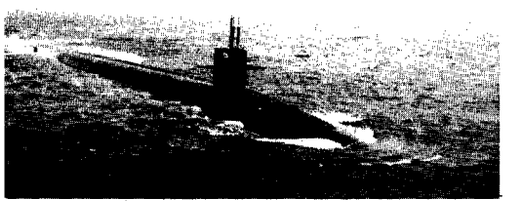
capable of attacking a range of Soviet military targets, such as airfields, submarine ports, utilities, troop formations, armaments plants, and some command links. The Trident II, which costs $15 billion (or half as much as Carter's plan for deploying the MX missile), has the sole additional capability of attacking Soviet silos and superhard command posts. As Representative Thomas Downey (D–N.Y.) states, this accuracy, plus a relatively short flight time, will make the Trident II "the most destabilizing first-strike weapon ever built, far more than the MX." The Soviets would be



U.S. Navy

The Trident submarine

Its equipment for electronics countermeasures can be continually updated.

less threatened and a superpower crisis would be less harrowing if the Trident II was scrapped.

William Perry says that the question about Trident II should be addressed as follows: "If you're going to be, in a sense, depending on subs for primary deterrence, what do you do that minimizes the attractiveness of the surprise attack? If I were the Soviet planner, I would be deterred from acting even by Trident I, although I don't know the calculus that goes on in that planner's head. I'm not persuaded by the argument that it is necessary to have a capability to kill hardened targets, although it is certainly true that you would be on the safer side to have it. Moreover, it is relatively easy to get." Excessive conservatism and technological wizardry are behind the decision for a Trident II, and the strategic implications are unsettling.

Once the technical objections to submarines—their inaccuracy and supposed vulnerability—are swept aside, there remains a less-stated but perhaps more significant objection. It is that moving from observable land-based missiles to invisible sea-based forces would diminish the political power of America's nuclear weapons. As Harold Brown recently wrote, "Abandonment of the land-based ICBM would signal a retreat in the face of a Soviet buildup of just those forces—a retirement from the competition, a major political-military defeat for the United States, and a very bad precedent,

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Livermore Wins Laser Battle

In a decision that could influence billions of dollars of investment, the Department of Energy (DOE) has narrowed the choice for the next generation of uranium enrichment technologies. On 30 April, DOE announced that it will build a demonstration enrichment plant based on a laser separation process developed at Lawrence Livermore Laboratory in California. It selected the Livermore process over competing technologies developed by Los Alamos National Laboratory and TRW Inc.

In selecting the Livermore technology, DOE put an end to a 5-year contest over which process is likely to supersede gaseous diffusion, which has been in use since the start of the nuclear age. (The only other process still under active consideration is the gas centrifuge.) But DOE's choice is already proving controversial.

The Livermore process, known as atomic vapor laser isotope separation (AVLIS), was chosen after a 7-month review by top officials at DOE. Last year, however, the Energy Research Advisory Board, DOE's highest level advisory committee, recommended that a decision be put off until 1983 because, it argued, the technical basis does not yet exist to make a choice between competing technologies. It reiterated that conclusion in a second report earlier this year. Richard Garwin, a senior scientist at IBM and a member of the advisory board, last week called the decision "premature." Donald Gaston, a DOE official in charge of the program, says, however, that DOE cannot afford to carry on supporting three competing programs and "elected to take the risk" by choosing now.

In essence, the Livermore process involves subjecting a stream of atomic uranium vapor to a series of very finely tuned laser beams. Energy is absorbed only by atoms of uranium-235, which eventually lose an electron. The resulting uranium-235 ions are then collected by passing the stream through a strong magnetic field, which deflects the ions while the neutral uranium-238 atoms pass straight through.

In contrast, the Los Alamos process, which is now being phased out by DOE, would have subjected uranium hexafluoride molecules to finely tuned infrared and ultraviolet lasers. Ultimately, those molecules containing uranium-235 would be stripped of a fluorine atom. And the TRW process, which will still get a small amount of research money "subject to availability of funds," involves the use of radio-frequency energy to selectively excite uranium-235 ions.

The plan now is to build a $150 million demonstration plant at Livermore by 1987. At that point, according to DOE officials, it should be possible to make a choice between the laser separation process and gas centrifuge technology. (A pilot centrifuge plant is now under construction in Portsmouth, Ohio.)

The Energy Research Advisory Board said in its report last year that it expects the laser process to be more economical than the centrifuge process. This expectation, says Garwin of IBM, should have led DOE to make a different choice. It should have dropped the gas centrifuge program and continued supporting the three competing laser technologies.

—Colin Norman

Union Carbide Quits Oak Ridge After 40 Years

The Union Carbide Corporation revealed on 3 May that it intends to end its nearly 40-year-old association with the Oak Ridge National Laboratory in Oak Ridge, Tennessee. It has already asked the Department of Energy (DOE) to find another contractor to manage the facilities that spawned the first atomic bomb. The news came as "a great surprise to most of the people here," said DOE spokesman Jim Alexander.

