1000th orbit on January 13, ASF supports two European Remote Sensing satellites (ERS-1 and ERS-2), which were launched in July 1991, and April 1995, respectively, and the Japanese Earth Resources Satellite (JERS-1), which was launched in May 1992.

ASF now receives an average of more than 70 minutes of data each day, even though the NASA-funded facility initially was designed to take in only 10 minutes of data each day.

Changes in equipment over time have enabled the facility to increase its data-collecting capacity.

Black-and-white and color-enhanced versions of the first RADARSAT image, which depicts Cape Breton Island in Nova Scotia, Canada, can be viewed on a special Internet page set up by the Canada Space Agency (http://radarsat.space.gc.ca/). ✦

EVELYN TRABANT

ADEOS Data-Receiving Dish Gets a Lift

An antenna soon to receive data from a Japanese-owned satellite designed to monitor the earth's environment recently was installed near a student campground on the West Ridge of the University of Alaska Fairbanks.

The antenna, constructed by contractor Scientific Atlanta, stands almost 70 feet (21.5 meters) tall when the dish is tilted vertically.

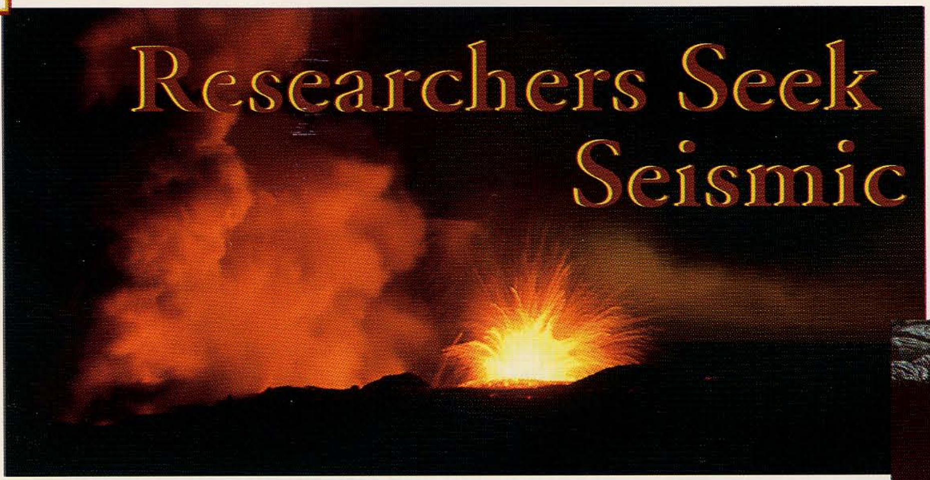
The antenna's reflector, or dish, which measures 45 feet (11.2 meters) in diameter, is positioned near tree line so satellite data can be received from at least two degrees above the horizon.

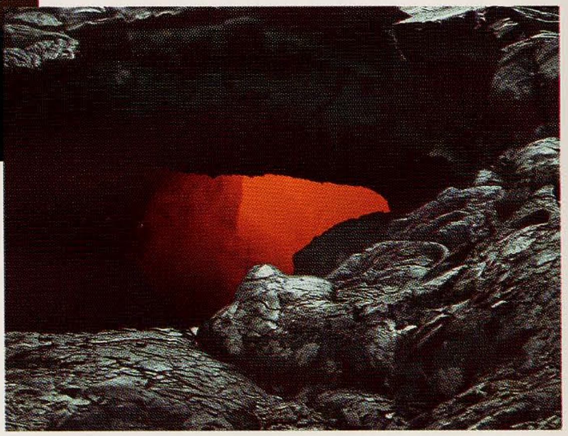
The antenna and its associated receiving system is undergoing detailed testing so it will be ready to receive data from the Advanced Earth Observing Satellite, which is scheduled to be launched into orbit in August.

ADEOS will carry a suite of sensors to monitor climate change and instruments designed to explore the global environment as part of NASA's "Mission to Planet Earth" program. In addition to revealing new information about the earth's climate, data gained from the satellite is expected to aid in international resource management, according to Carl Wales, project director for the Alaska Synthetic Aperture Radar Facility.

When tests are complete, ASF will operate the NASA-owned antenna and associated receiving system. ✦

Researchers Seek Seismic Secrets in Hawaii





An experiment designed to help researchers find out more about the earthquakes that occur when volcanoes erupt was set up near Hawaii's Kilauea Volcano this winter.

More than $1.5 million worth of equipment, including 116 seismic stations, was deployed in a unique array around the volcano by an international team of scientists from Japan, Italy, Hawaii, California, and the Geophysical Institute.

The seismic network, which contains the highest number of seismic stations ever to be deployed on a volcano for an experiment of this type, took nearly three years to design. The unique array is being used as a test case; if all goes well, researchers hope to deploy the same configuration at other volcanoes around the world.

Information gleaned from the network should enable scientists to make more accurate predictions about when volcanoes will erupt and to determine potential hazards in nearby areas.

Most networks used as a basis for forecasting eruptions contain only about 10 seismometers at the base of a volcano, according to Volcano Seismologist Steve McNutt, one of three scientists from the Geophysical Institute to help install the network in Hawaii. Working with McNutt were Associate Professor of Geophysics Doug Christensen and Research Assistant John Benoit, a graduate student working toward his doctorate degree in geophysics.

Funds for the experiment were provided by the Ministry of Education in Japan, an island that is home to 58 potentially active volcanoes.

"Every year, volcanoes in Japan erupt and cause property damage or take lives," McNutt said.

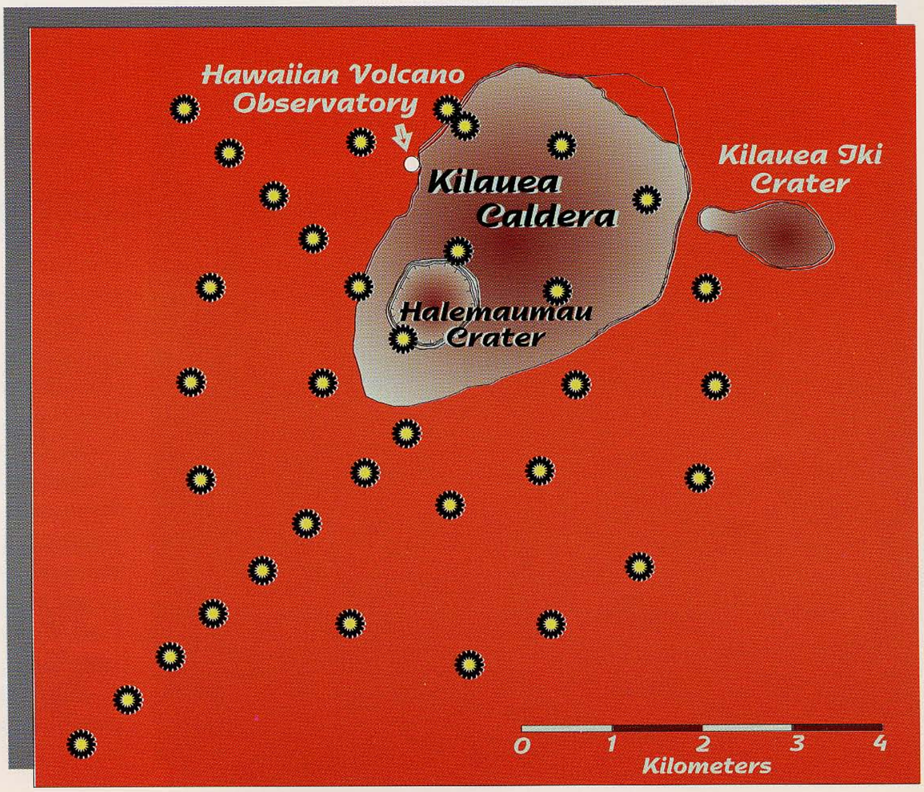
Japan's trouble has prompted scientists in that country to become some of the world's leaders in volcano seismology. Funding for the cooperative project in Hawaii was distributed through University of Tokyo Professor Yoshiki Ida, the principal investigator for the project.

