journals. Many journals publish only full-length reports of original research. Many others publish, in addition, editorials, technical communications, letters, notes, general correspondence, scientific news surveys and notes, book reviews, and so on; all of these are potentially citable items. I have not attempted in this article to limit the definition of items-published to lead articles, original communications, or the like. Even assuming it were possible to construct an acceptable classification that would accommodate all of the different kinds of published material, it would have been impossible for me, within the resources available for this article, to have examined individually each of the approximately 600,000 items that I use for the items-published base. If such a differentiation among kinds of material were included in an analysis such as this one, it is reasonable to assume that lead articles in such journals as *Science*, *Nature*, *Lancet*, and *Journal of the American Medical Association* would, as a group, have higher impact factors than those that are shown for these journals in Fig. 8.

29. The percentage (in terms of total citations) of citations of items that are 3 or fewer years old has been, for the years 1964 to 1970, 31.09, 30.24, 26.60, 25.91, 25.32, 25.18, and 23.95, respectively. It is interesting to note that the yearly percentage of such items has gradually decreased as SCI coverage has increased, while the citation rate per cited item has gradually increased (*19*). The significance of these trends is an interesting matter for future investigation.
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Cancer Advisory Board: Nobody's Rubber Stamp

The National Cancer Advisory Board is 9 months old and has met formally three times. It is beginning to get a sense of itself now, and it seems to be an advisory body with a difference. To be sure, there are still many facets of its official personality that have yet to be smoothed out, and its modus operandi remains somewhat ill-defined. Nevertheless, by the time the third meeting of the board, held recently at the National Cancer Institute (NCI), was over, one thing was apparent: the board, charged with overseeing the national cancer program, is taking its responsibility in deadly earnest. This advisory board intends to take a firm hand in *making* policy and setting priorities as the National Cancer Institute puts the new national drive to conquer cancer into high gear.

Unlike a host of other governmental advisory bodies, which tend merely to approvingly review the faits accomplis of the agencies they serve, this group intends to have a say about things before they happen. It also intends to look with a cold eye at programs of long standing, although that will cause a lot of people no small measure of discomfort.

The board is a successor to the old cancer advisory council, which had long been part of the organizational structure of the cancer institute. Eighteen members of the board are new. A half-dozen others are former NCI council members who will serve until their previous appointments expire. "The most striking difference between the old council and the board," said one holdover member during a coffee break, "is that the board is determined to have a mind of its own. At council meetings, we usually just said OK to whatever was put before us. But it is clear that this board is not going to be a rubber stamp for anyone."

The board was created by the National Cancer Act of 1971, the law that gave the NCI special status at the National Institutes of Health (NIH), and its members were appointed directly by the White House last March. It is responsible, in the Washington hierarchy, to the three-man cancer advisory panel, which, in turn, reports to Richard Nixon.

The October meeting of the board was billed as a "program review" session, at which the main order of business was a look at what the NCI was doing. During its two-and-a-half days of work, the board listened to about a dozen briefings by NCI officials and scientists, who described what is happening in their departments. When board members felt they were not getting the kind of information they wanted, they plainly said so.

The board agreed to name a "blue-

The members of the Cancer Advisory Panel are:

Benno C. Schmidt (chairman), J. H. Whitney and Company, New York; Robert A. Good, University of Minnesota Medical School; and R. Lee Clark, University of Texas, M. D. Anderson Hospital and Tumor Institute.

The current members of the National Cancer Advisory Panel are:

For 6-year terms: Jonathan E. Rhoads (chairman), University of Pennsylvania School of Medicine; Frank J. Dixon, Scripps Clinic and Research Foundation, La Jolla, California; John R. Hogness, Institute of Medicine, National Academy of Sciences; Howard E. Skipper, Southern Research Institute, Birmingham, Alabama; Laurance S. Rockefeller, Rockefeller Brothers, New York; and W. Clarke Wescoe, Winthrop Laboratories, New York.

