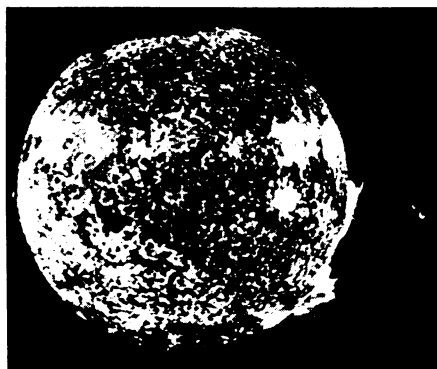


New twists in solar rotation rates



That the sun is not a rigid rotator has been apparent for centuries. It would, of course, be unusual for a gaseous body to rotate rigidly like a solid, and astronomers have long noted that the equatorial regions of the sun's surface go around faster than the polar regions.

Another part of the question is whether the matter below the surface rotates in phase with the surface regions. In a solid rotator it ought to. In an ordinary fluid rotator it characteristically does not. In the sun it doesn't either, according to what is said to be the first measurement of subsurface rotation in the sun. The work was done by a West German astronomer, Franz Ludwig Deubner of the Fraunhofer Institute, who was working as a visitor at the Sacramento Peak Observatory in Sunspot, N.M.

The part of the sun involved in Deubner's work is the convection zone, a subsurface region in which heat is convected to the surface by rising and falling columns of gas. The convection zone is important in solar theory for a number of things, one of which is the genesis of sunspots. Rotational and convective motion are supposed to couple to produce the spots.

Conditions in the convection zone manifest themselves on the surface through patches that vibrate up and down. These surface vibrations are coupled to sound waves in the convection zone. Deubner found that the frequency of the surface oscillations depends on whether the sound waves to which the surface oscillations are coupled are traveling with or against the solar rotation and to the rotational speed of the part of the convection zone in which those particular sound waves are trapped.

According to a theory developed by Roger Ulrich of the University of California at Los Angeles, the sound waves in the convection zone are trapped at different levels according to their frequency. Using this theory and his observations, Deubner was able to calculate rotation rates at different depths into the sun. For the first 10,000 kilometers down the sun does tend

to rotate solidly: The speed is the same as the surface. For the next 5,000 kilometers the rate is about 100 meters per second faster than the surface rate. Below 15,000 kilometers the rotation rate decreases and eventually becomes less than the surface rate.

The director of the Sacramento Peak Observatory, Jack B. Zirker describes Deubner's findings as "quite unexpected." This is a phrase that could describe a number of recent observations about the sun. In the last few years solar theory has been badly shaken by unforeseen discoveries. □

Lower smog standard

The level at which sensitive people react to photochemical oxidants, or smog, was believed to be at 0.10 parts per million in air. For an extra margin of safety, the federal standard was set at 0.08. But new health effects data and better understanding of existing data call for a relaxing of the current smog standard to 0.10, according to Environmental Protection Agency Administrator Douglas M. Costle.

In addition to proposing the new standard, EPA proposes changing the chemical designation of the standard from photochemical oxidants to the specific pollutant ozone. Ozone, a potent oxidizing agent, irritates the body's mucous lining, leading to chest tightness, coughing and wheezing. This pollutant forms during a complex series of atmospheric chemical reactions that is initiated when hydrocarbon and nitrogen-dioxide emissions are exposed to sunlight. □

Cancer and nutrition

A Senate nutrition subcommittee last week challenged the director of the National Cancer Institute on whether enough money was being spent for research on the relationship between diet and cancer. It echoed earlier questions by House members on whether the almost \$5 billion in federal cancer research funds over the past seven years had been properly allocated.

National Institutes of Health Director Donald Fredrickson testified that of the estimated 75 percent of all human cancers due to environmental causes, most may be related to diet. The subcommittee countered, asking why, then, only one percent of the NCI budget went to dietary research. NCI Director Arthur Upton promised more money would be spent on nutrition. He also said the institute would do more to warn people that strong evidence already exists linking cancer with overeating, excess drinking and high-fat diets. Some evidence also suggests that diet and nutrition modify rather than initiate tumor development, Upton said, possibly by influencing hormone levels in the body. □

Predicting cancer drug effectiveness

A quick means of evaluating which cancer drugs can help which cancer patients could have a profound impact on cancer treatment, because patients with the same kinds of cancers can vary widely in their response to the same cancer drugs, and because cancer patients who do not receive the right chemotherapy often die within a few months. Such an assay may now have been found, according to a report in the June 15 NEW ENGLAND JOURNAL OF MEDICINE.

