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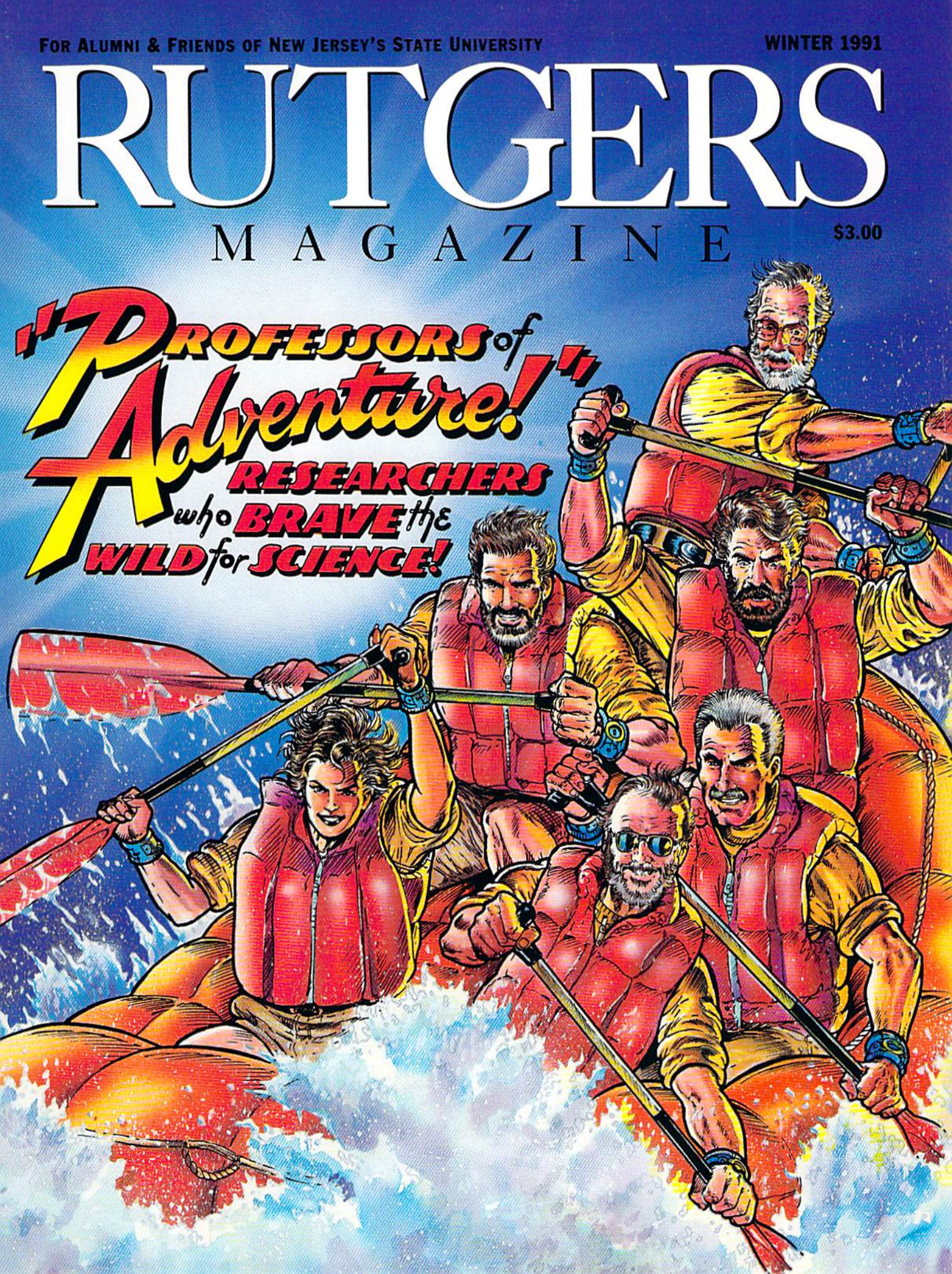
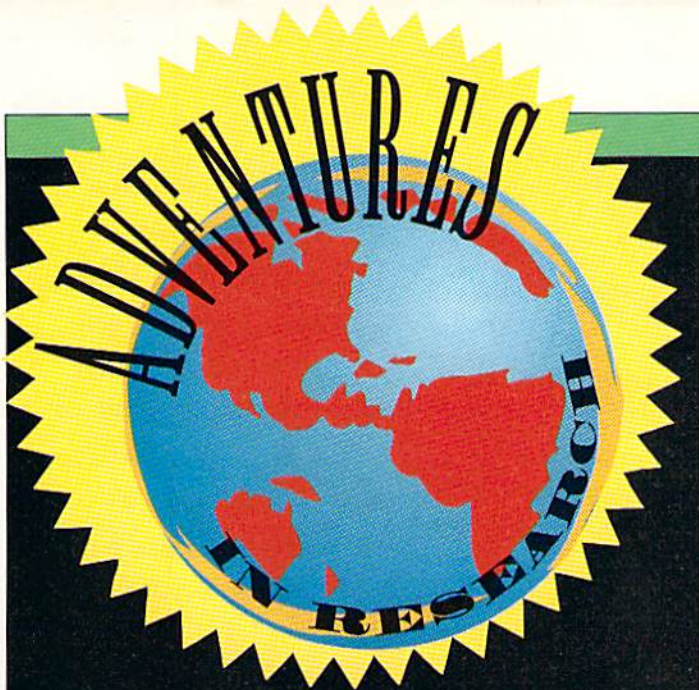




From the mountains of Africa to the depths of the Pacific, six Rutgers professors pursue science far from the safety of the lab.

