Those in favor claim the risks are minuscule but the potential rewards are great—the cure of cancer and the production of new kinds of organisms to eat up oil spills being frequently mentioned. On the other side, it is said that to dangle the cure of cancer before the public is to make an empty promise and that bugs that eat spilled oil will eat oil from other sources as well. According to those who were present at the first hearing, the City Council listened to it all but did not really come alive until the matter of the Cambridge city health commissioner came up.

Responding to the mayor's taunts about Harvard not involving the city in its research plans, one university scientist declared in prepared testimony that the health commissioner had been invited to attend meetings of the Harvard committee on the regulation of hazardous biological agents. It was a grievous mistake, for, as one observer told *Science*, "The members of the City Council didn't know a thing about DNA but there was one thing they did know and that is that Cambridge doesn't have a health commissioner. Hasn't had one for 19 months, and it's something of a sore point with them."

But now the mayor has promised to find a health commissioner posthaste because whoever fills that long-empty position already has a central role to play in the current DNA contretemps. It is the health commissioner who has the authority of last resort in this matter—the power to ban the research by declaring it a health hazard. (The reason the City Council issued only a "good faith" moratorium is that it lacks legal authority to decree anything more forceful.) And it is the health commissioner who is likely to be chairman of the Laboratory Experimentation Review Board that must recommend a course of action to the City Council. It is easy to see why recombinant DNA research proponents feel discouraged about having their fate in the hands of a nonexistent board, but there it is.

In all of this, the city councillors say, the most important issues are political, in part because it is nearly impossible to grapple with the scientific ones. During the weeks between the two City Council hearings, every councillor was lobbied by scientists hoping to convince them that the work is safe and a moratorium not necessary. But they found it hard to know what was true in the face of mountains of conflicting statements from scientists themselves. Councillor Leonard J. Russell told *Science* that listening to the scientific debate made him feel "fuzzy" because "every time I think I understand an argument, someone pokes holes in it." Councillor Saundra Graham tried to help but missed the point when she moved to change the 3-month moratorium to a 6-month one, so that the scientists themselves could resolve their differences. But they cannot, of course, and that is why the political process is going to help them.

Councillor David E. Clem, a city planner by training, put it this way: "I tried to understand the science, but I decided I couldn't make a legitimate assessment of the risk. When I realized I couldn't decide to vote for or against a moratorium on scientific grounds, I shifted to the political." In the end, Clem, who voted for the moratorium, was influenced by his concern for public participation and the need for scientists to educate the public, which he called "cumbersome but necessary," and by his fears that NIH is not the right agency to assume responsibility for monitoring work on recombinant DNA.

The issue comes down to this: Can an agency that promulgates research as its primary mission also effectively regulate that research? Clem is among those who think the answer is "no." He recalls what happened to the Atomic Energy Commission when it tried to do two jobs. What is needed, Clem maintains, is a separate, federal regulatory body to oversee recombinant DNA research not just in universities but in industry as well. He is urging the City Council to petition Congress on this point and believes that, short of federal regulation, NIH should at the very least provide funds to enable local communities to monitor for themselves research at local institutions.

The members of the City Council are adamant in saying that they do not want to stop work on recombinant DNA in its tracks, and, on the whole, most of them say they are more persuaded by its proponents than by its detractors. But the fact that federal guidelines have been written is not, in itself, enough to satisfy them. As one of the mayor's aides said, "We looked at the process by which they arrived at those guidelines and found it was anything but placid. We were not reassured." And so Cambridge is going to go through at least part of that process itself, redundant though it may be, until the local community is satisfied that all is well. Clem put it aptly when he said, "Science is just going to have to learn to bear with it."

—BARBARA J. CULLITON

Grant Applications: Panel Finds New Laws Enable Stealing of Ideas

The President's Biomedical Research Panel claims to have evidence that the Freedom of Information Act and various court rulings have made it possible for researchers to steal ideas from the grant applications of their rivals.

