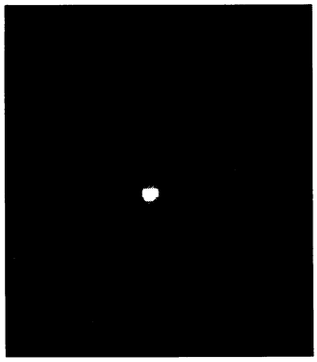
Briefings

edited by CONSTANCE HOLDEN

NASA



Parting shot of Spaceship Earth. *Sun is above.*

Voyager's Last Light

On the evening of 13 February 1990, as the Voyager 1 spacecraft was some 3.7 billion miles from the sun on its long, long journey out of the solar system, the venerable probe looked back over its shoulder and took the last images its cameras are ever likely to register: a 64-frame mosaic of the sun and its planets as seen from the outside. On 6 June, after months of processing and enhancement, NASA finally released the images to the public. Mercury and Mars were lost in the glare of the sun, and Pluto was out of range, but the other six planets—including Earth—were just barely visible as tiny flecks of light.

"We got them all dead center," exulted Jet Propulsion Laboratory spokesman Jurrie Van Der Woude. Creating the mosaic was extraordinarily difficult, he said, not only because the cameras were staring almost straight into the sun, but because most of the Voyager team are already being transferred to newer projects; the cameras will soon be deactivated and only a skeleton crew will be retained in the coming decades as the spacecraft continues magnetic field measurements along the way to interstellar space. Indeed, the mosaic is largely the work of about half a dozen true believers who would not give up on it. "Historically, we had to do it," he said. "We'll never get another chance—certainly not in our lifetimes."

Cornell University astronomer Carl Sagan, who has been urging NASA to take this picture for years, compared Voyager's mosaic to the famous photograph of the Earth taken by the Apollo astronauts in the 1960's that was so inspirational for the environmental movement. "This is where we live—a blue dot," he said, pointing to Voyager's tiny, one-pixel-wide image of Earth. "On that blue dot, everyone you know, and everyone you ever heard of, has lived out their life. It's a humbling experience to see it."

Damage to Animal Research Mounts

As animal rights supporters were massing for their weekend demonstration before the U.S. Capitol last week, the Association of American Medical Colleges launched a preemptive strike. The organization held a press conference on 7 June to reaffirm the message that such activists are nothing more than "animal rights terrorists."

According to data reported to the AAMC by 124 of 126 accredited American medical schools, the cost of lost data, break-in damage, property defacement, and demonstrations has mounted to $3.5 million and 15,000 staff hours over the past 5 years. Installation and maintenance of security systems intended to protect research facilities cost the institutions $5.5 million and more than 5700 staff hours. And that's not counting the millions spent in meeting new animal care regulations.

Seventy-six schools reported incidents of vandalism, break-ins, demonstrations, and other "disruptive incidents," while 54 described themselves as targets for "repeated disruptive incidents." Over the 5 years, schools reported about 3700 incidents of individual harassment, including bomb threats, death threats, picketing of family homes, and threatening letters and telephone calls.

AAMC chairman L. Thompson Bowles stressed that these figures represented only a preliminary analysis of the data, and said that AAMC would release a full report sometime in the fall.

Soviet Missile on Display

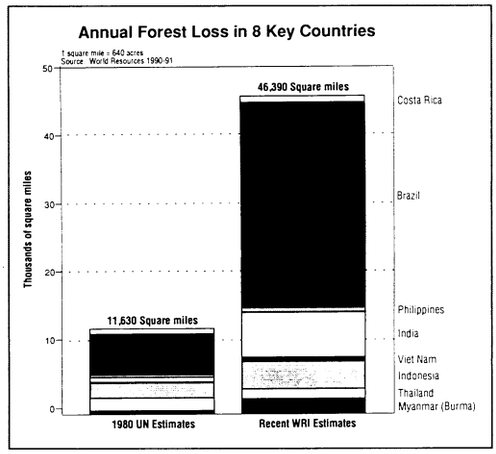
A Soviet nuclear missile landed in the United States in May, but instead of kicking up a mushroom cloud, it triggered a frenzy of photo-taking.

