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WEDNESDAY,
APRIL 16, 1997

SCIENCE

& HEALTH

INSIDE
EARTHWEEK,
F4
CLASSIFIED,
F5-28

RESEARCH

Notebook

Study finds stress lowers production of adult brain cells

Stress is known to contribute to heart disease, cancer and accidents. Now scientists have found that stress markedly lowers brain-cell production in adulthood.



A new study confirms that a specific brain area can grow new cells in an adult. But it also shows that stress can put the brakes on.

"Stressful experiences decrease the genesis of neurons in a brain area of the adult tree shrew," said Elizabeth Gould of Princeton University. Her study appears in the April issue of the *Journal of Neuroscience*.

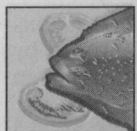
Stress expert Robert Sapolsky of Stanford University said the study is the first to demonstrate that stress can disrupt neuron production in the adult brain.

The idea that the adult brain of complex mammals can produce neurons is new in itself. But recent research found that the dentate gyrus area of the brain can produce new neurons in adult rats.

Gould's research shows this is also the case in the adult tree shrew, a mammal more similar to humans than rodents. She said the finding suggests that the neuron production also might occur in primates, including humans.

Ultrasound now used to inspect plastic-sealed food containers

Ultrasound's ability to see where human eyes cannot is being fine-tuned to improve food inspection and make plastic-sealed food containers safer and potentially longer-lasting.

