## To Our Readers

Last year's special double-sized issue on astronomy, published at the end of the summer, was so well received that we are preparing another such issue this year. It will combine the Aug. 24 and Aug. 31 issues of SCIENCE NEWS into one double-sized issue presenting news stories and illustrated feature articles in a variety of fields of astronomy. It will be mailed on Aug. 30.

*—The Editor*

more persons between 114 and 116 than between 110 and 114. And other studies showed a decrease in the percentage dying as they reached each higher age bracket instead of the expected increase. Also, although women have longer average life spans than men, the superold are usually men. "It is possible to suggest," Medvedev says, "that men are more likely to try to exaggerate their real ages than are women."

He presents two more bits of evidence. The distribution of centenarians is not random—usually one village has one centenarian. And psychological and biochemical studies show "the function and metabolism of longevous people of 100-110 years are on the same level as is usual for people of 55-60 years." Research on the superold in other countries does not usually show such paradoxes, he says.

The exaggerated claims are sometimes amusing and implausible, and have sometimes led to embarrassment. One couple from Misabecia, Rustam Mamedov and his wife, claim to be 142 and 116 respectively. They say their youngest son was born when he was 107 and she was 83. One man from Yakutia received great publicity during the 1959 census when he gave his age as 130. But articles reaching his Ukrainian home village brought a swift response from those who knew him when. A World War I deserter, it seems he had adopted his father's identification papers and was really only 78 years old.

Medvedev points to three social and political factors that have lead to these exaggerated claims. First, the older a person is, the more respect and honor he receives in his community. Local, regional and even national media have focused glowing attention on the centenarians. Second, the state program of political propaganda frequently refers to the large number of centenarians and "considers it to be a special social achievement of the Soviet Union." Finally, Stalin was from that area and grew increasingly fond of the legends as he grew older. Local authorities searched for area centenarians to prove the belief, and rumor became institutionalized, Medvedev says. □

# Accelerators in tandem: Bevalac

Even before Lawrence Berkeley Laboratory's aging Bevatron gained a new lease on life by becoming the first high-energy heavy-ion accelerator (SN: 10/16/71, p. 266), scientists at the hilly laboratory were looking a few hundred yards up the slope toward where the low-energy HILAC accelerator was being rebuilt to produce a dense flux of heavy ions. Suppose an evacuated tube, with magnets at its bends, were built between the two machines; could the new SuperHILAC then act as a source of ions for the Bevatron, creating a machine that would accelerate large numbers of heavy nuclei to very high energies and open new realms of experimentation in physics and medicine?

Yes, it could. In the middle of the night on Aug. 1, a beam of carbon ions from the SuperHILAC was accelerated to 2.1 GeV per nucleon by the Bevatron, and the first "Bevalac" experiment got under way. A variety of questions were already waiting for a chance to be tested, based on the limited experience gained from the component machines.

From the intense, but low-powered, beam of the SuperHILAC, physicists had found a discrepancy between observation and theory concerning the radioactive decay of certain partially ionized atoms. The Bevalac will allow pursuit of these experiments at higher energies.

Physicians have become increasingly interested in the high-energy particles obtainable in small quantities from the rejuvenated Bevatron, for they can be used to kill tumors with far greater precision than relatively more clumsy and dangerous X-ray treatment. The Bevalac will provide an intense enough beam for practical therapeutic use.

In one sense, the new machine will bring the heavens "down to earth," for the accelerated heavy nuclei are essentially artificial cosmic rays. The development of intense beams of these ions will allow duplication of intergalactic particle collisions in the laboratory.

Finally, theoretician T. D. Lee excited Berkeley experimentalists recently by suggesting that if an element as heavy as lead could be accelerated to very high energies and caused to collide with some equally heavy material, a new "condensed state" of matter might be formed. Such an experiment must wait, however, for the next proposed step in the Bevalac system. Laboratory scientists say that for a relatively modest sum, the vacuum system between the two components could be improved enough to transport nuclei this heavy.