Indiana Jones, the cinematic professor of archeology whose adventures inspired three films in recent years, would feel right at home traveling with some Rutgers faculty members. Not only do these intrepid professors help dispel the myth that a lab coat or sanitary laboratory is needed to conduct research, but they also experience the kind of adventures most of us only dream about.

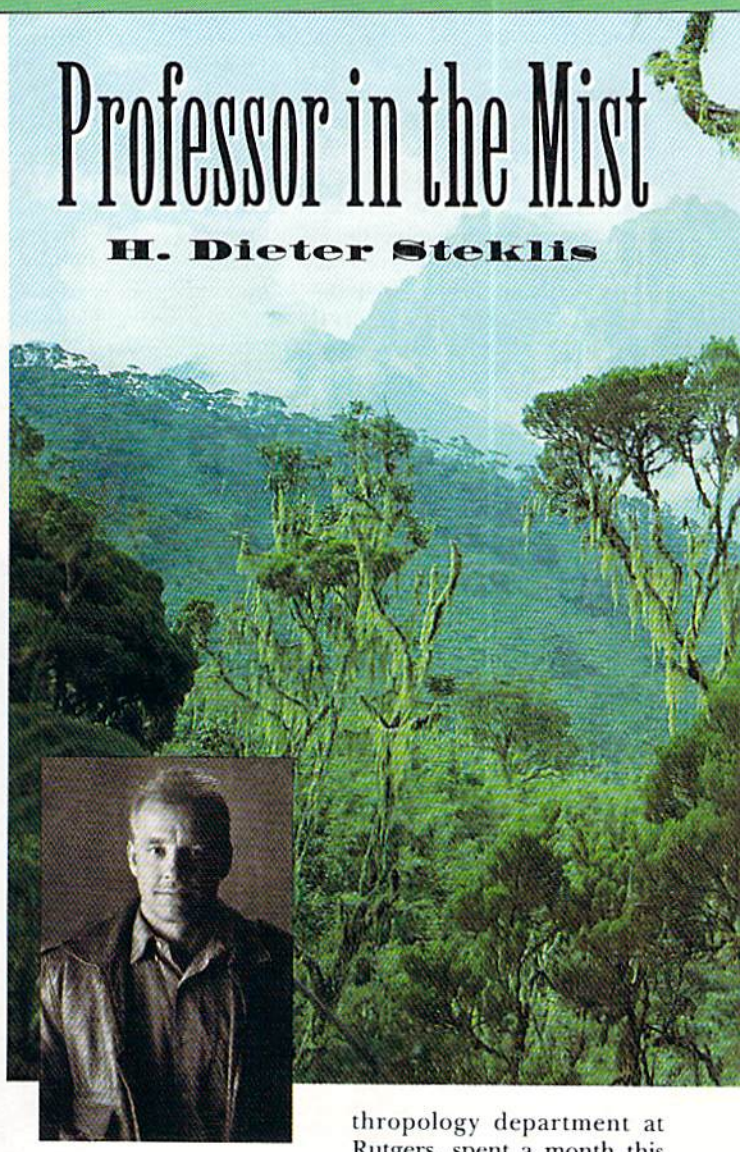
Whether the research takes place in the densest jungles of Africa, in the murkiest depths of the ocean, or in the wake of natural disasters, risk and uncertainty are always part of the equation. And while the dangers always create some degree of apprehension on the part of the researchers, one thing is irrefutable: Adventure is particularly useful as a teaching tool because it helps stir the creative juices and the desire to relate the experience.

But as these six faculty members who have braved some fairly formidable conditions could surely tell you: It doesn't happen only in the movies.

By Bill Glovin

Professor in the Mist

H. Dieter Steklis



"We ran for our lives and if we didn't find some trees to hide behind..."

After hearing H. Dieter Steklis talk about predators and poachers in the deepest jungles of Africa and about trying to steer clear of gunfire and antiaircraft artillery, you get the impression that monitoring gorilla behavior in the mountains is the easy part.

Steklis, chairman of the anthropology department at Rutgers, spent a month this past summer in Rwanda identifying research projects and preparing to become the director of the Karisoke Research Center, the facility established to study mountain gorillas by the late Dian Fossey of *Gorillas in the Mist* fame. Steklis will serve as the center's director for 18 months beginning in late December.

The mountains around the facility are the only place in the world where mountain gorillas are found. "Most people don't realize how physically and mentally demanding the work is," says Steklis. "Not only is the camp completely isolated, but it's cold and rainy and the night life consists of a beer. The days are spent climbing mountains and sides of ravines in

Portraits by Nick Romanenko, additional photos courtesy the researchers

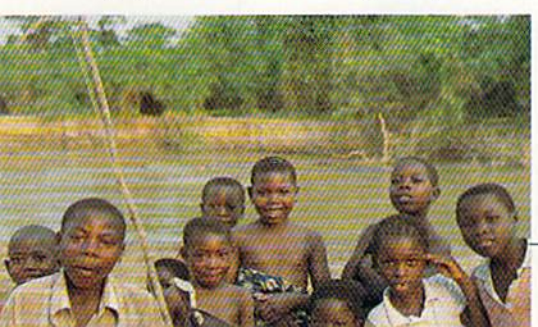
The volcanoes of Virunga National Park in Zaire (left) are home to the mountain gorillas that Steklis studies. In these mountains 10,000 feet above sea level, female gorillas raise their young (above). Because gorillas mature slowly, females give birth only once every four years. The long period of time it takes to replace even one gorilla taken by poachers places this small population at risk of extinction.

thick vegetation trying to find, keep up with, and then observe the gorillas."

