Astronomy

Rising to a sunspot peak

This could be the big one. Last month's jump in the number of sunspots and the accompanying increase in radio emissions put the present solar cycle on track toward matching or surpassing the most active solar cycle on record. The present cycle officially began in September 1986, when the number of sunspots reached an 11-year minimum. The record cycle, based on 250 years of data, peaked in 1957.

"From the nature of the increase and the location of the spot groups, it looks like there is no chance that this [activity] will subside very soon," says Patrick McIntosh of the National Oceanic and Atmospheric Administration in Boulder, Colo. The December observations clearly indicate the sun's shift into its most active phase, which usually lasts about four years. "The activity will not subside much below the present level until 1992," McIntosh says. "We can safely say we are in for an interesting ride for the next four years."

Although the sunspot number is the best-known method for tracking solar cycles, measuring intensity changes in radio-wave emissions is proving a more precise way to compare one solar cycle with another. McIntosh's data show an impressive fit between the present solar cycle and the record cycle of the late 1950s. Even last summer's plateau — when the rapid rise in the number of sunspots leveled off for a few months — was predictable because similar plateaus have shown up at the same point in the radio signatures of the last three solar cycles. Physicists need to look into what may be causing such distinctive, reproducible patterns, McIntosh says.

So far, scientists have not recorded any particularly intense solar flares. "We've had some respectable flares during this episode of increased sunspot activity, but nothing that would cause anybody concern," McIntosh says. "The big fireworks may be yet to come." The radiation from intense solar disturbances could disrupt radio and telephone communications, damage electronic systems in satellites, present radiation hazards to astronauts and aircraft passengers at high altitudes, and alter satellite orbits (SN: 7/2/88, p.8).

Now you see it, now you don't

The sudden disappearance of a star often provides a clear sign that an unseen, orbiting companion has moved in front of it, blocking the star's light. Eventually, as the obscuring companion moves aside, the star reappears. In the case of an unusual blue star (designated PG 1550+131) in the constellation Ophiuchus, the reappearance happens after only 12 minutes. Observed last summer by Reinhold Häfner of the European Southern Observatory at La Silla in Chile, this vanishing act represents the most complete and arguably the fastest stellar eclipse yet seen.

The double-star system apparently consists of one star that has already evolved into a small, bright, compact object (a white dwarf) and another, faint star (a red dwarf) still in the main phase of its life, converting hydrogen fuel into helium. When the fainter star passes in front of its brighter partner, only light from the fainter star is visible. Because the darkening is so complete, the red dwarf must be less than one-hundredth as bright as the white dwarf. Moreover, the short duration of the eclipse indicates the faint star is also very small. The two stars orbit roughly 700,000 kilometers apart, meaning the entire system would fit within the space filled by our sun.

The discovery of this binary star system provides important information about a rarely observed phase in the evolution of binary stars. The stars seem in a state that immediately precedes the unstable "cataclysmic" phase, in which a stream of gas begins to flow from the larger to the smaller star, causing the smaller star to brighten abruptly. Further observations of the system are planned for later this year.

Behavior

Blood test linked to alcoholism risk

University of Wisconsin-Madison researchers have added another candidate to the growing list of potential biological markers associated with an increased risk for developing alcoholism. Further research on the new marker — an alcohol derivative known as phosphatidylethanol — may lead to a simple blood test to screen for susceptibility to alcoholism, report Gerald C. Mueller and his colleagues in the Dec. 21 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

The linkage resulted from a chance finding in 1982, when Mueller's research team was studying ways to regulate the growth of cancer cells. They observed that when they applied chemical compounds called phorbol esters to cancerous cells, the cells produced a substance later identified as phosphatidylethanol. This alcohol by-product appeared because alcohol was used as a solvent in the experiments.

The scientists' discovery shifted their attention to alcoholism. In a pilot study, they conducted blood tests on 25 alcoholic men from 18 to 52 years old and 24 nonalcoholic men with no family history of the disorder, ranging in age from 20 to 48 years. They recruited only men because other studies suggest men have a greater risk of inheriting a predisposition to alcoholism.

Almost half the alcoholics registered phosphatidylethanol levels about twice those observed in the nonalcoholic group and in the remaining alcoholics. Those with elevated levels may have an inherited propensity to produce more of the alcohol by-product, Mueller says. To explore this possibility, the researchers are now examining phosphatidylethanol levels in members of 100 families. The sample includes women as well as siblings and children of alcoholics and nonalcoholics.

Another potential blood test for susceptibility to alcoholism targets abnormal responses of two enzymes found in blood platelets (SN: 1/30/88, p.69). Evidence also suggests that sons of alcoholics have unusually low blood levels of the hormone cortisol after drinking, indicating they have a less intense biological reaction to alcohol (SN: 11/21/87, p.324).

The heart of depression

Scientists estimate that as many as one in three people with coronary artery disease are clinically depressed. Evidence now suggests depressed coronary patients have an increased chance of requiring bypass surgery, suffering a heart attack or even dying in the year after their heart disease is identified.

Psychologist Robert M. Carney and his colleagues at Washington University School of Medicine in St. Louis diagnosed nine cases of "major" depression in a group of 52 patients newly diagnosed with coronary artery disease. Symptoms of major depression recurred over periods of at least two weeks and included extreme sadness or hopelessness, loss of interest or pleasure in most activities, insomnia, loss of energy and thoughts of suicide.

Major depression proved the best single predictor of serious medical problems, the researchers report in the November/December PSYCHOSOMATIC MEDICINE. One year later, seven of the nine depressed patients had undergone at least one serious cardiac complication, including one death. Only about one-third of the 43 nondepressed patients suffered the same consequences. Even when the researchers statistically controlled for the extent of coronary disease, amount of cigarette smoking and heart function, major depression's link to later cardiac ailments remained.

The scientists conclude they need to expand their sample to examine how major depression might contribute to complications from coronary artery disease. Severe depression may activate physiological processes that decrease the resilience of heart muscle, they propose.