The panel never actually uses the word "steal," but it notes that many scientists frankly admit that they have already peeked at their rivals' proposals in an effort to gain information that would assist their own research or help them improve their own grant applications.

This finding was gleaned from a recent questionnaire survey of persons who had requested disclosure of information from grant, contract, or fellowship applications submitted to agencies of the Department of Health, Education, and Welfare during 1975. Almost two-thirds of those who responded (47 of 71) said that they had requested the information because they wanted to examine the specific protocols, hypotheses, and designs of other scientists "to give better definition to their own research, or to improve the competitiveness of their own applications for research support," the panel reported.

"These data indicate that the intellectual property rights of researchers may not be sufficiently protected because they are subject to disclosure that could not only benefit less innovative researchers but could also jeopardize the original researcher's intellectual property rights under patent law," the panel said.

The panel's report* is the latest broadside in a continuing struggle between public interest groups and the research community over the extent to which documents relating to research proposals should be made public under such federal "openness" laws as the Freedom of Information Act and the Federal Advisory Committee Act. Before the advent of these laws, grant applications were typically not made public unless and until a grant was actually awarded, and then only certain information—the title of the proposal, the principal investigator, the performance site, and the broad objectives—was released. Other details, including the investigator's preliminary research, his analysis of the current status of research in the field, his proposed methods of procedure, his specific aims, and his estimated budget, were not disclosed.

Excessive Secrecy

But that degree of secrecy was deemed excessive in a decision handed down in 1974 by the U.S. Court of Appeals for the District of Columbia. The decision came in a suit filed by the Washington Research Project, Inc., a nonprofit organization concerned with the rights of minorities and children who are used as the subjects in research tests. The Washington project had sued the National Institute of Mental Health in an effort to obtain the grant applications and peer review documents for projects that involved testing drugs on children. A federal district court judge ruled that most of the information did indeed have to be made public under freedom of information laws. But the appeals court backtracked a bit. It ruled that peer review evaluations of research proposals could continue to be kept confidential, but that the proposals, or grant applications, themselves would largely have to be made public. Whether the decision applied to all grant applications, or only to those that were actually funded, was left fuzzy.

The decision left all parties unhappy, but no one took the case to the Supreme Court. Instead, the focus shifted to Congress, where the Association of American Medical Colleges (AAMC) and others in the research community lobbied hard for legislation that would overturn the court's decision while public interest advocates fought back to keep the research proposals in the public domain. The upshot of the pulling and tugging was a law—adopted on 22 April of this year—that called for a study of the implications of disclosing research protocols, hypotheses, and designs. Parallel studies were to be carried out by two separate organizations—the President's Biomedical Research Panel, which submitted its report to Congress on 30 June, and the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, which is to submit its report no later than 31 December.

The biomedical panel's study—the first to be released—comes down heavily on the side of researchers who want to keep the applications confidential. It contends that making the applications public will harm individual researchers, the patent system, the peer review process, and the general public while offering little if any protection to individuals who serve as subjects in clinical tests. For the most part the panel reasserts arguments that had been made earlier by the AAMC and others in the course of litigation and lobbying. But it also offers some new data—admittedly skimpy—to buttress those arguments.

The principal new data were derived from the questionnaire, which asked all those who requested access to grant applications what interests they represented and for what purpose they used the information. The 71 usable responses came from a variety of sources—commercial and nonprofit research organizations, academic institutions, private citizens, public interest groups, the press, and professional associations, in that order of frequency. A tabulation of the purposes of the requesters indicated that:

- 7 wanted to learn why winning proposals were selected over their own;
- 19 wanted to improve their own future applications;
- 14 wanted to keep abreast of developments in a field or determine if any new research methods were being employed;
- 5 wanted to avoid duplication of research activities;
- 10 were collecting material for publication in inventories or research reviews;
- 4 were interested in the protection of human or animal subjects;
- 2 were interested in patent and license applications; and
- 10 were lumped under "miscellaneous purposes," including an individual who tried to use the rating of his grant application as justification for advancement and another who sought to determine whether certain grantees were performing within the stated purposes of their grants.