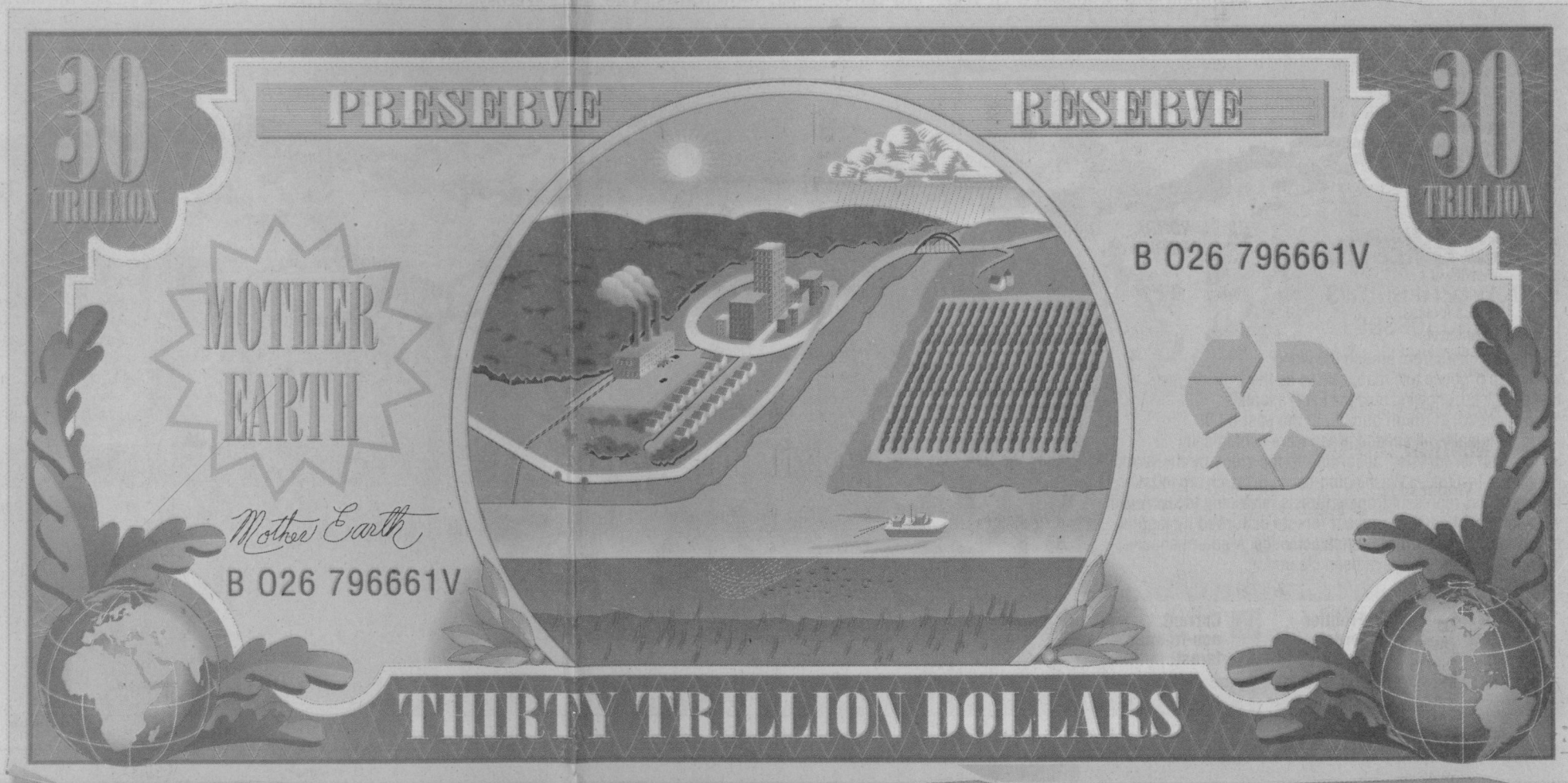


Tests at the University of Illinois with a newly developed pulse-echo acoustic technique have spotted defects in seals of less than 10 microns, which is one-fifth the diameter of a human hair. A new target is 6.5 microns. Research findings were published in the March issue of the *Journal of Food Protection*.

How much can the ultrasound see?

"We can distinguish what's in the channel of a defect — if it's air, if it's water or if it's tiny strands of protein," said Scott A. Morris, a professor of food science and agricultural

Putting a Price on Mother Nature



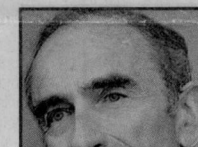
DAN AGUAYO/The Oregonian

The Earth's free services are worth trillions of dollars, but environmental scientists warn that humans are depleting and undermining those resources at an alarming rate — and losing them will be costly

By **RICHARD L. HILL**
of The Oregonian staff

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I firmly believe that the loss of nature's services



The value of nature

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How much can the ultrasound see? "We can distinguish what's in the channel of a defect — if it's air, if it's water or if it's tiny strands of protein," said Scott A. Morris, a professor of food science and agricultural engineering. "We can tell if a hole is empty or full. We can look at other contaminants, such as grease or dust, that may be in the seal and affect its strength."

Hubble Space Telescope picks up mysterious burst of gamma rays

The Hubble Space Telescope has shed a little light on one of the most mysterious events in the universe.

Gamma rays make up the uppermost reaches of the electromagnetic spectrum, more energetic even than X-rays. About once a day, like lightning, a flash of gamma rays appears somewhere in the cosmos. For two decades, scientists have wondered where these bursts come from and how they are produced.

Efforts to find a source of such gamma rays had failed. But in February, scientists announced that two ground-based telescopes had picked up something visible — an "optical counterpart" — associated with a gamma ray burst. The observatories took two images a week apart and detected a clearly visible if fading object.

In March, the Hubble telescope scanned in the direction of the object after it had dimmed from the view of surface telescopes and started tracking the remnants of light.

Scientists don't know what the object is, and they don't think it's the only source of gamma ray bursts. But the new Hubble observations might help them find out whether the rays are coming from within the Milky Way or from a distant galaxy.

Nose-drop vaccine for influenza succeeds in human tests in Israel

The effectiveness of an innovative anti-influenza vaccine developed at the Hebrew University-Hadassah Medical School in Jerusalem has been demonstrated on humans in clinical tests.

The vaccine is administered as nose drops, not as an injection. Delivering the vaccine through the nose provides a first line of defense against the flu virus, which enters the body via the respiratory system. The nasal vaccine stimulates the creation of antibodies in the respiratory system and in the blood, preventing the flu virus from gaining a hold in the body.

The vaccine was tested this winter on 51 patients at the medical school. None of the patients became ill with the flu.

— Compiled by Richard L. Hill

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...the Earth's free services are worth trillions of dollars, but environmental scientists warn that humans are depleting and undermining those resources at an alarming rate — and losing them will be costly

By RICHARD L. HILL
of The Oregonian staff

Air pollution. Water pollution. Imperiled wildlife. Those human-caused problems have dominated the environmental spotlight since the first Earth Day in 1970.

But a new concern is emerging among scientists: Nature's free services to humans are in trouble. With the planet-awareness day being observed again Tuesday, ecologists are drawing attention to the topic, which they say has been largely ignored by the public and policy-makers.