For 4-year terms: Harold Amos, Harvard Medical School; Elmer Bobst, Warner-Lambert Pharmaceutical Company, Morris Plains, New Jersey; Sidney Farber, Children's Cancer Research Foundation, Boston, Massachusetts; Donald E. Johnson, Advertisers Press, Flint, Michigan; Irving M. London, Harvard–Massachusetts Institute of Technology Program in Health Sciences and Technology; and Gerald P. Murphy, Roswell Park Memorial Institute, Buffalo, New York.

For 2-year terms: Mary Lasker, Albert and Mary Lasker Foundation, New York; Harold P. Rusch, University of Wisconsin Medical Center, Madison; Joseph H. Ogura, Washington University School of Medicine, St. Louis, Missouri; Frederick Seitz, Rockefeller University, New York; Sol Spiegelman, Columbia University; James D. Watson, Harvard University.

The members from the former advisory council are:

Arnold L. Brown, Mayo Clinic; James S. Gilmore, Jr., Gilmore Broadcasting Corporation, Kalamazoo, Michigan; Kenneth L. Krabbenhoft, Wayne State University School of Medicine; William W. Shingleton, Duke University Medical Center; and Philippe Shubik, University of Nebraska.

The ex-officio members are:

Edward David, Science Advisor to the President; Elliot Richardson, Secretary, Department of Health, Education, and Welfare; Robert Marston, Director, National Institutes of Health; Marc Musser, Veterans Administration; Richard Wilbur, Department of Defense. Alternates are Lyndon Lee, Veterans Administration; and D. Murray Angevine, Armed Forces Institute of Pathology.

ribbon" committee to check out the cancer institute's controversial special virus cancer program (SVCP). It raised some hard-nosed questions about the emotionally charged and scientifically unresolved debate over whether a simple or radical mastectomy is preferable in treating women with breast cancer. In closed, executive session, it reportedly expressed some dismay at the informal way in which the only partially complete national cancer plan came into the purview of the National Academy of Sciences (NAS) for review [the review is being conducted by the NAS Institute of Medicine (*Science*, 29 September 1972)]. The board decided to conduct its own additional review at a special meeting in December. It grappled with the NCI budget, which is already set for next year and is being sketched out for coming years. And, underlying all of this activity, members observe, the board thought about how it can best go about its business of guiding the activities of the NCI without either skirting its responsibilities or getting underfoot.

This latest meeting of the cancer board was the first one to be opened to the public under a presidential order (now superseded by an act of Congress) that restricts the circumstances under which federal advisory bodies can meet behind closed doors (*Science*, 4 August 1972). As had been the case at the two previous meetings, "invited" representatives of various organizations such as the Atomic Energy Commission, the President's Office of Science and Technology, and the American Cancer Society were present, occupying assigned seats in the generally crowded meeting room. Also present were several NCI officials and employees, at least one lobbyist, and a handful of other observers. Nearly all of the members of the board were present for at least part of the meeting which was conducted by board chairman Jonathan Rhoads, with the unofficial assistance of NCI director Frank J. Rauscher, Jr., and panel chairman Benno Schmidt, a financier. Altogether, at least 75 persons showed up.

This particular meeting of the board had much of the aura of a small scientific symposium about it. Half the time, it seemed, the lights were out, as speakers referred to their slides. Robert J. Huebner spoke to the board about current work in virology, and told them about so-called gs (group-specific) antigens, which immunologically distinguish the carcinogenic viruses of one animal species from those of another. He seemed particularly enthusiastic about work with a very controversial tumor virus known as the RD 114 agent. (There is some dispute over whether it is a human or cat virus.) It may be possible, he said, to use a vaccine, derived from this agent, in trials in man within a year. By and large, the board let this remark slip by. When asked about it later, NCI director Rauscher pointed out that the matter had not yet been brought to the appropriate review board and that it was premature to talk about using it in people.

Review of Virus Program

It was at the conclusion of Huebner's presentation that the matter of a review of the special virus cancer program, with which Huebner is intimately connected, came up. Schmidt, who repeatedly focused on financial matters, pointed out that $48 million is being spent on viral oncology—more than $6 million on intramural programs, the rest for work being done outside of the NCI's own laboratories. How much of that extramural money, he asked, is going to directly back up in-house research? John Moloney, who runs that program, answered, "About one-eighth of all contract funds, or $5 million." The matter was not pursued.

