Scientists lose contact with solar craft

The past couple of weeks should have been an easy transition for solar astronomer Arthur I. Poland. Retiring from his administrative role with an orbiting solar observatory so that he could devote his full attention to data acquired by it, Poland had been looking forward to obtaining new information on the giant flames of gas that arc high above the sun's surface.

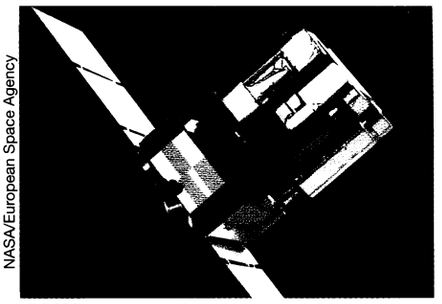
Alas, the spacecraft that Poland had pinned his hopes on may no longer be able to make these or any other observations. On June 25, ground controllers lost contact with the Solar and Heliospheric Observatory (SOHO), and some fear the $1 billion spacecraft may remain silent.

Launched in December 1995, SOHO houses 12 instruments that probe the interior of the solar cauldron as well as its million-degree outer atmosphere. The observatory has already revealed new details of how gas and magnetic clouds shoot out from the sun, events that can trigger large-scale power outages on Earth (SN: 2/1/97, p. 68). It has also helped generate a three-dimensional view of the sun's interior and has provided spectacular images of sun-grazing comets and solar flares (SN: 5/30/98, p. 342). For most astronomers, however, SOHO's raison d'être was to have come 2 to 3 years from now, when the sun is expected to reach the peak of its 11-year activity cycle.

Able to stare continuously at the sun from a vantage point 1.5 million kilometers from Earth, SOHO was central to the observations planned for the coming solar maximum. Without the craft, "we're going to be blind," says John W. Leibacher of the National Solar Observatory in Tucson. "It's as if you lived in Houston and you were in hurricane season and there were no weather satellites."

He emphasizes, however, that it's premature to mourn SOHO's passing. The craft is "missing in action, it's not known to be dead," he says.

Mission controllers at NASA's Goddard Space Flight Center in Greenbelt, Md., speculate that they lost contact with the craft because it tumbled out of control, leaving its power-producing solar panels pointing away from the sun. Recent calculations suggest that over the coming weeks, the craft's motion may allow an increasing amount of sunlight to strike the panels.



NASA/European Space Agency

SOHO spacecraft is missing in action.

If this prediction holds true, the panels may eventually absorb enough sunlight to charge the craft's batteries and allow SOHO to resume operation. Ground controllers are already trying to locate the craft using radar. Although the tumbling may have damaged instruments on the observatory, the mission scientists are guardedly optimistic.

In the meantime, Poland, who is based at Goddard, is already devising a backup plan. Contacting their colleagues, he and other SOHO scientists have begun making an inventory of spare parts and duplicates of instruments aboard SOHO. From that list, they hope to put together a smaller, less costly satellite that might be launched just after the turn of the century, in time to record solar activity at its most turbulent. *—R. Cowen*

Persistent pollutants face global ban

Last week, 34 northern industrial nations adopted two new United Nations agreements—pledges to phase down or out 19 toxic industrial pollutants. Known as the Aarhus Protocols, after the Danish city in which they were signed, the agreements call for mandatory controls on 16 persistent organic pollutants, or POPs, and on the heavy metals lead, mercury, and cadmium.

When ratified by 16 of the signatory nations, both agreements will become treaties with the binding force of international law, explains Lars Nordberg, deputy director of the United Nations Economic Commission for Europe (UN/ECE), whose 55 member nations drafted the new documents. Some of those members—such as Canada, the United States, and Russia—are not European.

At a United Nations Environment Program (UNEP) meeting in Montreal this week, representatives of 92 nations began a process to enact similar global controls on 12 of those POPs: polychlorinated biphenyls (PCBs), dioxins, furans, and the pesticides aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, and toxaphene.

"While everyone here has a copy of the Aarhus agreements, there's no draft text yet [for a global treaty]," explains Michael Williams, a UNEP spokesman in Montreal. Participants at this week's meeting "have yet to even come up with a good definition of a POP," he told SCIENCE NEWS. "Indeed, that will be the heart of this convention—agreeing on criteria for defining POPs and how additional ones might be added [to the list requiring global controls]."