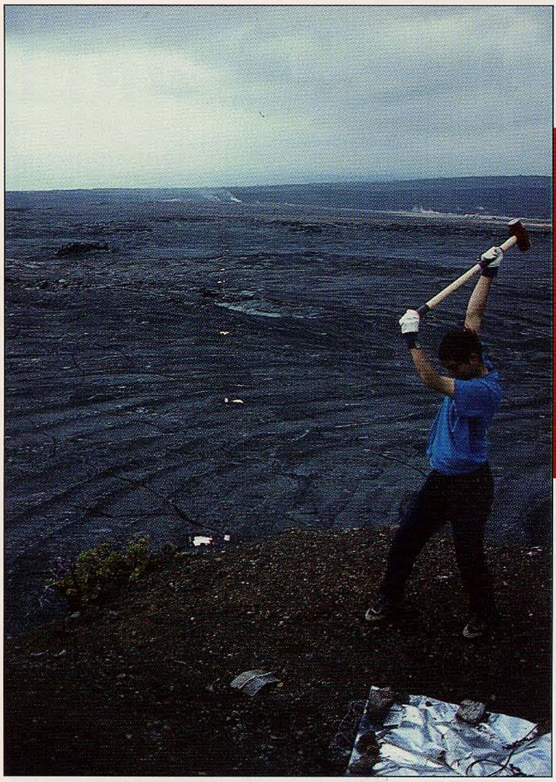
The massive network around Kilauea Volcano is designed to help scientists understand some of the little known physical characteristics about earthquakes associated with eruptions, such as where and how many of the earthquakes originate.

Researchers hope to design models based on data from the Hawaiian network that will help them distinguish among the variety of wave types and frequencies earthquakes produce.

"Just as white light breaks out to different frequencies that appear as a variety of colors in a rainbow, seismic waves traveling at different frequencies can illuminate different parts of a volcano," McNutt said.

The team selected Kilauea as the first volcano to be fitted with their seismic network because the dome has a history of eruptive activity and good access. ✦





SEISMIC STUDY—These photos, taken by Research Assistant John Benoit, show various aspects of volcano research in Hawaii. A littoral explosion, created when lava hits ocean water, is pictured in the upper left corner of the opposite page, along with an inset photo of an opening in a lava tube. Toshiyuki Kurihara, from Japan's Earthquake Research Institute, works on an experiment related to the newly installed seismic network on Kilauea Volcano (above left), while a researcher looks over a flow from a recent outbreak in a lava tube system (above right). The unique array of seismic instruments used over Kilauea's crater is depicted on the opposite page in an illustration by Deborah Coccia.

Eruption Spotted by Satellite

From about 2000 miles away, a Geophysical Institute graduate student was the first to spot the eruption of Bezymianny Volcano on Russia's Kamchatka Peninsula.

Research Assistant Chris Wyatt, who is working toward a master's degree in geology, discovered the eruption on satellite images during a daily inspection of the area.

Early on October 5, Wyatt noticed a white "hot" spot over a cluster of volcanoes on the Kamchatka Peninsula on an Advanced Very High Resolution Radiometer satellite image.

Since thermal-band, black-and-white AVHRR images depict the temperature of the ground, white hot spots indicate increased thermal activity. Sometimes the hot spots precede volcanic eruptions.

"I see a lot of hot spots come and go without an ash cloud forming," Wyatt said. "I watched this one carefully because it stood out from the background temperature more than in previous months."

A few hours later, Wyatt noticed the formation of a cold black cloud on satellite images above Bezymianny Volcano. He identified the cloud as an ash plume that had cooled after rising to high altitudes.

At first, the volcanic plume was difficult to differentiate from surrounding atmospheric clouds, but after using a band subtraction, Wyatt was sure he had identified an eruption.

Wyatt's discovery is unique because eruptions usually are reported first by pilots, local residents, or seismologists, then searched for on satellite images.

After finding the eruption, Wyatt notified Geophysical Institute Research Assistant Professor Ken Dean, who alerted the Alaska Volcano Observatory and other authorities.

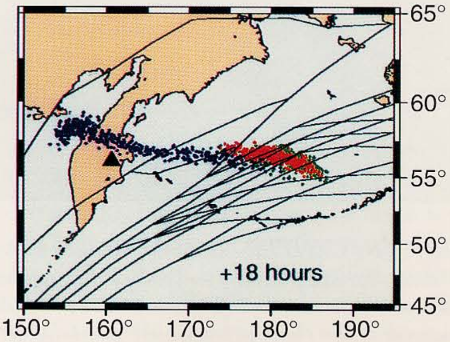
Dean and Research Assistant Craig Searcy, who is working toward a doctorate degree in geophysics, activated PUFF, a computerized ash-plume tracking model.

PUFF forecast the ash cloud would soon drift eastward into the air traffic corridor between Tokyo and Anchorage. Ash plumes are hazardous to aircraft because abrasive ash particles can cause engines to fail, windows to turn opaque, and delicate instruments to clog.

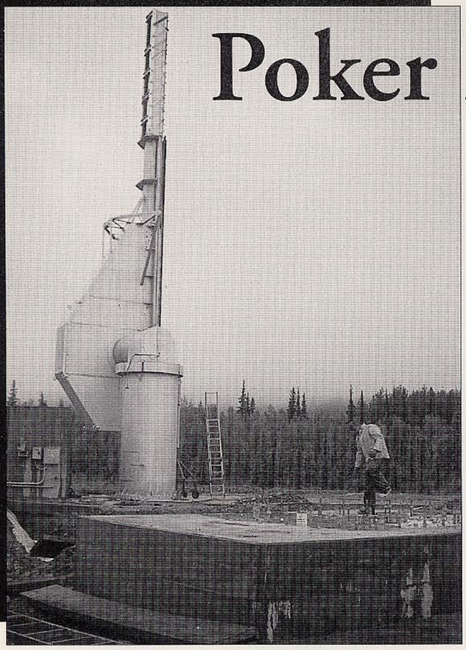
Since more than 40,000 large passenger-carrying aircraft annually fly over or near the Alaska, Aleutian and Kamchatka volcanoes, AVO immediately issued warnings about the movement of the ash plume to the Federal Aviation Administration, to the National Weather Service, and to airlines.

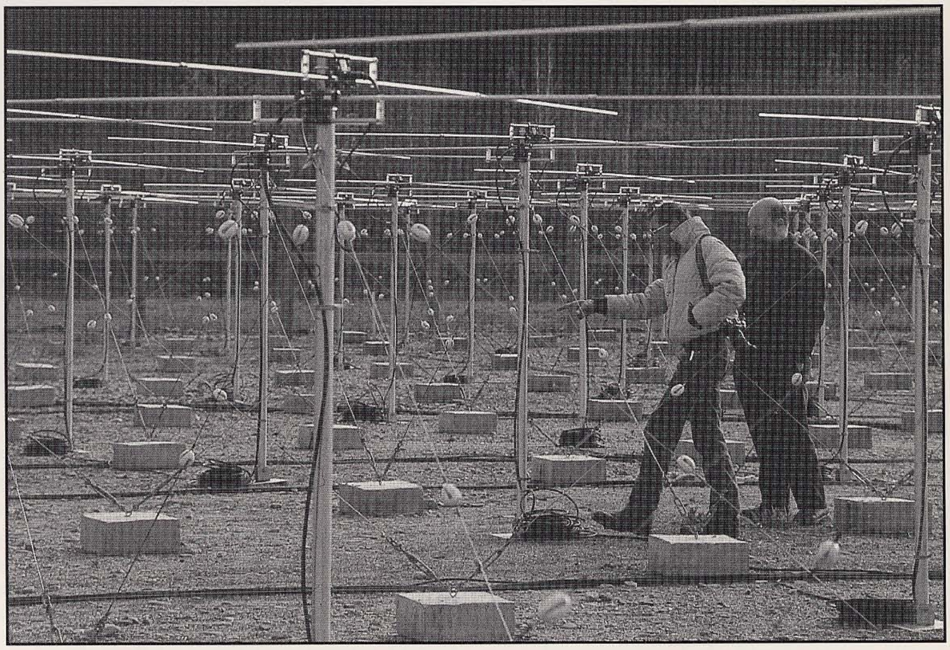
AVO is a joint program composed of the U.S. Geological Survey, the Geophysical Institute, and the Alaska Division of Geological and Geophysical Surveys. ✦

PUFF TRACK—The computerized simulation below shows ash from the eruption of Bezymianny Volcano drifting into the air traffic corridor between Tokyo and Anchorage. The volcano is shown as a triangle. Ash is 0-6 km high in blue areas, 6-12 km high in green areas, and 12-20 km high in red areas.



Poker Flat Gets a Face Lift





NEW RIOMETER—Instrument Technician DuWayne Bostow and Professor of Physics Roger Smith inspect the range's new riometer antenna array sent by the Japanese Communications Research Laboratory. CRL has agreed to send about $10 million worth of equipment to the range during the next 10 years to monitor the middle atmosphere.