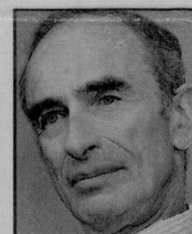
Environmental scientists warn that although natural ecosystems provide services worth trillions of dollars — at least \$30 trillion by one rough estimate — they're being depleted and undermined by human activities.

Those human life-support systems include pollination of crops, pest control, flood control, purification of air and water, soil fertility and regulation of climate. Losing those free services will be costly, scientists say.

"As more and more of the surface of the Earth is modified by human activities, we are losing more and more of these services," said Jane Lubchenco, a zoology professor at Oregon State University. "These services until now have been taken for granted."

Lubchenco organized a symposium on the

"I firmly believe that the loss of nature's services is one of the most crucial issues facing humanity today — far and beyond anything you will hear on the Sunday talk shows."



Paul R. Ehrlich, professor of biology at Stanford University on the value of nature's services

subject at the recent annual meeting in Seattle of the American Association for the Advancement of Science. "We don't buy and sell the services ecosystems provide, but we do buy and sell their goods," said Lubchenco, who serves as association board chairman. "There's an immediate short-term benefit to a lot of human activities — filling in a wetland to put in a shopping mall, cutting down a forest to get the resources for timber. So you get some economic benefit, but the cost-accounting does not

Please turn to EARTH DAY, Page F2

ELEPHANT SEAL



By KATY MULDOON
of The Oregonian staff

The tides were on their side. For the first time, northern elephant seal pups born this winter on Shell Island, south of Coos Bay, probably lived long enough to survive at sea.

By last week, six of the seven had left the rocky outcrop where they were born, just off Cape Arago.

It is the first time since the blubbery marine mammals established a breeding colony there in 1993 that pups have survived the critical first 100 to 110 days of life. In previous winters, high tides and storms coincided to sweep the young off the narrow beach and out to sea before they were old enough to survive.

But this winter was as mellow as a slack tide.

Scientists from the Oregon Institute of Marine Biology in Charleston kept a sharp eye on the whiskered pups. With help from the Oregon Department of Fish and Wildlife, the scientists tagged six pups — three male and three female. They didn't spot the sev-

enth pup until later, so they didn't tag it or determine its gender.

The tags will help marine biologists learn more about the elephant seals' range and habits.

Theirs is a well-studied species — one that has rebounded remarkably from the brink of hunter-caused extinction. In the late 1800s, just 50 to 100 northern elephant seals were thought to be left; they lived in a single colony on an island off the coast of Baja California. Today, about 160,000 animals range along the Pacific coast, breeding mostly on islands and beaches of Southern and Central California. Shell Island, part of the Oregon Islands National Wildlife Refuge, is home to the most northerly breeding colony.

Oregon's pups were born in January. The mothers nurse their pups for about a month, then abruptly abandon them and head to sea. But the milk they've provided is 55 percent fat, a diet rich enough to sustain the young seals for 10 weeks or so.

A fun fact: Some pups nurse from two or three females and grow to 600 pounds; they're called "superweaners."

Elephant seals are awkward beasts — they look like slugs on steroids — and the pups appear somewhat afraid of the water at first. But in late March or April, off they go in search of new territory and the first meal they've had in months.

"We don't know what their fate is," said Jan Hodder, "and we won't know until the first possible time they will return to land



STEVEN A. NEHL/The Oregonian

Northern elephant seal pups born on the southern Oregon coast have survived and headed out to sea.

this fall."

Hodder is an associate professor and education coordinator at Oregon Institute of Marine Biology. She has tracked the Shell Island elephant seals and wrote an article about them to be published this fall in the journal Marine Mammal Science.

It is thought many of the seals feed on squid, skates and small sharks off the coast of Washington and British Columbia; killer whales and sharks prey upon them.

Hodder said that at Año Nuevo State Reserve, a major elephant seal gathering area 55 miles south of San Francisco, one-fourth to one-half of the tagged pups are

The value of nature

Maintaining the health of nature's services makes good economic sense, says Janet N. Abramovitz, a senior researcher with the Worldwatch Institute. Here are a few of the examples she gives in the institute's "State of the World 1997":

■ Some wetlands near cities have measured values of \$40,000 a hectare (nearly 2½ acres). Despite their value, the United States and Europe have lost more than half of their wetlands. Asia has lost 27 percent.