The UNEP negotiators will not tackle the other four POPs slated for controls under UN/ECE—polycyclic aromatic hydrocarbons, chlordecone (kepone), hexabromobiphenyl, and lindane. "Everyone here [at the Montreal meeting] agrees that the other 12 are an environmental problem," Williams explains, "so they started with the easy ones—pollutants that there are no arguments over." In fact, disputes over extending limits to additional POPs may focus less on justifying a need to control them, he says, than on how to limit ones that are still used, of great economic significance, and lacking affordable alternatives.

Many countries have already banned the production and use of some of the POPs, but the resistance of these compounds to breakdown and their propensity to evaporate and settle out hundreds or thousands of miles away (SN: 7/15/95, p. 38) means that distant populations, even those who have never used the chemicals, "may still feel their toxic impacts," observes Luke Trip of Environment Canada in Hull, Quebec.

POPs' long life gives them time not only to move around the globe but also to build up in the food chain, observes Michael Gilbertson of the International Joint Commission in Windsor, Ontario. This explains the need for global controls, he argues, because "if you make these chemicals, there's nowhere that won't eventually have them." *—J. Raloff*

Chemical switch cuts off melatonin

Many jet-lagged travelers, eager to reset their internal body clocks, rely on timely doses of the natural hormone melatonin to trigger sleep. Now, researchers at Rockefeller University in New York have found a substance that may have the opposite effect, promoting wakefulness by switching off melatonin's production.

A compound synthesized by chemists Ehab M. Khalil and Philip A. Cole effectively blocks one of two enzymes required to produce melatonin in the brain. The compound could help researchers explore the details of melatonin synthesis and offer a way to see if a reduction in the hormone's levels affects the sleeping patterns of animals and people.

"It's really an unexplored area because we haven't had the tools to evaluate it before," says Cole. Melatonin, made primarily by the pineal gland in the brain, plays a role not only in sleep but also in aging and reproduction (SN: 5/13/95, p. 300).

The transformation of the neurotransmitter serotonin into melatonin begins with an enzyme called arylalkylamine *N*-acetyltransferase (AANAT). This enzyme binds to both serotonin and a molecule called acetyl-CoA, then attaches a frag-

ment of acetyl-CoA to serotonin.

Cole and Khalil made their new compound by connecting the molecule tryptamine, which is very similar to serotonin, to a variant of acetyl-CoA. The enzyme AANAT should readily take up this molecule, they reasoned, because it looks so much like the serotonin–acetyl-CoA combination. "It wasn't a large leap of faith to think that . . . we could generate a structure which would be a potent inhibitor," says Cole. The synthesized compound indeed binds to AANAT 1,000 times better than its usual targets do. The team reports its findings in the June 24 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY.

Cole and Khalil also learned that, in test tube experiments, a molecule found naturally in cells also blocks AANAT quite well. Called a fatty acyl-CoA, it resembles the synthesized tryptamine-CoA compound. Its inhibitory action could explain two earlier observations. People who fast for one or two days experience an increase in fatty acyl-CoA levels. Also, their melatonin production drops. The Rockefeller results may be "one way to put those two unconnected observations together," Cole says, although a link between AANAT and fatty acyl-CoA in the body remains speculative.

The study is "a stepping stone toward a novel class of inhibitor compounds that could be of clinical value," says David C. Klein of the National Institute of Child Health and Human Development in Bethesda, Md. "If you want to bring melatonin synthesis to a very low level, that might enhance alertness." Klein and his colleagues are working on blocking a process that destroys AANAT—yet another approach to regulating melatonin synthesis. —*C. Wu*

Fatal skin fungus found in U.S. frogs

Chytrid skin fungi, which have devastated frogs in parts of Australia and Central America, have now turned up in the wild in the United States. Early signs hinted that U.S. species might tolerate the infection as no more than a nuisance, but new data from Arizona raise the possibility that chytrids cause die-offs in the United States.

