

Serious shortfall of solar neutrinos

The mystery of the "missing" solar neutrinos deepens. Thermonuclear reactions at the sun's core should produce copious quantities of neutrinos, but preliminary data from a neutrino detector operating since January in the Soviet Union indicate that the new detector has apparently failed so far to capture any of these elusive particles. This follows the pattern of long-running solar neutrino experiments elsewhere, which have all revealed that the number of neutrinos detected on Earth falls significantly short of the apparent rate of neutrino production in the sun (SN: 10/28/89, p.280).

The new data come from the Soviet-American gallium experiment (SAGE) at the Baksan underground laboratory in the mountainous North Caucasus region. The apparatus consists of a tank containing 30 tons of liquid gallium metal. When an atom of the isotope gallium-71 absorbs an electron-neutrino (one of the three types of neutrinos known to exist), it turns into radioactive germanium-71. By extracting germanium-71 from the gallium and measuring its radioactivity, researchers can count the number of neutrino interactions.

What makes gallium special is that relatively low-energy electron-neutrinos — including those produced in the main nuclear-fusion reactions occurring at the sun's core — can trigger the reaction. In contrast, the detector in the Homestake gold mine near Lead, S.D., and Japan's Kamiokande II detector are sensitive only to certain high-energy electron-neutrinos created in a rare type of fusion reaction. Thus, the number of neutrinos in a gallium-based detector would presumably reflect more closely the sun's rate of energy production, which is directly related to the sun's brightness.

Theoretical calculations indicate that the Baksan gallium detector should pick up roughly one neutrino per day. Data from the first few months of operation suggest that the actual rate of neutrino capture is virtually zero. Because gallium interacts with low-energy neutrinos created in the prime energy-producing reactions in the sun, such a low rate provides strong evidence that electron-neutrinos somehow disappear between their creation and reaching Earth.

However, the number of neutrino events counted in the experiment is only what one would expect as a background count, and the results may represent some kind of statistical fluke or an unforeseen problem in the apparatus or analysis. To see if the pattern holds, researchers are now awaiting further results from SAGE and the first data from a gallium detector that has just begun operating at the Gran Sasso underground laboratory in the Apennines east of Rome. If further work confirms the initial results, then theorists will have to look more closely at the properties of neutrinos to account for their mysterious behavior.

A peculiar stellar outburst

New observations of a bright star designated MWC560 — first listed in the Mount Wilson star catalog nearly 50 years ago but never studied in detail until now — reveal an unusual pattern of brightening, apparently caused by a rapid but erratic ejection of gas from the system. Spectroscopic evidence obtained by Bulgarian astronomers and described in the Aug. 16 NATURE suggests the presence of a red giant star accompanied by a compact white dwarf star. The system's light output varies erratically from day to day and year to year, indicating that gas may be passing from the red giant to a ring of material surrounding the white dwarf — a phenomenon seen in what are called symbiotic systems. However, the astronomers also detect gas leaving the system at highly variable velocities — with peak velocities much higher than those encountered in typical symbiotic systems or even in nova outbursts. Why MWC560 should be so different remains a mystery.

Steam cure for colds: Full of hot air?

In 1987, Israeli researchers reported that three-fourths of the cold sufferers they had studied showed symptomatic improvement the day after inhaling hot steam. "The potential impact was mind-boggling," recalls pediatrician Michael L. Macknin. "To think that with two 20-minute treatments you could cure the common cold . . ."

To see if Americans might likewise benefit from the steam treatment, Macknin and his associates at the Cleveland Clinic have now repeated the experiment with snuffy-nosed volunteers from Cleveland. Each of the 66 patients received two 20-minute treatments, 60 to 90 minutes apart, consisting of air inhaled from a pair of exhaust nozzles held an inch from the nose. Roughly half the group inhaled dry, room-temperature air; the others inhaled hot, humidified air. Neither subgroup knew which was the supposed cure.

To the researchers' surprise, reports from the volunteers one week later revealed that sneezing, sniffing and stuffiness were 33 percent more likely to persist in steam inhalers than in their unsteamed counterparts, who — like most people after a week of cold symptoms — were essentially cured. A machine measuring nasal congestion showed an 11 percent improvement in the unsteamed group and a 6 percent worsening in the steam-treated sniffers, Macknin and his colleagues report in the Aug. 22/29 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. "If steam treatment works, we couldn't show it," says Macknin.

The study dampens the hopes of steam-cure enthusiasts while also raising concerns about the treatment's potentially aggravating effects on virally besieged nasal membranes, Macknin says.

The notion that colds improve with steam treatment may have originated with the traditional steaming cup of chicken soup, say some cold experts. In recent decades, however, the practice has acquired a scientific rationale. Rhinoviruses, which cause more than one-quarter of all colds, grow best at 33°C — a temperature conveniently provided by the human nose, explains Macknin. According to the steam theory, increasing the intranasal temperature kills the rhinoviruses. "But nobody has demonstrated convincingly in people that you can kill the virus in this manner," he says.

HIV babies need pneumonia protection

All infants aged 1 year or less and infected with the AIDS-causing virus (HIV) should receive preventive antibiotic therapy to ward off *Pneumocystis carinii* pneumonia, scientists urge in a new report. Currently, HIV-infected children do not receive such treatment until their blood levels of CD4 T-lymphocytes fall below 500 per cubic millimeter. Physicians base the practice on the knowledge that HIV-infected adults risk getting *P. carinii* pneumonia when these immune-system cells dwindle to that level.

However, even infants with CD4 levels above 500 can contract this lethal pneumonia, according to a study described in the Aug. 23 NEW ENGLAND JOURNAL OF MEDICINE. William Borkowsky and his colleagues at the New York University Medical Center in New York City studied 22 pneumonia-afflicted infants aged 3 to 11 months, finding that six of them had CD4 counts of more than 1,000 when physicians diagnosed the pneumonia.

The researchers report that 13 of the 22 infants (59 percent) died from the pneumonia — a mortality rate that underscores the danger of *P. carinii* in infants, who have underdeveloped immune systems. In contrast, HIV-infected adults run a death risk of about 20 percent during their first *P. carinii* infection, the team notes. Preventive treatment with drugs such as trimethoprim sulfamethoxazole may help ease HIV-infected infants through the extra-risky first year of life, Borkowsky says.