■ Restoration of half of the upper Mississippi's lost wetlands could control a flood of the magnitude of the 1993 disaster, which cost about \$15 billion. This restoration would affect 3 percent of the region's land but would prevent a repeat of the disaster.

■ In the United States, 70 percent to 95 percent of fisheries worth more than \$3 billion at dockside depend on threatened coastal wetlands and estuaries.

■ About 80 percent of the world's crops and one-third of U.S. agricultural output depend on pollinators such as bees, insects, bats and birds, whose populations are in jeopardy.

■ The pollination services of bees are worth as much as 100 times more than their honey.

■ Crop improvements such as disease resistance and improved yields come from breeding with wild relatives. Nature's crop genetic library has added an estimated \$66 billion to the global economy.

■ The value of coastal mangrove ecosystems for flood control has been estimated at \$300,000 a kilometer in Malaysia. The figure represents the cost of building rock walls to replace that service.

never seen again. So she is unsure whether she'll ever get another look at the Shell Island pups, though they are inclined to return to the site where they were born.

Elephant seals come ashore several times a year to molt, rest, breed and give birth.

During the next month, females and 1- to 3-year-old elephant seals will haul out at Cape Arago and other beaches throughout Oregon to molt, a process in which they lose fur and skin. They don't eat or drink during the approximately three weeks on land, Hodder said. Sub-adult males and adult males will follow suit through August.

The pups born this year will haul out in the fall to rest for a few weeks, but they won't molt until next spring.

Elephant seals get their names from the males, whose long snouts resemble elephant trunks.

To learn more, check out the Internet site put together by elephant seal experts at Año Nuevo. The address is <http://www.anonuevo.org>

COMING UP

■ Look for these graphics to run monthly in the Science section:

- 1st Wednesday: astronomy
- 2nd Wednesday: weather
- 3rd Wednesday: animals
- 4th Wednesday: geology
- 5th Wednesday: environment

Earth Day: Nature's services are being lost throughout the world

Continued from Page F1

include the loss of these ecosystem services."

Lubchenco and more than 30 other scientists also have contributed to a new book, "Nature's Services," which is the first to detail humanity's dependence on these natural systems.

Gretchen C. Daily, an ecologist at Stanford University who edited the book, said most of nature's goods — such as timber, pharmaceuticals, seafood, fuel wood and animal fodder — are well-recognized. But the public is generally unaware of the nature and value of the services.

"For example, few people know that one in three mouthfuls of our food was derived from plants that were pollinated by natural pollinators living in natural ecosystems next to farmland," Daily said. And about 44 billion metric tons of waste is processed annually by natural ecosystems, she said.

Paul R. Ehrlich, a professor of biology at Stanford University, said if people don't become aware now of the value of nature's services, they're going to learn about them in often catastrophic ways. He cited the overharvesting of forests as partly responsible for this winter's lethal and damaging mudslides in Oregon and Washington.

Ehrlich said a recent study by Julia A. Jones of Oregon State University and Gordon E. Grant of the U.S. Forest Service found clear-cutting forests and building roads increased peak flows in mountain streams by as much as 50 percent. He said the destruction of the natural flood and mudslide controls provided by forests should be included in the cost of timber harvesting on public lands.

"But these kinds of things are happening throughout the world," Ehrlich said. "There's everything from rising fish prices to the loss of 24 billion tons of topsoil each year.

Interference with nature's services comes home to the rich in higher fish prices and loss of sports fisheries; loss of real-estate values; higher risks from 'natural disasters' such as floods, droughts and other weather events."

Ehrlich added that when ecosystems are disrupted, North Americans suffer outbreaks of agricultural pests; acidification and decline of forests; and rapid siltation of reservoirs, threatening the sustainability of irrigation and power generation.

"I firmly believe that the loss of nature's services is one of the most crucial issues facing humanity today — far and beyond anything you will hear on the Sunday talk shows," he said.

New York City recently discovered what it costs to gradually lose the natural regulation and purification of water by soils and vegetation. The city receives 90 percent of its drinking water from reservoirs in the Catskill Mountains. The

reservoirs, which supply water to about 9 million people, are fed by rivers and streams. But increasing pollution from a variety of sources — from weekend homes and their septic fields to runoff from farm fertilizer and livestock wastes — has led to a deterioration in the water's quality, making it a potential health threat.

City officials were faced with building the world's largest water-filtration plant, a \$4 billion project that would filter more than a billion gallons of water a day from the reservoirs. But three months ago, the city chose to spend \$600 million in a five-year program to restore water quality.