Adding another dimension of concern is the tribal warfare currently taking place in Rwanda between the Hutu and Tutsi tribes. As a result of the fighting, there is less manpower to police the ever-dangerous poachers in the mountains. Steklis says that it's a bit unnerving to hear gunfire in the distance on a daily basis.

On an earlier trip to the region, he was taking aerial photographs of the area along a river separating Uganda and Zaire. Although the pilot had alerted authorities of their mission, only a circuitous route back to the airport saved the plane from being shot down because soldiers manning the anti-aircraft artillery in Zaire hadn't gotten the word.

Avoiding gunfire, however, was just the beginning. "Twice my party came across lions in Zaire," says Steklis, who was studying chimpanzee habits in Virunga National Park in 1990 with his wife, Netzin Gerald, a graduate student at Princeton.



Children crowding the banks of the Ishasha River in Zaire are unperturbed by the hippos that wallow near the opposite shore, even though the lumbering creatures are strong enough to kill a human.

"If you're in a group that makes a cautious, circular retreat, lions aren't likely to attack. But if you're alone, you can bet that they'll come after you. We heard of one fellow who was taken from his bicycle. All they found were his shoes and some bike parts."

On that trip, their tent was pitched right outside a small chunk of forest where the chimps lived—bordered by the Ishasha River and an open savannah inhabited by large predators.

"The most dangerous and unpredictable animals were the hippos, who came from the river and through the forest to graze in the savannah," says Steklis, a primatologist. "People often perceive hippos as cute and thumping, wearing ballerina shoes and riding a unicycle. But they've been known to bite through a person's chest."

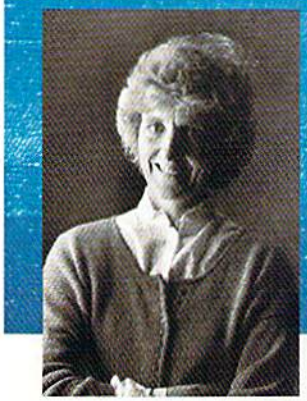
In fact, Steklis, his wife, and an armed ranger almost were breakfast for two hippos one morning. Upon hearing the noisy animals coming through the brush, their ranger realized he had the wrong cartridges for his rifle and was unable to fire the usual warning shots. Says Steklis: "We ran for our lives and if we didn't find some trees to hide behind...."

A lion rests in the savannah of the Parc National des Virungas in Zaire. Lions are a constant source of danger to Steklis' team; they have been known to attack and even eat people.

Besides the deadly predators, there was also danger from aggressive poachers, who hunt hippos and African buffalo to eat or sell. "We saw remnants of their work but didn't run into them," says the professor, who may have more lives than a cat. "The last thing in the world you want to do is surprise a poacher."

In the Land of Ice and Snow

Gail M. Ashley



"Occasionally, a block of ice will break off the glacier you're trying to collect a sample from."

Last winter, while taking samples from glaciers and collecting data in the peninsula area of Antarctica, geologist Gail M. Ashley heard what sounded like ice cracking. Quickly, she instructed her colleague to start their boat and back away.

"Our winter is considered their [the region's] summer," says Ashley, a professor at Rutgers since 1977. "Although the temperature is below freezing at night, during the day the temperature generally runs from 30 to 40 degrees. Occasionally, a block of ice will break off the glacier you're trying to collect a sample from. Although we kept our distance from the face of the glacier, we were ready to instantly retreat."

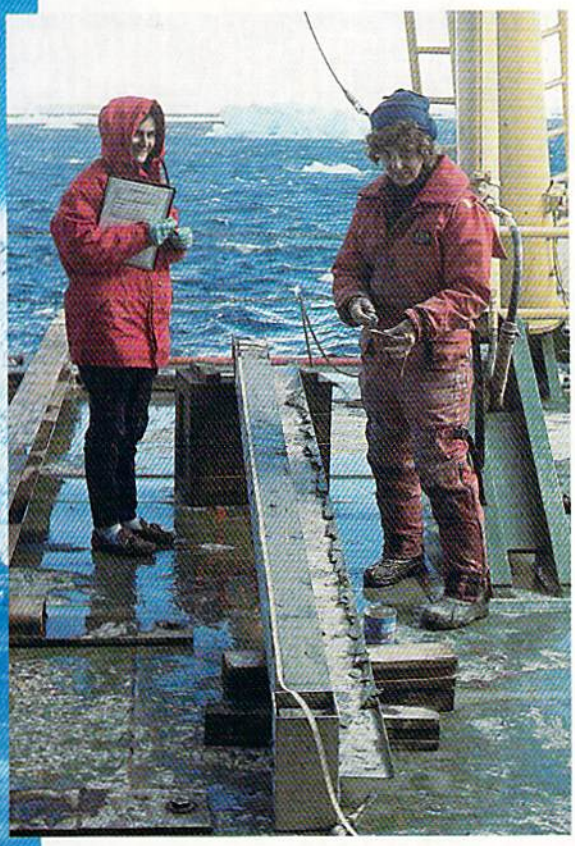
Another danger to the work, Ashley says, were the huge waves that sometimes occurred when large ice blocks fell into nearby waters.

With the help of a National Science Foundation (NSF) grant, Ashley was in Antarctica to study how glacial stability is affected by sediment and water flow. The work involved collecting glacial sediment samples from aboard a 12-foot motorized rubber boat.

