

the decision. Atomic Industrial Forum President Carl Walske said the policy "mortgages our energy future" by foregoing energy from the breeder for a bargaining chip abroad. On the other hand, Richard Pollack of Critical Mass, a Ralph Nader-organized lobby, said the new policy would undermine our leverage overseas in stopping nuclear proliferation because the failure to close down the Clinch River plant along with the Barnwell facil-

ity made the policy too ambiguous.

Reaction abroad indicated that the nuclear exporting countries were unwilling to go along with Carter's plan. Participants at an international conference on the transfer of nuclear energy held in Iran gave the statement a lukewarm reception. There is some indication that the countries are worried that the United States is attempting to hoard all nuclear fuel as a means of attaining nonproliferation. □

The strange rings of Uranus

The recent discovery of apparent rings around the planet Uranus (SN: 3/19/77, p. 180) has grown more interesting still, with the possibility that there may be more rings than originally inferred and that the largest ring may be strangely irregular in shape.

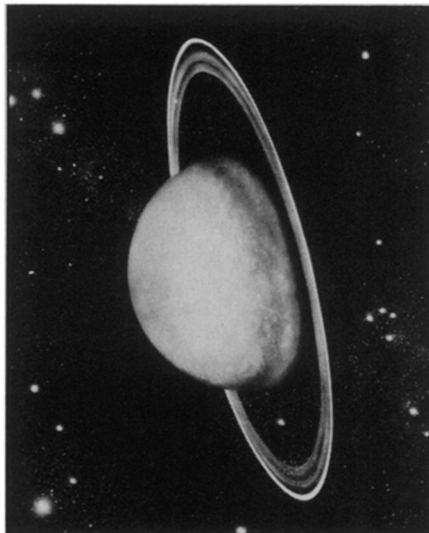
The March 10 observations were in the form of a series of "dips" in the measured light from a star (SAO 158687) shortly before and after it was blocked out by Uranus itself. The blockage, called an occultation, was recorded by James Elliot of Cornell University, flying over the Indian Ocean aboard a NASA airborne observatory, as well as Robert Millis of Lowell Observatory, working at Perth Observatory in Australia, and other astronomers in India, Japan and South Africa.

Elliot's original speculation was that the inbound and outbound "mini-occultations" represented a number of individual objects, or moons, with diameters as large as 100 kilometers. Study and comparison of the observations, however, showed that the spacing and duration of the inbound mini-occultations was almost identical to those recorded after the planet had passed from in front of the star. It is extremely unlikely that individual moons would be spaced so regularly, so it is now felt that the starlight was blocked by the two sides of a series of rings. The light was not completely shut off—only reduced by about 50 to 90 percent—and Elliot concludes that the individual ring particles are probably smaller than 2 kilometers across.

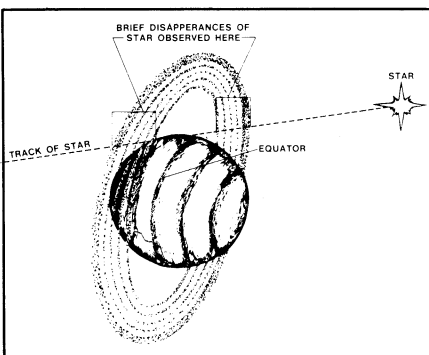
There seem to be five principal rings, which Elliot has labeled (beginning with the innermost one) alpha, beta, gamma, delta and epsilon, together occupying a band about 7,000 kilometers wide. Each of the four inner rings appears to be perhaps 10 kilometers wide, while the outer ring may be as wide as 100 kilometers. The outer ring may also be either thicker or more dense, since it occulted about 90 percent of the light from the star, compared with about 50 percent for each of the others.

Further study has now made the strange structures (far narrower than the rings of Saturn, the largest of which is more than 25,000 kilometers wide) seem even stranger.

Millis's data from Perth, although they



Uranus with possible rings, showing their steep inclination to the ecliptic plane.



Occultation track as seen from earth.

missed the alpha and delta rings while the telescope was being recentered (only the inbound occultations were visible from Perth), show two additional partial occultations *inside* the alpha ring. This could be evidence of two more rings, with the "shallowness" of the occultations possibly indicating that these rings are narrower or less dense than the others.

Still more perplexing is the matter of the wide outermost, or epsilon, ring. The inbound occultation, says Elliot, lasted about 7 to 8 seconds. The outbound occultation of presumably the same ring, however, lasted only 3 seconds. This translates to mean that the ring's inner edge is about 600 kilometers closer to the planet on the outbound side.

This asymmetry could mean that the epsilon ring is not in the same plane as the others, or that it is more elliptical, or perhaps that it is "ragged," with its particles distributed irregularly within it. Each of these ideas poses difficulties, particularly in the dynamical problems of the first two. But, says Lawrence H. Wasserman of Lowell Observatory, "the theorists will have a field day."

Meanwhile, Edward Bowell of Lowell is investigating an intriguing possibility: The relative transparency of the rings, compared with solid planets, means that dimmer stars could be used for occultation studies. There may thus be extra chances in the future to study the most recently discovered spectacular in the solar system. □

DNA rules backed by administration

The Secretary of Health, Education and Welfare last week asked Congress to regulate recombinant DNA research. Until future experiments allow a more precise assessment of possible risks, the Carter administration believes the best course is to allow the research to go forward, but only under strict safety conditions, Joseph A. Califano Jr. told a hearing of the Senate subcommittee on health and scientific research.

The administration bill, one of several under consideration, was introduced in the Senate by Edward M. Kennedy on April 1. It is based on the recommendations of a 25-member committee of representatives of different federal agencies. But the bill has a surprising difference from that group's suggestion. It stipulates that instead of the federal law superseding state and local laws, local laws more stringent than the federal regulations may be administered. The interagency committee had argued that potential hazards extend beyond the local levels, and therefore a single set of national standards must govern.

Another difference between the administration bill and two other bills on recombinant DNA before the subcommittee is the application of the rules to production and possession of recombinant DNA, instead of to research involving recombinant DNA. The interagency committee felt such wording would avoid problems of determining whether a given activity is research, pilot production or manufacture. "The language thus covers all use of recombinant DNA techniques," Califano said.

Unlike the bill proposed by Sen. Dale Bumpers (D-Ark.), the bill backed by the administration does not include any specific patent restrictions. Nor does it include the assignment of liability without regard to fault to persons carrying out recombinant DNA research, a clause of the