Tissue samples from dead and dying frogs in Arizona—wild lowland leopard frogs and captive Chiricahua leopard frogs, a rare species—show chytrid infection, reports pathologist Donald K. Nichols of the National Zoological Park in Washington, D.C. Large numbers of both species have died off in the wild in the last decade, notes Philip C. Rosen of the University of Arizona in Tucson, who had collected the samples. Just what role the fungus plays is far from clear, but "we're taking it very seriously."

The chytrid fungus made headlines two weeks ago when an international team of scientists fingered it as the culprit in die-offs of 19 amphibian species in pristine tropical streams in Australia and Central America. Details will appear in the July 21 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

One of these outbreaks, in Panama last year, caught the attention of coauthor Karen R. Lips, now at Southern Illinois University in Carbondale. She collected some 50 dead amphibians during a single trip to Panama and sent samples to D. Earl Green, now at the National Institutes of Health in Bethesda, Md. He found small, round bodies in their skin. "These were quite a conundrum," he says.

Coauthor Lee Berger of the Australian Animal Health Laboratory in Geelong also found the odd structures in wild frogs and toads from Australian die-offs. DNA analysis suggested chytrid fungi, a group not previously known to attack vertebrates.

Meanwhile, another pathology team was also closing in on the fungus. Nichols first noted the fatal skin disease in 1991 in captive arroyo toads in California. In 1996, he saw it in zoo frogs in Washington, D.C., and sent electron microscopy images and samples to mycologist Joyce E. Longcore at the University of Maine in Orono. She recognized the agent as a chytrid fungus and suggested that it represents a new genus.

Nichols has since found low levels of the fungus in wild cricket frogs in Illinois. Likewise, Green found infections in several Maryland specimens of the common American toad. In neither case did the animals appear to be suffering a fatal disease like the Arizona frogs. —*S. Milius*

Jean-Marc Hero/Griffith University

A fungus is attacking frogs worldwide, such as this Australian tree frog.

Ancient North American shoes step to fore

By about 8,000 years ago, inhabitants of what is now the United States were making and wearing sophisticated sandals and slip-on shoes, according to researchers who analyzed a rare sampling of ancient footwear.

Prehistoric North Americans apparently fashioned shoes in regional styles using a variety of materials and techniques, contend archaeologist Michael J. O'Brien of the University of Missouri at Columbia and his coworkers.

O'Brien's group applied accelerator mass spectrometer (AMS) dating to 7 of 18 footwear specimens discovered more than 40 years ago in central Missouri's Arnold Research Cave.

"The design and weaving observed in the oldest specimen are about as complex as what we see in later ones that we've dated to around 1,000 years ago," O'Brien says. "These people knew exactly what they were doing."

Radiocarbon dating of sediment at the Missouri cave suggests that it was occupied as early as 11,000 years ago, O'Brien says. Researchers had not previously dated footwear at the site because the traditional radiocarbon method would have destroyed large portions of the items. The AMS technique uses tiny samples to measure the presence of different forms of carbon.

Two types of shoes appear in the Missouri collection. Most of the sandals have straps; the slip-ons generally have sides that hold the shoe on the foot. The footwear was constructed of plant fibers or, in two cases, leather.

Kuttruff *et al.*/SCIENCE

Leather, grass-lined moccasin found in Missouri resembles a similar shoe that is about 1,000 years old.

The recent dating places the oldest specimen, a nearly complete sandal, at between 8,325 and 7,675 years old, the scientists report in the July 3 SCIENCE. It features a pointed toe, a sling-like heel formed out of twisted cords, and interlaced fibers in the sole. A braided cord apparently passed through side loops and over the foot and was tied at the ankle.

Other examples of ancient footwear, such as those attributed to the Anasazi in the U.S. Southwest around 1,000 years ago, exhibit few similarities to the Missouri finds, the researchers hold. Their results add to evidence of early advances in weaving and textile production in North America and elsewhere (SN: 5/23/98, p. 331).

For example, AMS dates extend back to as early as 9,000 years ago for sandals of a different style unearthed in Colorado, says Phil R. Geib, a Navajo Nation archaeologist based in Flagstaff, Ariz. Similar analysis of intricately woven baskets previously found in Nevada, conducted by Catherine S. Fowler of the University of Nevada, Reno, places their age at about 9,400 years. —*B. Bower*