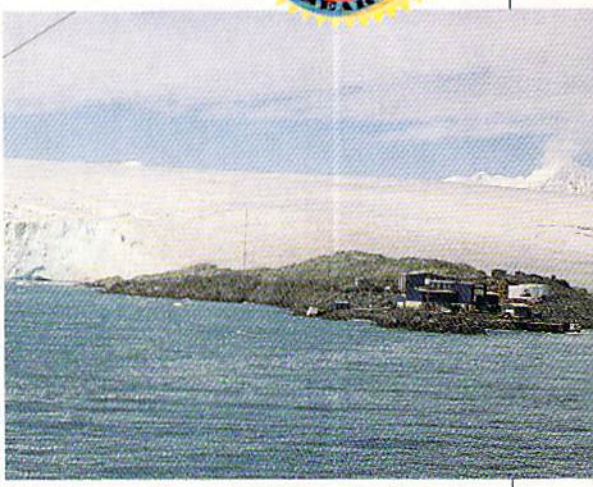
"There is concern that as sea level rises with the possible greenhouse effect, the ends of large glaciers will break off, start to flow faster, and add more water to the sea," says Ashley. "I was examining some smaller glaciers to determine trends."

Home for Ashley during the five weeks of research was Palmer Station, owned by the U.S. government and indepen-

Because they have no fear of man, elephant seals are frequent visitors at Palmer Station, where the dock area provides a comfortable napping place.



Ashley examines a sample of sediment collected from the bottom of the Lallemand fjord while an undergraduate student from Hamilton College observes (above). The sediments give researchers clues to the glacial history of the area around the Antarctic Peninsula (left), where icebergs the size of apartment buildings can be seen drifting in the sea (right).



Ashley's base was Palmer Station (above), which is located on a stretch of exposed rock on the Antarctic Peninsula.

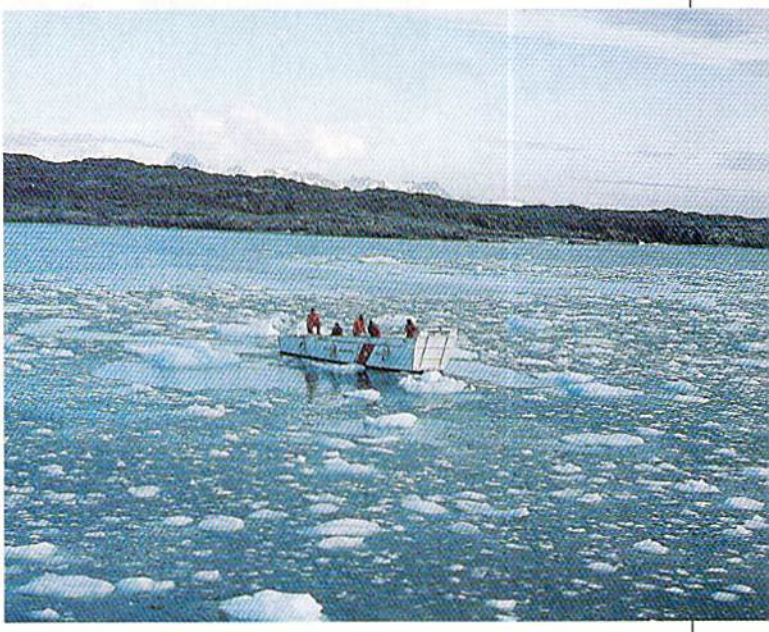
dently operated by a 40-staff commercial logistic company. To reach the station, Ashley had to fly to Chile and cross Drake Passage by ship. Because of the severe Antarctic winter and access only by water, Palmer Station is staffed by only seven people part of the year.

Despite the remote location, a communication satellite enabled Ashley to contact Rutgers almost daily. And the desolation didn't stop the staff from enjoying some luxuries—Ashley recalls a delicious Christmas dinner complete with wine.

"The beauty of the region is particularly inspiring," she says, noting that she spotted whales, exotic birds, and colonies of penguins, elephant seals, and leopard seals on her sojourns to sea. "We were told that leopard seals are known to be very aggressive and sometimes bite into rubber boats," she says. "We were instructed to leave an area if we spotted one."

Ashley plans to continue the research at the station in late 1992 if she can obtain NSF funding. By then, she hopes that work on a remote-operated submersible vehicle will be complete. The jet-propelled device operates on a cord with an attached camera and samplers and can be controlled from the craft, somewhat lessening the dangers of sampling. It also provides access to the underside of glacial tunnels.

"This would not only lessen the danger of sampling but would also allow us to reach places where we're currently not able to get to," says Ashley.



Marine geologists in a small 20-foot rubber craft collect data in the waters around the Antarctic Peninsula. Scattered on the surface of the water are small icebergs that remain after the melting of large tidewater glaciers.

20,000 Leagues Under the Sea

Robert Vrijenhoek & Richard Lutz

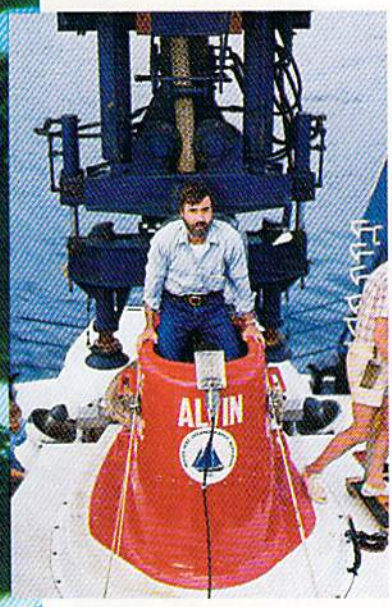
The Alvin, the world's smallest underwater vessel, is launched from its mother ship, the Atlantis II (above). Once the Alvin reaches the ocean floor, both still and video automatic cameras provide thousands of underwater photographs like the one at right, which shows a bed of clams off the tip of Baja California.

Vrijenhoek (standing) and Lutz: Joining forces at the sea bottom.