The project includes buying thousands of acres of land around the reservoirs to improve and preserve the watershed.

Geoffrey Heal, an economist at Columbia University who has been studying ways of placing dollar values on ecosystem services, said New

York City's dilemma will be common elsewhere in coming years. He said the cost for replacing the planet's natural water-control and water-purification systems would be about \$900 billion.

"I think it's a reasonable forecast that by the year 2020, the investment required for the infrastructure to supply drinkable water will be on a scale comparable to the investment we now have in providing power," Heal said. "I'd also be willing to bet that by 2020 — in significant parts of the world — pure drinking water will be at least half the price of crude oil — it will be a expensive and valuable."

Heal said researchers at the University of Maryland and Cornell University had made a rough estimate of \$30 trillion for the costs of all global ecosystem services. He believes that's a conservative figure.

Ehrlich, in an interview last week in Portland, called the notion that

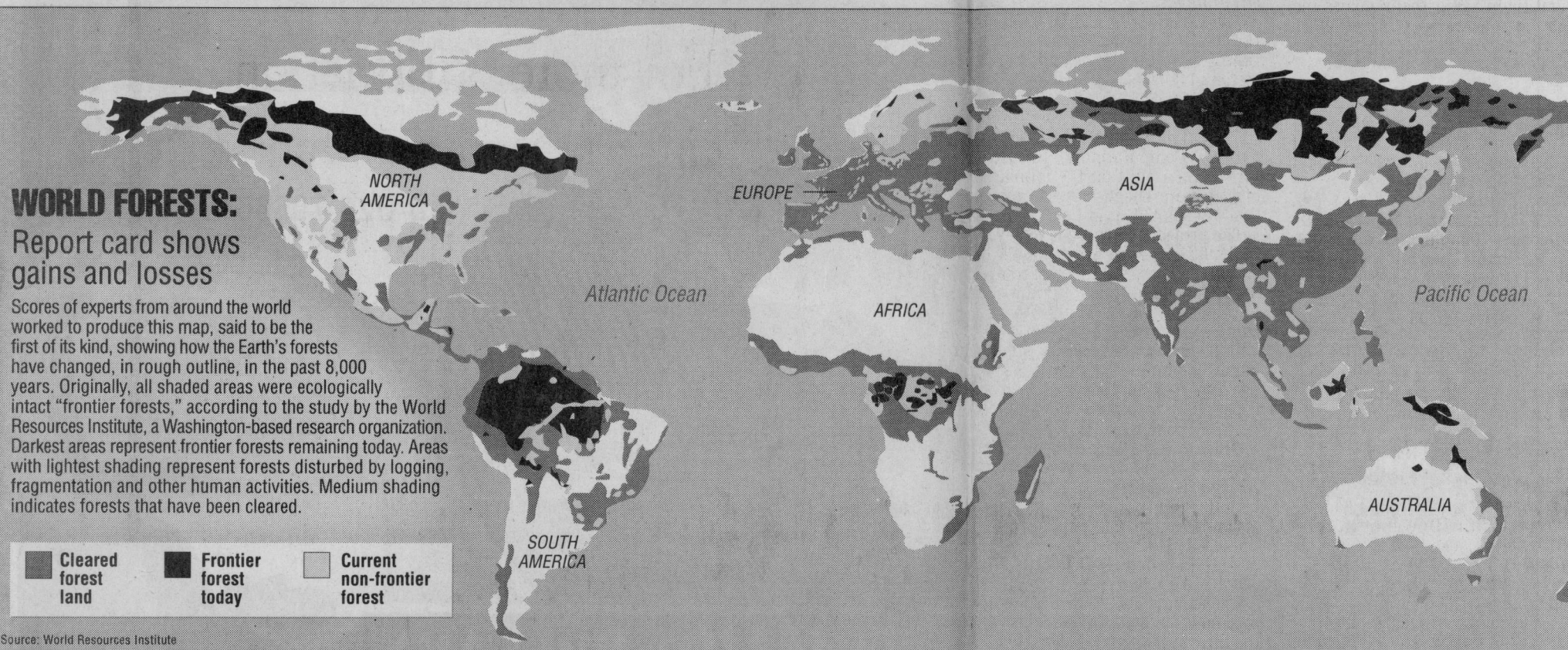
environmental and economic concerns don't mesh "ridiculous."

