LETTERS

Nuclear Weapons Materials

Harold Agnew's letter "Tritium production" (5 Feb., p. 612) and Richard Garwin's earlier letter "Plutonium production" (1 Jan., p. 6) show the need for public assessment of the adequacy of our present stockpiles and the extent of future requirements for nuclear materials in our nuclear weapons program. Garwin, while bypassing the question of whether we need additional plutonium, supports the development of laser isotope separation technology for obtaining "weapons grade" plutonium from civilian spent fuel as an economic alternative to building new plutonium production reactors. Agnew agrees with Garwin's views on plutonium requirements, but he extends a call for the planning and budgeting of a new production reactor to supply tritium.

We suggest that the output from our existing production reactors at Hanford and Savannah River and the nuclear material recovered annually from weapons retired out of our burgeoning stockpile of 26,000 nuclear weapons are sufficient for the plutonium and tritium needs of weapons planners and designers for several decades to come.

In recent years, the three operating production reactors at Savannah River have been adding an estimated 1400 kilograms of weapons grade plutonium annually to the defense stockpile of some 100 ± 20 metric tons. And tritium is also being produced in these reactors, in the lithium control rods, at a rate of about 3 kilograms per year, which is presumably enough to preserve a stockpile. However, as much as 20 kilograms per year could be obtained from runs dedicated to the production of tritium in lithium targets in the three reactor cores, something that did not occur at Savannah River between 1972 and 1981 (*1*). Also residing in the defense stockpile are some 500 to 700 metric tons of high enriched uranium that were built up before 1964, although plutonium is now favored over high enriched uranium as an "efficient" material for nuclear warheads.

Our materials production capacity should experience a sharp jump when the upgrading and restoration program for the three operating reactors is completed, the L reactor at Savannah River is restarted in October 1983, and the N reactor at Hanford is converted to the production of weapons grade plutonium with the restart of the PUREX reprocessing facility in April 1984. A further option being considered for Savannah River would increase plutonium production by 25 percent by replacing the mixed oxide core of highly enriched uranium fuel assemblies and depleted uranium targets with a uniform core of 1.1 percent enriched uranium and increasing the reactor power (*2*). This combination of actions could provide as much as 3200 kilograms of plutonium annually by the middle of 1984, more than doubling current production.

After the facility upgrading, production of tritium in lithium control rods during plutonium runs at the Savannah River reactors would continue to maintain the tritium stockpile. Occasional dedicated tritium runs, yielding as much as 30 kilograms annually from the four Savannah River reactors, could build a stockpile of tritium for defense purposes that would be adequate for decades, despite tritium's 12.3-year half-life. The urgency in Agnew's call for more tritium production capacity is possibly based on his claim that 10 percent of the tritium stockpile decays each year. Using the correct value of 5.5 percent decay per year might well double his estimates of the lifetime of the present tritium stockpile as well as the size of the tritium stockpile that can be maintained with production in the control rods (and an occasional dedicated tritium run) at Savannah River.

A determination as to whether we need new production facilities turns on whether we can design and maintain "exotic enough" nuclear weapons with the quantities of materials we already have. Surely our national laboratories can design the weapons needed for our national security while working within the scope provided by the material in our stockpile and the existing production facilities. Will our strategy of nuclear deterrence (or even a first strike capability) in any way be diminished by not proceeding to plutonium laser isotope separation and costly new production facilities for weapons materials?

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References and Notes

1. As of May 1981, one dedicated tritium run was planned for the latter part of the year.
2. *Inside Energy*, 27 November 1981. Another option is to blend supergrade plutonium produced at Savannah River with up to 8 metric tons of fuel grade plutonium stored at Hanford in a 2 to 1 ratio to produce weapons grade plutonium.

*The writers are coauthors of *The Nuclear Weapons Databook*, in preparation.

Assessing Agricultural Research

Nicholas Wade (29 Jan., p. 483) describes the Office of Technology Assessment's (OTA) report on the U.S. agricultural research system (*1*) as being "lackluster." This adjective also very well describes Wade's critique of the report.

Wade takes OTA to task for not placing more emphasis on the Pound report (*2*)—a 1972 analysis of the status of agricultural research. A thorough discussion of OTA's findings with program staff would have revealed why OTA placed lesser credence on the Pound report.

The OTA assessment of agricultural research represents the findings of a select group of intelligent, perceptive people from all segments of agriculture—both public and private. They spent hundreds of hours researching, discussing, and analyzing the problems of the U.S. agricultural research system. As editor of the OTA report, I disagree with the implication that these people missed the mark. The Office of Technology Assessment is one of the most honest and conscientious government agencies in Washington.

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2. *Report of the Committee on Research Advisory to the USDA* (National Academy of Sciences, Washington, D.C., 1972; available from the National Technical Information Service, Springfield, Va.).