Two miles beneath the ocean, mussels cluster at the base of the Florida escarpment —the point where the edge of the continental shelf drops to the deep sea. The mussels eat bacteria that feed on seepage from oil deposits under the escarpment.

"We had a limited oxygen supply and things were pretty tense for a while."

Robert C. Vrijenhoek, director of Rutgers' Center for Theoretical and Applied Genetics, waxes poetic over traveling to the ocean floor in the *Alvin*, the world's smallest underwater vessel. "Intellectually, you know it's safe, but you still feel apprehension," he says. "It's like visiting another world, one that's as different as anything I ever knew existed, where the only light is phosphorescently produced by organisms that are unlike anything in our terrestrial environment. In many ways, we know a lot more about the moon."



Lutz emerges from the Alvin (above left). While submerged, Lutz studies organisms such as Raftia (above right). These six-foot worms secrete chitin—the substance that forms the shells of insects and crustaceans—to form the tubes they dwell in.

For about $40,000, and with the proper authorization, you can take the three-passenger submarine as far down as 4,000 meters, to a realm where underwater volcanoes can warm water temperatures to 500 degrees, water pressure is 4,600 pounds per square inch, and worms can grow nine feet long.

Vrijenhoek and co-investigator Richard A. Lutz, director of Rutgers' Fisheries and Aquaculture Technology Extension Center and associate director of Rutgers' Institute of Marine and Coastal Studies, spent two weeks this past August off the Oregon and Washington coast working on their National Science Foundation–funded project: "Genetics and Migration in Deep Sea Hydrothermal Vents."

The biologists are trying to find why organisms like tube worms, clams, and limpets live in temporary communities and how they travel to other communities. The pair has also examined underwater populations off Ecuador's Galapagos Islands, off the Pacific coasts of Mexico and the U.S., and in the Gulf of Mexico.

The *Alvin* was launched each day from a mother ship. Vrijenhoek describes the *Alvin* as "a 25-foot red-and-white vessel that resembles the Beatles' *Yellow Submarine*." Owned by the Navy and operated by the Woods Hole Oceanographic Institute, it runs on battery power, supplies its own oxygen, and can operate under water for eight hours at a time.

Vrijenhoek and Lutz would situate themselves at the lucite portholes and use strobe lights to take videos and still pictures. A pilot ran manipulator arms and a suction device to collect samples of rocks, organisms, and shells.

"The *Alvin*'s most famous mission involved the recovery of a nuclear bomb from a fighter plane off Gibraltar, and it was also used to find the *Titanic*," says Vrijenhoek. "There are about a half-dozen *Alvin*-type submarines in the world owned by the U.S., Canada, Russia, France, and Japan."

This summer's trip—marred by 45-mile-per-hour winds and rough seas that initially rendered most of the mother ship's crew seasick—was Lutz's 15th expedition since 1979 involving the *Alvin*. Vrijenhoek, who has been out on the vessel four times, was asked to join the project, he says, when scientists "couldn't make headway using traditional approaches in learning how organisms disperse and colonize in deep sea vent sites."

In addition to bumpy seas, Lutz faced the harrowing experience of being trapped in the *Alvin* on the ocean bottom during the last dive. Part of the vessel's outer structure came loose and scooped up some 400 pounds of mud. After about four hours, technicians found a way to release enough weight to allow the *Alvin* to make the three-hour-plus trip to the surface.

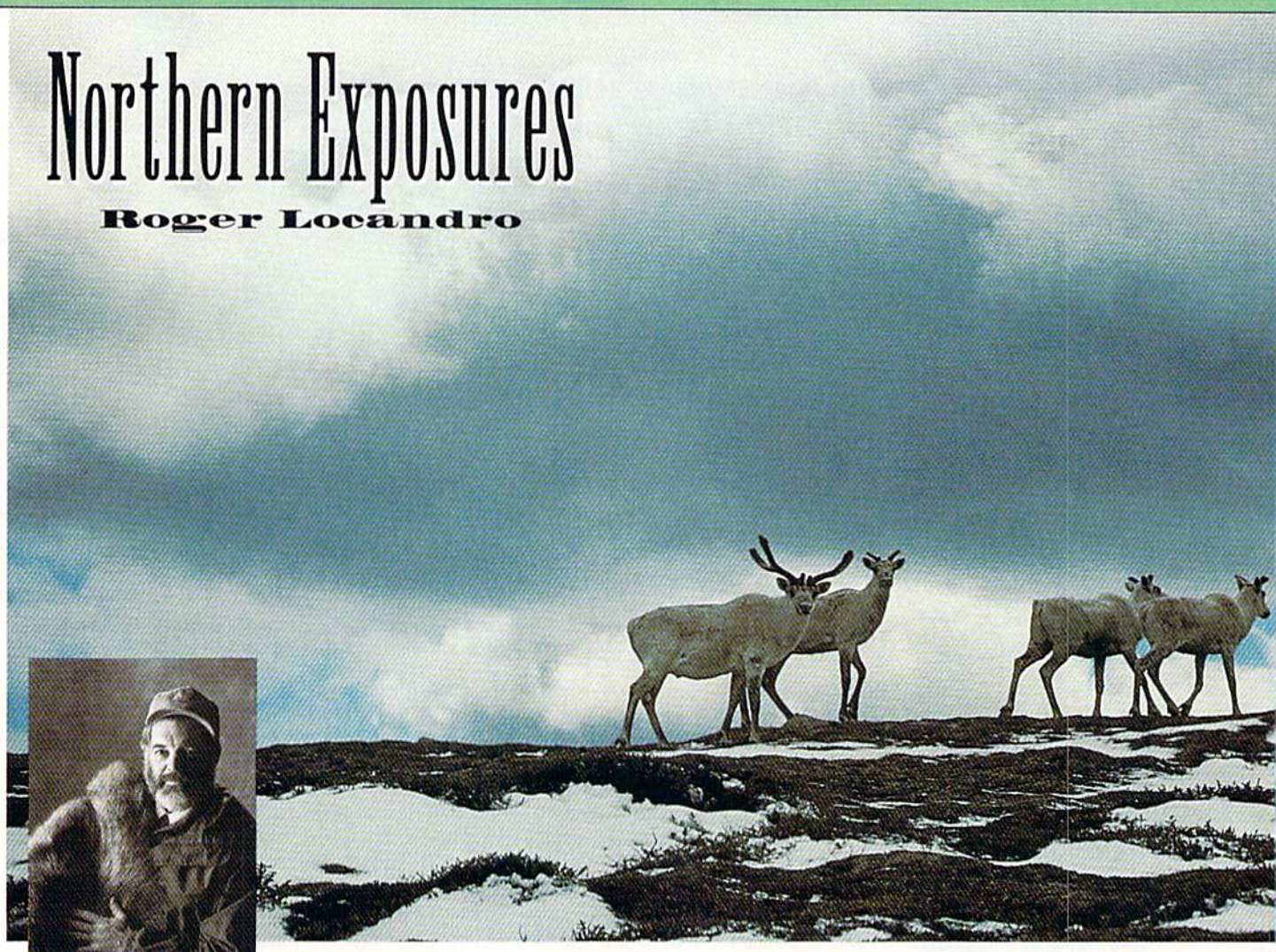
"It was the first time I had to put on my emergency thermal gear, which helps prevent hypothermia," says Lutz. "We had a limited oxygen supply and things were pretty tense for a while. I had five pounds of organic material in my pants."