Poker Flat Research Range is nearing the end of a six-year $19 million upgrade program and the beginning of a new era as an international center for space and environmental research in the Arctic.

A $1 million launcher enclosure to be built this summer is the last major construction project scheduled for the upgrade program, which started in 1990 with funds from the National Aeronautic and Space Administration's Wallops Flight Facility in Virginia.

The new launcher enclosure will provide a climate-controlled environment so rocket motors and payloads designed to carry delicate instruments into space can be kept warm during assembly.

Funds from the upgrade program also were used to build the recently completed *T. Neil Davis Science Operations Center,* a facility dedicated to the first director of Poker Flat. The center operates as the principle data gathering and observing facility at the range and as the rocket science command center.

It also will contain a high-tech classroom in which students can learn about the aurora. Funds to set up the classroom were donated recently by Asahi Breweries, Limited, a private company in Japan.

In addition, a special room within the center is being designed to serve as the primary monitoring point for a suite of instruments owned by the Communications Research Laboratory of Japan.

CRL has agreed to send about $10 million worth of equipment to Poker Flat during the next 10 years to study the hard-to-reach middle atmosphere, which contains the ozone layer, night-shining clouds, and other possible indicators of global climate change.

The first of the CRL instruments to arrive at the range is a large riometer antenna array, which consists of 256 antenna elements designed to monitor the aurora and other conditions in the middle atmosphere.

Two more CRL instruments—a millimeter wave radiometer that will measure ozone and trace gases, and a partial reflection radar to measure electron density associated with the aurora—are scheduled to arrive at the range within the next two years.

Data from all of the CRL instruments will be transmitted into the science operations center, then to the Data Analysis Center in the Geophysical Institute, according to Stan Schwafel, assistant director of Poker Flat.

"Ultimately, we want to make the data accessible over the Internet so it can be analyzed in real-time directly by scientists in Japan," Schwafel said. ✦

ALL PHOTOS BY EVELYN TRABANT

ARCTIC CENTER—Geophysical Institute Director Syun Akasofu is pictured above inside the T. Neil Davis Science Operations Center, the principle data gathering and observing facility at Poker Flat Research Range. A launcher enclosure to be built this summer on Pad 4 (shown above left) is the final project in a six-year, $19 million upgrade to turn the range into an international center for space and environmental research in the Arctic.

Finishing Up the Rocket Season

Four rockets were launched from Poker Flat Research Range this winter. All of them carried experiments designed to help scientists improve satellite communication and understand more about the aurora. The next launch from the range is scheduled for January 1997.

Oedipus-C, a rocket named after a Greek myth about a wayward son and his mother, was the first to launch this winter season. Three smaller rockets, two of which released brilliant chemical tracers, concluded the rocket season in late November.

The four-stage rocket Oedipus-C shot more than 560 pounds of instruments about 500 miles high through the auroral zone in the upper atmosphere on November 6.

During the flight, the rocket payload separated into two units, which were tethered together about a half mile apart aligned along Earth's magnetic field.

One part of the payload held a transmitter; the other held a receiver. The transmitter sent out radio waves at different frequencies, ranging from 25 khz to 8 mhz. The transmissions were sent two ways—over the tether and using a series of antennas on the payload.

Space-borne communication between the split payload, which continued for about 13 minutes, was tracked by two large antennas on the ground at Poker Flat and recorded for later study. The payload later landed about 642 miles downrange in the Arctic Ocean, where it was not recovered.

Experiments aboard Oedipus-C were designed to help scientists figure out how an active aurora affects satellite transmissions, according to Gordon James from the Communications Research Center in Ottawa, Canada.

"By studying charged particles associated with the aurora, the experiments may help scientists understand and prevent undesirable noise from spreading around a satellite and from interfering with its operation ," said James, the principal investigator for the launch.

The rocket motor used to propel Oedipus-C into the upper atmosphere was a NASA-provided Black Brant-12. The primary contractor for the payload, which was developed by the Canadian Space Agency, was Bristol Aerospace Limited, from Winnipeg, Canada. The experiment was the second in a series of launches.The first Oedipus rocket was launched from Norway seven years ago.

ATMOSPHERIC WIND—Miguel Larsen's photo (above) shows how brilliant chemical trails can trace winds in the upper atmosphere. The center oval was created when trimethyl aluminum was released during the upward flight of a rocket launched from Poker Flat this winter; the smaller oval was discharged during the rocket's descent. The luminous trails have helped scientists identify a narrow band of wind blowing about 65 miles above Earth.

Brilliant blue-green chemical trails that traced wind in the upper atmosphere were released duing another series of launches from Poker Flat this winter.

The luminous trails, released by rockets launched from the range on November 24 and 26, each curled into coil-like designs after being buffeted by winds at various altitudes above Earth.

The trails, which each persisted for about 10 minutes, were photographed at ground stations in Coldfoot, Fort Yukon, and Poker Flat.

Photographs of the trails will help scientists determine the speed and direction of wind in the upper atmosphere. High-altitude wind can affect the orbits of satellites and interfere with long-range radio transmissions.

"Data from the experiment may help scientists design, track and operate satellites and other manmade space systems more effectively," said Clemson University Professor Miguel Larsen, the principal investigator for the mission.

Colorful trails from previous launches helped researchers identify a narrow band of wind about 65 miles above Earth that scientists believe is associated with the aurora.

The final rocket of the winter season was launched after Larsen's rocket released chemical tracers on November 26.

Andrew Christensen, the director of the Space and Environment Technology Center at the Aerospace Corporation in California, was the principal investigator for the final rocket launch, which shot about 700 pounds of instruments nearly 200 miles high to measure light in the aurora and small-scale weather in the upper atmosphere.

After it descended under parachute to a remote location in the Brooks Range, the instrumented payload was recovered by helicopter.

Taken together, Larsen and Christensen's rocket launches marked the last stage of a four-part series of experiments funded by NASA. They launched similar rocket combinations from Poker Flat seasonally from 1992 through 1995. ✦

Roederer Celebrates a 20-year

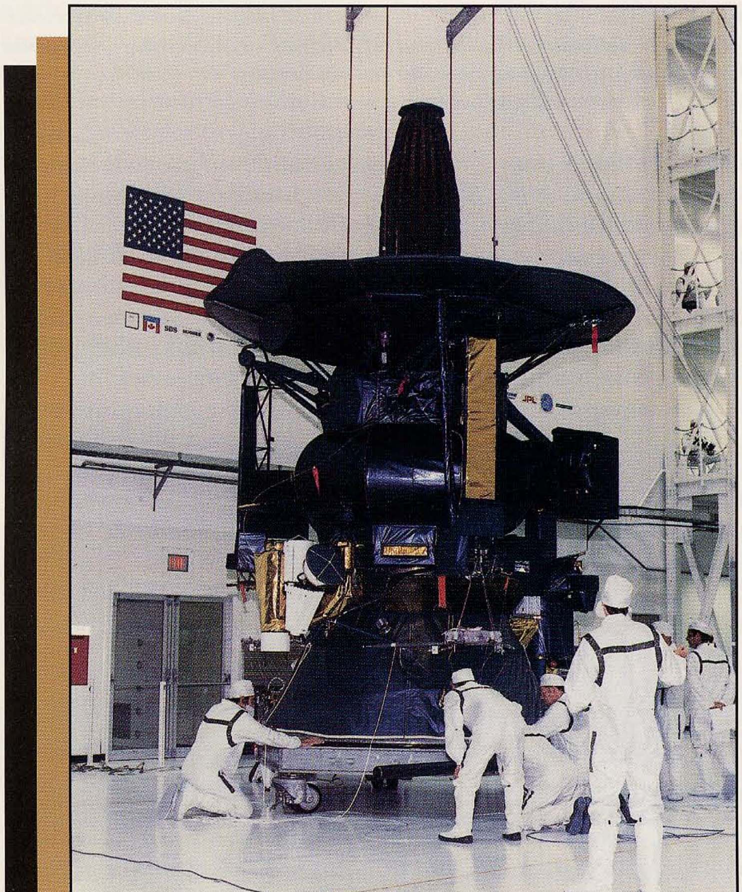
When the Galileo spacecraft shot into orbit around Jupiter last December, institute Professor Emeritus Juan Roederer celebrated a 20-year odyssey of his own.

In 1976, an international team working on the initial planning stages of the Galileo mission asked Roederer to join them. Because he is one of the world's leading researchers on Earth's radiation belts, they asked if Roederer would help them study the radiation belts circling Jupiter.