Cancer researchers have been trying for some time now to find an assay to quickly predict the effectiveness of cancer drugs on specific patients' tumors. Yet most of the predictive tissue culture tests explored, such as the analysis of drug uptake by tumor cells, have not been found to correlate in a clinically useful way with the subsequent response of a patient to a given cancer drug. The reason, essentially, is that these tests have dealt with the 99 percent of cancer cells in a tumor that eventually die, not with the one percent that go on to multiply.

In 1955, a cell culture test was developed in which cells capable of sustained replication produced, after an appropriate time, small colonies containing 50 or more progeny of the original cell. Single-cell suspensions of mammalian cells were dispersed in a semisolid medium. This technique has subsequently become a widely used experimental tool for studying clone-forming cells from various healthy organs and also from various tumors. And now Sydney E. Salmon and his colleagues at the University of Arizona College of Medicine have adapted the test for evaluating the effects of drugs on those few cancer cells in tumors that keep the cancer spreading.

As Salmon and his co-workers report, the assay can predict, with very high accuracy, which drugs will help which patients with ovarian cancers or myeloma cancers. Before the assay can benefit patients with other kinds of cancers, though, some problems have to be worked out.

For instance, the assay requires that cancer cells be taken for study without compromising their viability. For cells from myelomas and leukemias, and for solid tumor cells floating in exudated material, the problem is minimal. The same is true for highly cellular tumors such as non-Hodgkin lymphomas and melanomas; single-cell suspensions can usually be prepared with relative ease. The situation is more difficult, however, for some other kinds of solid tumors and may be extremely tough for certain tumors such as breast cancer, in which small numbers of tumor cells may be scattered throughout fibrous connective tissue of an organ. Nor does the assay take into account a major

variable for at least some cancer drugs — the transformation of drugs by the body before the drugs enter cancer cells and act on them. Still another drawback: Drug-sensitivity testing usually takes two to three weeks, and it is not always possible to wait for culture results before starting chemotherapy on a patient.

In spite of these and some other difficulties, however, the assay “represents a promising approach to the *in vitro* assessment of tumor behavior and response to therapy,” conclude Emil Frei III and Herbert Lazarus of the Sidney Farber Cancer Institute in Boston, in an editorial in the June 15 NEW ENGLAND JOURNAL OF MEDICINE. □

Another hepatitis virus discovered

About 90 percent of all cases of hepatitis transmitted by blood or blood products are not caused by the hepatitis B virus, a known origin of blood-carried hepatitis. Nor are these cases triggered by the hepatitis A virus, which is spread by contaminated food. So might there be another, yet-to-be-discovered hepatitis virus that initiates these many cases? Yes, it seems so, according to a report in the June 16 MORBIDITY AND MORTALITY WEEKLY REPORT, published by the Center for Disease Control in Atlanta.

First, two patients who had received transfusions of a commercial blood plasma product came down with hepatitis. For both patients, blood tests ruled out acute infection with hepatitis A virus, hepatitis B virus or other causes. So CDC scientists took some of the blood plasma the patients had received and injected it into four chimpanzees. All four animals gave evidence of coming down with hepatitis. Plasma from these chimps was then injected into two others. They too got hepatitis. The CDC scientists then visualized, by immune electron microscopy, virus-like particles in plasma from one of these chimps (see accompanying photo). The particles are from neither hepatitis A nor hepatitis B viruses. Thus, CDC scientists believe the particles may be from the virus that causes most cases of blood-transmitted hepatitis.