# Orion nebula and molecule No. 30


The great molecular cloud, the nebula, in the constellation Orion is a favorite spot for those interested in the dust and molecular gases of interstellar space. In the variety of molecules discovered there its only rivals are the clouds in Sagittarius that lie toward the center of the galaxy. Many molecular species have been found only in Orion and Sagittarius.

Orion is thus a good place to look for new molecules. Scientists now report the discovery of the 30th interstellar molecule, a new addition to the long list of organic molecules in the interstellar clouds. It is a nine-atom molecule, dimethyl ether, $(CH_3)_2O$.

The new molecule was found by a group led by L. E. Snyder of the Joint Institute for Laboratory Astrophysics of the University of Colorado and the National Bureau of Standards at Boulder, Colo. The instrument used was the 11-meter dish of the National Radio Astronomy Observatory. The report is in the ASTROPHYSICAL JOURNAL (Vol. 191, p. L79).

Three characteristic frequencies of dimethyl ether were recorded at frequencies of 90.9, 86.2 and 31.1 gigahertz. Taken together the measurements indicate either that there are collections of dimethyl ether molecules in Orion moving at two distinct velocities or that somehow certain internal motions of the molecule are preferentially energized.

Because dimethyl ether has a particular symmetry of construction and a large probability of collision with other molecules it should be useful for studying how interstellar gas molecules are energetically pumped. Some samples of interstellar gas show maser emission, and this requires a mechanism for pumping them with energy. Just what this mechanism is is one of the great mysteries of molecular astronomy.

One of the most ubiquitous of the interstellar molecules is carbon dioxide. It exists over quite a large area in Orion, and it is therefore a good medium from which to get some idea of the over-all configuration of the cloud.

Such a study is reported in the ASTROPHYSICAL JOURNAL (Vol. 191, p. L31) by T. G. Phillips of Queen Mary College of the University of London and Bell Laboratories at Murray Hill, N.J., K. B. Jefferts of Bell Labs, P. G. Wannier of Princeton University Observatory and P. A. R. Ade of Queen Mary College. It shows a kind of oscillatory structure in the cloud.

The observation consisted of making a strip map across the face of the cloud and charting the temperature of the carbon monoxide along a line through the center of the cloud. The observers find that the temperature varies in a wavelike way. The plot has a temperature maximum at the center of the cloud and secondary maxima at intervals of 4.8 light-years on both sides of the center.

Phillips and his co-workers suggest that this strange oscillatory structure may indicate a gravitational instability in the cloud, namely that it is a disk or sphere collapsing under the influence of its own gravitation. It has been suggested that patches or pieces of interstellar clouds might collapse to form new stars, and there is evidence to support that contention. But the collapse of a whole cloud in a symmetric structure over several light-years of space is something new. It is bound to be looked into more closely. □

# Quarks, timelike photons do not mix

Early this year particle physicists were somewhat mystified by the results of an experiment at the SPEAR storage ring at the Stanford Linear Accelerator Center (SN: 3/30/74, p. 207). The experiment involved the production of hadrons, particles subject to the strong interaction, the force that binds atomic nuclei together, in collisions of electrons and positrons. It was expected that the experiment would give further evidence that hadrons are made of constituents called quarks or partons. The mystifying thing was that the experiment gave no such evidence. It thus went counter to a recent trend. Now there is a theoretical suggestion as to why it went counter.

Another experiment, performed at Brookhaven National Laboratory, looked for leptons (particles not subject to the strong interaction) coming out of collisions of hadrons. Its results had an apparent ambiguous relation to the theory. In the Aug. 5 PHYSICAL REVIEW LETTERS Robert Savit and Martin B. Einhorn of the Fermi National Accelerator Laboratory at Batavia, Ill., make what they call a rigorous review of the Brookhaven data and conclude that they too are discrepant from the quark-parton theory.

