Briefings

edited by CONSTANCE HOLDEN

Secret Rocket

It was awfully close to April Fools' Day when the news broke: The Department of Defense is secretly developing a multibillion-dollar nuclear rocket for deep space travel and heavy cargo lifting from Earth. But the front-page articles appearing in national newspapers on 3 April were no joke. Steven Aftergood, electrical engineer and researcher at the Federation of American Scientists, had blown the cover of a top-secret Pentagon project named "Timberwind."

According to Aftergood, for several years the U.S. military has been funding the design of a high-impulse rocket, driven by nuclear fission. The documents claim that, if fitted into the frame of a Titan III, the nuclear engine would more than triple that workhorse launcher's payload capacity. At the core of the dream: tiny (0.5 mm diameter) uranium carbide particles coated with zirconium carbide. The intense heat created by a fission reaction in a bed of such radioactive grains would be used to "flash vaporize" liquid hydrogen, creating a powerful jet.

The design has drawbacks, though, says Aftergood. The exhaust would be radioactive, and the rocket, if it crashed, could create quite a blight. Aftergood has obtained records indicating that the Strategic Defense Initiative Office (SDIO), the sponsor of this project, would like to test the engine in a flight over the Antarctic. If the rocket failed in mid-flight, says Aftergood, the Pentagon figures it would have a slight chance (4 in 10,000) of hitting New Zealand. He adds that the Pentagon has already chosen a ground test location—at Saddle Mountain, Nevada—but defense officials are keeping their lips sealed. "I am afraid we have no comment to make at this time," says an SDIO spokesperson—"absolutely none."

The Mind: Buddhism and Biology

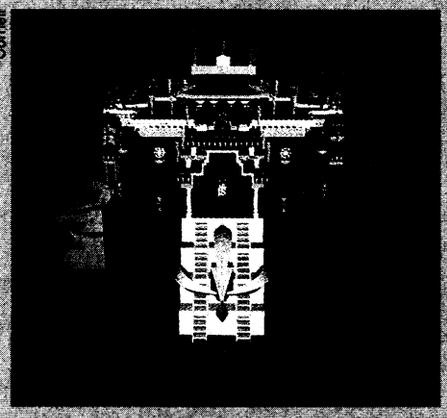
The Dalai Lama, the exiled Tibetan leader now living in India, thinks neurobiologists and Buddhists have something in common.

Addressing a packed symposium at Harvard, where he shared the podium with five neurobiologists, the winner of the 1989 Nobel Peace Prize told nearly 1000 attendees that both share a keen interest in mind-body connections and rely on experiments rather than dogma. Just as scientists may start with a theory, he said, the Buddhist, "when investigating the ultimate nature of reality...uses the Buddha's words as a key, not as the authority." And, like scientists, "interpreters are encouraged to rely on their own understanding and experience."

Whether the majority of scientists in the audience accepted the Dalai Lama's analogies, one scientist, Harvard Medical School's Herbert Benson, has tried to embody in his career the dual path of science and Eastern religion. An organizer of the symposium, Benson is a longtime meditation researcher who has been studying how Tibetan monks control bodily functions to the extent that they can do things like generate enough heat to melt snow.

He now heads the Mind/Body Institute, which offers relaxation and meditation training for everything from infertility to the side effects of AIDS. "The Tibetans," says Benson, "are the real professionals in the area of mind science." He believes the application of powerful advanced meditation techniques may open up entire new areas of clinical applications.

Not all of the neurobiologists at the meeting shared his enthusiasm. Addiction researcher David Potter of Harvard Medical School, calling himself a "radical materialist," said he preferred looking at the effect of a chemical such as crack on specific, "wonderfully nonformless cells," rather than on the formless entity called "mind."