Then Schmidt asked whether it is true that the SVCP reached the peak of its productivity 2 or 3 years ago. "Is it not now in a state of diminishing return?" he queried. Huebner, Moloney, and others rose to the defense of the SVCP, which is among the most visible of all the NCI programs. It constitutes a separate line item in the budget. It is one of the biggest efforts to date to conduct biomedical research by contract rather than grant. It has received a tremendous amount of publicity.

Speaking to the issue of contract research in the SVCP, James Watson, who is said by other board members and NCI officials to be critical of the virus program, observed that the criticism of the SVCP is that its operation is too restrictive, not that its goals are unworthy. Then Schmidt stressed that *he* was not criticizing the SVCP, but merely asking questions and raising issues that others had raised to him.

Discussing the SVCP informally later, Schmidt made it plain that he is counting on the committee that will review the virus program to settle much of the controversy that surrounds it. "Many charges have been leveled against the SVCP," he said, "charges which were reflected in no small measure in an article in *Science*. Many members of the board are concerned about this. I want those charges investigated and either confirmed or rejected." As an aside, Schmidt commented that he suspects that the SVCP will come out of this all right. (The article to which he referred was by News and Comment writer Nicholas Wade, *Science*, 24 December 1971.)

After the briefing on virology, there was one on chemical carcinogenesis which included a string of presentations. As is usually the case at scientific meetings, some of the talks at the board meeting were better than others. What distinguished it sharply from more formal scientific gatherings was the bluntness of the members of the board in reacting to what they were hearing. Halfway into the afternoon session, Harold Amos asked a question that others admitted afterward they had shared. Where, Amos wanted to know, is the meat? Where is the substance of the NCI programs? Amos was explicit in saying that he, for one, did not want a catalog of every project in every department. He wanted to know the goals of its programs, its highlights, its most productive aspects, and, when pertinent, its failures.

Amos's question sparked a lively discussion and the tone of the meeting picked up. All the expected, and valid, explanations were made about how hard it is to summarize a year's work in a broad area in a few minutes. That was accepted. The NCI staffers apparently had geared their briefings to the modest demands of the old advisory council. It was apparent that that would no longer do. They said they were willing to give the board whatever kind of information it wanted. Irving London took advantage of the break in the scheduled proceedings to add another thought. He said the board needed to know more about how the NCI makes decisions, how priorities are set, why one type of research is supported by grants and another by contracts, and how resources are allocated. In short, London wanted a blow-by-blow description of how the NCI really works.

No real decisions were made about what to do to resolve these matters, but some of the frustrations of the board had been forthrightly aired. (In retrospect, most of the board members said they felt it was a good thing.) Then everyone settled down for a cou-

ple more presentations, and afterward the board adjourned for dinner at the Cosmos Club.

Overnight, a lot of reshuffling went on back at NCI headquarters as changes in the program for the next day were hastily made. The NCI's chemotherapy program was first on the morning's agenda.

Gordon Zubrod, who is head of chemotherapy, briefly recounted the history of what he described as the government's entry into the pharmaceutical business, which he said began around 1954 when board member Sydney Farber was doing pioneering studies with an antitumor drug called methotrexate. Ever since 1960, Zubrod said, the line of new and useful anticancer drugs has been rising almost vertically. He cited that fact as one measure of his program's success and, as another, data indicating that many of these drugs appear to increase the life expectancy of cancer victims almost to normal. The major handicap to successful chemotherapy, he acknowledged though, is that drugs work against no more than 10 percent of all tumors and, even then, of course, they are not effective in every case.

The emphasis was on the potential value that investigators now see in combined chemotherapy, a procedure in which two or more drugs are used in delicately balanced combination with one another to kill off tumor cells during the moment in their lives when they are undergoing division and are, therefore, susceptible to the lethal potential of the drugs. (Cells in a nondividing or resting phase appear to be virtually immune to the effects of known anticancer agents.)

