physical sciences

Nuclear breakup at 300 GeV

Spallation is the term for the breakup of an atomic nucleus when it is struck by (or when it strikes) a smaller particle such as a proton. A group at Brookhaven National Laboratory and Argonne National Laboratory used 200- and 300-billion-electron-volt protons from the accelerator at the National Accelerator Laboratory to see whether the cross sections (probabilities) for the formation of various daughter nuclei vary at high energies.

Targets of cobalt and vanadium were used in the test. Dozens of daughter nuclei were examined. In all cases the cross sections were virtually the same at 200 billion or 300 billion electron-volts as they were at 11.5 billion electron-volts, the nuclear chemists report in the June 11 PHYSICAL REVIEW LETTERS. It thus appears that the spallation cross sections are constant at high energy, which is contrary to their behavior at energies between 3 billion and 10 billion electron-volts, where changes occur. A corollary conclusion is that the range of excitation energies deposited in the nucleus by the projectile proton is independent of the energy of the projectile.

Hydroxyl masers and stellar evolution

Most of the celestial radio sources in which hydroxyl radicals (OH) appear to be acting as masers have been found in the neighborhood of large diffuse clouds of ionized hydrogen. Now comes a report of one OH maser found in association with a small dense cloud of ionized hydrogen instead of a large diffuse one. The source, called ON-1, is in the constellation Cygnus.

The significance of the discovery is that the small dense cloud may be an early stage in the evolution of ionized-hydrogen clouds. If the clouds represent ionized remnants around newly formed stars, there should be many of them in regions of the galaxy where evolution of diffuse ionized-hydrogen clouds has not yet occurred. The observers suggest a search.

The discovery is reported in the June 4 NATURE PHYSICAL SCIENCES by A. Winnberg of the Max Planck Institute for Radio Astronomy in West Germany; H. J. Habing of the Leiden Observatory in the Netherland, and W. M. Goss of the Kapteyn Astronomical Institute in the Netherlands.

The 100th pulsar

The radio observatory at Jodrell Bank, England, has announced discovery of pulsar number 100. It is designated PSR 1831—04. This is the 38th pulsar to the credit of the Jodrell Bank team, making them the world's most prolific pulsar discoverers. The discovery was made during a survey of pulsar positions to see whether they correspond to what would be expected if they were remnants of supernova explosions. The instrument used by the Jodrell Bank astronomers, the Mark I telescope, happens to be the smallest telescope ever to have seen a pulsar, and the Jodrell Bank people are very proud of its performance.

A double white dwarf

While processing a pair of sky survey plates made at Mt. Palomar, W. J. Luyten and P. Higgins of the University of Minnesota at Minneapolis came across a double white dwarf star in the constellation Leo. The two components have magnitudes of about 16. Their linear separation appears to be about 60 billion miles, and their orbital period about 12,000 years.

behavioral sciences

Feeling in the dark

Blindness, it is believed, is compensated for in some persons by increased sharpness in other senses. Psychologists at the University of Mantoba in Winnipeg have found that even one week without sight can result in an increased acuity in the sense of touch.

John P. Zubek, Michael Bross and W. Gelfant measured the sensitivity to pressure and pain applied to the forearms of 14 students who volunteered to spend seven days in total darkness. Pressure sensitivity was measured by an esthesiometer. In this test the skin of the subject is touched in two places simultaneously. When the touches are close together, they feel like one. As they are moved farther apart, both can be felt. The more sensitive the skin, the closer the touches will be when they are perceived as two. Pain sensitivity was measured with a dolorimeter. Heat was applied to the arm gradually. The time between the onset of heat and the first indication of pain was used as a measure of sensitivity. The subjects were tested prior to the experiment and on days three and seven. They became increasingly sensitive as the experiment progressed. A control group showed no increased sensitivity. The researchers conclude in the June PERCEPTUAL AND MOTOR SKILLS that visual deprivation resulted in a significant increase in both pressure and pain sensitivity.

The cross-eyed white tiger

Many Siamese cats are cross-eyed. R. W. Guillery of the University of Wisconsin has reported that the gene that causes albinism or lack of pigmentation in these cats also produces a misconnection of the nerve fibers that link the eye to the brain (SN: 10/21/72, p. 264). The fibers pass to the opposite side of the brain resulting in eye disorders such as nystagmus (rapid involuntary movement of the eyeballs) or strabismus (cross-eye or walleye). In the June 22 SCIENCE Guillery and J. H. Kaas report that a similar condition has been found in white tigers.

Rewati, a rare white tiger at the National Zoological Park in Washington, suffers from strabismus. When a younger brother of this tiger died, his brain was preserved. Guillery and Kaas examined the brain and found, as expected, an abnormality in the visual pathways. Because human albinos often have visual defects, Guillery says it seems probable they have similarly misrouted pathways.

When marijuana and amphetamines meet

Studies with animals have suggested that marijuana and amphetamines, when taken together, have a synergistic effect. Because drug users occasionally combine the two, a study was undertaken to determine whether the two drugs do have an interaction effect on human physical and mental performance. Steven Zalcman, Barry Liskow, Remi Cadoret and Donald Goodwin of the Washington University School of Medicine in St. Louis tested 10 adult males. On four occasions the subjects were given either marijuana and amphetamine, marijuana and placebo, amphetamine and placebo or a placebo for each drug. Neither the subjects nor the observers knew which drugs were or were not given. Before and after the drugs were taken, all subjects were given a battery of physiological and psychological tests.

The researchers report in the June AMERICAN JOURNAL OF PSYCHIATRY that previously reported effects were confirmed for each drug. They found, however, no evidence for synergistic action. The drugs, they say, seem to act independently.