Computerized mandala-Dharma goes high-tech. *During his visit to Cornell, the Dalai Lama "blessed" a traditional mandala, created by students with colored sand, and then went on to view a color video of the mandala done by the Program in Computer Graphics. The mandala is built up into three dimensions, and the viewer travels into the symbolic "mansion" of a Buddhist deity. The work, created as an aid to students of Buddhism, was supervised by Tibetan monk Pema Lobsang Chogyen, who has spent two years at Cornell learning computer modelling. Pema believes computers can be of great use to Buddhist monks and envisages the day when workstations with computerized mandalas will stand side by side with prayer wheels in monasteries.*

Darkness in the East. *Black plumes of smoke from hundreds of burning oil wells sabotaged by the Iraqis stream 200 miles across Kuwait and southeast over Saudi Arabia. This is one of the first satellite images of the disaster to be made public. It was taken by a NOAA polar-orbiting satellite and computer-enhanced at NASA's Langley Research Center in Virginia. Low clouds are light yellow, high clouds are deeper yellow. Dotted line shows Kuwait boundary; Persian Gulf is to the right.*

Antiviral AIDS Drug Nears Approval

AZT is now the only antiviral drug on the market for treating AIDS. But it may soon have a competitor. Bristol-Myers Squibb Company last week applied to the Food and Drug Administration for approval to market ddI (dideoxyinosine) under the trade name VIDEX for pediatric and adult patients infected with HIV.

Even before the filing, some 23,000 patients had received the new drug, either in clinical trials or through an expanded access program for patients ineligible

for trials. Like AZT, ddI improves the health of AIDS patients by interrupting the process by which the AIDS virus infects cells. But unlike AZT, ddI doesn't cause the severe anemia that makes some patients unable to tolerate AZT. Initial experience with ddI led some proponents, including National Cancer Institute director Samuel Broder, to believe that ddI might have virtually no harmful side effects (*Science*, 28 July 1989, p. 353). But subsequent experience has shown that some patients who take the drug experience painful neuropathies and pancreatitis.

How long will it take to get FDA approval? Agency spokesman Brad Stone says the application has been given "top priority." He says the record—held by AZT—is 3 ½ months.

Appropriate Agriculture

The World Resources Institute (WRI), a Washington, D.C., think tank, has contributed to the case for "sustainable" agriculture in what it calls the first comprehensive economic comparison with conventional farming.* If the environmental costs are factored in, says WRI, sustainable farming techniques—such as multiple-crop rotations, fewer pesticides, and alternative plowing methods—would save not only the environment but farmers' money as well.

WRI illustrates its case with two case studies of individual farms. It estimated costs to society by subtracting estimates of losses, such as nutrient depletion and soil erosion, from overall operating profits. On a Pennsylvania farm, a conventional crop rotation of corn and soybeans resulted in an overall loss of $61 per acre over 10 years. But a rotation of several crops including corn, soybean, wheat, and clover saved $325 per acre. And the farmers themselves saved money: When off-site environmental costs were excluded from the analysis, leaving just the toll from environmental damage on the farm, sustainable agriculture still saved $280 per acre.

The other case study was in Nebraska, where environmental costs of farming are among the lowest in the nation. There, alternative methods didn't make much difference. But, says WRI, most of the country, like Pennsylvania, would gain.

*Paying the Farm Bill: U.S. Agricultural Policy and the Transition to Sustainable Agriculture. WRI, March 1991.

Sleeping With Scuds

During the Gulf war, jittery residents of Tel-Aviv and Haifa slept poorly under the threat of nocturnal Scud attacks—many feared they might not hear emergency sirens. So sleep researchers at the Technion-Israel Institute of Technology devised an ingenious solution: "Silent Radio."

On the advice of the researchers, the Israeli government created a special radio station that was quiet at night—unless there was trouble, when it would broadcast air-raid sirens. The new program caught on rapidly; almost half the population tuned in at bedtime, according to Technion's sleep lab director Peretz Lavie.

