social, and strategic impacts. ACDA would have the key role of analyzing proposed projects from the standpoint of their impact on the future of the arms race.

From the viewpoint of arms control people, such legislation would have the virtue of formalizing ACDA's advisory role, now possibly the only role the agency is to be allowed to play. For Congress to go beyond this and demand that ACDA be restored to a position of leadership in arms control negotiations would no doubt be futile. If the President is determined to remove ACDA from such a role, there probably is nothing Congress can do about it.—LUTHER J. CARTER

Cancer Virus: Link to Disease in Man Reported Again

One sure way for a scientist to make news is to announce that he has discovered a human cancer virus. In the last few years, more than half a dozen investigators have enthusiastically claimed to have caught the elusive cancer-causing virus, and, although some of those claims were duly modified by "maybe's," the implication always was that with just a bit more work the data would be conclusive and the cautionary note could be discarded. As it turned out, it was the claims that had to be discarded.

But past failures are no deterrent, and the search for a human cancer virus goes on. One of the first persons to proclaim success was Albert Sabin, who said he had found the virus shortly after he switched to cancer research in 1962. But what he found was not a virus after all, and talk about an exciting lead was quietly dropped.

The latest person to proclaim success is also Albert Sabin. At the annual meeting of the National Academy of Sciences, he reported that he has nailed down, once and for all, the long-suspected link between herpesviruses and cancer. Sabin, who is something of a showman, summarized his findings at a press conference and later spelled out his evidence in a contributed paper that he coauthored with Giulio Tarro of the University of Naples in Italy. Tarro, feeling slighted, has said that he was not invited to participate in the meeting with the press. However, he did show up at the press conference after things were under way. He is miffed by a news account that he feels failed to give him due credit.

Sabin's claim and the circumstances surrounding the research have become matters of some contention among persons close to the situation.

To begin with, Sabin seems to be the only one who regards the experimental evidence as conclusive proof that herpesviruses play a role in causing certain cancers. John B. Moloney, associate scientific director for viral oncology at the National Cancer Institute (NCI), which funded the studies under the Special Virus Cancer Program, accompanied Sabin to the academy press conference, at which he toned down some of Sabin's more definitive remarks. Moloney said the Sabin-Tarro findings "provide additional evidence suggesting that herpesviruses may be causally implicated" in some cancers. However, he added that, before one could say the etiological role of the viruses was proved, there must be further studies involving larger numbers of patients to determine the statistical significance of the relation between the viruses and tumors. In addition, the sensitivity of the test for picking up evidence of the viruses must be increased, and the nature of the protein (called a nonvirion antigen) that is used to indicate the presence of the virus must be defined. Tarro agrees that it is too soon to say that a cause and effect relationship has been proved beyond doubt and is satisfied with saying that the evidence looks very, very good.

In experiments that were completed only 3 days before the presentation at the academy, Sabin and Tarro showed that ordinary herpes simplex and herpes genitalis viruses are specifically associated with nine types of human cancers. Herpesviruses are extremely common in nature, and most people harbor them. They are known to cause fever blisters, or cold sores, and genital sores. Now, Sabin and Tarro are saying that these same viruses, which are transmitted from person to person, "may in *certain individuals* under *special conditions* play a role in inducing some human cancers in a manner comparable to that obtaining for the cancers *experimentally* [in animals] produced by other DNA viruses."

In a telephone interview, Sabin stressed the fact that there must be cofactors of some as yet unidentified nature involved in producing malignancy—that the virus does not act alone. But, he added, this is the "first demonstration that an ordinary virus is associated only with cancer and not with infection."

Sabin and Tarro have not actually found the herpes simplex and genitalis viruses (also known as herpes type 1 and type 2, respectively) in the serums of cancer patients. Instead, they found evidence that the viruses had been there by identifying antibodies to nonvirion antigens specific to those viruses. A nonvirion antigen is simply a protein which is produced by a cell that has been infected by the virus and that uses a piece of DNA from the virus in the production process. Thus, it is the viral information that codes for production of the antigen which, while specific to that virus, is not a structural part of the virus itself. These nonvirion antigens, like any other antigens, stimulate antibody production.

In experiments conducted during February, March, and April at the NCI's Frederick Cancer Research Center in converted Fort Detrick, Sabin and Tarro screened a variety of human serums for antibody to the nonvirion antigen. They found it in serums from patients with advanced cancers of the following nine types: lip, mouth, oropharynx, nasopharynx, kidney, bladder, prostate, cervix, and vulva. There was no antibody in serums from patients with 20 other types of cancer, including cancer of the lung, stomach, colon, and breast, as well as a couple of types of leukemia. Nor was it present in fetal tissue, thereby discounting the possibility that the antigen in question is really an embryonic one that is frequently associated with various cancers. Studies of persons with active herpes infections—but no malignancy—were also negative.