"Our economy depends entirely on the proper function of a whole array of environmental systems," he said. "Without them, you're not going to have any economy at all."

Janet N. Abramovitz, a senior researcher with the Worldwatch Institute, agrees. "In just a few centuries we have gone from living off nature's interest to depleting the natural capital that has accumulated over millions of years in evolution," she wrote in the institute's "State of the World 1997."

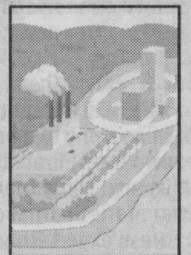
"As a result, governments, businesses — and ultimately, taxpayers — must pay for the services that nature can no longer provide."

Richard L. Hill covers science for The Oregonian's Health/Medicine/Science team. He can be reached at 221-8238 or by fax at 294-4150.



READ MORE ABOUT IT

Try these books for more detailed information about the natural services that ecosystems provide society:



"Nature's Services: Societal Dependence on Natural Ecosystems," edited by Gretchen C. Daily (Island Press; \$49.95 hard cover, \$24.95 paperback)

"The Work of Nature: How the Diversity of Life Sustains Us," by Yvonne Baskin (Island Press; \$25)

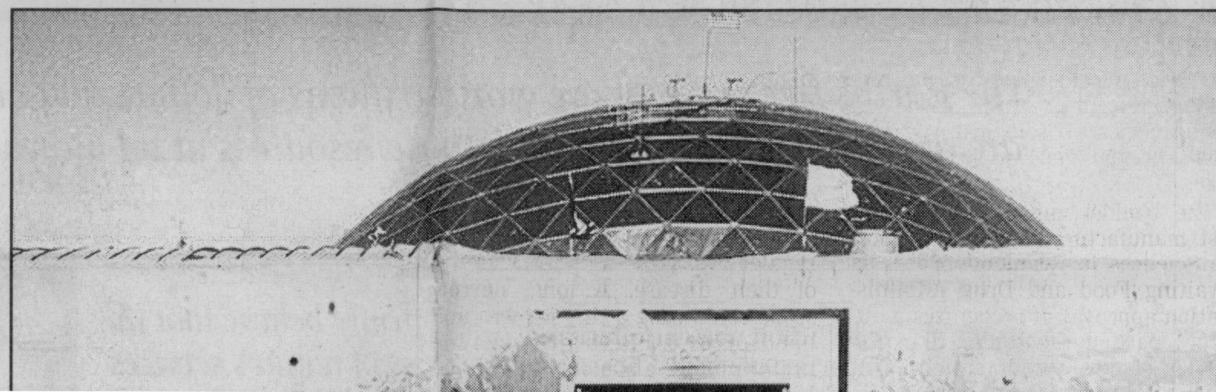
"State of the World 1997," annual report by Worldwatch Institute; Chapter 7, "Valuing Nature's Services," by Janet N. Abramovitz (W.W. Norton; \$13.95)

Big changes loom for U.S. activities around South Pole

The need to spend money on facilities probably will crimp

desk work and computer analyses.

Savings would limit scientists



to Antarctic territory. These claims are held in indefinite abeyance by the treaty, but they have never been relinquished.

U.S. stations are by far the most populous on the continent, and U.S. influence is regarded as an important factor in keeping the peace.

Every dollar the National Science Foundation can save for rebuilding South Pole Station will be needed. Even if large savings are realized, the foundation might have to close Palmer Station for several Antarctic

for U.S. activities around South Pole

■ The need to spend money on facilities probably will crimp money for scientific research

By MALCOLM W. BROWNE
New York Times News Service

As the green parkas worn by U.S. Navy men and women in Antarctica rapidly are replaced by the red parkas of civilians, significant changes are taking place in U.S. Antarctic operations. They're driven by leaner budgets, safety concerns, the end of the Cold War and new priorities in science.

Although it is only 23 years old, the United States' South Pole Station is sinking under the ice and warping under the pressure of drifting snow and ice crystals. Mounting problems with sewage disposal, garage space, electricity generation, fuel storage, fire prevention and a host of other things have convinced experts that the station needs to be replaced. But the earliest the station could be replaced, even if work began in the next summer season, is 2005.

To restore South Pole Station to a safe condition by 2005 requires a large investment, independent analysts agree. The money might have to come partly out of Antarctic budgets for research on ozone depletion, global warming, ice sheet melting, the birth of stars in distance galaxies and the search for extraterrestrial life.

