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." □