

Pulsar mystery ends: The TV camera did it

Oops! Forget that dramatic report last year of a rapidly spinning pulsar at the heart of supernova 1987A — the fastest pulsar ever described. "It was a television signal," says John Middleditch of the Los Alamos (N.M.) National Laboratory.

Middleditch, a member of the team that reported discovering the pulsar rotating 1,968 times a second (SN: 2/18/89, p.100), retracted the finding in New Orleans this week at the American Association for the Advancement of Science meeting. Many researchers studying the supernova had been notified of the embarrassing development a few days before.

"We didn't expect a television camera to be this coherent, but it was," Middleditch says. "You can't tell the difference between this [signal] and a pulsar."

Since supernova 1987A temporarily brightened the Southern Hemisphere's night sky three years ago, astronomers have expected eventually to find a pulsar there — a dense, spinning sphere of neutrons left after the cataclysmic collapse of a large star. On Jan. 18, 1989, astronomers recording the supernova's visible and infrared light at the Cerro Tololo Inter-American Observatory in Chile got nearly seven hours' worth of data. The observations seemed to reveal pulsations about 0.5 milliseconds apart, with variations in the pulsar's spin frequency that suggested the presence of an orbiting companion with the mass of Jupiter, and perhaps a second companion with the mass of Neptune.

No one ever confirmed the pulsar sighting. Theorists offered suggestions for why the pulsar might have appeared and then disappeared from view, as well as models for its composition (perhaps pure quarks) and why it rotated so rapidly.

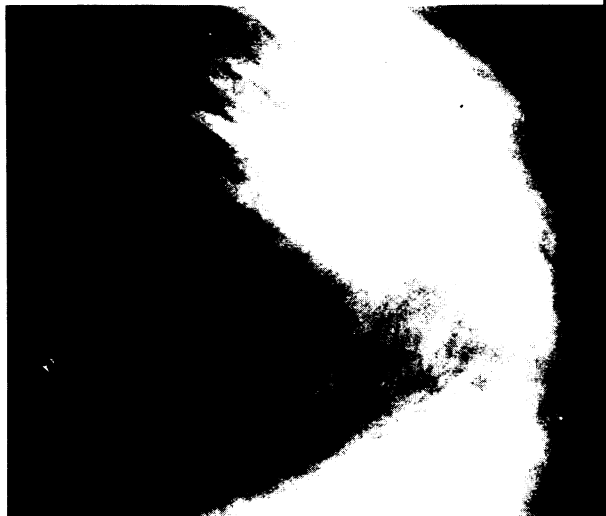
Then, on Feb. 8 of this year, as the team prepared for new observations of supernova 1987A, they pointed the Cerro Tololo telescope at the Crab nebula, site of a well-studied pulsar, and recorded the identical pulse rate reported for supernova's pulsar. "So obviously the universe is pulsed or the signal has nothing to do with the pulsar," Middleditch says.

He says the spurious signal apparently came from one of two television cameras used to help guide the telescope. It appears, Middleditch adds, that the camera was used on Jan. 18, 1989, but not for subsequent looks at supernova 1987A until this month. "We're not absolutely sure if it is the TV camera alone or the camera and the electronics that guide the telescope," he says.

The search for the telltale pulses continues. Says Mark M. Phillips of the Cerro Tololo staff: "We still think a neutron star is in there."
— P. Young

Venus gives Galileo a boost in space

The Galileo spacecraft took this photo of Venus on Feb. 12 from slightly more than 1.6 million kilometers away, as it swung around the planet to accelerate toward a 1995 encounter with Jupiter. An atmospheric circulation feature shaped like a sideways "V" familiar from past Venus observations, crosses the surface-masking clouds. The image also shows atmospheric wave patterns and convective clouds, revealing details as small as 40 km across. The ring-like features are blemishes, possibly due to dust in the optical system, and will be removed later by computer processing.



The Venus swing-around, which NASA added to the mission's planned trajectory after deciding to use a smaller booster rocket to begin the trip, increased Galileo's speed by more than 8,000 km per hour, to about 134,000 kph. An Earth flyby in December will add another 25,000 kph, followed two years later by a 12,000-kph boost when the craft comes around for a second Earth maneuver that will fine-tune the course for Jupiter.

Acid assessment: The state of the science

Only 10 years ago, respected researchers contended that "there is no reason to state that pollutants in modern time are the chief reason for the acidification of surface waters," recalls Patricia M. Irving, associate director of the National Acid Precipitation Assessment Program (NAPAP). Since then, NAPAP has gathered ample evidence to the contrary. In a mammoth draft report unveiled last week, this \$500 million federal program — one of the largest research efforts in history — concludes that the sulfur- and nitrogen-based air pollutants emitted during fossil-fuel combustion are indeed responsible for most of the acidification plaguing sensitive lakes and streams in the eastern United States.

While refuting those who once downplayed the problem, the new study also contradicts the doomsayers of a decade ago who predicted widespread collapse of aquatic and terrestrial ecosystems under assault from acid rain. NAPAP reports that only about 4 percent of the lakes sampled in the National Surface Water Survey — the largest analysis to date of vulnerable U.S. waters — are acidic. In addition, the authors conclude that ambient levels of acidic precipitation in the United States are "not responsible for regional crop yield reductions" or for damage to "the vast majority" of North American forests.

NAPAP has "changed the way the world thinks about acid rain," says Michael R. Deland, chairman of the President's

Council on Environmental Quality, which administers the interagency research program.