So the National Science Foundation, the agency that directs U.S. operations in Antarctica, is seeking ways to slash the cost of research on the ice.

One way is to reduce the time scientists spend on the continent. Agency officials expect to continue supporting most active research in Antarctica, but they will encourage scientists to stay home, perhaps for one year out of three, to do their

desk work and computer analyses.

Savings would limit scientists

By transferring most Navy operations to civilian contractors in the next two years, the agency expects to save \$30 million. But a saving that will be less welcome to many scientists is a projected reallocation of \$20 million in research money, mainly by reducing the number of scientists working in Antarctica in the next five years.

The 23-year-old dome at South Pole Station is settling ever deeper into the 2-mile-thick ice sheet and posing many safety and operational hazards. The science foundation plans to dismantle it and ship it back to the United States, erecting in its place a pair of horseshoe-shaped residential and office buildings expected to cost about \$120 million. They will be mounted on stilts to prevent the accumulation of drifting snow around their bases — a large problem with the old dome.

Dr. Cornelius W. Sullivan, the marine biologist who has headed the foundation's polar programs since 1993, thinks that his agency will win congressional approval for financing the new South Pole Station at the Amundsen-Scott base as well as preserving the other two permanent U.S. stations in Antarctica: McMurdo Station on Ross Island and Palmer Station near the tip of the Antarctic peninsula. He summarized the program's needs at a congressional hearing Thursday before flying to Christchurch, New Zealand, for talks with his counterparts from Britain, New Zealand and South Africa about cooperation on logistics and ways to cut costs in Antarctica.

To lend support to Antarctic research, Secretary of State Madeleine Albright recently added her signature to an open State Department letter that said: "Main-

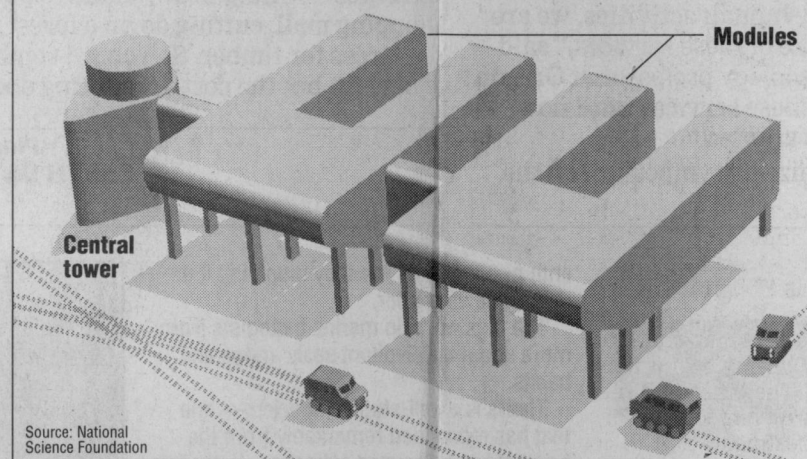


MALCOLM W. BROWNE/New York Times News Service

Researchers enter the snow-walled entrance to the National Science Foundation dome at South Pole Station, which the foundation wants to dismantle and send back to the United States because of safety and operational hazards.

A NEW SOUTH POLE STATION

Schematic drawing of the proposed replacement for the decaying dome at South Pole Station. Expected to cost about \$120 million, the pair of residential and office units would rest on stilts, above drifting snow.

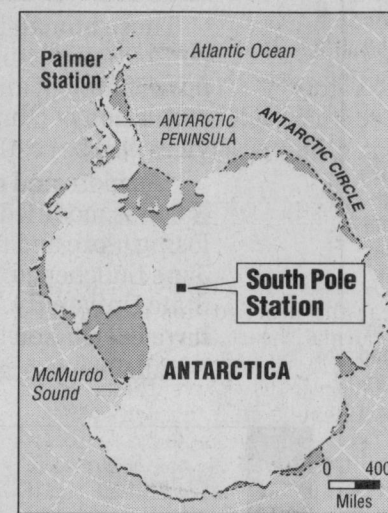


New York Times News Service

taining an active and influential United States presence in Antarctica serves important strategic and foreign policy objectives. This presence in Antarctica gives us a decisive voice in the Antarctic Treaty

system, which is the basis for the peace and stability of the area."

The letter was sent to Norman R. Augustine, chief executive of Lockheed Martin Corp. and head of a panel of experts who recently



New York Times News Service

assessed the needs of the Antarctic program.