In a new style "nuclear exchange" of the 1990s, it came as a gift to the U.S. National Air and Space Museum under the auspices of the Intermediate Nuclear Forces Treaty. This 1987 agreement calls for the destruction of a whole class of

Third World Pollution

Poor countries are fast catching up with the rich when it comes to producing greenhouse gases, according to the latest biennial report of the World Resources Institute in Washington, D.C.* WRI, which has developed a new "greenhouse index" tracking contributions to global warming on a country by country basis, says Brazil, China (already a bigger coal burner than the United States), and India now rank as the biggest global warmers after the U.S. and the Soviet Union. In 1987, a year of intense land clearing by fire in the Amazon, Brazil accounted for more carbon dioxide emissions than the United States. India's methane emissions—from rice growing and livestock—are second only to those from the U.S. The U.S. is still way ahead of everyone else in the production of chlorofluorocarbons, the third major greenhouse gas.

On a per capita basis, data show "unexpectedly high" carbon emissions among less developed countries, with the Lao People's Democratic Republic (Laos) in the lead—10 metric tons of carbon per capita—because of deforestation. Qatar and the United Arab Emirates rank next because of energy consumption and gas flaring.

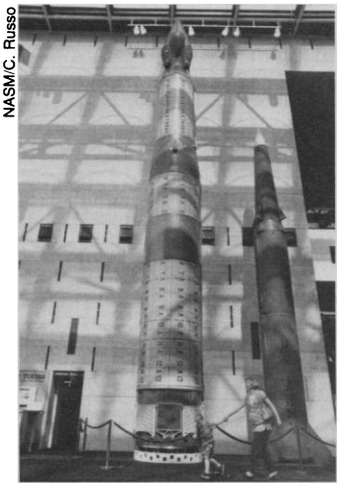


Deforestation accelerating. *WRI estimates that 46,390 square miles (29.7 million acres) of tropical forest were lost in eight countries in 1987, more than four times the rate calculated by the U.N.'s Food and Agriculture Organization in 1980. Worldwide, says WRI, satellite sensing shows that tropical forests are vanishing at a rate of 40 million to 50 million acres a year—considerably faster than the U.N. estimate of 28 million. In India, for example, satellites show that large areas legally designated as forest land are already bare.*

According to a report issued in mid-May by the United Nations Population Fund, Third World countries—which will be supplying 90% of global population growth in the coming decades—will be emitting four times as much carbon dioxide as the developed world now produces by 2025.

**World Resources 1990–91*, available for $17.50 plus $3 handling from WRI Publications, P.O. Box 4852, Hampden Station, Baltimore, MD 21211.

NASM/C. Russo



Missiles of yesteryear. *Soviet SS-20 missile (left) side by side with a U.S. Pershing II.*

missiles—including Soviet SS-20s and American Pershing IIs. Each nation gets to keep 15 of the other's "demilitarized" weapons.

Gregg Herken, chairman of the museum's history department, says the museum worked out a deal with the Soviets last December to retain an SS-20 for its "Milestones of Flight" display in Washington, D.C. Herken went to the Soviet Union last month to baby-sit the missile on its Moscow-to-Washington trajectory. "The biggest hassle was getting it loaded" aboard the U.S. Air Force C-141 cargo plane, he said. "That took 12 hours." The SS-20 made it safely to ground zero, however, accompanied by three Soviet technicians who spent a week at the museum reassembling the former instrument of megadeath.

Snagging the Soviet missile was a coup and also a departure for the museum. In the past it has focused on glorifying aerospace technology. The new exhibit will glorify a different kind of human achievement: the destruction of a dangerous technology.

INS Puts Limits on Togetherness

It used to be that the Soviets wouldn't let a citizen leave the country with his family for fear he wouldn't come back. Now we have a case of a Soviet scientist visiting the United States whose family members have been barred from joining him because the U.S. Immigration and Naturalization Service is afraid they won't go home.

