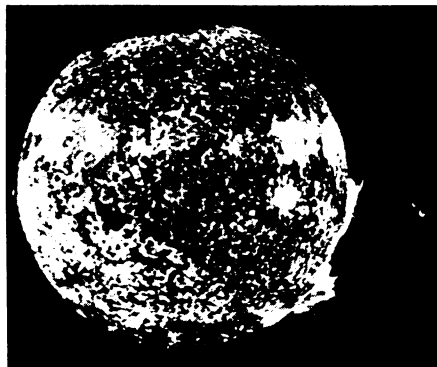


## New twists in solar rotation rates



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