Neither Permutt nor Togias was available to comment. But in a protocol submitted to Hopkins's Institutional Review Board (IRB) last year, Togias explained that the experiment was designed to examine two distinct aspects of normal lung physiology called "bronchoprotection" and "bronchodilation." Togias intended to ask up to 10 healthy subjects to inhale chemicals or saline (as placebo) and breathe into instruments that measure lung capacity. All volunteers were to inhale methacholine, which causes a temporary constriction of the airways, mimicking asthma. And some were to be given hexamethonium, a ganglion-blocking drug that affects the nervous system, lowering blood pressure and relaxing the airways.

"It's proper to characterize this as a mysterious death."

—Joann Rodgers

Hexamethonium formerly was prescribed to lower blood pressure, but that use was withdrawn by the manufacturer. It has not been used in many recent studies, researchers say, although Togias's protocol cites four human studies in the 1980s that used the drug. The protocol suggests that its main risk is that it can induce an excessive drop in blood pressure, and for this reason the protocol calls for a physician to be on hand to oversee its staged administration.

Togias suspended the research in May after Roche became ill. He notified the IRB in a 9 May letter of "a serious adverse event," explaining that a volunteer had reported dry cough, shortness of breath, and flulike symptoms 24 hours after participating in the hexamethonium part of the experiment. The volunteer was hospitalized after an x-ray showed signs of "early pneumonitis." On 17 May, Hopkins vice dean for research Chi Van Dang alerted the U.S. Office for Human Research Protections (OHRP) of the "serious, unexpected" adverse event. Three weeks later, Dang sent notice that the woman had died. He added that the clinicians had performed an autopsy and were investigating many aspects of the study, including the supplier's claim that the hexamethonium was 99.6% pure. OHRP has now begun its own investigation. "It's proper to characterize this as a mysterious death," says university spokesperson Joann Rodgers.

Claude Lenfant, director of NIH's National Heart, Lung, and Blood Institute, which funded the research, says clinicians seem to have followed the right procedures, and that Hopkins is known to be "ferocious" in getting ethical issues correct. Clinical experiments always contain an element of risk, adds Richard Boucher, an expert on cystic fibrosis at the University of North Carolina, Chapel Hill. He cited the death 5 years ago of a volunteer at the University of Rochester in New York after a reaction to an anesthetic. Since then, he says, "everyone has redoubled their efforts to make this research as safe as possible." **–ELIOT MARSHALL**

NEUTRINO PHYSICS

Polymorphous Particles Solve Solar Mystery

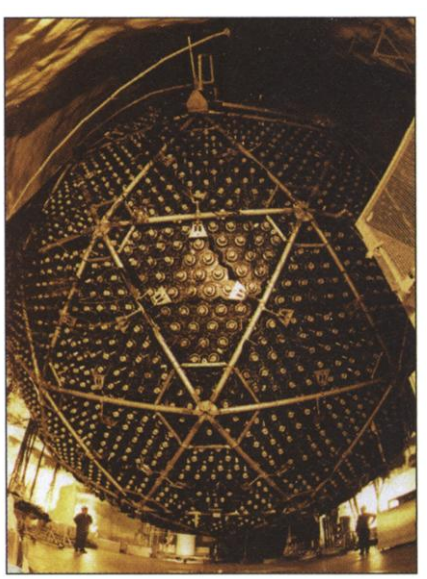
For particles with almost no mass, neutrinos are making quite a splash. On Monday, scientists from three countries announced that they had spotted neutrinos that had been missing for 3 decades.

In the late 1960s, physicists calculated the number of relatively energetic neutrinos that should be streaming from the sun—due to the decay of boron-8 cooked up in the solar furnace—but experiments came up short. There were too few neutrinos. This is the mystery that Canada's Sudbury Neutrino Observatory (SNO) has now cleared up. "I'm thrilled by the precision of the result; I'm thrilled it agrees with the solar model calculations; I'm thrilled we have an answer to the problem," says John Bahcall, a physicist at the Institute for Advanced Study in Princeton, New Jersey.

In fact, SNO has confirmed what several experiments, notably Super-Kamiokande in Japan, had already indicated: The missing neutrinos had simply changed flavor. Neutrinos come in three flavors, named after the particles they are linked with. Electron neutrinos are the type produced by the sun; muon and tau neutrinos, which result from various particle interactions, are harder to detect. In the late 1990s, experiments provided fairly strong evidence that electron neutrinos turn into muon and tau neutrinos as they stream away from the sun—something that can happen only if the particles have mass (*Science*, 4 July 1997, p. 30). The "missing" neutrinos from the sun had merely changed into muon and tau neutrinos and escaped detection.

Buried 2 kilometers underground in a nickel mine in Ontario, SNO has just given a resounding conformation to this picture. The detector measures the neutrinos coming from the sun in two ways. The first method spots the recoil of a neutrino off of an electron. Any of the three flavors of neutrino could potentially cause such a recoil and be detected. The second method detects when an electron neutrino strikes a neutron within a 1000-ton sphere of heavy water. Only an electron neutrino can make the neutron spit out an electron, triggering the detector. The two methods, combined with results from Super-K, reveal just how many neutrinos are coming from the sun and what proportion of them is either muon or tau neutrinos.

"What we find is that there is an appearance of muon and tau neutrinos en route from the sun to the Earth," says SNO project director Art McDonald of Queen's University in Kingston, Ontario. "The electron neutrinos transform into another type." The transformation confirms earlier observations that neutrinos have mass. Better yet, the measurements agree with first-principles calculations of the amount of solar neutrinos created by the sun. "It is in very good agreement," says SNO team member Kevin Lesko, a physicist at Lawrence Berkeley National Laboratory in Califor-



CREDIT: SNO

Neutrino detector. At Sudbury, 10,000 photomultipliers on an 18-meter-wide sphere watch for elusive particles.

nia. "Basically, we've resolved the solar neutrino problem with a 99% confidence level. It's oscillations."

