Frommer, the committee recommended that Medicare pay for heart transplants at Stanford and other U.S. centers that meet comparable standards of expertise, resources, and commitment, and for patients who fit the Stanford selection criteria or "acceptable equivalents." They also identified "several dangers which must be forcefully resisted or carefully avoided," though they didn't say how. These included proliferation of other centers not as well-equipped as Stanford and loosening of patient selection criteria (for example, to encompass older patients or those with multiple organ failure).

Frommer who, like NHLBI director Robert I. Levy, is an advocate of controlled expansion of heart transplantation, also tried to allay some of the anxieties he was hearing from HHS headquarters. It's highly unlikely that cardiac transplantation will become a runaway technology, he argued, because the supply of donor hearts will be so limited for the foreseeable future. Only about 1000 usable donor hearts might be "harvested" annually, Frommer estimated. Because of this foreseen shortage and the probability that many U.S. hospitals with the capacity to transplant hearts probably won't want to (see box), Frommer predicted there would be no more than 10 to 20 groups taking up the technique "for at least the next 5 years." If all these centers eventually geared up to Stanford's arduous two-a-month rate, that would still mean only 250 to 500 heart transplants a year.

Frommer's report, passed on to HCFA as the recommendation of the NCHCT, got mixed reviews at HHS headquarters. Hanft told the center's advisory board that the issue was being addressed too narrowly: "We'll have to face the same series of questions" for all transplants, she said, including liver (about which Medicare has already had a reimbursement query), bone, pancreas, lung, and heart-and-lungs together, which is within about 2 years of clinical trial at Stanford.

Harris was unsatisfied with the NHBLI-NCHCT report too. "The experts kept saying, 'Fund these, fund these at Stanford,' and I kept asking more questions to which there were no answers," she said recently.

As the debate progressed, a special point of contention was the way the NHLBI-NCHCT recommendation brushed over ethical questions about how to choose the lucky 250 or 500 or 1000 or 2000 recipients from a potential candidate pool of 15 to 120 times that size.

Noting that these issues have been discussed extensively in the past, Frommer said that to say that no one should benefit from a technology so scarce and expensive that it can be extended to only a fraction of those who might benefit "is analogous to arguing that if not everyone can fit into the only lifeboat from a sinking ship, it is unethical for anyone to get in."

This argument does not satisfy some within HHS who are troubled by Stanford's screening criteria, which require:

- A stable, rewarding family and/or vocational environment to return to posttransplant;
- A spouse, family member, or companion able and willing to make a long-term commitment to provide emotional support before and after the transplant;
- Financial resources to support travel to and from the transplant center accompanied by a family member for final evaluation; living expenses near the center before, during, and after the transplant (a period of up to 10 months); and all pretransplant medical care, which can run more than $8000. Contraindications at Stanford are a history of alcoholism, job instability, antisocial behavior, or psychiatric illness.

Hanft told the NCHCT advisory board that the Stanford criteria "raise questions of distributive justice." One HCFA official added recently: "If it turns out that all these patients are white middle-class males under the age of 50, that isn't the population that the department is concerned about."

Lois K. Christopherson, the Stanford social worker who does the initial screening of heart transplant patients, defends the criteria and says that in reality they produce candidates with a wide spectrum of socioeconomic and educational characteristics—though this has never been analyzed systematically in the nearly dozen years of the transplant program. The point, Christopherson says, is to find patients with a fierce will to live and strong coping skills, since having a heart transplant is an arduous lifelong process. "The coping skills to deal with financial problems are the same coping skills that make for long-term survival."

At least one Stanford observer, however, acknowledges the potential for selection of heart recipients based on unstated grounds of "social worth." Stanford Medical Center Chaplain Ernle Young, whose office is decorated with smiling pictures of successful heart transplant recipients and their families, worries about "a subtle temptation for

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Debate Continues on the Bomb That Wasn't

"A lot of people remain convinced that this was a nuclear explosion," said a White House briefer as he released a sanitized report on the "event in the South Atlantic" seen on 22 September by the Vela surveillance satellite. The paper, given out on 15 July, summarized the findings of a group of independent experts brought together by the President's science adviser in an attempt to settle a technical dispute within the Administration (see *Science*, 1 February). It concluded that the Vela probably did not see a nuclear explosion, but may have seen sun glinting off some debris chipped loose from the satellite.

The technical dispute was in plain view last week. Just before the White House released its study, the word had gone out that the Defense Intelligence Agency (DIA) had finished its own classified paper concluding that the satellite had, in fact, seen a nuclear blast. The White House official would not discuss the contents of the DIA report. It was a coincidence, he said, that the two papers came to light in the same week.

Jack Ruina, chairman of the White House review panel and a professor of electrical engineering at the Massachusetts Institute of Technology, said that his group had started its task assuming that it would confirm that there had been an explosion. But by the end of the exercise in early April, the consensus was that the 22 September signal was too different from known blast signals to be taken as the sole confirmation of a blast. As one member of the panel put it, "On the first day we were betting four-to-one that it was an explosion, and at the end we were betting four-to-one that it was not."