If more tests show that this virus is really the cause of most blood hepatitis, then it should be possible to develop a screening test to keep the virus out of blood supplies. Such screening could markedly reduce the incidence of blood hepatitis, which is debilitating and sometimes fatal. □



Center for Disease Control

Kepone — more news and it's mostly bad

What is the extent of kepone pollution and can it be removed? The Environmental Protection Agency completed a year-long study to determine just that, and it rings a grim toll for Virginia's James River fishing industry: Though methods exist to get rid of kepone, none is currently effective enough to make cleanup of the severe contamination in that river worthwhile. For Maryland fishermen the news is better; the highly toxic pesticide appears not to have entered the Chesapeake Bay except as carried in the bodies of migrating fish and shellfish.

Kepone was discharged in and around Hopewell, Va., by its manufacturers for ten years. Adverse health effects in employees forced the sole producer to close its plant in 1975. Subsequent findings of high levels of contamination in the adjacent James River closed much of it to fishing for a wide range of species.

Results of the more than 900 soil and sediment samples that EPA scientists studied indicate that kepone pollution is extensive. An estimated 20,000 to 38,000 pounds of kepone resides in just the top foot of James River sediments (data on whether the contamination goes much deeper are currently unavailable). Biodegradation is “insignificant,” EPA says, estimating that it may take many decades for the river to clean itself.

The soil samples indicate there may be as many as 1,000 pounds of residual kepone around Hopewell, another 3,000 pounds in the top four inches of an adjacent quarter-acre marsh, and 220 pounds in a kepone-sludge lagoon (which may be leaking into a nearby creek). Rainwater runoff is estimated to carry 1.8 pounds of kepone per day into local waterways under “low flow” conditions, up to 35 pounds per day during storms, the study says.

The estimated cost of dredging contaminated portions of the James is “in the billions.” But that's just dredging costs; if dredge spoils must also be treated, says EPA's Jim Kohler, costs will be higher. And dredging 200 square miles of the most turbid regions of the James could end up destroying many of the life forms in or near the sediment. “We don't have the technology in the United States to extract and remove toxic chemicals from river bottoms,” Kohler told SCIENCE NEWS. There were many “promising” technologies reviewed in this study, but most have never been tried outside the laboratory. The Japanese oozer dredge is an exception, but according to the Washington Post, no such dredge is working in the United States.

According to Gary Gardner in EPA's Philadelphia office, other pollutants — such as high levels of bacteria and toxic chemicals — “essentially closed” the James River to shellfish harvesting prior to

the finding of any kepone. For this reason, and because currently available cleanup techniques may do more harm than good, EPA recommends no comprehensive river cleanup attempts at this time.

What they do recommend, Kohler says, is that monitoring of kepone levels in fish, water and soil continue throughout the contaminated area and nearby Chesapeake Bay regions. And against the possibility that kepone may start moving toward the Chesapeake, an emergency removal regimen should be prepared. The agency also recommends that quick action be taken to remove and destroy concentrated sources of the pesticide in soil. □

Light flashes from an X-ray burster

One of the main things astronomers always want to know about a given kind of radiation source is how far its spectrum extends over the range of possible electromagnetic wavelengths. Different ranges of the spectrum are monitored with very different kinds of equipment in different locations. If the objects in question are periodic or transient radiators, the process can involve precisely timed cooperative observations by various people in widely separated spaces. In the matter of looking for bursts of light that appear at the same time as the bursts of X-rays from X-ray burster sources, it involves space literally. The X-ray observatory is the SAS 3 satellite.

The cooperative observations are being arranged as a result of the first detection of light bursts coincident with X-ray bursts by the 150-centimeter telescope at the Cerro Tololo Inter-American Observatory in Chile on June 2. The source was MXB1735-44. Two optical bursts were recorded. There are no X-ray data for the time of the first burst, but SAS 3 recorded an X-ray burst coincident with the second. The discovery is reported by Jonathan Grindlay of the Harvard-Smithsonian Center for Astrophysics and J. McClintock, C. Canizares and J. van Paradijs of the Massachusetts Institute of Technology in International Astronomical Union circular 3230 (June 15).

Theoretically the question of a mechanism that can produce simultaneous bursts of light and X-rays should produce some interesting suggestions. Experimentally the discovery means an invitation to astronomers to look for other instances. There are four known X-ray bursters that appear to have steady optical sources associated with them. The circular urges interested optical astronomers to arrange cooperative observations with SAS 3 to seek optical bursts from these. □