Twenty years later, Roederer will finally begin his long-awaited study of the belts around the solar system's largest planet. In June, he and other team members will review data from an energetic particle detector, one of about a dozen experiments aboard Galileo, which is now in an orbital path around Jupiter and eight of its 16 moons.

"The energetic particle detector works like a telescope," Roederer said. "It scans and sees the particles moving in Jupiter's radiation belts. We want to figure out where those particles come from, what they are made of, and how they get their energy."

Jupiter is a logical target for Roederer's research because it supports the fiercest, most intense radiation belts in the solar system.



Radiation belts contain the most energetic particles of the magnetosphere, the plasma envelope composed of ultrahot particles that surrounds all planets with magnetic fields.

Jupiter's massive magnetosphere, by far the largest object in the solar system, extends up to 300,000 miles from the surface of the planet toward the sun. Solar wind continuously blowing around Jupiter's magnetosphere pushes the outlying particles back, causing the formation of a comet-like tail that stretches for millions and millions of miles.

Researchers plan to study many aspects of the magnetosphere, but Roederer is particularly interested in how Io, one of Jupiter's moons, affects the planet's radition belts. After sifting through data, he hopes to compare Jupiter's radiation belts to the Van Allen belts surrounding Earth.

"Earth's radiation belts are formed like the aurora," Roederer said. "Particles heated up in the tail of the magnetosphere are shot like a gun toward Earth. Some of them zip along magnetic field lines to create the aurora; other particles stay trapped, feeding Earth's radiation belts."

Scientists don't know if the same process is at work on Jupiter. Information about Jupiter's radiation belts and data from other Galileo experiments will help scientists understand more about how weather and activity in space affects Earth systems.

"The more we depend on satellites for so many uses, the more vulnerable we are to conditions in space," Roederer said. "Scientists hope someday to be able to predict weather in space the way forecasters predict weather on Earth."

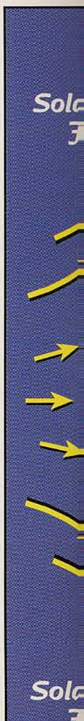
Scientists obtained the first atmospheric data ever from the surface of any outer planet after Galileo dropped a 746-pound probe through the top of the cloudy, gaseous envelope surrounding Jupiter this winter.

According to NASA scientists, all instruments on the probe appeared to operate without a hitch after traveling for six years during Galileo's 2.3 billion-mile journey to Jupiter.

At the December meeting of the American Geophysical Union in San Francisco, scientists announced that the probe radioed data from Jupiter's turbulent upper atmosphere to Galileo for 57 minutes before contact was broken and the spacecraft fired its main thrusters to propel itself into orbit around the massive planet.

The success of the probe, the fastest manmade object ever to enter an atmosphere, was a boost to the Galileo mission, which has suffered some setbacks since it was approved by Congress in 1977.

For example, the spacecraft was ready in 1984, but after the explosion of the shuttle Challenger, Galileo's launch from a space shuttle was postponed until 1989.



Space Odyssey

Then its high-capacity main antenna failed to open properly, forcing scientists to find alternative methods to beam data home using a slow-rate antenna. More recently, the temporary malfunction of a tape recorder forced engineers to restrict its use so it could be dedicated fully to receiving data from the probe.

When the 1984 launch was delayed, scientists had an opportunity to update only certain aspects of the instrumentation aboard the spacecraft.

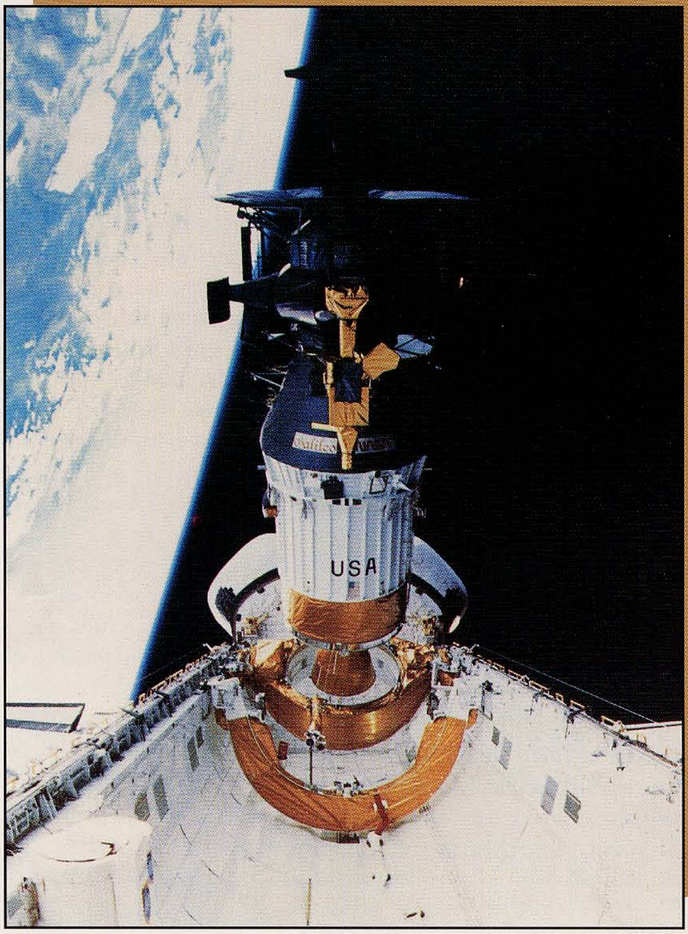
"We are dealing with data that is arriving in the middle of the 1990s derived from early 1980s technology," said Roederer, who estimates that Galileo would be one-fifth its size if modern electronics were aboard.

Regardless of how soon the data is analyzed, Roederer is sure to be associated with Galileo for a lifetime because his signature and those of other researchers are engraved on a plaque carried by the spacecraft.

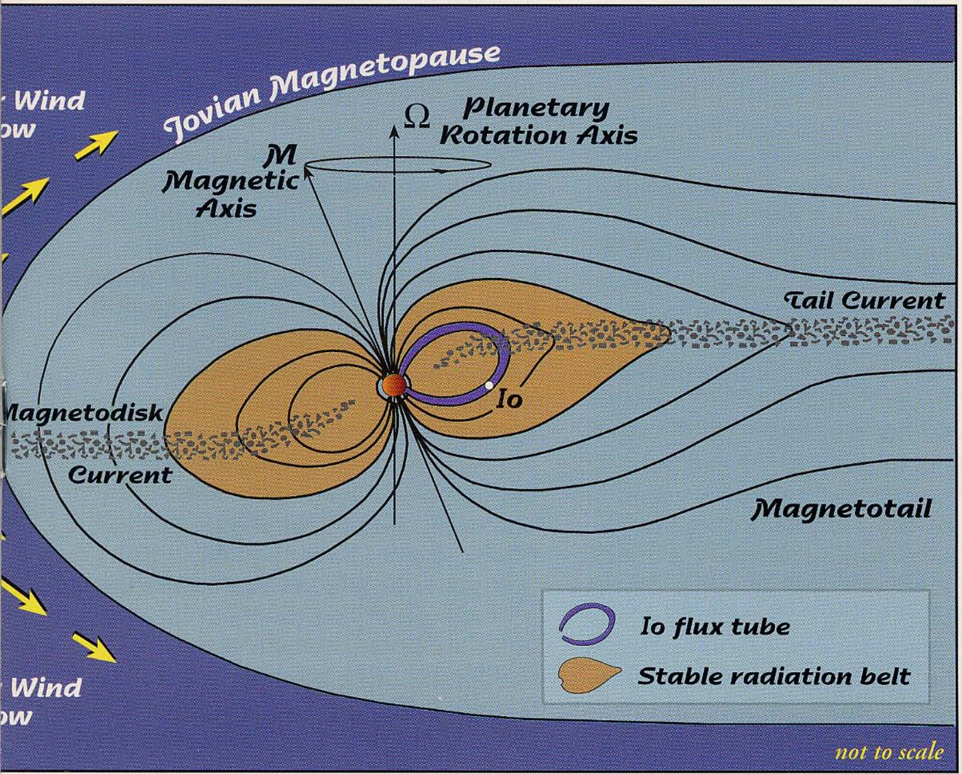
Scientists estimate Galileo will orbit in space for at least 400 million years before it disintegrates under the intense bombardment of particles trapped in Jupiter's radiation belts.

"With a little luck, our signatures might even last more than a billion years," Roederer said.