Despite the pitfalls, Lutz and Vrijenhoek aren't discouraged from taking future dives. "You always walk out of the thing with a stiff neck, but it's so fascinating down there you don't even feel the pain," says Vrijenhoek. His advice to anyone who wants to spend $40,000 to see the bottom of the ocean: "Don't drink any coffee before you go out. There isn't a restroom."

Not all the divers' work is glamorous. Inside the Alvin, Vrijenhoek sifts through sediment from the ocean floor.

Northern Exposures

Roger Locandro



"Last year an adiabatic wind blew a man off that ledge to his death."

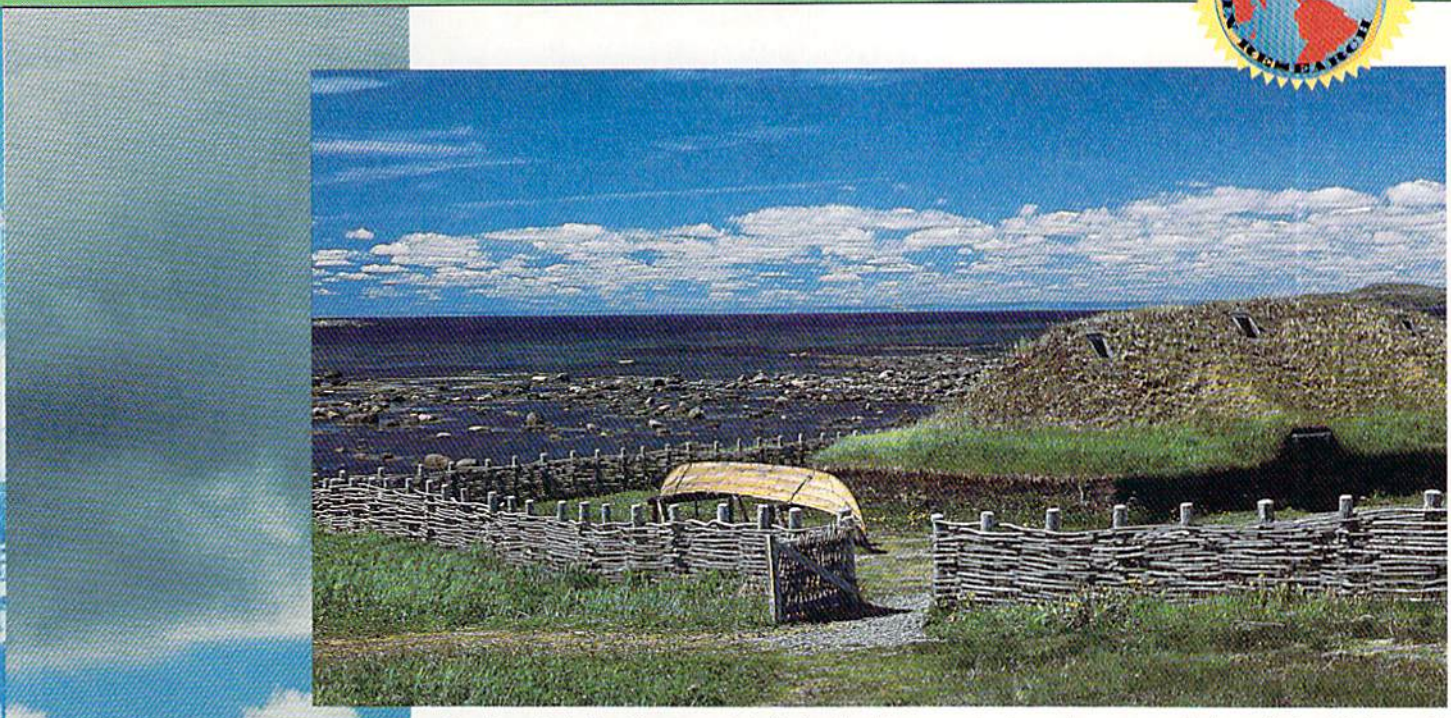
A few students were boldly inching their way toward a ledge on the summit of Gros Morne Mountain in Newfoundland, Canada, when Professor Roger R. Locandro issued this warning: "Last year an adiabatic wind blew a man off that ledge to his death."