The board, generally favorably impressed by Zubrod's lucid presentation of fairly clear-cut information, followed up. Amos wanted to know how many groups are studying combined chemotherapy in animals. About three. Why not more? There really are no ideal animal models for this kind of research. There was a fair amount of talk about the NCI's drug screening program. Attempts were made to convince the board that chemicals from a range of sources are screened for possible anticancer activity on a rational basis. At this point, one of the speakers thanked Congress, "our enlightened President," and all "you good men and women of the board" for helping cancer researchers obtain more money. The good men and women (actually, woman, Mary Lasker) went back to the issue of screening chemicals. The NCI will look at agents from 8000 plants and a large number of insects. Amos observed that there appears, after all, to be no systematic method of selecting materials for the screen. "We're just wandering around," was the way he summed it up. There was no substantive argument.

Then NCI scientist Robert C. Gallo spoke, having been summoned by Zubrod at the 11th hour to help fulfill the board's wish to hear about the substance of some of the research judged to be in the forefront. Gallo decided he was not going to talk down to the board, and he did not. In the end, it paid off.

Gallo reported that he and his colleagues were using basic tumor cell biology as a starting point for thinking about new concepts and approaches to antitumor drugs. Expanding on the idea of a chemical screen, Gallo advocated development of in vitro systems as an adjunct to current screening procedures, which rely on animals. (His laboratory is working, in part, on such a system.) "When you screen chemicals in an animal, you lose time and money," he said, adding that one may also be missing the effect of an agent because of the way it is metabolized by the animal, usually a mouse. There are almost invariably differences between human and animal metabolism, he pointed out. Furthermore, he observed, in vitro systems could be useful for finding agents that will act against the 90 percent of tumors that are not rapidly dividing and that are, therefore, unaffected by available drugs. (Generally, in animal screens, chemicals are evaluated for their ability to affect fast-growing, dividing, tumors.) While acknowledging that in vitro systems are not going to solve the problem single-handedly, Gallo maintained that their simplicity, rapidity, and low cost would make them worth developing. An agent with which he has been working, for example, has selective toxicity for tumor cells in vitro. Even if this chemical, a derivative of the antibiotic rifampicin, is not useful in man, Gallo says, the fact that it works in vitro gives a model to study. "Even if it works only in vitro," he declares, "there is a reason for its antitumor effect and we want to know what it is."

He went on to talk about the issue of pursuing research in antiviral agents (he thinks we should), and discussed an in vitro system in which investigators have gotten leukemic cells to revert to normal, probably because of an "inducing factor" in the soft agar medium on which the cells were growing. Gallo called the identification of this factor, thought to be a glycoprotein, one of the most important areas of leukemia research.

By the time he was through describing this and related work, he was breathless and most of the members of the board were dazzled. It was apparent that most of them found Gallo's substantive talk and obvious enthusiasm for research gratifying and encouraging, even though the details of the work he discussed were too complex and presented too quickly to be absorbed completely by those not well acquainted with the molecular aspects of cancer research.

Simple versus Radical Mastectomy

The meeting continued with a briefing on the status of the clinical care of cancer patients that unexpectedly plunged the board into one of the most controversial and highly emotional areas in all of cancer—the debate over simple versus radical surgery for women with breast cancer. As part of a summary report of on-going activities, John Potter of Georgetown University mentioned a nationwide study designed to answer what is presently an unanswerable but crucial question: If a woman has early breast cancer, should she have a simple mastectomy in which only the breast is removed or will she be better off if she has radical surgery in which not only her breast but also her axillary lymph nodes and pectoral muscles will be taken out? It is an issue which the medical community has been unable to resolve and each procedure has its vigorous and articulate proponents.

The problem seems to be that there is no conclusive data to indicate whether a woman who has radical breast surgery will live longer, and without recurrence of disease, than one who has the simpler, less disfiguring, operation. The current NCI study is meant to resolve the issue.

Even though the study's protocol is set and the study itself has been going on for a couple of years, the board has decided to take a fresh look at it. The reevaluation was brought about somewhat by happenstance, but the incident that led to it is significant because of what it says about the way the advisory board is taking its responsibility.

Potter's presentation to the board was problematic in a couple of regards.