The impact of the change is not yet clear, but as Alexander said, the contractor that replaces Union Carbide will certainly want to bring in new people to take over supervisory positions. Thus, the laboratory and associated weapons facilities at Paducah, Kentucky, are due for a shake-up.

Some have speculated that Union Carbide may have pulled out because some stockholders have objected to its involvement in the nuclear weap-

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ons program. However, this was not the reason for leaving, according to Edward Van Den Ameele, a company spokesman. "It was purely a business decision. . . . We decided it would be better to concentrate our resources in our main lines of business—plastics, polyethylene, batteries, industrial gases," Van Den Ameele said. The annual fee Union Carbide received for managing Oak Ridge was $8 million. "We were never really making money on it," according to Van Den Ameele, "and if that had been the reason for leaving, we'd have gone a long time ago."—***Eliot Marshall***

Samios Named Director of Brookhaven

Nicholas P. Samios, a widely respected high energy physicist who has worked feverishly for the past year and a half to pull the ailing Isabelle accelerator project out of a tailspin, has been named director of its parent organization, the Brookhaven

Nicholas P. Samios

National Laboratory on Long Island. Samios, who since 1 January has been Brookhaven's acting director, replaces George H. Vineyard, who resigned last August when the accelerator was beset by a variety of problems. Isabelle, meant to be the Cadillac of the next generation of U.S. atom smashers, has fallen behind schedule and nearly doubled in price because of problems with the design of its superconducting magnets.

Samios, who has been at Brookhaven since 1959, was recently elected to the National Academy of Sciences. Said Robert E. Hughes, president of Associated Universities, which operates Brookhaven: "Dr. Samios' warm human qualities, his intellectual strength, and his energetic life-style will serve him well in the demanding role of director."—***William J. Broad***

U.S. Votes Against Law of the Sea Treaty

Under relentless pressure from its president, Tommy Koh of Singapore, the United Nations Convention on the Law of the Sea concluded its work on schedule on 30 April. After more than 8 years of debate, the delegates from 150 countries agreed to a new law to apply to international waters. However, the accomplishment was undermined by the refusal of several major powers to give their endorsement.

The final vote on the treaty was 130 in favor and 4 opposed, with 17 abstaining. Voting against the treaty were the United States, Israel, Turkey, and Venezuela. Among the abstainers were the Soviet Union, West Germany, the Netherlands, and the United Kingdom.

In explaining his stand, the U.S. ambassador to the talks, James Malone, said that he had decided to vote against the treaty "for reasons of deep conviction and principle." The terms of the agreement "fell far short of our objectives," he added, referring to the points laid out earlier this year by President Reagan (*Science*, 19 March, p. 1480). Malone did not specify the issues that rankled the U.S. delegation, but it was clear that one of the more important was the provision that signers of the treaty would be bound to abide by future amendments, even if they opposed them. American officials also balked at the requirement that proceeds from deep-sea mining be shared with movements of national liberation.

Several observers said that they anticipate the United States' refusal to support the treaty will not cause immediate problems for commercial, scientific, or military ventures in international waters. Mining companies, for example, are sheltered temporarily by a Resolution on Preparatory Investment Protection (PIP). It guarantees the claims of consortia which have already invested in deep-sea technology, provided that at least one member of each consortium comes from a nation that has signed the treaty. The treaty also sets a deadline by which all mining companies must be based in a country that has signed. The purpose, it appears, is to spur the companies to lobby in favor of the treaty.

If territorial claims linked with the new treaty clash with U.S. interests, the United States will assert that customary law takes precedence over the treaty. This position is likely to prevail in most cases, for the treaty at present lacks the support of a number of leading sea powers.

Despite the treaty's rather uncertain status, Koh has scheduled to carry on with a formal review of the draft on 22 September, followed by signing ceremonies in Caracas in early December. According to the State Department, it is conceivable but not likely that President Reagan could change the Administration's position on the treaty between now and December.

—***Eliot Marshall***

Medical Data Bank: A Security Risk?

The government's concern about the leakage of high technology secrets to the East has touched the seemingly innocuous MEDLINE service of the National Library of Medicine (NLM). MEDLINE, with over 2000 subscribers in America and overseas, is a computerized index of articles taken from 3000 medical and biomedical journals. Last December, NLM informed foreign purveyors of MEDLINE that they should not allow any person from a Communist country to have direct "on-line" computer access to the system, unless prior approval had been obtained from the Export Administration of the U.S. Department of Commerce.

The Commerce Department, according to officials there, is not worried that foreigners will be able to extract the secrets of bomb building from back issues of the *New England Journal of Medicine*. Rather, officials have recently become aware of ways that a skillful computer operator might enter a MEDLINE data bank in a government computer center in, say, West Germany, then jump from MEDLINE into sensitive files on national finance. There is no fail-safe way to prevent file jumping, and less than adequate control of sensitive data in foreign computer banks. Therefore, Communist users of MEDLINE will be required to make their inquiries by mail.—***Eliot Marshall***