With the prospect of being swept from a mountain top, Rutgers environmental science students who are enrolled in "Natural Resources of Newfoundland" aren't likely to be bored. The unusual five-credit course, which meets once a week during the spring semester, includes a 3,500-mile, two-week field trip to Newfoundland and casts students in the role of researchers. Following the field trip, students are required to either publish or teach about the experience.

Locandro, who has been traveling to Newfoundland for 19 years and often watches whales in the Straits of Belle Isle from the porch of his vacation home in Gros Morne National Park, says that adiabatic winds are known to sweep across the top of mountain ranges when temperatures fluctuate wildly and, at the same time, blow air currents both vertically and horizontally.

"The field trip aspect of the course attempts to combine basic science with social science," says Locandro. "About 14 students are in the field from 5 a.m. to 10 p.m. each day. They go out with local fishermen to get an independent perspective on things like the economy, local politics, and the art of fishing in cold temperatures. They also do extensive hiking in Gros Morne National Park to learn about geology,

Locandro's field class takes time out from exploring Green Gardens, a part of Gros Morne National Park that features unique vegetation growing on a volcanic base.



Gros Morne Peak, the tallest mountain in Newfoundland, has an arctic climate that supports animals usually found farther north, such as caribou (left). L'anse aux Meadows (above), on the northwest tip of Newfoundland, is the only Viking settlement to be discovered in the Americas. The area has been carefully reconstructed—complete with sod houses made of seal hide and whalebone—to appear as it did when Vikings settled here 500 years before Columbus arrived in America.

Gros Morne National Park's fresh water fjords provide a prime spot to study the plate tectonic theory of terrain formation (above left). At right, Locandro displays an Atlantic salmon from Main River, one of the world's finest salmon spawning grounds. The park has been designated a World Heritage site by the United Nations; its natural state is to be maintained in perpetuity.

ecology, and wildlife. It's not uncommon to run across moose and stag caribou, and we even saw a black bear this year."

A plant ecologist and a specialist in marine science, Locandro is a former dean of students at Cook College and has worked at Rutgers since 1962. He is also an expert on edible meats, fish, and plants and has developed two minicourses on food preparation at Cook College. In Newfoundland, he enjoys preparing many of the meals for the students.

How do the students respond to a land where lobster can be sky blue and is served on a roll at the local McDonald's, or where a glacier can rise 700 feet out of the ocean and represent only a tenth of its actual size?

"Newfoundland was definitely an important learning experience; I liked the holistic approach and particularly the interaction with nature and people," wrote one student in the course evaluation. Another student wrote: "This field trip was simply the most exciting, thrilling thing I've ever done."

The course has received such favorable response that the department is planning to offer a similar course this coming spring in Fjords National Park in Alaska. Locandro spent part of the summer there in the Prince William Sound meeting with wildlife and forestry officials to set up the project. Students would travel to Alaska late next summer to view a recently extinguished volcano, compare an array of glaciers, and learn about commercial and sport fishing.

"The problem is that the course will be limited to 12 people, and we already have 1,200 people thinking about it," says Locandro.

To emphasize the precautions he needs to take in setting up the course, Locandro relates that he was almost killed on an Alaskan expedition to learn more about fishing there. "Our boat was run over by a larger boat on automatic pilot, and it capsized into the freezing water," he says. "It was a miracle no one out of the six of us got caught in either of the boat's propellers."

Flirting with Disaster

Ken Mitchell

In Tokyo, firemen drill at a specially built apartment complex that serves as both housing and a firewall (top). To protect central London, which is slowly sinking, moveable gates that lie on the bottom of the Thames can be pulled to a vertical position during flooding (bottom). Mitchell studies how communities like these prepare for potential disasters.

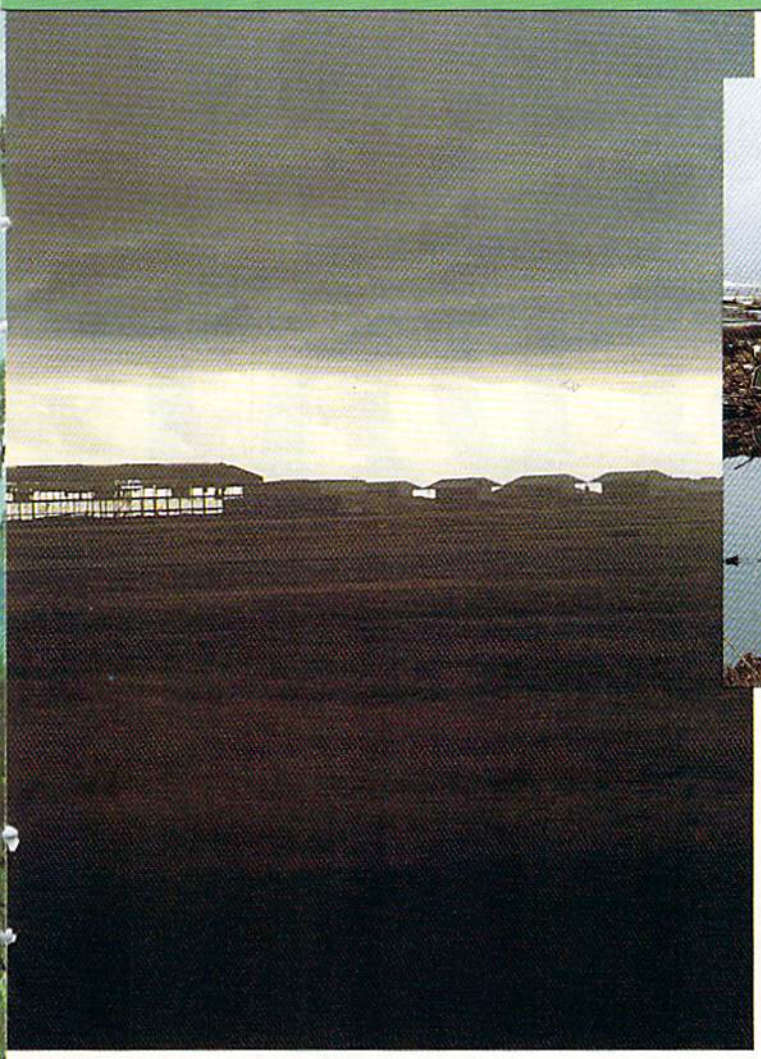
Perched precariously at the coast's edge, the heavy development of Waikiki Beach in Honolulu, Hawaii is easy pickings for tsunamis and hurricanes. Mitchell notes that while Waikiki has thoroughly prepared disaster measures, other heavily developed coastal areas like Ocean City, Maryland, have not displayed as much forethought.