His reference to the breast study was by way of example of on-going work and was not intended to be a thorough discussion. As it turned out, many people wish he had chosen some other example. In glossing over the details of the study, Potter was apparently assuming that the board members were as familiar with the protocol as members of the old council had been. This was not the case. As a result, some of the members of the board began asking rather penetrating questions about the program's validity. On the face of it at the time, some members got the impression that women being treated in the breast study might be getting less than the best possible care. "Are we being asked to endorse this project?" Amos inquired, seeking clarification.

Having heard a great deal about the promise of chemotherapy, some members asked whether women in the study would get drugs after their surgery. The answer is no. That too raised questions, and again their resolution is difficult. Potter said there is not "one scintilla" of evidence that drugs after surgery do any good. He could find a long line of supporters for this opinion. He could find just as long a line of opponents. The board, aroused by the issue, did not try to express any coherent feeling at the time but took the matter up again the next morning in executive session.

Many of their concerns were apparently allayed when they received a fuller explanation. They learned that the old cancer advisory council had gone over the study protocol in great detail before approving it. They found out that only those women whose tumors are small and localized are included in the study and, then, only with their consent.

Some board members, contacted after the executive session, said they felt that things had been explained to their satisfaction. Others said they felt the breast study should continue because of the importance of resolving the conflict over the simple versus radical surgery but added that they were still not entirely comfortable about the situation. In any case, the matter has not been dropped. Stressing the fact that much of the concern about the breast study arose because of lack of good communication, Schmidt said that, nevertheless, "We can't afford to have any experiment in which one group gets treatment thought to be better than another. And it is important that whatever is done happens with the full understanding of the patient. Clearly, this study is not as arbitrary as it first seemed to some of us. However, there will be a full report at the next meeting of the board."

And that, at the moment, is the way it looks that things will go. The board is struggling to come to grips with its own role in the life of the cancer program. Its members are not in full accord on all points; indeed, they do not all even know each other very well yet. But they are operating with a fairly large measure of goodwill toward each other in spite of differences. And, as a body, they fully intend to have a strong hand in the development of the massive program they are supposed to oversee.—BARBARA J. CULLITON

Reactor Safety: AEC Concedes Some Points to Its Critics

Esoteric pieces of hardware that they are, the emergency cooling systems of nuclear power plants have thoroughly replaced radiation standards as the Atomic Energy Commission's leading technological millstone. A long and convoluted internal debate over the adequacy of these backup cooling systems has placed a drain on the energy and resources of the commission's regulatory staff, has inflamed philosophical differences among reactor safety experts, and has helped to strain relations between elements of the AEC's headquarters staff and safety researchers in the commission's national laboratories.

More than that, the internal debate on emergency core cooling has incited a growing public discussion of reactor safety, which may or may not reach an apex early next year with the first public hearings on the subject ever to be scheduled by the congressional Joint Committee on Atomic Energy.

Against this background, the long tussle over emergency core-cooling systems (ECCS) took a new twist last week—one that may have opened the way to a resolution of the issue, and one that may also lead to some minor, if irritating, economic problems for utilities and reactor manufacturers in the United States. In a news conference, the commission's Director of Regulation, L. Manning Muntzing, announced that his side of the agency was contemplating a "more conservative" or cautious stance on the issue that could well manifest itself in the form of operating restrictions on nuclear power plants. Such restrictions would remain in force until technical uncertainties surrounding the performance of the backup cooling systems were cleared up.

"We find the added conservatism to be dictated by safety," Muntzing told a handful of newsmen gathered for the occasion. One practical implication, he added, might be that "several" of the 26 water-cooled nuclear power plants now operating would be obliged to reduce their output of electricity by as much as 20 percent. Thus, for example, a nuclear plant designed to generate 1000 megawatts, as many of the newest plants are, could be restricted to an output of 800 megawatts.

Such "deratings" are anathema to utilities and, accordingly, are almost unprecedented. But if public safety seemed to dictate such a cutback, Muntzing said, "Then that's the way the ball bounces."

This new element of conservatism is contained in a tentative set of rules drawn up by the regulatory staff to govern certain key aspects of reactor operation. These proposed regulations —upon which the five-member Atomic Energy Commission will not take final action for about 6 months—are intended to compensate more "realistically" than a previous set of rules had for the uncertain adequacy of emergency cooling systems, Muntzing said. In several respects, the proposed new rules seem to vindicate the critics, both