"This is an absolutely direct measurement," Bahcall says. "Previous results were not so direct." SNO scientists have already added salt to the heavy-water sphere, which will increase the instrument's sensitivity to muon and tau neutrinos and add another level of precision. "That will be a thrill," says Bahcall. –CHARLES SEIFE

U.S. RESEARCH BUDGET

Picture Brightens a Bit As First Bills Advance

U.S. scientists anxious about next year's federal research budget got some good news last week. Several congressional panels approved preliminary 2002 spending bills that restore research programs targeted for cuts by the Bush Administration, while others are considering channeling part of larger budget allocations to science. Pentagon officials also signaled that they may request a significant boost for defense R&D. Congress, however, still has a long way to go before any numbers become final for the fiscal year that begins 1 October.

The first bit of good news came from a panel that oversees the U.S. Geological Survey (USGS). Its members recommended that the agency get an $18 million boost to $901 million, some $87 million above the president's request. The biggest winner was USGS's $203 million Water Resources Division, which would get a 1% increase rather than a 22% cut (*Science*, 13 April, p. 182). "It's essentially a restoration budget, [and] that's a good thing," says lobbyist David Applegate of the American Geological Institute in Alexandria, Virginia, which had lobbied hard against the cuts. He is optimistic that the full House will approve the numbers later this month, and that the Senate will eventually follow suit.

The USGS funding was part of an $18.9 billion bill approved 13 June that funds the Department of Interior and a flock of smaller agencies. One, the Smithsonian Institution, was singled out in the wake of a controversial effort to reshape the museum complex's science programs. The panel ordered Secretary Lawrence Small to tread water until a new external advisory panel makes its report later this year, in effect backing complaints by Smithsonian scientists that Small has ignored their advice (*Science*, 11 May, p. 1034).

Many biomedical scientists were also pleased with language in a $74 billion agriculture spending bill approved by a House panel on 13 June. It would postpone for another year the development of new federal rules for the care of millions of laboratory mice, rats, and birds. Biomedical groups claim the rules would be duplicative and expensive.

Prospects for the Department of Defense's (DOD's) science budget—a mainstay for university math, engineering, and computer science departments—are also looking up. New DOD R&D chief Edward Aldridge told a Senate subcommittee on 5 June that he hoped to spend between 2.5% and 3% of the Pentagon's total budget on basic and applied science, endorsing a goal set by an advisory panel several years ago. That target, if incorporated in a long-delayed DOD budget request later this summer, could generate more than $10 billion for research, a 10% increase over current levels.

National Science Foundation (NSF) officials, meanwhile, are hoping to get a portion of an extra $1 billion allocated to the House and Senate panels that handle its budget, along with those of the Veterans Administration, the Department of Housing and Urban Development, NASA, the Environmental Protection Agency, and several other agencies. Lawmakers from both parties have deplored the Administration's 1.3% increase for NSF, a paltry $56 million, including a cut in its $3.3 billion research account. The House subcommittee will vote on a bill next week. –DAVID MALAKOFF

With reporting by Erik Stokstad and Jeffrey Mervis.

U.S. SCIENCE POLICY

Memo to Congress: Get Better Advice

Add science policy wonks to the list of those hoping to bring extinct species back from the dead. Academics, science lobbyists, and government officials gathered in Washington last week to hash out ideas for reviving Congress's Office of Technology Assessment (OTA), a science advice agency that lawmakers killed in 1995. By the end of the daylong workshop, however, there was no consensus on what might convince Congress to change its mind.

Created in 1972, OTA was known for organizing diverse panels that churned out well-regarded reports on hot policy topics such as genetic engineering. It's also been the inspiration for similar science advisory agencies established in other countries. But

ScienceScope

Banking on Chemicals Gene hunters have GenBank. X-ray crystallographers have their Protein Data Bank. Now Harvard University chemist Stuart Schreiber wants chemists to have a bank of their own to store the wealth of information on new bioactive small molecules.

The notion behind the aptly named Chembank, says Schreiber, is to collect a standard set of information on the way small biologically active molecules affect organisms. Chembank entries would cover both general effects, such as how a molecule might change a developing organism's appearance, and specific effects, such as how it might inhibit a specific protein kinase receptor. Chembank could also allow researchers to pinpoint common structural motifs in bioactive compounds—a feature that Schreiber believes could help synthetic chemists design more potent drugs with fewer side effects.

"It is a terrific plan; it would be a very valuable database," says Kevan Shokat, a chemical biologist at the University of California, San Francisco. But he and other supporters won't know until August if the National Cancer Institute, which is currently reviewing Schreiber's idea, will back the project.

Universities Fall in Line The government's controversial plan to privatize Japan's 99 national universities—and perhaps close or merge as many as two-thirds of them—got a big lift last week when the target population withdrew its opposition.

The Japan Association of National Universities changed its stance after deciding that greater independence is the key to coping with changing demographics, says that group's chair, Makoto Nagao. The association's traditional view that every national university should emulate the others and be treated uniformly, he says, clashes with attempts to meet growing demands on universities to conduct advanced research and provide adult education and other types of real-world training.

At the same time, Nagao remains concerned about local communities that might lose their national university. "Japan's future rides on the shoulders of education and research, and there should be more careful discussion over how to not jeopardize those functions," says Nagao, who is also president of Kyoto University. The association hopes to be consulted as the government makes plans to implement privatization over the next few years.