Now, that's a family legacy. ✦



PHOTOS COURTESY OF NASA JET PROPULSION LABORATORY



BEFORE LAUNCH—Scientists work on the Galileo spacecraft in the Kennedy Space Center Vertical Processing Facility (lower left on the opposite page) about a year before launch. The fabric covering most of the spacecraft is designed to provide thermal protection from the heat and the chill of interplanetary space.

The sun shields near the top are positioned to shade the spacecraft's high-gain antenna and body. The conical structure at the base conceals the atmospheric probe, which carried six instruments to Jupiter to study its atmosphere this winter.

AFTER LAUNCH—The Galileo spacecraft and its Inertial Upper Stage booster (pictured above) were launched from the cargo bay of the space shuttle STS-34 Atlantis on October 18, 1989. Galileo is now in an orbital path around Jupiter and eight of its 16 moons. The orbiter carries 10 scientific instruments to study Jupiter, its satellites, and its magnetosphere.

IN ORBIT—Jupiter's magnetosphere, the largest object in the solar system, extends up to 300,000 miles from the surface of the planet toward the sun (as shown in the graphic by Deborah Coccia at left). Solar wind blowing continuously around Jupiter's magnetosphere pushes the outlying particles back, creating a comet-like tail that stretches for millions of miles. Roederer wants to find out how Io, one of Jupiter's moons, affects the planet's radition belts.

GI News

Largest On-Land Earthquake

Institute scientists with the Alaska Earthquake Information Center were the first to pinpoint the location and the magnitude of the largest on-land earthquake in the United States for 1995.

The 6.2 earthquake occurred about 34 miles northwest of Fairbanks in the Minto Flats area. It was followed by a 4.3 aftershock, which is movement felt as the fault continued to slip, 18 minutes after the initial earthquake. Within the following week, more than 3,000 measurable aftershocks were detected by AEIC, a cooperative effort of the Geophysical Institute and the U.S. Geological Survey.

Alaska State Seismologist Roger Hansen received numerous reports of damage caused by the earthquake, one of the largest to occur in Alaska's Interior in more than 25 years.

Earthquake Codes for Alaska

Homes, schools and office buildings in Alaska often are constructed using earthquake protection codes based on seismic data from California.

Professor of Geophysics Niren Biswas and his colleagues hope to create more pertinent codes using a network of 15 seismometers designed to monitor earthquake movement in Anchorage. The seismometers are calibrated to record strong local shaking, a motion most conventional seismometers can not respond to adequately.

With assistance from the Alaska Science and Technology Foundation, information from the network will be used to draw up new building codes for Anchorage. When the program is complete, researchers plan to install the network in other cities around the state and to rewrite construction codes to make all of Alaska's buildings more earthquake resistant.

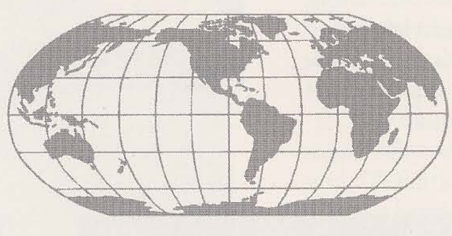
Signs of Global Warming

The Arctic already shows signs of global warming, according to more than 60 scientists who attended the *Wadati Conference on Global Change and the Polar Climate* in Japan last November. Scientists from the Geophysical Institute and from the University of Tsukuba jointly organized the four-day international conference, which grew out of a desire to synthesize the results of polar climate research into a consistent picture of recent global changes.

Evidence compiled at the conference showing that global warming has occurred in the polar regions was found throughout a spectrum of variables, including temperature, precipitation, snow, and ice.

The combined findings are consistent with what scientists expected to see as a result of the enhanced greenhouse effect, which is created when pollutants in the atmosphere trap solar heat close to Earth. However, the scientists were not able to determine with certainty if the warming has been caused by natural or manmade influences.

"We recognize an urgent and international need to monitor the polar climate system carefully for rapid, complex and perhaps surprising changes in the near future," said Professor Gunter Weller, who serves as the institute's deputy director and the director of the Center for Global Change and Arctic System Research.



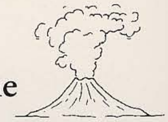
An International Workshop

Instruments and research designed to monitor global warming across international boundaries were discussed during a three-day workshop this winter in Fairbanks. The symposium was sponsored by the Communications Research Laboratory of the Japanese Ministry of Posts and Telecommunications, the Geophysical Institute, and NOAA's Environmental Technology and Environmental Research laboratories in Boulder, Colorado.

Long-range plans to conduct research in the Arctic, remote sensing technologies, and new instruments at Poker Flat Research Range used to monitor the middle atmosphere were reviewed during the workshop, which was attended by 65 scientists from Japan and the United States.

The workshop grew out of an agreement signed last year by the Geophysical Institute, NOAA, and the Japanese government to jointly conduct arctic research.

Science for Everyone



Geophysical Institute professors offered free, weekly public lectures about their research as part of the *Science for Everyone* lecture series in Fairbanks, Anchorage and Juneau this winter.

The after-dinner seminars, presented in terms understandable to all ages, covered a variety of topics including the aurora, volcanoes, laser rock dating, global climate change, mountain ranges, earthquakes, and glaciers.

An average of 300 people crammed into libraries in Fairbanks and Anchorage to hear each talk in the series, which was dedicated to former UA president Dr. William Wood and his wife Dorothy Jane. Two free public lectures were offered each night of the series to accommodate science enthusiasts in Anchorage.

Speakers for this year's lecture series were Syun Akasofu, Doug Christensen, Keith Crowder, Charles Deehr, John Eichelberger, Tom Hallinan, Will Harrison, Paul Layer, Steve McNutt, Charlotte Rowe, Glenn Shaw, and David Stone.

A special continuing-education course was offered in conjunction with the series so science teachers from elementary, middle, and high schools in Fairbanks and Anchorage could prepare lesson plans based on individual lectures.

Geophysical Institute On-line

Computer users around the world can learn about research and services offered at the Geophysical Institute on a new home page (http://www.gi.alaska.edu/).

Also accessible from the home page is information about organizations affiliated with the institute, such as Poker Flat Research Range, the Alaska Earthquake Information Center, the Alaska Volcano Observatory, the Alaska Synthetic Aperture Radar Facility, the Center for Global Change, the Cooperative Institute for Arctic Research, and the Alaska Climate Research Center.

The home page also displays regularly updated information, such as weekly aurora predictions, the latest institute news, current opportunites in graduate education, and upcoming research ventures.

It additionally provides pages to report various observations, such as sightings of Red Sprites and Blue Jets, the upper atmospheric flashes captured on color video above storm clouds by institute professors Davis Sentman and Gene Wescott.

Several institute publications, including this *GI Quarterly*, also are accessible from the home page, as well as several animations, including black-and-white MPEG movies of the aurora taken with an automated all-sky camera at Poker Flat once each minute during moon-down periods (check Poker Flat's *Science Archives* category).

Santa Search

Geophysical Institute scientists set up a special telephone hotline on Christmas Eve to help children track Santa and his eight tiny reindeer during their flight around the world. The hotline rang into the control room of the Alaska Synthetic Aperture Radar Facility, where technicians used data from polar-orbiting satellites to locate Saint Nick. The hotline script, written by ASF Program Assistant Donna Sandberg, described Santa's whereabouts in colorful, educational language suited for children.

Nobel Prize for Ozone Studies

Sydney Chapman was honored last fall when the first Nobel Prize in chemistry was given to three atmospheric scientists for explaining how the destruction of the ozone layer, which absorbs solar ultraviolet radiation, can be harmful to life.

Chapman, the scientific director of the Geophysical Institute from 1951 to 1970, was recognized for formulating the first photochemical theory describing the creation and destruction of ozone in the atmosphere.

Chapman's contributions were mentioned by the Royal Swedish Academy of Sciences when the 1995 Nobel Prize in chemistry was awarded to professors Paul Crutzen of Germany, Mario Molina of the Massachusetts Institute of Technology and F. Sherwood Rowland of the University of California.

Several nations have agreed to ban man-made agents that destroy ozone due in part to the scientists' research, which shows how chemical mechanisms affect the thickness of the ozone layer.

Institute professors Glenn Shaw, Dan Jaffe, Richard Benner, and Roger Smith have worked with the Nobel laureates on common problems involving the ozone layer over the Arctic.

