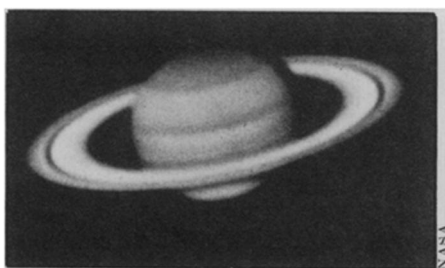


# Another Beacon Under the Sun



For two decades, Jupiter has stood alone as the only known radio beacon, other than the earth, among the planets, pouring out bursts of energy that can be detected across hundreds of millions of miles of space by the giant ears of radio astronomy. Now there is another. For the first time, evidence has been found of non-thermal radio emissions from the planet Saturn.

The discovery was made by Larry Brown of the radio astronomy branch in the Laboratory for Extraterrestrial Physics at the National Aeronautics and Space Administration's Goddard Space Flight Center in Greenbelt, Md. He emphasizes that the finding is tentative—the signal had to be detected through the fierce radio “noise” of the earth itself—but the signature of Saturn does appear to be present.

The emissions were detected when Brown performed what is called a power spectrum analysis of the data from an earth-orbiting satellite named IMP-6, one of a series of Interplanetary Monitoring Platforms that study conditions in the depths of the solar system. In addition, Brown found that the times when the radio bursts occurred matched (within his measurement uncertainty of a few minutes) with times when Saturn had a given face turned toward the earth. In other words, the bursts carried the “signature” of Saturn's 10.5-hour rotation.

The frequencies of the pulses (from about 300 to 500 kilohertz) are so low that earth's atmosphere largely blocks them from getting through to ground-based instruments. They are also extremely weak compared to the background noise. Earth is such a noisy place for radio astronomy, in fact, that even IMP-6, which ranged from about 2,100 miles to more than 125,000 miles above the earth, heard scarcely a dozen bursts in its 18-month lifetime.

Fortunately, NASA has an even better ear, which is even now being turned toward the ringed planet. RAE-2, the second of the Radio Astronomy Explorer satellites, was launched in June of last year into an orbit around the moon, far from the aggravating static of its mother planet and the filtering

effect of earth's atmosphere. A bigger plus, however, is the moon's nice, sharp-edged horizon. By aiming the satellite's antennas in the direction of Saturn, and measuring the exact time when the lunar horizon cuts off the incoming radio signals, it should be possible to precisely confirm their origin as well as to match them more closely with Saturn's rotation. The plane of the satellite's orbit around the moon is not always lined up with Saturn, Brown points out, but the relationship changes slowly enough that he expects as much as a year of data.

After that, perhaps inspired in part by the new findings from Saturn, radio astronomy branch chief Robert Stone and his Goddard colleagues hope to turn the RAE satellite's talents to the rest of the solar system. Mercury, Venus and Mars do not hold out much promise, but Uranus and Neptune may well turn out to be radio beacons in their own rights.

The difference is a matter of magnetism. Jupiter and the earth both have

strong magnetic fields, while those of Mercury, Venus, Mars and earth's moon range from weak to nonexistent. One of the major implications of Brown's Saturn discovery, in fact, is that it almost demands a strong magnetic field there, a valuable datum for Pioneer 11, which will arrive there in 1979 to find out for certain.

The reason is that in order to produce such intense emissions, there must be some process that causes the energetic electrons around the planet to give off more than the sum of their individual energies. The likeliest explanation, says Stone, is that they are accelerated by spinning around the magnetic field's lines of force and dumped into an auroral zone from which the strong bursts are an amplified, collective effect. Large, primarily gaseous planets—Jupiter, Saturn, Uranus and Neptune in our solar system—are naturals for strong magnetic fields, although earth seems to be an exception among the rockier worlds. (Mercury's newly discovered weak field may produce some faint emissions, but they will be difficult to detect because of its nearness to the noisy sun.)

There seems to be a correlation between the strength of the field and the radio frequency of its bursts, and Brown's Saturn emissions suggest, not unreasonably, a field strength somewhere between those of earth and Jupiter. When more and better data become available, there is also likely to be a search for any possible effects due to Saturn's moons, such as the strong modulation of Jupiter's emissions by Io. □

## Food weapon unsheathed

Government policy makers are meeting this week to decide how American food aid will be apportioned, amidst growing discussion over the use of food as a “weapon” to sustain military and political allies at the expense of more needy but less strategic countries. SCIENCE NEWS has learned that the State Department has drawn up a set of three options for food aid, varying in cost from \$894 million to \$1.45 billion, with each option giving the largest share of aid to U.S. allies in Southeast Asia and other “traditional recipients.”

The first (low) option would meet only the needs of Southeast Asian recipients in full. Option two (total food cost \$1.21 billion) would “enable us to meet the Egypt and Syria political requirements” and permit small increases to Israel and Jordan. It would also provide a “minimum essential level of programming to Bangladesh, India and Sri Lanka,” the nations faced with the most widespread threat of famine. A third option would give

these nations higher priority, permitting the sale (on concessional terms) to India of a million tons of grain, and to Bangladesh, 350 thousand tons—some 40 percent of the country's unmet requirements through June. The State Department document says of this third option: “The humanitarian rationale is strong; there is domestic political support for such emphasis.” The grain for Bangladesh, though inadequate to stop the continuing threat of famine after a year of disastrous weather in that country, is seen as America's “proportionate share we have used as a rule-of-thumb over the past two years.”

(In addition to “concessional sales”—based on low-interest, long-term credit—authorized by “Title I” of the Food for Peace Program, the total costs include smaller amounts of outright gifts, under the program's “Title II.” Much of this will go for “emergency” aid to places like the Sahel and Honduras.)