Some physical data seemed to confirm that there had been a blast, but none of it persuaded the committee. One acoustic signal picked up at the right time in the Northern Hemisphere seemed to be contradicted by the absence of similar signals in the Southern Hemisphere. Some weak hydroacoustic signals were detected as well, but a study of them done by the Naval Research Laboratory was judged "too incomplete to apply to the event" because it contained ambigui-

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tites in "signal identification and source locations." A large disturbance in the ionosphere sighted by astronomers at Arecibo, Puerto Rico, was set aside because too little is known about the phenomenon observed that night. It might have been caused by a tropical storm or other natural event, the panel concluded.

Having rejected all evidence save that provided by Vela, the panel then found a flaw in the Vela data. Although the signal recorded on 22 September in most ways fit the classic profile of 42 previously recorded blast signals, it contained a significant anomaly. In all previous cases, the two light registers on the satellite have recorded roughly parallel intensities in the light burst. But in this case, one of the registers deviated from the parallel. This distortion in the pattern suggested to the reviewers that the flash seen by the Vela was close by, not 60,000 miles away on the surface of the earth.

It was suggested at first that the satellite might have seen a meteoroid passing in space, but a statistical analysis showed that the likelihood of this happening was too small to be plausible—one in a billion. The present hypothesis is that the 22 September signal, like about 60 other unexplained signals, may have been triggered when a speck-sized meteoroid hit the satellite at high speed and sent particles flying at low speed in front of the sensors.

The explanation is not satisfying, but it is clearly more palatable to the Administration than leaving the mystery utterly unresolved.

Church Leaders Question Decision on New Genetics

Now that the Supreme Court has ruled it legal to patent forms of life engineered by man (*Science*, 27 June), some powerful religious institutions have said that they may seek to have the patent laws changed. General secretaries Thomas Kelly of the United States Catholic Conference, Bernard Mandelbaum of the Synagogue Council of America, and Claire Randall of the National Council of Churches, signed a statement recently saying they are asking the President and Congress to look into the dangers that may arise from the Court's ruling.

"New chemicals that ultimately prove to be lethal may be tightly controlled or banned," their statement said, "but we may not be able to 'recall' a new life form. For unlike DDT and DES, both of which were in wide use before their tragic side effects were discovered, life forms reproduce and grow on their own, and therefore would be infinitely harder to contain." They charged that the government is not providing adequate oversight or control of genetic engineering projects, "nor is anyone addressing the fundamental issues" which have to do with "the dignity and worth of the human being."

The signers have already written the congressional judiciary committees asking for hearings to review the patent laws. They have asked President Carter to "provide a way for representatives of a broad spectrum of our society to consider these matters and advise the government on its necessary role." Randall said they may try to take their concern before the President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research.

The chairman of the commission, Morris Abram, sent his own message to the President on 17 July. The churches' criticism came up during a meeting on 12 July, Abram wrote, and the commission decided to "survey the field" to find out whether genetic engineering should be made the subject of an ethics review. Abram indicated that the commission would not touch on biohazards—a technical problem falling within the purview of a special advisory committee at the National Institutes of Health.

The ethics commission, according to its executive director, will try to decide on 15 September whether it will jump into the debate. "We obviously have a full agenda," he said, "and we don't want to reach out and take on a new issue unless it seems necessary." The church groups also seem content to press their concern in a deliberate way. None has budgeted funds to do additional research on the issue. And Kelly said that the Catholic Conference has dropped the two staffers who were working on it.

Nuclear Industry versus Amory Lovins

The nuclear industry's quick-response public relations team was galvanized into action in July by an adverse article appearing in the summer issue of the quarterly *Foreign Affairs*. As soon as the quarterly hit the streets, the industry's Committee for Energy Awareness (CEA) began to stir, asking friends and allies to read the article and fire off a personal critique to the editor.

The target: an essay entitled "Nuclear Bombs and Nuclear Energy," written by British environmentalist Amory Lovins; his wife, L. Hunter Lovins; and former California utility commissioner, Leonard Ross. In it, Lovins and company argue that the commercial development of nuclear power should be halted because (i) it unavoidably helps spread abroad the technology of nuclear weapons, (ii) the industry is moribund in any case, and (iii) nuclear electricity cannot be used in the short term to reduce our dependence on oil by more than a fraction.

The CEA was founded in 1979 shortly after the accident at Three Mile Island as part of the industry's new effort to combat bad publicity. Housed under the Edison Electric Institute—an association of investor-owned utilities—the CEA was originally planned as a temporary project; but, like so many emergency institutions in the nation's capital, it has become a permanent fixture. It has helped place industry technicians on television and radio talk shows, conducted an expanded pronuclear advertising campaign, and sent an "energy truth squad" to follow and correct Jane Fonda and Tom Hayden on their nationwide antinuclear campaign last year.

CEA official Theora "Bunny" Webb said that "all we are trying to do is to communicate an alternative response" when articles like the Lovins piece turn up. The CEA has contacted a handful of potential letter writers, and the Atomic Industrial Forum, according to Webb, has alerted its members to the article and is preparing a lengthy technical rebuttal for distribution later. "You will be hearing more about it," she said. No doubt we will.

Eliot Marshall