

## Carter on Nuclear Power: Defer Reprocessing

In a major policy statement, President Carter announced last week that his administration would seek to "defer indefinitely" funding for the commercial reprocessing of plutonium from spent nuclear fuel. The decision will have a major effect on the future of the Allied-General plant in Barnwell, S.C., and possibly the Clinch River breeder-reactor project in Tennessee. In addition, Carter's statement marks a new direction for U.S. policy in the areas of energy, nuclear wastes disposal and nuclear proliferation.

As a prelude to his proposed energy policy announcement to be issued April 20, Carter outlined several new decisions relating to plutonium and nuclear energy. "We have concluded that a viable and economic nuclear power program can be sustained without (plutonium) reprocessing and recycling," Carter said. Consequently, funding for the Barnwell plant will be dropped and the administration will not encourage any commercial reprocessing effort. Carter also planned to give greater priority to alternative breeder programs and fuel cycles.

To make up for the loss of recycled uranium, which reprocessing plants could have provided, Carter called for increased production of enriched uranium. Tied to this proposal is another program that was to be part of the April 20 energy message but eventually emerged as an essential component of the new energy policy: the accelerated use of light-water reactors. Evidently, the plan is to rely upon non-breeding reactors until new "exotic" energy sources can replace conventional nuclear power in the next century.

The final proposals dealing with nuclear proliferation were designed to provide the United States a measure of control over nuclear weapons. Carter wants legislation to permit the United States to sell nuclear fuel abroad, but he will continue the embargo on sales of uranium enrichment and reprocessing designs and plants. Finally, he proposed an international nuclear fuel cycling program in which the United States would store spent fuel from other nations.

Despite official discouragement, General-Allied, the company owned by General Atomic and Allied Chemical, is not planning to abandon the South Carolina facility. "We're not making any moves to close the thing down," Jerry Halverson of their Washington office said. Research and development on reprocessing and waste solidification will continue at the plant.

Although the liquid metal fast breeder reactor at Clinch River is ultimately dependent on fuel reprocessing, Carter made

no plans to terminate the project. His budget, still under consideration in Congress, cut \$84.8 million from the research funds, but work is still continuing, at a slower rate. Officials at Clinch River were still unsure just what the new policy meant for their work, and they hoped the April 20 message would clarify their position.

One of the more conspicuously absent provisions from Carter's statement was one dealing with nuclear wastes. Under the old policy, spent fuel rods were to be reprocessed into uranium and plutonium. But with the reprocessing plant deferred, the multiplication of spent fuel rods suddenly becomes a waste problem. Also, if Carter's plan to step up use of light-water

reactors goes into effect, waste fuel rods will increase at a faster rate.

Another problem is that ERDA's research into safe waste disposal does not define a spent fuel rod as "waste" because the old policy was to reprocess. Now, ERDA officials are discussing retrievable storage for the rods until some use can be made of the uranium. However, without a clear indication of the overall thrust of the new energy policy, people at ERDA were a little confused about a mode of action. Like everyone else, they look to the April 20 message as a clarification of the energy policy.

Despite the confusion over the new policy, many people were unhappy with

## Pakistan fossils: New origins for man

It now appears that Asia, as well as Africa, may have been the birthplace of the human race. Though it has been suggested over the past few years, it was not until last week that the idea was apparently validated by a major archaeological finding.

An international scientific team, headed by Yale University anthropologist David Pilbeam, reports it has found 8-million to 13-million-year-old remains of some 80 "pre-men" in the arid badlands of Pakistan's Potwar plateau, southwest of Rawalpindi. "These early specimens contain the ancestors of all later, manlike forms, including human beings," Pilbeam says. Most of the specimens are upper or lower jaw fragments of large primates—primarily, the group believes, of the genus *Ramapithecus* and *Sivapithecus*.

In addition, the discovery almost certainly means the evolutionary split between ape and man occurred before 13 million years ago—probably at least 15 million years, Pilbeam says—or, about double other widely accepted estimates. The oldest Pakistani fossils are also about three times older than the remains of primitive man (genus *Homo*) reported recently by Richard E. Leakey, Donald Carl Johanson and Mary Leakey (SN: 11/8/75, p. 292). However, Pilbeam notes that such comparisons must take into account that those other findings involved "pure" man at a later evolutionary period.

Johanson, of the Cleveland Museum of Natural History, calls the Pilbeam group's fossils "an extremely significant find because of its completeness



The site: Potwar's badlands

in a well-dated context." The specimens, collected over the last two years, were dated by radiometric, faunal and paleomagnetic means. The new evidence also lends fuel to an argument—which Johanson has previously advanced—that fossils tend to be older as one moves northeast along the rift system that extends from Eastern Africa to Asia. "Africa has been the center of attention for quite some time now because of all the evidence uncovered there," says Johanson, who made his latest find in Ethiopia.

Now, Pilbeam says it is highly probable that the same evolutionary process that took place in Africa in prehistoric times also occurred in South Asia. The newly found fossils are of a "diverse intermediate group," Pilbeam says. They are pre-men—not really apes and not really men. This [the specimens] will add a lot to our knowledge about what pre-man looked like."

The anthropologist says the find also suggests that fossils of 3- to 5-million-year-old near-man may exist in Asia as well as Africa. □

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.

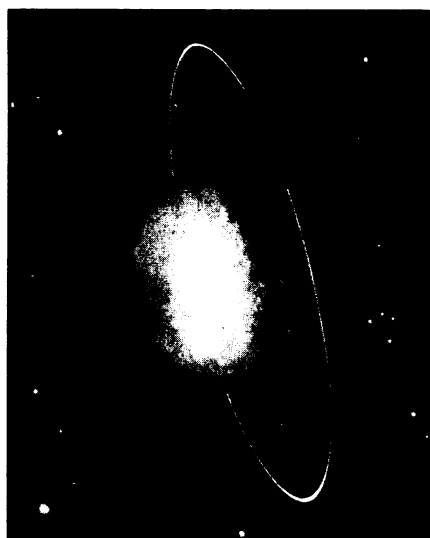
The March 10 observations were in the form of a series of "dips" in the measured light from a star (SAO 158687) shortly before and after it was blocked out by Uranus itself. The blockage, called an occultation, was recorded by James Elliot of Cornell University, flying over the Indian Ocean aboard a 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.

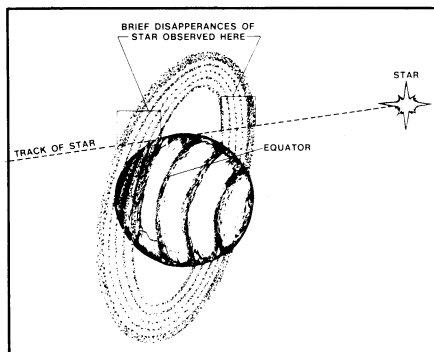
There seem to be five principal rings, which Elliot has labeled (beginning with the innermost one) alpha, beta, gamma, delta and epsilon, together occupying a band about 7,000 kilometers wide. Each of the four inner rings appears to be perhaps 10 kilometers wide, while the outer ring may be as wide as 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

Painting: R. Sternbach/NASA

J. Elliot/NASA