"Your whole perspective changes when your life passes before your eyes."

Nothing surprises James K. "Ken" Mitchell anymore after spending 20 years studying the social implications of natural disasters. As chairman of a Department of Interior committee on the Outer Continental Shelf, Mitchell once led a research team into Alaska. While in the Prudhoe Bay region, one of the state's most remote areas, eight team members accepted a rare invitation to visit an isolated Inuit village.

"Our small plane landed in a snowstorm in the middle of nowhere," recalls Mitchell, chairman of the geography department at Rutgers. "No one was there to meet us, and, as we were about to start up the road, the pilot warned us that it was polar bear cubbing season and that the bears had picked up the scent of a dead whale in the area and were probably out looking for food. When we returned to the base, we phoned to find out why we hadn't been met. It turned out the entire village was watching *Monday Night Football* on their new satellite dish."

Although the Northern Ire-



While landing at Honolulu, Mitchell had the rare opportunity of snapping this photograph of a funnel cloud near the airport (left). The week before, on November 23, 1982, Hurricane Iwa hit Hawaii. On the island of Kauai (above), the hurricane left a decorative pond at the Sheraton Hotel filled with cars and other wreckage and the building behind it with nothing more than a foundation.

land native specializes in wind storms, he has also examined the aftermath of earthquakes, volcanoes, floods, and tidal waves. Part of the work often involves visiting a location to assess the potential hazards of a natural disaster, such as determining the effects that hurricanes and earthquakes could have on new oil wells and offshore platforms in the Outer Continental Shelf.

There are several factors involved in the assessment process, says Mitchell, who from 1985 to 1987 was involved in formalizing the United Nations' International Decade of National Disaster Reduction, a collaborative program to confront disasters in the nineties.

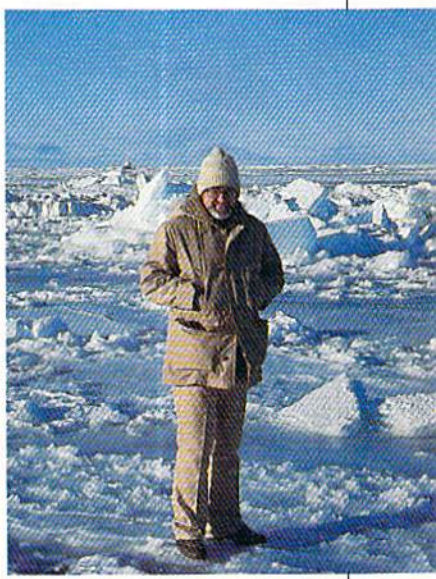
"If it's after the fact, I try to determine how the population coped," says Mitchell. "Were they prepared for [the disaster]? Was there enough warning? Did they understand the warning signs? How did the population react? Did the reaction measure up to expectations? Were the people in need of emergency assistance able to obtain it?"

The risks of visiting natural disasters can be particularly harrowing: environmental accidents, disease, unstable structures, and lack of utilities. "It's always strange coming to an area to conduct your research when so many people are trying to leave because of the hazards," says the 48-year-old professor. "And despite the fact that looting is generally overemphasized as a problem associated with natural disasters, I'm sometimes erroneously perceived as a looter."

The ancillary benefits of his research include a wide range of travel and experiences that Mitchell calls "incredibly diversifying."

One of his more memorable expeditions was one in which, as a member of the National Research Council team , he was sent to Hawaii shortly after Hurricane Iwa hit Kauai in 1982. "We were without electricity or running water," says Mitchell. "It forced us to experience a tropical night through native eyes."

But Mitchell's most serious brush with danger and an experience he calls "invaluable in learning how human beings behave in a crisis" occurred in 1976 on a routine trip to a conference in New Orleans. Shortly after taking off from Denver, the DC-9 shook violently and was forced to make an emergency landing. As the plane began to literally fall from the sky, the pilot was able to bring it down in an undeveloped area. Although the plane burned until only its frame remained, no passengers were killed.



Near Barrow, Alaska, Mitchell stands atop the frozen Arctic Ocean. The ice poses a threat to the area's oil rigs.

"Everyone dealt with an overwhelmingly stressful situation in a very different way," says Mitchell. "For me, time just slowed down. I learned that whether it's a natural or technological disaster, your whole perspective changes when your life passes before your eyes." ❑