CONGRATULATIONS

Faculty

Keith Crowder, associate professor of geology and a member of the institute's tectonics and sedimentation research group, won the College of Natural Science's Introductory-level Teacher of the Year Award in January. Crowder earned the award by assuming responsibility for the sequence of courses *General Geology* and *Historical Geology*, renaming them *The Dynamic Earth* and *The History of Earth and Life*, and developing them into two of the most popular introductory-level science courses at UAF.

Dave Sentman, associate professor of geophysics, received this year's Terris and Katrina Moore prize for scientific excellence and vigor in his accomplishments, particularly distinguished by his research into the upper atmospheric phenomena Red Sprites and Blue Jets.

Professor of Geophysics **Glenn Shaw** was elected to serve a three-year term on the board of trustees for the University Corporation of Atmospheric Research. UCAR operates the National Center for Atmospheric Research in Boulder, Colorado, and is administered by 85 member universities from around the United States and by foreign affiliates. UCAR budgets about $200 million annually for research activities in the atmospheric, oceanic and social sciences.

Professor of Geophysics **David Stone** received a grant for $15,000 from ARCO Alaska to support research that could reveal a clearer picture of potential oil and mineral reservoirs in the Arctic. Stone, Associate Professor of Geophysics **Paul Layer**, and teams from Stanford and Michigan State universities, have researched plate tectonics in Siberia and in Yakutia, Magadan, and Chukotka in northeastern Russia since 1990. Together, they revealed the geologic character of northeast Russia by determining the age of rocks in the area, and by studying the direction and the intensity of Earth's magnetic field through time.

Professor of Geophysics **Gene Wescott** received the 1995 UAF Alumni Achievement Award for Professional Excellence. Wescott, who graduated from UAF with an M.S. in 1960 and a Ph.D. in 1964, has achieved national and international acclaim for his research in geophysics.

Students

Gwang-Son Choe, who recently earned a Ph.D. in space physics from UAF, won the 1995 Ed Hones Space Physics Award and $1500 for his in-depth examination of the formation of solar prominence and the eruption of solar magnetic arcade systems.

Tom Immel, who is working toward a doctoral degree in physics, was one of four students to receive an award for the best student poster at a Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) meeting in Boulder, Colorado. The title of his poster was "Observations of Large-scale Thermospheric Oxygen Density Variations due to Geomagnetic Forcing." Co-authors of the poster were Professor of Physics John Craven and University of Iowa Professor Louis Frank.

Ming Yan's paper, "Interaction of Interplanetary Rotational Discontinuities or Alfven Waves with the Earth's Bow Shock," was selected as one of the outstanding student papers at the 1995 American Geophysical Union spring meeting. Yan recently earned a Ph.D. in space physics.

Support Staff

Human Resource Manager **Kate Barr** recently earned certification as a Senior Professional in Human Resources. To be certified as an SPHR, an applicant must pass a comprehensive exam and have at least eight years of professional experience.

Science Editor-in-Chief **Kathy Berry** won a national first-place award from the National Federation of Press Women and a first-place statewide award from the Alaska Press Women for writing and editing the *GI Quarterly*.

Berry, Graphic Artist **Deborah Coccia**, and Administrative Assistant **Jan Dalrymple** won a national award for excellence in content and presentation by the editors of the *Journal of Government Information* for producing the publication, *Global Change and the Polar Regions: Regional Research Programs for the Arctic and the Antarctic.*

Their accomplishments also were honored with a citation from the Alaska State Legislature.

Watching the Aurora from Above

Dynamic auroras do more than paint brilliant displays, they can change the part of Earth's atmosphere where satellites orbit and space shuttles fly.

Auroras change the upper atmosphere mostly by heating it, according to Research Assistant Tom Immel, a graduate student working toward his doctoral degree in physics.

An active aurora can generate heat by freeing electrons that enhance already strong electrical currents flowing in the thermosphere, the atmospheric shell extending from about 50 miles above Earth to outer space.

"These currents heat the thermosphere like electrical currents heat a light bulb," Immel said.

Immel and institute Professor of Physics John Craven recently produced the first two-dimensional images of large-scale changes caused by the aurora in the thermosphere.

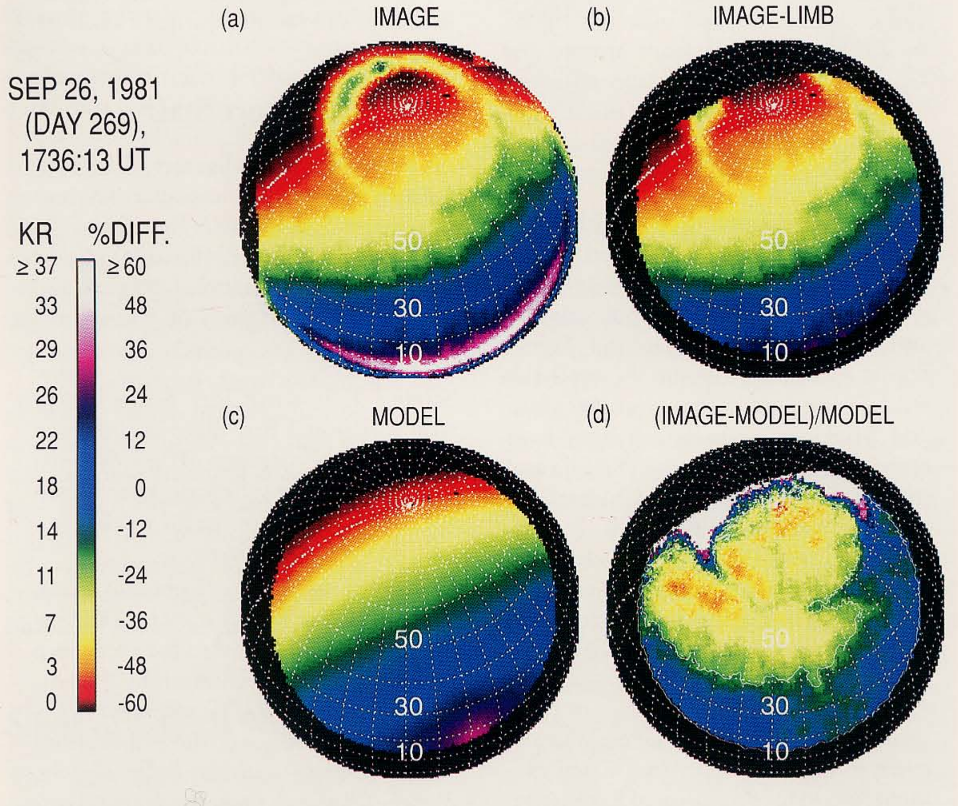
Researchers can correlate the colorful 2-D images with theoretical models designed to study the effects of heating in the upper atmosphere. They also can use the images to help determine how such heating might affect the paths of space stations, the flight of the space shuttle, or the orbits of low-altitude satellites in the upper thermosphere.

Craven and Immel created the 2-D images using data from the Dynamics Explorer-1 satellite, which orbits up to 14,500 miles above Earth.

The images from the high-altitude satellite allow researchers to get a broader view of the thermosphere than is available through more traditional measurements taken from the ground or from low-flying satellites.

Craven compared data from the Dynamics Explorer-1 satellite during intense auroral activity to images from a model he constructed of how the thermosphere looks when the aurora is quiet.

By electronically subtracting the model images from the satellite images, the researchers came up with a 2-D format that illustrates where energy from the aurora heats up gases in the thermosphere to change its composition. ✦



THE AURORA—Figure A shows an original image of ultraviolet light from Earth's sunlit hemisphere and an active aurora. Figure B shows the original image with light near the outer edge removed, while Figure C depicts a model image for periods when there is very little auroral activity. Figure D shows the percent change in ultraviolet light caused when auroral energy heats gases in the upper atmosphere, thereby altering the thermosphere's composition. It was created by reprocessing the image in Figure B, then subtracting and dividing by the model image in Figure C.

Predictions Accurate

The Geophysical Institute's popular weekly predictions of auroral activity over Alaska have had a high accuracy rate of approximately 75 percent since they were initiated in March, according to Professor Emeritus Charles Deehr.

Deehr, a space physicist who began studying the aurora borealis at the Geophysical Institute in 1958, calculated the accuracy of the predictions recently by comparing actual auroral displays with his weekly predictions.

Except for a half-month period in November, Deehr found that the aurora occurred within the range of predictions issued by the Geophysical Institute.

Aurora watchers have accessed the Geophysical Institute's aurora prediction Internet page up to 2,000 times per week (http://www.gi.alaska.edu/), and the predictions are distributed weekly to all major media outlets and visitor centers in Alaska and Canada.

