Unraveling solar magnetism

Threads continue to unravel from the cloak of mystery covering the sun's magnetic nature. At the recent meeting in Toronto, Canada, of the American Geophysical Union, John M. Wilcox of Stanford University offered the latest bit of magnetic fabric: a previously undetected magnetic feature at the middle latitudes of the sun's face.

Like most everything else associated with solar magnetism, the polarity of the sun's magnetic field has a 22-year cycle. Every 11 years, the polarities of the hemispheres reverse, so that after 22 years, the sun returns to "normal" — a field directed into the sun in the southern hemisphere and out of the sun in the northern hemisphere. But how does that change come about?

Wilcox and co-workers P.H. Scherrer and J.T. Hoeksema think they may have a toehold on the answer. Using magnetic observations of the most recent solar cycle from the Stanford Solar Observatory, which can detect magnetic intensities to a few hundredths of a gauss, the researchers found a very weak field — about ¼ to 1½ gauss, says Wilcox — at about 30° in both the northern and southern solar hemispheres. The feature stands out because it is of the polarity that will be the new polarity when the field reverses. The feature appears about one year after minimum sunspot activity, says Wilcox, and enlarges and spreads toward the north pole from its birthplace in each hemisphere.

Furthermore, when the researchers looked back at the five previous solar cycles beginning in 1926, they found good evidence that the newly identified feature had been present all along and that its position and other characteristics are constant. The timing of the appearance of the magnetic feature correlates well, says Wilcox, with that of a previously detected variation in the structure of the interplanetary magnetic field. (The interplanetary magnetic field is the field that is swept from the sun's surface throughout the solar system by the solar wind.)

Noting that this poleward migrating feature bears some similarities to the equator-ward migrating solar currents recently described by Robert Howard and Barry LaBonte of Hale Observatories (SN: 4/19/80, p. 245), Wilcox says there is "no obvious answer to how it fits with [that] work, but we suspect it is related."

"What's important is that all these are clues to guide the theoreticians toward a more realistic understanding of the magnetic structure of the sun," he says. "Even theorists would agree that the observations [of the magnetic structure] are ahead of theory at this point." □

Tropical herbal: Down to the chemistry

"The plant kingdom is an untapped source of chemical wealth," Richard E. Schultes told reporters at a recent meeting at Rockefeller University in New York. As a Harvard University botanist he has collected from the Amazon jungles more than a thousand plants used medicinally by the region's native inhabitants. "Most of the plants have never been looked at by chemists. And they contain chemicals so strange they were never thought of by chemists," Schultes says. "The chances of finding medically valuable agents in them is incredible."

Jungle trees of the nutmeg family (*Myristicaceae*) are one example. Schultes has observed that leaves, bark and the blood-red resin of certain of these flowering plants are used by unrelated groups of native Indians in plasters for skin treatment and in washes to clean infected wounds. In addition, these plants are the source of potently hallucinogenic snuff, an oral psychomimetic agent and an arrow poison. "So far only the hallucinogenic properties of these plants have been traced to the presence of constituents of clearly defined structures," says chemist Otto R. Gottlieb of Brazil's University of São Paulo in the JOURNAL OF ETHNOPHARMACOLOGY (Vol. 1, No. 4, 1979).

Gottlieb, who has been analyzing trees of the nutmeg family, now tentatively ascribes the alleged wound-healing power of the plants to chemicals called pterocarpans and neolignans. Some of these compounds have antifungal activity and may become valuable additions to the modern pharmacopoeia. Two other neolignans, from a tree called *Virola surinamensis*, protect the human body against penetration by larvae of a blood fluke that causes schistosomiasis. Gottlieb mentions that these novel neolignans structurally resemble compounds of the Malaysian nutmeg and mace plants, which also figure in folk medicine.

Previous attempts to identify wound-healing compounds of the *Virola* trees failed because dried material was used. Schultes emphasizes the advantage of analyzing fresh material in nearby laboratories and of using chemical techniques for which only a few leaves collected from inaccessible plants may suffice.

"Man in primitive societies has lived for millennia in close association with his ambient vegetation and has, through trial and error, discovered many unusual properties of the plants in his environment," Schultes says. "It is urgent that we try to learn as much as possible from him before the relentless advance of acculturation or extinction of races forever obliterates his knowledge of natural organisms and their peculiar properties." □

Heredity: Genes or experiences?

The notion that maternal experiences can be passed on vertically to one's offspring is off the mark, to say the least, since it seems on the surface to support the unpopular theory of Russian scientist Trofim Lysenko. Lysenko argued, contrary to 20th century genetic dogma, that heredity is the result of environmentally induced changes assimilated during the course of preceding generations rather than the result of transmission of genetic material according to Mendelian laws. But during the past few years some evidence has surfaced that seems to support vertical transmission of maternal experiences. And now still more evidence for such transmission is reported in the June 6 SCIENCE by Neil J. Skolnick, Sigurd H. Ackerman, Myron A. Hofer and Herbert Weiner of Albert Einstein College of Medicine.

In 1975 the scientists found that 10 to 20 percent of rat pups normally separated (21 days after birth) from their mothers will develop ulcers when placed under restraint, but a much larger percentage of rat pups prematurely separated (14 days after birth) will develop ulcers. Then the researchers undertook another experiment to see whether prematurely separated female rat pups could pass on ulcer susceptibility to their own normally separated offspring. First, a female rat pup was separated prematurely from its mother, and another female rat was removed at the normal time. Both were allowed to grow undisturbed to maturity and were then mated. Half of each female's litter was then separated either normally or prematurely from its mother, forming four groups of animals. All four groups were then restrained, sacrificed and examined for ulcers by an experimenter who was unaware of the origin of each group.

As Skolnick and his co-workers report, the two groups of rat progeny prematurely separated from their mothers had a high incidence of ulcers (around 80 percent) whether or not their mothers had been prematurely separated. Of prime interest to the investigators, however, was the finding that only 19 percent of the normally separated rats from normally separated mothers had ulcers, while 64 percent of normally separated progeny from prematurely separated mothers had ulcers — a highly significant difference statistically. The researchers concluded that "a prematurely separated rat mother transmits her acquired restraint-induced gastric erosion [ulcer] susceptibility vertically to her normally separated offspring."

Skolnick and his colleagues then conducted another experiment to see whether vertical transmission of ulcer susceptibility occurs postnatally or prenatally. Four female rat pups (two prematurely separated and two normally separated) were