Space

Lunar magnetism from within

So weak is the moon's magnetic field, and particularly its dipole moment, that it might seem reasonable to assume the field to be nothing more than the remnant of some external magnetizing force. S. K. Runcorn of the University of Newcastle upon Tyne, England, however, maintains that the same evidence—a vanishingly small magnetic moment—shows that the moon used to have an internally produced magnetic field.

The basis for this conclusion, reported at the recent Lunar Science Conference in Houston as well as in NATURE (253:701), is the calculation that a shell of any thickness, magnetized by a dipole at its center, will have a dipole moment of zero when the dipole field is removed. The reason, says Runcorn, is that the strongly magnetized material in the polar regions is exactly balanced by the greater volume of more weakly, oppositely magnetized material in the equatorial regions.

The likelihood, Runcorn suggests, is that the moon acquired a uniform, permanent magnetization from a primordial field in the condensing solar nebula. Or there may have been a dynamo effect, creating a field from electric currents spinning in the lunar core. Either way, the magnetization in the lunar interior would have produced a dipole field at the surface, "which magnetized both the anorthositic highlands as they cooled after differentiation and the basalts after they solidified in the maria basins."

The final step—the disappearance of the interior field—would have occurred when accumulated heat from radioactive elements raised the temperature of the interior above the Curie point of iron (780 degrees C.), at some time between 3.2 billion years ago and the present.

Thunderbolts of Jove

Thunder and lightning on Jupiter have long been the subjects of speculation, scientific and otherwise. Recent data on the planet have now led to an estimate of just how stormy the giant world may be.

In 1974, Stephen Ridgway reported the observation of acetylene in the Jovian atmosphere (SN: 2/9/74, p. 91). From a combination of laboratory experiments and calculations, Akiva Bar-Nun of The Hebrew University in Israel reports that the lifetime of all the acetylene in the atmosphere is only about 6.1 million years—brief by geological standards—so it must be regenerated somehow. Because there is so much hydrogen on Jupiter, he writes in ICARUS (24:86) thermal formation of acetylene from methane is probably unlikely. "Consequently," he says, "acetylene can be generated in the Jovian atmosphere only during thunderstorms." And what storms!

If Jovian lightning bolts are like earth's in size and strength, he says, it would take 10,000 times as many of them to account for the acetylene. A reasonable acetylene production rate would require 53,000 bolts per year for every square kilometer of Jupiter's "surface," or about one stroke per square kilometer every 10 minutes.

Acetylene may also be an indirect contributor to Jupiter's spectacular color scheme, since, Bar-Nun reports, about one-fourth of acetylene's steady-state concentration is converted to a yellow-brown polymer. Bar-Nun's estimated production rate for the polymer would not account for the intense color of the Great Red Spot, however, which means, he says, that storms in the Spot are probably either 10 times stronger or 10 times more frequent than on the rest of the planet.

Zoology

Violated voles

Pregnant female voles will abort 8 times out of 10 if a new male is introduced and will then breed with the new male four or five days later, Robert A. Stehn and Milo E. Richmond of Cornell, report in the March 28 SCIENCE.

Female prairie voles (*Microtus ochrogaster*) are apparently more vulnerable to male-induced abortion during most of pregnancy than are mice, which no longer respond to males four or five days after mating. Female voles respond to a male's stimulation as late as 15 days after breeding, possibly because voles have longer, male-induced estrus periods, which influence sexual urge. Abortion in prairie voles is apparently unavoidable, as a side effect of endocrine reactions to estrus induction, and introduction of a strange male has an overriding influence on the female regardless of her reproductive condition. Should the female vole maintain her pregnancy in spite of introduction of a strange male, she will deliver those young much earlier than normal.

Although application of the research to wild voles is based on speculation, the interruption of social relationships by excessive immigration, for instance, would lead to increased occurrence of abortions. A continuously disrupted, shifting population probably would produce very few juveniles, but breeding might remain high.

What makes a fly fly?

A fly's flight is fueled by a blood carbohydrate "trehalose" stored in fat body cells, but where the hormone that stimulates trehalose production is located is a mystery. Speculations are that brain nerves regulate the level of blood trehalose in a fly's body, gearing them up just before a fly takes off. Some experiments also indicate that when a fly drinks sugar water, that triggers release of some natural trehalose from fat cells. But in investigating the hormone, Tom Christian Normann of the University of Cambridge discovered that decapitated blowflies (*Calliphora erythrocephala*) can remain alive for 30 hours, move, have heart beats and produce blood trehalose.

Since, without a head, a fly can neither drink sugar water nor register brain waves, Normann tested its medial neurosecretory brain cell (MNC) terminals, located near the aorta wall. Even after interrupting the pathway to the neurohaemal organ (which regulates blood changes), blood sugar levels still increased. The more active the MNC and the corpus allatum (which may regulate the MNC) are, the smaller is the content of trehalose in the blood. But when MNC terminals are removed or prevented from secreting hormones, fatty acids increase drastically, accompanied by blood hyperactivity and fatigue, leading Normann to conclude that medial brain cell terminals must have a key role in regulation of carbohydrate metabolism.

Explaining sounds in young bats

Newborn bats, depending on their species, have varying capacities to emit supersonic sounds, Edwin Gould, of Johns Hopkins University, reports in the JOURNAL OF MAMMALOGY (56:15). A bat's ability to emit characteristic calls depends primarily on its development at birth. Some bats, born with eyes and ears closed, and lacking hair, can only emit one-syllable, nearly constant frequency calls, while precocious species emit more than one call at birth. Since young bats are unable to fly for up to three weeks after birth, Gould suggests that preflight vocalizations may act as an identification call to the mother.