To predict the activity level and the viewing range of the auroral displays, Deehr studies data on worldwide disturbances in the earth's magnetic field. The earth's magnetic activity is a direct reflection of auroral activity.

He compares the earth's magnetic profile to active regions on the sun, which face the earth every 27 days as the sun rotates on its axis. These active regions create an electrically charged wind that blows through the solar system and reaches the earth in rings around the north and south geomagnetic poles, creating the aurora.

Aurora predictions, the innovative idea of Director Syun Akasofu, are possible this year because the active regions of the sun are at the low end of an 11-year cycle, when solar activity is relatively stable. Erratic bursts of solar flares, common at the high end of the cycle, make prediction difficult. ✦

Alaska Student Rocket Project Soars

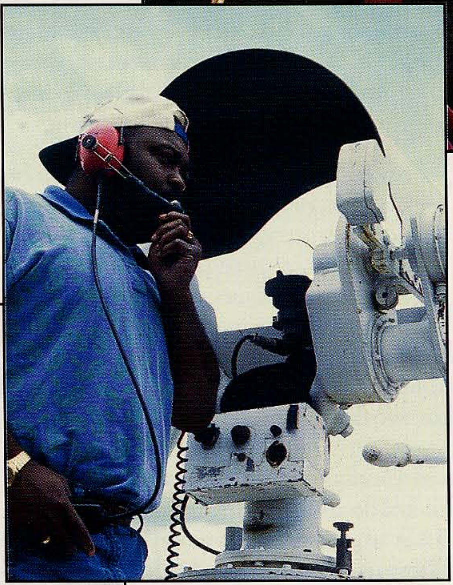
The launch of a small 13-foot rocket from Poker Flat Research Range marked the end of a three-year project in rocketry for a group of students involved in the Alaska Space Grant Program last summer.

The upper-level students, many of whom were freshmen and sophomores when they started the project, watched as the 100-pound rocket flew 21,369 feet high, then landed about four miles downrange.

The students designed every aspect of the rocket, with the exception of two components: the motor and the Global Positioning System used to track the rocket in flight.

"Almost all of the rocket was machined right at the university," said Ian Ruiz, a 20-year-old electronic engineering major. "There were only a few instances where we had to contract out for the work, but other than that, everything was built on site by the students."

The students constructed even the most complex components, such as the rocket's microstrip patch antenna, dual on-board microprocessors, and a parachute recovery system with pyrotechnic actuators for controlling payload separation and deployment of the main parachute.



PHOTOS BY EVELYN TRABANT

STUDENT ROCKET COUNT DOWN—
UAF Student JoAnn Neumaier connects an umbilical cable to the rocket, enabling her to check systems before launch (top), while NASA Open Site Radar Operator Mersha Baily gets ready to help the students track the rocket in flight (middle). The student rocket is shown moments after launch below.

Before the flight, the students encountered many real-life problems related to the rocket business, including simulating preflight mechanical situations, getting FAA and military flight window authorizations and completing the project within budgetary restrictions.

Unfortunately, they also went through real-life disappointment when the telemetry failed shortly after the launch and most of the data the students hoped to gain was lost.

"It's hard, but failure is sometimes part of the risky rocket business," said Electrical Engineering Professor Joe Hawkins, the director of the Alaska Student Rocket Project.

All the steps involved in the project gave students valuable information they can use to pursue jobs within the commercial arena or additional educational opportunities.

"The primary goal of the project is to provide opportunities for students to become involved in the hands-on design, construction and launch of sounding rocket payloads," Hawkins said.

The project was funded by the Alaska Space Grant Program, a federally funded organization set up in universities and schools around the country to encourage space science research at all grade levels. The rocket was the second to be built by UAF students. The first student rocket was launched in July 1992. ✦

GI Notes

WELCOME

Abdul Alkezweeny joins the institute as a research professor of atmospheric sciences. He brings his experience in cloud physics, chemistry, modifications, and interactions to the arctic site for the Atmospheric Radiation Measurement Program. Alkezweeny earned a Ph.D. (1968) in atmospheric sciences from the University of Washington in Seattle, an M.A. (1962) in physics from the University of California, and a B.A. (1958) in physics from the University of Baghdad. He taught atmospheric sciences at the University of North Dakota, and worked as a senior research scientist for 15 years with Battelle Northwest. He also served as a Native American representative in the U.S. Department of Energy's High Level Waste Program.

Dan Delano is the new senior system administrator for the Alaska Synthetic Aperture Radar Facility. Delano, a 20-year resident of Alaska who grew up in Kenai, earned a B.S. (1985) in computer science and engineering at LeTourneau University in Longview, Texas. He served as a captain in the U.S. Army from 1986 to 1989. Delano later worked as a senior system analyst for CACI, Incorporated, in Anchorage from 1990 to 1992 and in Arlington, Virginia from 1992 to 1996.

Jeffrey Freymueller joins the institute as a research assistant professor of geophysics. Using global positioning system (GPS) techniques, he guides the institute's seismology group in crustal deformation research. Freymueller completed his M.S. (1988) and his Ph.D. (1991) in geophysics at the University of South Carolina. He worked as a postdoctoral research associate in geophysics at Stanford University and as a member of the technical staff at the Jet Propulsion Laboratory from 1986 to 1991. Freymueller was given a NASA Group Achievement Award in 1992 and became an associate of the International Association of Geodesy in 1993.

Milton Garcés comes to the institute as a postdoctoral fellow in seismology after obtaining his Ph.D. (1995) from the Scripps Institution of Oceanography. He graduated summa cum laude with a B.S. (1989) in physics from the Florida Institute of Technology. He specializes in analyzing the sounds generated inside volcanoes for the Alaska Volcano Observatory.

Richard Harding is the operations manager for the Alaska Synthetic Aperture Radar Facility, which acquires, processes, distributes and archives remote sensing data used to support advanced polar research. He also supervises the Geo-Data Center and the Map Office. Harding earned his B.S.E.E. (1971) at North Carolina State University and his M.S.A.E. (1981) at the Naval Postgraduate School in Monterey, California. Previously, he worked as a senior staff engineer for Delfin Systems in Virginia, as a special programs manager at the Naval Research Laboratory in Washington, D.C., and as a senior systems engineer for both Titan Advanced Digital Systems in Virginia and Aeronix in Florida.

NEW EMPLOYEES—Pictured from left to right in the top row are Richard Harding, Dan Delano and Jeff Tilley. From left to right in the front row are Suzan Underwood, Jeffrey Freymueller, and Milton Garcés. Abdul Alkezweeny is absent.

Jeffrey S. Tilley joins the institute as a research assistant professor of atmospheric sciences. He earned his B.S. (1984) and his Ph.D (1990) in meteorology from Pennsylvania State University. At the institute, he works on regional climate modeling and on short-term weather prediction. Prior to his arrival, Tilley was a research associate working on high-latitude regional modeling for the Program in Atmospheric and Ocean Sciences at the University of Colorado in Boulder. As an assistant professor at the University of Wisconsin in Milwaukee from 1990 to 1992, he taught undergraduate survey courses in meteorology and graduate courses in mesoscale dynamic and synoptic meteorology. He is a member of the American Meteorological Society, the American Geophysical Union, and the U.S. Arctic Research Consortium.

Suzan Underwood is the human resource coordinator for the Alaska Synthetic Aperture Radar Facility. Underwood is responsible for all human resource functions at ASF, including recruitment, development and implementation of policies and procedures, maintenance of personnel records, and personnel assistance, training and development. Prior to joining ASF, Underwood worked as an administrative assistant to the dean at the UAF College of Liberal Arts, as the personnel representative for First Health Services Corporation in Anchorage, and as the office manager at Phil A. Younker & Associates, Limited.

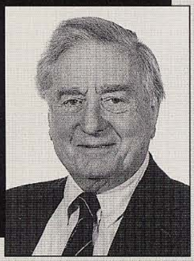
FAREWELL

Lou-Chuang Lee, professor of physics, is taking a special leave of absence to work as the Dean of the College of Natural Sciences at the National Cheng Kung University in Tainan, Taiwan. Lee, who joined the institute in 1978, has performed research on auroral arc formation, solar wind-magnetosphere-ionosphere interactions, solar flares and the formation of solar prominence. He also taught a variety of classes, including mechanics, statistical mechanics, atmospheric fluid dynamics, plasma physics and space physics. His wife **Li-Her Lee**, a programmer analyst with the Computer Resource Center, also is taking a leave of absence.