Eric Wickstrom, associate professor of chemistry at the University of South Florida, reports that Nikolai Bulychev from the Institute of Bioorganic Chemistry in Novosibirsk arrived in January for a year of postdoctoral work in his lab, with the agreement that his wife and baby would come in June. The Soviet side of the paperwork went smoothly, but when Bulychev's family arrived at the U.S. Embassy in Moscow, they were denied visitors' visas. Why? There was a "presumption" the family wanted to immigrate to the United States.

Wickstrom checked with the office of Florida Senator Bob Graham (D) and was told by a staffer that the INS assumes that visiting Russian biomedical scientists are all planning to set up private medical practices.

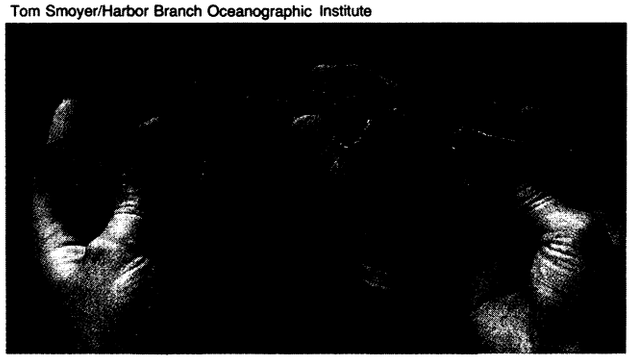
Not Bulychev, says Wickstrom. "He sees the collapse of federal support for science and couldn't imagine wanting to come here" permanently. Wickstrom, an antisense DNA researcher working to develop new AIDS drugs, says he is contacting Florida legislators interested in AIDS research to get them to pressure the embassy to change its mind.

U. of Maryland Gains from Glasnost

Roald Sagdeev, one of the Soviet Union's leading physicists and an early proponent of domestic and international glasnost, faced a most modern dilemma—how to balance the needs of his new two-career, bicontinental marriage to Susan Eisenhower, granddaughter of Ike. His solution was equally modern—he has accepted a Distinguished Professorship at the University of Maryland in College Park, a suburb of Washington, D.C. "My wife is living in the Washington area and her interests are centered there. I believe this is the best change I can make. I am very honored," he told *Science*. Eisenhower, head of the Eisenhower Group, arranges commercial ventures in the Soviet Union.

Professionally, the choice of Maryland was also a natural for Sagdeev. It was one of the first U.S. institutions he was able to visit 30 years ago, and he has worked with Chuan Sheng Liu, head of the Department of Physics and Astronomy, for 20 years. Sagdeev will retain a position at Moscow's Institute for Space Physics (IKI), where he has been head of the theoretical studies division. He expects "a special type of cooperation between IKI and space scientists of the University of Maryland."

Tom Smoyer/Harbor Branch Oceanographic Institute



Hatchlings. *From left, loggerhead, leatherback, and green turtles.*

Turtle Navigation

How do sea turtles stay on course in their long trips between feeding and nesting sites? Odors, light, and Earth's magnetic field have all been proposed as cues. But researchers at Florida Atlantic University in Boca Raton have recently found that three species—the green, the leatherback, and the loggerhead—do it by sensing wave motion.

A team headed by biologist Michael Salmon has spent the past two summers studying hatchlings for clues as to how they reach the open ocean after heading out from their sandy nests. Hatchlings were captured as they emerged, and taken out to sea where they were placed in cages. When observed at night, the time they normally enter the ocean, all swam into the waves. When the sea was calm they either circled or took off in different directions. To test whether they were responding to the mechanical stimulus of the waves or to starlight, the team put hatchlings in a darkened laboratory with artificially generated waves. There they continued to swim into the waves, revealing what the researchers call a "surface wave compass." According to Salmon, "this is a unique guiding mechanism never before observed for any open-sea species."

The researchers determined that some species also have a "magnetic compass" calibrated by a first exposure to light.

U. of Maryland

Roald Sagdeev. *New U.S. professor.*