Transamazon Highway: Impact on Indians

While reading Nigel J. H. Smith's article "Colonization lessons from a tropical forest" (13 Nov., p. 755), I was troubled to note that the discussion of the social, economic, and ecological impact of the Transamazon Highway project does not include mention of the cultural and physical destruction of the Amazonian Indians.

At the inception of the Transamazon project, the recognition of the danger to the indigenous population prompted the Brazilian government to establish the National Indian Foundation (FUNAI). This government bureau was given the responsibility for the protection of the Amazonian Indians and is a successor to previous, maladroit efforts meant to protect the indigenous population.

Public statements by Brazilian bureau-

crats notwithstanding, FUNAI has failed to prevent, and in some cases has abetted, the seizure of Indian land. Since the mid-1970's, prospectors primarily seeking gold have invaded Indian territory; laws later enacted to stop those seizures were rescinded in a government decree of 15 January 1980 that allowed prospectors working for government enterprises to enter Indian lands. Furthermore, the introduction of diseases such as malaria, whooping cough, and hepatitis against which the Indians have no resistance, has decimated their ranks in the same manner that the expeditions accompanying Columbus all but eliminated by disease the original population of the islands of the Caribbean.

FUNAI has been pressured for years to create a national park for the protection of the Indians; all of FUNAI's proposals, including one which called for the creation of 21 small, disconnected Indian reserves, have been soundly rejected by those concerned about the survival of the native population. A proposal for one undivided park that was advanced by the Committee for the Creation of Yanomami Park was rejected by FUNAI. At the present time, while FUNAI considers and rejects proposals, the destruction of the native population continues.

One can only hope that in the future the Brazilian government will show as much concern for the survival of its native population as it does for technocratically defined economic development.

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X-ray Holography

In Arthur L. Robinson's article "X-ray holography experiment planned" (Research News, 29 Jan., p. 488), reference is made to my "enthusiasm" about the possibility of trying an x-ray holography experiment. What I said in a telephone interview with Robinson, in response to a question about the possible importance of x-ray holography, was that our work here on soft x-ray microscopy (*1*) had convinced me that soft x-rays have an important potential in biological imaging. I also said that the advantage of holography as an imaging technique over microscopy in my opinion is rather doubtful, but that naturally the holographic technique should be tried if it becomes possible to do so. To go further and be really enthusiastic about a technique that may require a nuclear explosion as the price of switching on the microscope seems a little difficult to me.

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The Cray-1

Arthur L. Robinson's Research News article "New superconductors for a supercomputer" (1 Jan., p. 40) contains the following line: "This is more than 25 times as fast as today's large, general-purpose computers can run and is about 10 times as fast as the Cray-1, a special-purpose scientific computer."

The Cray-1 computer is neither "special-purpose," nor are its uses confined to "scientific" applications. The Cray-1 is a powerful, general-purpose computer and can be programmed (in assembly language or in higher level languages) to do anything normally required of any other general-purpose computer (but usually faster). Signal processing is one example of its use that could be called "scientific" only by severely stretching the usual meaning of that word.

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Synthetic Vaccines

As mentioned in Nicolas Wade's article (News and Comment, 7 Aug., p. 623), the concept of synthetic antigens as a research tool is not in itself particularly new. Futhermore, even the idea of the synthetic vaccine is in fact not novel, since it was published 8 years before the articles by the groups at the University of California, San Diego, and the Salk Institute and at the Scripps Clinic and Research Foundation appeared in the fall of 1980 (*1*).

In a 1972 publication Arnon (2) outlined the advantages of using synthetic macromolecules as multivalent vaccines. As the result of studies with MS-2 bacterial virus, Langbeheim *et al.* (*3*) in 1976 reported evidence that a synthetic peptide corresponding to a region involved in viral neutralization can be utilized for eliciting antiviral activity. The concept of synthetic antiviral vaccines was, with this, established and demonstrated in a suitable virus model. The complete nucleotide sequence of bacterial virus MS-2 RNA was published during the same year by Fiers *et al.* (*4*) using the slow, work-intensive sequencing methods of that time. However, the synthetic vaccine against MS-2 was developed based on the sequence information of the proteins and not the nucleic acid; obviously protein sequencing was far easier to do than RNA sequencing. The Weizmann Institute team did not take out a patent on the idea of synthetic vaccines, since commercialization of ideas and concepts was still an unusual event in academic research at that time.

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Damaging Stereotype

Thomas H. Maugh II's article on the Food and Drug Administration's approval of the new hepatitis B vaccine (Research News, 4 Dec., p. 1113) contains an error which perpetuates a damaging stereotype of homosexuals. In the middle of Maugh's article one reads: "[The vaccine] is not meant for the population at large, but for the roughly 10 million Americans considered at high risk of developing the disease—health care workers, drug addicts, sexually promiscuous individuals, and male homosexuals." Certainly the only male homosexuals at risk are those adequately described under the rubric "sexually promiscuous individuals." Nonpromiscuous homosexuals are at no higher risk than nonpromiscuous heterosexuals.

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