

# Breeding in light water: The test begins

On Aug. 26, the light-water breeder reactor in Shippingport, Pa., went critical, and in so doing marked the beginning of commercial-scale tests for a potentially proliferation-proof reactor. Although this reactor won't solve problems of nuclear wastes or recycling of spent fuel, it does promise to greatly extend our dwindling nuclear-fuel supplies and will use a potentially safer fuel cycle.

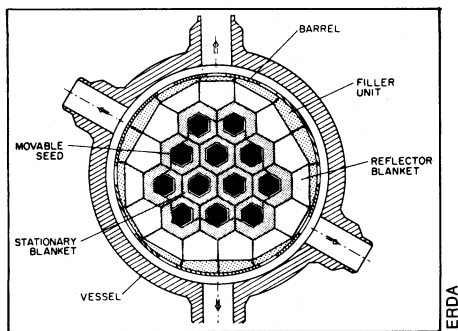
Each fissioning atom in a reactor core absorbs one neutron and ejects two or three more. Only one neutron is required to keep the chain reaction going; excess neutrons escape the reactor or are captured by nonfissile (nonfissionable) material in its core. In the light-water breeder, there must be enough excess neutrons to convert a rich blanket of nonfissile thorium into more uranium-233 fuel than is burned by fissioning. This constitutes breeding.

Calculations show that a light-water reactor fueled with U-235 will not breed; U-235 is the fuel burned by commercial reactors in the United States. However, the higher neutron release associated with fissioning U-233 indicates that that isotope can breed in light-water reactors.

The light-water component of its name refers to the regular hydrogen isotope present in water moderating its core or nuclear-assembly area. A moderator slows the speed or energy with which neutrons move through the core. Here it is also a coolant, carrying off heat generated by fission to generate electric power.

How important is the light-water breeder? Some type of breeder becomes essential as the nation exhausts its uranium supplies (and if a nuclear-power economy is agreed to). Also, as Westinghouse Electric Corp. showed in having to renege on its uranium-supply contracts last year, the age of inexpensive uranium is over. Economically recoverable U-235 is in tight supply, which is one reason why utilities here and elsewhere are so eager to get their hands on the Australian uranium offered last month for export. (Australia holds 20 percent to 25 percent of the noncommunist world's uranium reserves.) President Carter's preference for eliminating fuel recycling further heightens concern over uranium availability. And most energy supply estimates show an increasing reliance on nuclear power (together with coal) to ease the energy crunch during the next 50 years.

There are other types of breeders. In fact, most talk focuses on a more costly, controversial and complicated cousin, the liquid-metal fast-breeder reactor (LMFBR). Because plutonium will figure strongly in its fuel cycle and because Theodore Taylor has brought visibility to the relative ease with which thousands of



This core cross section shows configuration of rods containing seed, or fuel, and thorium blanket. Coolant flows alongside fuel. The reflector rods limit neutron losses.

nuclear sophisticates could fashion a crude but effective bomb with plutonium, nuclear-weapons proliferation has become a major obstacle to LMFBR endorsement. The LMFBR may also have several technical obstacles to overcome, but the proliferation issue could make that moot.

The comparatively simpler light-water breeder offers the following potential advantages:

- It makes use of the abundant and currently unused thorium-U-233 fuel cycle instead of U-235 fuel.
- It should be possible to alter existing commercial power reactors to accept a light-water breeder core.
- Gamma-ray emissions from highly enriched U-233 fuel make it too hot to handle—radioactively speaking—which should deter potential saboteurs from diverting it for use in weapons. Studies underway will also examine the feasibility of denaturing its fuel—mixing it with nonfissile material—so that it will still burn but no longer be of weapons-grade purity; denaturing could also kill its ability to breed.
- It significantly reduces production of dangerous transuranic elements as byproduct wastes—among these is plutonium. However, the radioactive-waste total would be similar to that produced in current light-water reactors.

If the light-water breeder sounds so good, why haven't you heard of it before? Because of Admiral Hyman G. Rickover. The formidable Rickover runs a tight ship; no one talks about the naval nuclear program—of which the light-water breeder is an off-shoot—but Rickover. He oversees all naval nuclear research and development, and because he has never been one to tout technology in the public forum, the light-water breeder's development has passed almost unnoticed heretofore.