In 1980, President Carter created NAPAP as a 10-year program to study not only the causes and effects of acid deposition but also the best strategies for controlling it (SN: 2/16/80, p.106). At an international NAPAP meeting in Hilton Head Island, S.C., last week, more than 600 scientists shared new findings and debated how well the draft report — entitled "State of Science and State of Technology" and spanning more than 15,000 pages — sums up what NAPAP scientists have learned.

Each book in the 28-volume series was anonymously peer-reviewed by at least three scientists before the meeting and by an identified reviewer at the conference. In general, critics deemed the study comprehensive and reasonably balanced. However, most also noted data gaps that leave several important questions unanswered. Among those questions: Which chemical constituents, whether in rain, snow, fog or dry particulates, have the greatest effect on the health of humans and other species? Which of the many new computer models of toxicology described in the report (and showcased for the first time at last week's meeting) best predict the effects of acids on aquatic species? And to what extent do brief but acute acidic episodes

News of the week continued on p.124

Positive Illusions

Creative Self-Deception and the Healthy Mind

By *Shelley E. Taylor*

In this provocative and important book, Shelley Taylor shows how the healthy human mind seems to cordon off negative information, creating positive illusions that help us cope. These creative self-deceptions are particularly adaptive when one is threatened by adversity.

Taylor draws on decades of award-winning research with cancer patients, disaster victims and ordinary people facing crises to explain how mental and physical well-being can actually be enhanced by unrealistic optimism about one's self, the world and the future. As this delightfully written and thoroughly authoritative book amply demonstrates, "whistling a happy tune" may turn out to be a better buffer against stress than many of today's sophisticated remedies.

— from the publisher

"One of the world's leading scholars has masterfully woven state-of-the-art psychological research into a well-written provocative narrative . . . A lively description of the creative strategies we use to navigate the ups and downs of our daily lives."
— Daniel Weinberger, Ph.D., Stanford University

Basic Books, 1989, 301 pages, 6 1/2" x 9 1/2",
hardcover, \$19.95

PosIllusions

Science News Books

1719 N St., NW, Washington, DC 20036

Please send _____ copy(ies) of *Positive Illusions*. I include a check payable to Science News Books for \$19.95 plus \$2.00 postage and handling (total \$21.95) for each copy. Domestic orders only.

Name _____

Address _____

City _____

State _____ Zip _____

Daytime Phone # (_____) _____
used only for problems with order RB1192

News of the week continued from p. 119

— such as runoff of acid snowmelt — reduce the species diversity of sensitive waters?

Because data collection and analysis financed through NAPAP will essentially shut down later this year, such questions will likely remain unanswered for many years to come. Some of the 1,000-plus researchers employed through NAPAP, especially the atmospheric modelers, may secure financing to continue their investigations through the rapidly growing and congressionally popular "global change" program (SN: 2/3/90, p.71), but most ecologists say they will be left high and dry when NAPAP's large aquatic programs wind to a close.

In general, the draft report concludes that:

- The average pH of precipitation in remote — and therefore relatively pristine — regions of the world is about 5 rather than 5.6 as scientists once assumed. Moreover, "no site anywhere in the world is at all times free from long-range transport of [human-generated acidifying] pollutants" — a problem that complicates numerical comparisons with industrial areas. The NAPAP data do indicate, however, that in the United States the median annual concentrations of sulfates are generally eight times higher, nitrates 10 times higher and hydrogen ions four

times higher than those in most remote regions. At the same time, the report shows that about seven times more acid-neutralizing ammonium ions fall upon the United States than on most remote areas.

- As aquatic pH drops to a level of 6 to 6.5, sensitive fish species and other vulnerable organisms in the water begin to lose their ability to reproduce and survive. Below a pH of 5, the whole ecosystem may start falling apart, although some naturally acidic Florida lakes support diverse fish communities, including game fish, at a pH of 4 to 4.5. While the study did not determine how many U.S. lakes have been seriously impaired or killed by acid rain, new data from a survey sponsored by New York State and a consortium of electric utilities show that 23.5 percent of the 1,469 Adirondack lakes surveyed are "entirely fishless," reports aquatic ecologist Joan P. Baker, a Raleigh, N.C.-based consultant who both participated in the Adirondack study and coauthored the NAPAP report's aquatic biology volume. And in roughly one-third of these lakes, fishlessness appears due to acidic air pollutants, she says.

- North American forests are not suffering substantially from acid pollutants, according to the report, "with the possible and notable exception of high-elevation red spruce in the northern Appalachians." Data collected on these

high-elevation stands over the past two years indicate that acid-mediated soil changes are fostering nutrient imbalances and a general weakening of red spruce — changes similar to those now held responsible for European forest declines (SN: 7/22/89, p.56).

- Technologies have so improved that U.S. emissions standards for new fossil-fueled power plants could be cut to just one-tenth the current standards and could be met by systems costing no more than those available in 1979, says former NAPAP Director J. Laurence Kulp of Federal Way, Wash.

Over the next few months, the authors of each volume will formally address their reviewers' criticisms and incorporate changes where warranted. The revised version of this encyclopedic series, due out this fall, should provide the scientific underpinnings for NAPAP's swan song — a much shorter report now referred to only as the "integrated assessment." Due out by year's end, that final report is expected to include comparisons of the likely environmental and health impacts of more than 30 pollutant-emissions scenarios of the future. The "integrated assessment" is intended to help policymakers choose among various levels or patterns of pollutant controls, including those proposed by President Bush last year in his clean air legislation (SN: 6/17/89, p.375).
— J. Raloff