On the basis of these findings, the panel concluded that the "intellectual property rights of researchers . . . cannot be protected adequately under present court rulings." It also warned that this might impede the successful transfer of research innovation to industry and the marketplace. It reasoned that successful transfer of innovation depends on a licensable patent right, and patent rights in turn depend on adequate safeguards for the intellectual property of researchers. But if the ideas and techniques of a researcher must be made public before he is ready to file a patent application, then the process of obtaining a patent becomes more difficult, the risk becomes greater for industrial entrepreneurs who might want to purchase the invention, and the innovation may never be transferred to the marketplace, thereby depriving the public of potentially important advances.

On another key issue, the panel suggested that uncontrolled disclosure could harm the peer review system because investigators might be reluctant to submit complete information about their proposals (lest their ideas be stolen) and because the "less innovative researchers" might imitate the proposals of their more successful brethren, thereby leading to more "derivative research" rather than original work. However, the panel acknowledged that members and staff of some 68 peer review groups had thus far "perceived no change in the quality or quantity of information provided in research grant applications," perhaps, the panel suggested, because it is too soon for such changes to be visible.

The panel also warned that the public could be harmed if scientific hypotheses (such as proposed new medical treatments) are made public before they are adequately tested and validated.

As for the protection of human subjects, the panel concluded that such matters are best handled by institutional review boards at the local level rather than by the federal grant application–peer review process. Moreover, it found that only a few of those who looked at grant applications were interested in protecting the rights of subjects. Thus the panel found no "compelling grounds" to believe that disclosure does much to protect human subjects, and it urged that federal laws be amended to protect the rights of researchers.

The panel's report was generally applauded by leaders of the AAMC but it was condemned by William Smith, the at-

*_Disclosure of Research Information_, U.S. Department of Health, Education, and Welfare Publication No. (OS) 76-513, submitted to the House Committee on Interstate and Foreign Commerce and the Senate Committee on Labor and Public Welfare, 30 June 1976. The panel was chaired by Franklin D. Murphy, Times Mirror Corporation, Los Angeles. Other members included Ewald W. Busse, Duke University Medical Center; Robert H. Ebert, Harvard Medical School; Albert L. Lehninger, Johns Hopkins University School of Medicine; Paul A. Marks, Columbia University College of Physicians and Surgeons; Benno C. Schmidt, J. H. Whitney and Company, New York; and David B. Skinner, University of Chicago Hospitals and Clinics.

torney who handled the issue for the Washington Research Project. Smith, who had not yet seen the panel's report, said the evidence sounded slim that there is really any "significant threat" that a scientist's ideas will be stolen. He also said the Washington project had obtained several hundred protocols in 1975 and 1976 and found that such information did, in fact, help protect the rights of subjects because it provided useful leads to projects that might "present interesting ethical issues" that would warrant further investigation. In those few cases where patentable ideas were involved, he said, the project did not challenge the right of the investigator to screen out patentable material before making the protocols public.

Clearly Smith, who is primarily concerned with the health of human subjects, is approaching the issue of disclosure from a different direction than the President's Biomedical Research Panel, which is dominated by medical researchers and is primarily concerned with the health of the biomedical research enterprise. Still to be heard from is the National Commission for the Protection of Human Subjects, whose name implies that it may approach the subject more from Smith's perspective.

—PHILIP M. BOFFEY

The B-1 and the Cruise Missile: To Have and Have Not

Observers of the country's hard fought battles over buying new weapons often marvel at the power of the armed services to win what they will. This year's controversy over whether to let the Air Force build the B-1, a new strategic bomber whose total program cost will be $22 billion, is a good example. The B-1 has been vigorously opposed for years by people inside and outside of government: an alternative has even been under development in the form of the air-launched cruise missile. Nevertheless, as of this writing, B-1 proponents will probably carry the day: the plane seems likely to be built after all. How the Air Force managed to outride these assailants in the Pentagon, in other parts of the Washington bureaucracy, and in Congress, is a story which illustrates the way national decisions on weapons procurement are really made.