An unusual core geometry makes this reactor uniquely suited for breeding. In conventional light-water reactors, con-

trol rods act like sponges to soak up excess neutrons which could otherwise cause a runaway reaction. Changing positions of the rods controls the neutron flux, and therefore the power output. But all neutrons lost to the control rods' spongelike action in a conventional reactor are put to good use breeding fissile fuel in this breeder. Criticality is controlled by moving fuel, not control rods. The thorium blanket sponges up excess neutrons, but makes fuel in the process, something control rods didn't do.

Various physics tests will be performed in coming months before stepping up the reactor to full power—about 50 megawatts. President Carter has been invited to a dedication of the breeder, according to ERDA. Electricity produced in the reactor, owned by ERDA, during its three years of scheduled testing will enter the Duquesne Light Co. power grid. Duquesne and ERDA jointly own the Shippingport power plant. □

## Soviet psychiatric practices criticized

Before they even stepped into the Hawaiian sun, the nine Russian delegates to last week's World Congress of Psychiatry could attest to Honolulu's heat. Although more than 1,500 scientific papers were presented at the meeting—the first such worldwide gathering of psychiatrists in six years—it was clear from the outset that this year's congress was to have but one overriding theme: The abuse of psychiatry for political purposes, particularly in the Soviet Union.

By conference time, months of public disclosures by Soviet emigrants documenting more than 200 cases of alleged use of psychiatric diagnoses to suppress healthy dissidents had reached a crescendo. And timed with the start of the meeting was the release of *Psychiatric Terror: How Soviet Psychiatry is Used to Suppress Dissent*, a voluminous review of many of these cases. Sidney Bloch, one of the book's authors, flew to Honolulu for the congress along with two purported victims of the Soviet mental health system—mathematician Leonid Plyushch, confined to a mental institution for two years after being prohibited from attending his own trial, and Marina Voikhanskaya, a psychiatrist who fled to England two years ago after criticizing the practices of her colleagues in Soviet mental hospitals.

The drama culminated close to midnight, Aug. 31, when the general assembly of the World Psychiatric Association (WPA) voted by secret ballot to condemn the Soviet Union for "the systematic

abuse of psychiatry for political purposes" in all countries in which they occur (allegations have also been made against psychiatrists in Rumania, Czechoslovakia, Chile, Argentina and elsewhere in South America), and called upon professional organizations in those countries "to renounce and expunge those practices."

While the vote may seem on the surface to constitute little more than a wrist-slap, its implications appear to reach far beyond that. First, observers note that the action was not taken by political representatives of the countries involved, but rather by a body of scientists that historically and instinctively has shied away from such human rights issues. "This is an historic occasion," Bloch told the psychiatrists the night before the vote. "This is the first time we are able to tackle the most important issues that face us today."

Second, the almost frantic efforts of the Russian psychiatrists themselves to convince the delegates to defeat the condemnation proposal showed that they were far from willing to shrug off the action as a harmless, symbolic gesture. Indeed, even as the delegates were filling out their ballots, chief Soviet psychiatrist E. A. Babayan pleaded his case, via an interpreter, into a microphone. "This is an unprecedented case in international practice, when one side is given the opportunity to present slanderous materials, and there is no opportunity for us to take the floor and explain our practices . . . I strongly protest," Babayan said before being ordered to take his seat. The day before, however, the Russian delegates declined to attend a special open session on ethics—a no-holds-barred forum in which they would have had almost unlimited opportunity to state their case to the congress.

But the Soviet explanations and defenses, finally presented at the assembly and at a press conference several hours before, apparently had a tremendous effect upon the congress delegates. In a vote that was expected to pass by a wide margin, the condemnation measure was approved by only two votes: 90 to 88. The vote of individual delegates was actually in favor of the Russians, 33 to 19, but like the electoral college, each delegate carries a weighted number of votes, depending on the size of his or her country's membership to the World Psychiatric Association. (U.S. delegate Jack Weinberg had 30 votes, Babayan had 23.) "It was much closer than expected," National Institute of Mental Health Director Bertram Brown said after the vote. "It was very surprising."

In the end, the anti-Soviet arguments of western psychiatrists, as well as the personal horror stories of the Russian emigrants, swung the delegates' vote. Although the resolution was drawn up by the Royal Australian and New Zealand College of Psychiatrists, it was representatives of the United States and Great Britain who delivered the harshest at-

attacks on Russian psychiatry. Washington psychiatrist Paul Chodoff asserted that for the past six years Russia has engaged "in a systematic policy of suppressing national, political and religious dissent by confining dissenters in psychiatric hospitals until they abandon their views. It is further asserted that certain psychiatrists there connive in this perversion of their profession," Chodoff said.