43 nations have bases

To date, 43 nations have established bases in Antarctica under the Antarctic Treaty. Although scientific relations among them are harmonious, seven nations — Argentina, Australia, Britain, Chile, France, New Zealand and Norway — have longstanding and conflicting claims

Patients do better in warm surgery

■ In decades of operating-room disputes, anesthesiologists turn the thermostat up, and surgeons try to keep cool at work

By DENISE GRADY
New York Times News Service

Anyone who has ever lain naked and shivering on an operating table or come to with teeth chattering in a recovery room knows that having surgery is not only lonely but also cold.

Now research is confirming what patients might have suspected. According to a study published last week, operating rooms, which usually are kept cool to let surgeons work in comfort, are too cold for many patients.

The combination of a cool room, anesthesia, intravenous fluids and an open incision can lower a

patient's body temperature by 2 to 4 degrees Fahrenheit. In some people, that chill can cause serious heart problems, the leading cause of death in patients recovering from surgery.

Simply keeping patients warm during and after surgery can reduce the risk of heart trouble, researchers from Johns Hopkins University reported in the April 9 issue of *The Journal of the American Medical Association*.

"Surgeons and anesthesiologists have constant fights over the thermostat in the operating room," said Dr. Steven M. Frank, an anesthesiologist at Johns Hopkins and director of the study. "It's been going on for years.

"The surgeons want it as cold as possible. We want it as warm as possible for patients. We monitor the patient's vital signs, and temperature is one."

Operating rooms are usually kept at 65 to 70 degrees Fahrenheit. Anything less than 70 degrees puts the patient at risk for lowered body temperature, or hypothermia, Frank said.

But surgeons often prefer lower readings because their work can be stressful and physically demanding, and they tend to get overheated. That problem has worsened in recent years, he said, as surgeons have been required to wear waterproof gowns that blood cannot soak through to protect themselves

against AIDS.

To gauge the importance of body temperature in surgical patients, Frank and his colleagues studied 300 people who had abdominal, vascular or chest (but not cardiac) surgery.

In 158 patients, routine warming methods were used, including paper drapes during surgery, warmed cotton blankets afterward and warmed intravenous fluids. The thermostat in the operating room was set at 70 degrees. Despite those measures, patients became hypothermic, with body temperatures dipping below 96 degrees Fahrenheit; about 98.6 degrees is normal.

The other 142 patients were treated the same way with one exception: During surgery and for two hours

relinquished.

U.S. stations are by far the most populous on the continent, and U.S. influence is regarded as an important factor in keeping the peace.

Every dollar the National Science Foundation can save for rebuilding South Pole Station will be needed. Even if large savings are realized, the foundation might have to close Palmer Station for several Antarctic winters. Palmer is the smallest of the three stations, but it is especially important for marine biologists because of the rich variety of birds and sea animals around it.

The current interest in the search for signs of extraterrestrial life has raised the stakes for financing U.S.-supported science in Antarctica, including support for Russian programs.

Scientists long have suspected that primitive microorganisms living at temperatures as low as minus 100 degrees Fahrenheit between layers of rock sediment in Antarctica's Dry Valleys might have counterparts on Mars and elsewhere. During the past two decades, much research has focused on these organisms, called endoliths. Scientists also are looking for signs of life in meteorites found in Antarctica and thought to have come from Mars.

Recently, however, scientific interest has focused on a huge lake of liquid water, 140 miles long and 30 miles wide, lying two miles beneath the ice sheet near Russia's Vostok Station. Russian scientists and their collaborators have been drilling deep into this ice.

Because of fears that penetrating the subglacial lake, called Lake Vostok, would contaminate it with microbes from the surface, leaders of the international project have halted the ice drilling a few hundred feet above the water. They hope that when they have found a sure way to prevent contamination they will be able to pierce the last layer of ice and look for primitive forms of life in the lake — forms that might resemble life in the liquid water that is thought to lie under the frozen surface of Europa, one of Jupiter's moons.

afterward, they were kept warm with a special cover pumped full of heated air, which was adjusted to keep their body temperatures as close to normal as possible. Covers of this type are becoming more widely used.

The warmer patients fared better after surgery. In the following hours, only 1.4 percent had cardiac complications as heart or cardiac arrests, compared with 6.3 percent of the hypothermic group. Two patients in each group died, so the death rates were the same, but patients with complications spent more time in intensive care.