Amanda Lynch, assistant professor of atmospheric sciences, left the institute to assume a position at the University of Tasmania in Hobart, Australia. After joining the institute in August 1992, Lynch worked in climate modeling to develop an arctic model of ocean-ice-atmosphere and land-atmosphere interactions. **Henry Johnson**, who worked as a CD-ROM designer for the Computer Resource Center, is accompanying her.

Julia Triplehorn, an associate professor of library science, is taking a year-long sabbatical to work at the Atmospheric Science Library in Toronto, Canada, and at the NOAA Central Library in Silver Springs, Maryland. During her absence, contract-librarian **Betty Galbraith** is overseeing the institute's Keith B. Mather Library. Galbraith formerly was the librarian at the UAF Institute of Marine Science, and the librarian for the Office of the Gas Pipeline Coordinator.

In Memoriam



Stanley Keith Runcorn, who held the Sydney Chapman Endowed Chair in Physical Sciences at UAF, was slain in December in his hotel room in San Diego, California.

The apparent victim of a robbery, Runcorn, 73, was visiting the area to lecture at the University of California before attending the annual meeting of the American Geophysical Union in San Francisco. He accepted the position of endowed chair at UAF shortly after he retired from the University of Newcastle upon Tyne in 1988.

The chair was named in honor of Chapman, the scientific director of the Geophysical Institute from 1951 to 1970.

Originally from Lancashire, England, Runcorn was highly regarded internationally as a geophysicist. Considered a scientific pioneer in plate tectonics, he is renowned as a central player in two of the major earth-science debates in the mid-twentieth century: the origin of Earth's magnetic field and the validity of the theory of continental drift.

Professor of Geophysics David Stone calls Runcorn, who remained unmarried, one of the great generalists in geophysics.

"He knew a great deal about the various aspects of the moon, the earth, and the origin of planets," Stone said. "Right up until his death, he was working on how magnetic reversals occur."

A Fellow of England's Royal Society since 1965, Runcorn held honorary doctoral degrees of science from Utrecht University, Gent University, Paris University and Bergen University.

In 1984, he received the Gold Medal from the Royal Astronomical Society, and in 1987, he was awarded the Wegener Medal from the European Geophysical Society, an organization similar to AGU.

Runcorn also sat on a committee of scientists overseeing the experimental Biosphere II Space Habitat in Arizona from 1991 to 1993, and he was a member of the Papal Academy of Science, which is Pope John Paul II's science advisory panel.

Runcorn will be missed by many for whom he was both personal friend and mentor. Kenneth Creer with the Department of Geology and Geophysics at the University of Edinburgh wrote:

"For all his achievement and many awards, Keith Runcorn remained modest and unpretentious. His reputation as one of the foremost geophysicists of his generation will remain long after his death, as will memories of his warmth and sincerity."

One of Runcorn's students, Jim Stuart Runner-Beuning, adds, "Professor Runcorn will always be an inspiration to me as he has been to so many throughout his productive, creative life. He will be missed."

RETIRED

Kristina Ahlnäs, who retired as a remote sensing specialist, came to the Geophysical Institute from the Institute of Marine Science in 1973 to work with geochronology, paleomagnetism, glaciology, meteorology and volcanology. Ahlnäs investigated the use of satellite data for Alaska and for sea ice studies in Antarctica when, respectively, the NOAA-AVHRR satellite became operational and a NOAA station was established in McMurdo, Antarctica. Ahlnäs operated ASF's geophysical processor system following the launch of the ERS-1 SAR satellite in 1991. Most recently, her research interests include the analysis and color enhancement of SAR data for glaciers in Alaska and dipole eddies around St. Matthew Island in the Bering Sea.

Neal Brown, who recently retired as a research assistant professor of physics, was drawn to the institute to study the northern lights as a graduate student 31 years ago. He earned his M.S. (1966) in geophysics at UAF, and joined the institute faculty in 1968. Brown was the first full-time director of Poker Flat Research Range, a position he held from 1971 to 1989. Since then, he has devoted his time to science education. In 1993, he founded the Alaska Space Academy, a summer science camp for middle-school students from Alaska, western Canada, and Russia. Brown maintains ties with the institute as a senior consultant and his passion for science education continues in his retirement.

Jim Burton, a recently retired specialist in computer-aided design, was hired at the institute in 1973. As a draftsman, Burton used computer software to create maps, graphs, line drawings, models and true-sized replicas of instruments needed for scientific purposes. He also taught CAD classes at the UAF Downtown Center. In 1987, Burton was diagnosed with retinitis pigmentosa, a progressive illness that causes the gradual loss of eyesight. A member of the National Federation of the Blind, Burton was appointed by Governor Tony Knowles in 1995 to a three-year term on Alaska's Statewide Independent Living Council. He remains an active volunteer in the local community.

Larry Sweet was hired at the institute as a high-school graduate in 1958 during the furor caused by the launch of Sputnik. As a laborer for the institute's carpentry, electronic, and machine shops, he helped erect antennas to track the satellite. Sweet retired as a systems engineer for the Alaska Synthetic Aperture Radar Facility, a position he assumed in 1987. Prior to that, he worked as the statewide research manager for the Alaska Department of Transportation and served the university in various administrative capacities, including as the executive officer to both the vice president and the vice chancellor for research.

Sweet earned a B.S.E.E. at Washington State University in 1963 and a master's degree in engineering management from the University of Alaska in 1972. For many years he was involved with upper atmospheric research activities at Poker Flat Research Range. He describes himself as the tall guy who won institute stair races and as a master laborer (the planer that took off the tip of his finger is still in the machine shop).

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Deborah Coccia—Graphic Artist
Cheryl Katje—Publications Assistant

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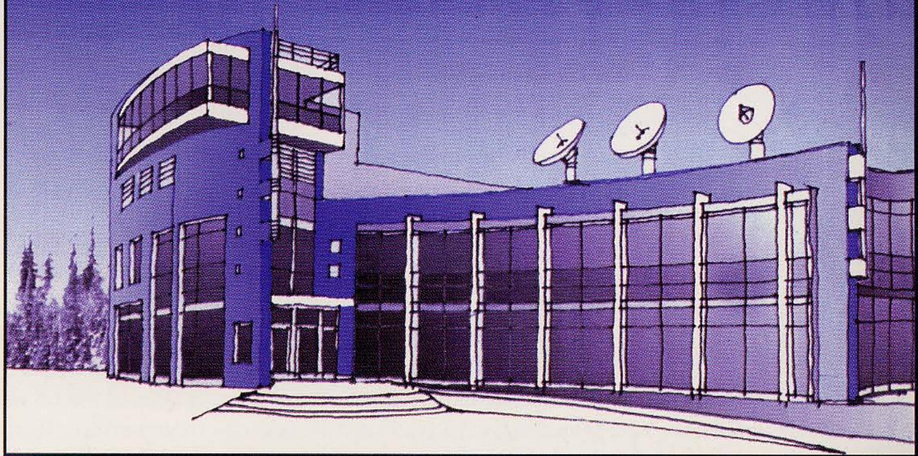
An International Arctic Research Center



KUMIN AND ASSOCIATES, INC., AND KAPLAN/MCLAUGHLIN/DIAZ

Scientists from around the world will work together on global research in a new center designed to attach to the west side of the Geophysical Institute's Elvey Building.

The new 100,000 square-foot building will become the headquarters of an International Arctic Research Center, which will house experts on arctic phenomena from several countries.

Construction of the center, scheduled to start in June, is financed by funds from the government of Japan, the state of Alaska, the U.S. National Science Foundation, the Fairbanks North Star Borough, the North Pole City Council, private donations, and the sale of revenue bonds from the University of Alaska.

The center, which is expected to be ready for occupancy in 1998, will contain a variety of laboratories, classrooms, computer facilities, office space for faculty and graduate students, and public information areas.

Atmospheric scientists from the Geophysical Institute will be among the first to move into the new center, along with the institute's Keith B. Mather Library, the Map Office, the Geo-Data Center, and the Photo-Graphics Service Center.

Scientists from universities in Japan who participate in arctic research also plan to occupy the buildings, along with several major research organizations, including the National Space Development Agency of Japan, the Japan Marine Science and Technology Center, and Japan's National Research Institute for Earth Science and Disaster Prevention.

The federal groups from the United States set to occupy the building include the Fairbanks Forecast Office of the National Weather Service with the National Oceanic and Atmospheric Administration and the College International Geophysical Observatory of the United States Geological Survey. ✦

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