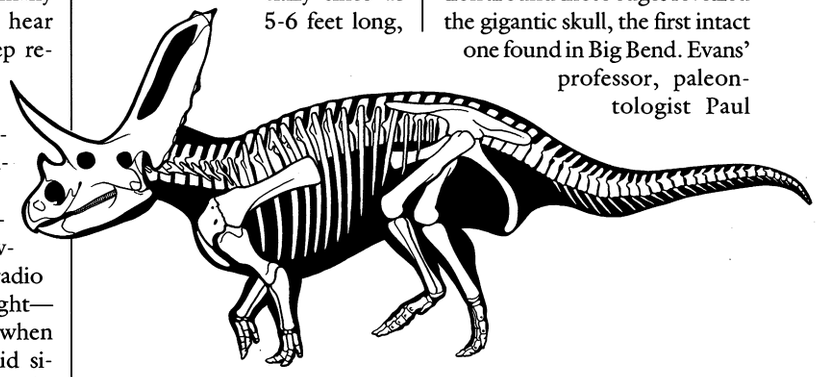
Looking to longer term scientific concerns, the researchers also used wartime anxiety to study the effects of sleep disruption—40 subjects wore wrist actigraphs measuring their body movements, and, it turned out, most people got back to sleep within 30 minutes after an attack. The researchers surveyed the population as a whole at weekly intervals to assess the impact of war on sleep; data analysis on that front is still in progress.

Largest-Ever Dinosaur Skull

Some would credit the discovery to beginner's luck, while others would explain that chance favors the prepared mind. By any measure, the discovery of an almost complete, 80-million-year-old, horned, dinosaur skull and shield is a major one—especially since at 5-6 feet long, this relic is thought to be the largest skull of any land animal ever found. Getting the credit: University of Chicago senior Tom Evans.

Evans uncovered his unique prize in Big Bend National Park in Texas while prospecting with his paleontology class last month during a spring field trip. The finding offers the best evidence yet that this type of dinosaur, known as Chasmosaurus—a relative of the better known and also large-horned Triceratops—roamed farther south than had been thought. Chasmosaurus is believed to have weighed about 5 tons and been about 30 feet long.

On his very first day of prospecting, Evans—whose preparation consisted of an 11-week paleontology course—glimpsed something interesting sticking out of the sand. "We were looking for edges, and it just kept on going," he said. Careful excavation around those edges revealed the gigantic skull, the first intact one found in Big Bend. Evans' professor, paleontologist Paul Sereno, described the find as a "once-in-a-century kind of thing." Sereno ought to know. He himself has had uncommon success, having discovered the oldest known dinosaur, the 230-million-year-old Herrerasaurus, in Argentina in 1988, and, last December, a graveyard of huge sauropod dinosaurs in the southern Sahara. This time around Sereno selected a site where the Rocky and Appalachian mountain ranges once met. The area is the southernmost extremity of the ancient western North American landmass, which was once bordered by a midcontinental seaway. A team of researchers at the University of Texas, Austin, that specializes in the paleontology of the region will finish separating the fossil from the rock.



Big Bend find. *Reconstruction of Chasmosaurus, based on new fossil skull and skeletal bones found previously. Skull has two large brow horns and shorter curving nose horn. Bony "frill" resembles shield but was probably used for intimidation or sexual attraction.*

Drawing by Carol Abraczinskas and Paul Sereno

Submariner to Captain Science Service

Science Service, Inc., the publisher of *Science News* and organizer of the Westinghouse Science Talent Search, is getting a new head, geophysicist and former naval officer Alfred S. McLaren.

In October McLaren will take the helm from Edward G. Sherbourne Jr., who for 25 years oversaw the weekly, which has a circulation of about 260,000.

McLaren, currently at the Cooperative Institute for Research in Environmental Sciences at the University of Colorado in Boulder, spent 24 years as a naval submarine officer. His only direct experience with publishing is via marriage—his wife, Avery Battle Russell, is editor of *The Carnegie Quarterly*.