One of the things the two discrepant experiments have in common is a timelike or real photon, a photon that lasts long enough for its existence to be possibly recorded. In both cases the collision produces first a photon, and then the photon turns itself into a lepton or hadron pair. In experiments that support the quark-parton theory, effects are also mediated by photons, but in contrast these are spacelike or virtual photons, whose existence is too fleet ever to be measured.

Savit and Einhorn suggest that perhaps the quark-parton theory applies only to cases where spacelike photons are in play and not those where timelike photons are found. If the suggestion is correct, it will start a whole new theoretical game and heighten the interest in experiments with timelike photons that the high-energy equipment makes possible. □

# Anesthetic can cause learning defects

A massive study of the widely used anesthetic halothane was made by the National Academy of Sciences in the mid-1960's. The anesthetic's structural similarity to the toxic chemicals choloroform and carbon tetrachloride and the reports of liver damage in some patients caused widespread concern that halothane itself was toxic and damaging. More than 850,000 patients in 34 hospitals were studied, and although halothane was definitely implicated in some cases of liver damage, the anesthetic was pronounced safe enough for use on most patients (SN: 5/10/69, p. 449).

But a nagging concern remains over chronic low-level exposure. Operating room personnel—doctors, nurses, anesthesiologists and technicians—often are exposed to 10 parts per million of halothane all day long, every day. Some preliminary data indicating that the exposure might have behavioral and learning effects on hospital workers sparked a study now reported in the Aug. 16 SCIENCE. The study found that permanent learning defects did occur in young rats chronically exposed to halothane. Five investigators from the University of Wisconsin at Madison were involved, including psychologists Kelvin L. Quimby, Lea J. Aschkenase and Robert E. Bowman, pathologist Louis W. Chang and anesthesiologist Jordan Katz.

Katz told SCIENCE NEWS he personally had noticed personality changes in anesthesiology residents after their first few years of study. "Of course there are lots of factors in human behavior, like their increasing age and increasing physical and mental stresses, but I still wondered if exposure to the anesthetics played a part. It is very difficult to speculate on a direct link because there is no direct data under controlled circumstances. So this is why we began studying rats."

The team knew from previous work that acute exposure to halothane could cause temporary behavior changes in operating teams, exhibited in deficits in thinking, perception and motor reaction. Their present study sought to discover whether long term, low-level exposure could cause lasting behavior deficits. They exposed rats to halothane during different stages in their developments. One group was exposed throughout early development, from conception to 60 days; one group was exposed during later development, from 60 to 105 days; and one group was continually exposed.

The rats were then taught light-dark and spatial discrimination exercises and tested. The data revealed that "early exposure to halothane in trace amounts causes apparently permanent learning deficits" while those exposed only in later development showed "no behavioral deficits in either learning task." So the critical exposure to halothane is early development, they say.

The team took this evidence a step farther and examined tissue samples from the cerebral cortexes of learning-deficient rats. They found degeneration of neurons and improper development of the nerve cell synapses in the early-exposed rats, and only slight damage in the late-exposed rats.

Although the data on humans are sketchy at the present, the implications of this study for adult operating room personnel are many. "We know that these personnel have higher rates of spontaneous abortion than control groups" and the connection between this and halothane exposure must be further studied, Katz says. And although babies and children normally are not chronically exposed to low levels of halothane, pregnant operating room personnel are. And several studies have shown that the placenta and fetus are reached by anesthetics (SN: 11/9/68, p. 473). More sophisticated behavioral and physical tests on primates are now needed, Katz says.

"The whole field of toxicology in general has been involved with the physical effects of toxic substances and not their effects on the ability of the intellect to grow and the psyche to mature. This area has been untouched, and needs to be examined.

"The documentation is not there at the present time to warrant regulation of pregnant women on operating room teams," Katz says, "but I can tell you that if I were a female and pregnant, I would not want to work in an operating room during those nine months." □