One relatively immediate application of this research may be in establishing a therapeutic index of the effect of treatment on cancers of the herpes-related types. High levels of antibody to the nonvirion antigen persisting after therapy would be a sign that things were not going well, and, perhaps, treatment could be adjusted accordingly. Conversely, an absence of antibody would be a good sign.

Further in the future, Sabin says, is the prospect of a vaccine. Although he has been, for the last couple of years, an outspoken critic of the notion that there is any point in hoping for a vaccine against cancer, he says that his skepticism is over the prospect as far as it applies to RNA viruses, not DNA ones like herpes. (Most of the claims that have been made of the discovery of a human cancer virus have been about RNA viruses, which, presumably, are vertically transmitted from cell to cell, from generation to generation. If so, everyone carries these viruses from conception, and the thought of vaccinating against them in a traditional sense is impractical. Furthermore, virtually all of these RNA viruses are known to be oncogenic. The potential hazards of injecting them in anyone are obvious.)

But, as Sabin sees it, the situation with the herpesviruses is different. "If," he says, stressing the if, "we could find strains of herpesviruses that are infectious but are definitely not oncogenic, it might be possible to develop an attenuated vaccine which would produce immunity to all forms of herpes, including the oncogenic ones. But that is a very long way away, if it happens at all." Nevertheless, Sabin, who only began working at the Frederick center in January, is optimistic about the chances.

The work that Sabin and Tarro have just completed after weeks of intensive effort began, in a sense, as long ago as 1965, when Tarro came to Sabin's laboratory in Cincinnati as a post-doctoral student to learn virology. At the time, they were looking for ways to identify nonvirion antigens and prepare them for laboratory use by separating them from the virus antigens with which they are associated. "There was a long period of poking around in the proverbial dark room looking for a black cat that may not be there," Sabin says of the time, using one of his favorite expressions.

During that period, the two Cincinnati researchers did some work with Ariel Hollinshead of George Washington University, whose studies focused on ways of identifying, isolating, and characterizing specific virus-induced tumor antigens. That marked the beginning of a close association between Tarro and Hollinshead which has continued to this day. Their most recent joint effort involved experiments from which they demonstrate that herpesvirus nonvirion antigens are associated with lip and cervical carcinomas, but not with normal vaginal tissue or intestinal tumors. They found evidence of the antigen in tumor tissues, as opposed to serums, which Tarro and Sabin used, and concluded in a report in the 16 February issue of *Science*, that, because the nonvirion antigens are probably specific markers for the presence of virus within the tumor cells, "the findings could support an etiological role of herpesvirus in selected human malignancies." Both Hollinshead and Tarro have said that Sabin urged Tarro to ask *Science* to delay publication of that paper. The authors believe that he did not want them in print before a paper of his own with Tarro would appear in the *Proceedings of the National Academy of Sciences*. Sabin, on the other hand, says he had reservations about the soundness of the Hollinshead-Tarro data. Tarro considered their data the best so far with respect to the connection between herpesviruses and lip and cervical tumors.

But to go back to earlier work, by 1970 Sabin and Tarro had resolved—reportedly with Hollinshead's help—some of the problems of getting a handle on the antigens and published a paper in the *Proceedings of the National Academy of Sciences* (to which Sabin belongs) describing properties of the nonvirion antigen of the herpesvirus type 1. It was about that time, too, that Sabin left Cincinnati to assume the presidency of the Weizmann Institute in Israel and Tarro went back

Two Patent Studies Pending

In her maiden speech as Assistant Secretary of Commerce for Science and Technology, former Boeing Company physicist Betsy Ancker-Johnson announced that two programs to put the department's file of 11 million patents to work in aiding American technology are under way, with some preliminary results expected soon.

Speaking to the Washington Chapter of the National Association of Science Writers, Ancker-Johnson said that the larger effort is to break out the data in the Patent Office's massive files of 11 million patents (which already divides new inventions into 85,000 subclasses), to indicate where technology is advancing rapidly, where it is proceeding more slowly, and who literally owns it. The premise, she said, is that "Changing patterns of patent activity . . . can be an accurate indication of technological activity throughout the world."

Patents granted in tunneling technology are one example. "U.S. inventors clearly dominate in the broad field of hydraulic and earth engineering, with 69 percent of the patents. However, in the subcategory dealing with tunneling, the figures are quite different. The U.S. share is only 31 percent, while Germany, with 37 percent, emerges as the most active country." In citing this sort of example, Ancker-Johnson was reflecting a feeling shared by others in the Commerce Department and in Administration science circles that, increasingly, American scientists and technologists should keep a weather eye on their foreign competition. At present, she explained, Commerce is preparing a preliminary report which will suggest formats and categories for breaking out this kind of patent information for use by business and government.