The B-1 passed a key congressional landmark in mid-June, when a House-Senate conference committee voted to spend the $960.5 million in procurement funds for the first three B-1 planes sought in this year's defense authorization. The Senate had passed an amendment delaying spending of the money until after a new administration takes office. Senate foes of the plane will now focus on the appropriations process to delay spending. So, for the time being, the B-1 has the upper hand over its congressional foes.

The B-1 is a follow on to the present manned strategic bomber, the B-52, whose mission is to be able to strike Soviet cities and missile silos after U.S. land-based missiles have been attacked in a Soviet first strike. The B-1's radar signature is far smaller than the B-52's. The B-1 flies supersonically which the B-52 cannot (Mach 1.6 compared to Mach 0.8). Most important, the B-1 will be able to fly subsonically 200 feet from the ground; present-day B-52s' combat altitudes are from 500 to 30,000 feet; at high altitudes Soviet radar-guided surface-to-air missiles are deadly. Low-flying aircraft are far more difficult for radars to detect.

Foes of the B-1 have suggested delaying modernization of the force, or updating the unusually hardy B-52 aircraft fleet. But with increasing frequency they have proposed yet another alternative: a force of 1500 or more long-range, nuclear-armed cruise missiles. These could be carried aboard big, tanker-cargo aircraft, similar to Boeing 747's, and fired as these tankers approach Soviet shores. Launched in great quantity, flying only 200 feet above ground, and computer guided to targets 1500 to 2000 miles away, a force of cruise missiles could inflict "unacceptable damage" on the Soviet Union—that is, it could destroy one-third of the population and three-fourths of the industry. Since this alternative does not risk the lives of American pilots by flying them over Soviet territory, it has been called the "stand-off option."

Ostensibly, the debate over these two alternatives has involved ascertaining which hardware can do the job better. Can the cruise missile carrier get off the runway fast enough to escape the initial Soviet attack? Can the B-1's electronic guidance and warning systems be fooled by "winking" Soviet radars? An outside observer of this discussion might conclude that the United States buys weapons on the basis of a debating match: whoever wins the most "if . . . then . . ." arguments wins the whole game.

But the major, perhaps a determining, factor in the B-1 battle has been the political clout of the program. Production of a new, manned bomber has been the preeminent goal of the Strategic Air Command (SAC) and Air Force headquarters since the early 1960's. Along the way, they have picked up some powerful allies, including two Republican presidents, several sympathetic secretaries of defense, and a major industrial contractor. Internal industry documents show that to boost the program, industry sought to enlist the active support of such groups as the American Legion and the National Council of Jewish Women. By contrast, the cruise missile alternative has been less potent. Its advocates are more scattered; their reasons for supporting it are more subtle.

Phase I

The story of the B-1 begins in 1960 with the shooting down of Francis Gary Powers' U-2 spy plane over the Soviet Union with a surface-to-air missile. Air Force spokesmen say the event brought home to the military the level of Soviet concern with improving their air defenses. The U-2 shootdown also put a hole in SAC's plans for the B-70, at that time the planned, high-flying successor to the B-52. An indication of the incredible longevity of SAC-backed bomber programs is the fact that, although the 1960 U-2 incident sounded the death knell for the B-70, the $1.4 billion program continued through the 1960's until Secretary of Defense Robert McNamara canceled it in 1967.

In any event, the U-2 incident sparked Air Force investigations of low-flying manned bombers: in 1961 there was SLAB (Subsonic Low Altitude Bomber); in 1963 there was LAMP (Low Altitude Manned Penetrator). By 1965, these converged in AMSA (Advanced Manned Strategic Aircraft), which studied several possibilities (including even supersonic flight at low altitude). Politically, AMSA became the cynosure of Air