Chodoff and others attacked the Soviet diagnosis of "sluggish schizophrenia" that appears to be frequently ascribed to dissidents such as Plyushch, Zhores Medvedev and, most recently, to Vladimir Bukovsky, who sent a written appeal for passage of the condemnation measure to this year's congress. (Bukovsky made a similar appeal to the 1971 meeting, but the matter was not discussed at the gathering.) "Even if one should accept the diagnosis of sluggish schizophrenia in these and similar cases," Chodoff said, "one must wonder why a disease without delusions, hallucinations or agitated behavior should require injections of chlorpromazine (an antischizophrenic drug) for its treatment." Finally, Chodoff said that "none of the emigrants" examined by the western psychiatrists "has exhibited signs of mental illness once outside the borders of the USSR."

Babayan and his colleagues vehemently disputed that point, and just before the vote, dramatically produced what they said were certificates documenting the cases of emigrants subsequently hospitalized in western countries. The cases included one person who allegedly committed suicide and one who Babayan said was admitted to a U.S. hospital. Babayan refused to specify the hospital when asked. "Ask your State Department," he said. The case certificates were not released to the press because of the WPA's medical ethics ruling.

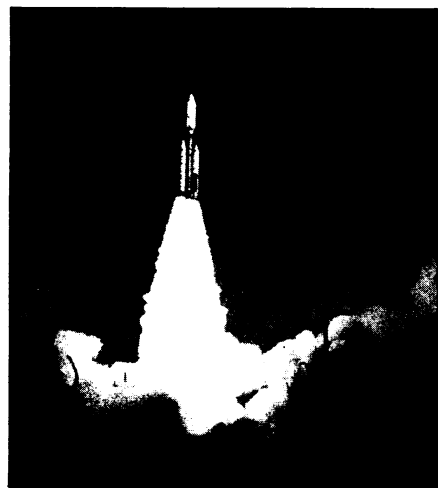
The Soviet psychiatrists systematically denied all the charges against them and denounced Bloch's book as "well-composed slander." "In no one case in USSR history was a healthy person admitted to a hospital," Babayan said. The Russian delegates condemned the congress voting procedure as "undemocratic." Moscow psychiatrist Dmitri Venediktov added, "Sometimes one forgets whether this is an international congress and mistakes it for an American one." The Soviets challenged their detractors to produce formal certificates of examination documenting the alleged sanity of the Russian patients who emigrated to the West. And an open invitation was extended to psychiatrists from the United States, Great Britain and other countries by Georgi Morozov to visit the Serbsky Institute, a forensic psychiatry institution which is the main target of western critics.

Perhaps the strongest attack on the Russians came from London, Ontario, psychiatrist Harold Mersky, who called

for the outright expulsion of the Soviet delegation from the World Congress. "The pretense that we can still cooperate with such representatives would be both ludicrous and shameful," he said. During the open session from which they were absent, the Soviets sent a message to the delegates, surprisingly, through American Psychiatric Association president J.P. Spiegel—claiming they were being "tried and found guilty . . . beforehand," and saying they deserved a "change of venue."

Current APA President Jack Weinberg, whose resolution for the establishment of a permanent WPA investigative committee on ethics was adopted, blasted the allegations (and Spiegel, himself, for relaying them). "There is no change of venue," Weinberg said. "This is the World Congress of Psychiatry. The people are here." □

## Voyager 1: On the catch-up trail



*Voyager 1 makes its smooth departure.*

You'd barely think they were twins. The Voyager 2 spacecraft was launched toward the outer planets on Aug. 20 (SN: 8/27/77, p. 132) to the accompaniment of bumps, shivers and an instrument-laden "science boom" that apparently failed to lock in its fully extended position. With Voyager 1, however, it was an entirely different story. On Sept. 5, a day so calm (despite storms to the west in the Gulf of Mexico) that weather-monitoring aircraft were sent home, Voyager 1 was carried aloft from Florida's Cape Canaveral in a blissfully smooth beginning to its multi-year mission to Jupiter and Saturn.

Voyager 1 was the second of the two probes to be launched, because it will follow a faster course and be the first of the pair to reach the giant planet. It will take the lead on Nov. 28, when it passes by its predecessor at a distance of about 16 million kilometers, bound for encounters with Jupiter on March 5, 1979, and Saturn on Nov. 12, 1980. Voyager 2 will not reach Jupiter until July 10, 1979,