A second, smaller effort she cited is a review of the 25,000 government-owned patents to see which might be turned into profitable commercial ventures, or, in her words, into "acres of diamonds" for industry. The effort here, according to a department spokesman, is a result of the President's Technology Message of March 1972. If Ancker-Johnson's speech, with its concluding pitch for women's rights, is an indication, the long-silent science office in the Commerce Department could be livening up.—D.S.

to Italy, "carrying this work to Naples with me."

In Naples, Tarro, who is described by his friends and associates as a shy, retiring young investigator, worked under a grant from the cancer institute which, Sabin says, he got because he (Sabin) would continue to be associated with the project. By the late fall of 1972, Tarro's work in Naples had progressed so far that he was able to say that there was a clear relationship between herpesviruses and several human cancers. Says Tarro, "In November, we got some very nice results. When I communicated them to Sabin—he was the first person to be informed—he said they were 'too good to be true.' " In February, Sabin sent a joint Sabin-Tarro paper off to the *Proceedings*, where it was published in the April issue. Sabin, who was by this time back in the United States, also asked Tarro to come to this country for a stay in his laboratory at the Frederick center. Tarro arrived in February and will return to Italy soon.

According to Tarro, the work he and Sabin did at Frederick was a "repetition" of the work he did in Naples, although it was done with more "sophisticated" equipment and with different controls. A travel order to Tarro from Robert A. Manaker of the NCI partially supports Tarro's contention that the work he did in the last 3 months essentially duplicated previous work: "Dr. Tarro will participate in a collaboration with investigators at the Frederick Cancer Research Center to verify and extend observations made on human cervical carcinoma patients by techniques developed by Dr. Tarro in Naples."

Once back in Italy, Tarro hopes to continue his research along the same lines he has been pursuing and to continue his collaboration with scientists in this country, including Hollinshead, even though Sabin is reportedly less than pleased about that. When asked, Tarro tactfully says he believes his work with both individuals is equally important.—BARBARA J. CULLITON

NAS and APS Meetings: Changes in Moods and in Modes

The National Academy of Sciences (NAS) and the American Physical Society (APS) both met in Washington in the week after Easter. Beyond the coincidence of time and place it is fair to say that the meetings shared a common mood. The truce in Vietnam is generally regarded as the principal cause of a muting of the voices of protest that have been heard at so many scientific meetings in recent years and finally had disturbed the even tenor of the academy's ways. Particularly at APS there seems to be new interest and energy directed to exploring ways to work within the system.

National Academy of Sciences

The National Academy of Sciences devoted its spring meeting this year mainly to commemorating the 500th anniversary of the birth of Copernicus and to discussing the scientific revolution he did much to initiate. On more immediate problems facing science and society, the academy members also tended to take the long-range view.

It would be unfair to suggest that the academy has relapsed into the complacency of the past. A lot has happened to the academy in recent years, and it is now in a period of consolidating the changes that have been made; the members are in no mind to see any major rocking of the boat.

Asked to characterize the atmosphere of this year's meeting, academy president Philip Handler replied, "Quiet." Handler says he feels that for several years the problems that were on the minds of many members had their origins in the Vietnam war. "The matter of our relationship with the military—classified activities—has been regularized. As far as I know this has satisfied the concerned portion of the membership."

The issue of secrecy of the military work accepted by the academy was the cause of sharpest dissent among academy members in recent years. As a result of the criticism, the academy last year adopted new rules on classified work which essentially provide that members be informed of the nature of classified work before the academy accepts it and creates machinery through which members can protest and have a particular contract rejected.

The debate over classified work and the compromise reached led to the resignation of two members critical of the situation, Richard Lowentin of the University of Chicago and Bruce Wallace of Cornell. Technicalities had left the resignations in limbo until this year's meeting, but the academy council this year clarified the situation by changing the bylaws to provide a direct means of resigning and also, so to speak, left a light in the window by adding that a resigned member may be reinstated after not less than 4 years by a two-fifths vote of the council.

What seemed to concern members most this year, according to Handler, was the "funding of the scientific endeavor." He said that "the most acute concern was expressed by biomedical researchers." He suggested that this may be the case because "others felt the pressure earlier."

On another internal matter that has troubled the academy for several years, the members received the formal word that the leadership of the National Academy of Engineering (NAE) was recommending dissolution of its decade-long partnership with NAS (*Science*, 13 April). NAS members received the news calmly and approved a discreetly worded resolution inviting NAE to cooperate with NAS in matters of "mutual and overlapping concern," and adding that if NAE decides to remain under the NAS charter, "the invitation to do so remains open."

There was really not much else that NAS could do since NAE was scheduled to meet the following week, and the decision to stay or go rests with a vote of the NAE members. In the event that the decision is to stay with NAS—considered against the odds—the two academies would reopen negotiations. These negotiations seem to have stuck mainly on the issue of how the two academies could jointly operate the National Research Council (NRC), the framework organization for the voluntary committees which perform the academy's function of advising the government.

Reorganization and reform of NRC