ical literature." Said Adler, "Any business, including ours, that goes head-to-head with Uncle Sam and his 'deep pockets' cannot survive." Eugene Garfield, head of the Institute for Scientific Information in Philadelphia (which also competes with MEDLARS), says that despite the fast-growing market, computerized information services are very competitive. "With the advent of the on-line revolution, various subsidized services have made it extremely difficult for other providers," he adds. The NLM may say its data are complementary rather than competing, but "the fact is all the information services are competing today."

Thus, providers of these services differ with Cummings not only on the MEDLARS' relation to private industry; they also have different concepts of what it ultimately should be. The privates envisage wide-open competition, while Cummings believes that public and private data bases should complement one another.

Whether or not the amendment becomes law, the issues will not go away as long as public (subsidized) and private information systems are vying for the same market. Cummings hopes it will become included in public policy debates and NIH director Donald S. Fredrickson believes it deserves extensive exploration before any laws are changed. Fredrickson, unlike Cummings, does not believe a differential fee structure would constitute "a breach of an inalterable philosophical principle." But, he says, the stipulation that exempt organizations not be allowed to supply information to nonexempt ones is completely impractical. How, for example, would a state system deal with requests for services from private physicians? He also foresees complications with foreign entities, where the NLM obtains bibliographic services in exchange for tapes. The amendment will be "bad news," he says, if it is passed in absence of a full understanding of its implications.

—CONSTANCE HOLDEN

At Long Last, Linus Pauling Lands NCI Grant

Nobelist's claims about vitamin C to be tested; Cancer Institute lends special hand to Pauling to win funding

Linus Pauling, a Nobelist who has caught the public eye with maverick claims that vitamin C can help prevent cancer, has at last snared a National Cancer Institute grant to study his hypothesis. The grant was approved on his eighth try in 8 years. Pauling will use the $204,000 allotted for the 2-year grant to study the effects of vitamin C on breast cancer in mice.

Pauling complains that he has failed repeatedly to secure NCI funding because his unorthodox ideas on the role of vitamin C in cancer prevention never took hold in the mainstream of medical thinking. On the other hand, NCI officials say that his proposals were never very well presented. Pauling's proposal was approved only after NCI went to great lengths to help him correct weaknesses in his application, detailing every change needed to meet the institute's substantive and technical requirements.

> "We're trying to make discoveries, not elaborations on old breakthroughs," Pauling says. The medical establishment "doesn't know how to recognize new ideas that are worthwhile."

The grant application submitted by Pauling, who has received the Nobel Prizes for chemistry and peace, passed NCI inspection after an all-star NCI ad hoc panel, headed by Bruce Ames of the University of California at Berkeley, made a site visit to the Linus Pauling Institute of Science and Medicine in Menlo Park, California. The group, which also included Richard Peto and Phillipe Shubik, both from Oxford, and Gerald Wogen from the Massachusetts Institute of Technology, recommended changes in Pauling's experimental design, particularly in the proposed biostatistical analysis of the data. Pauling complied.

Specifically, Pauling will study the influence of different dietary doses of vitamin C on tumor development in a strain of mice, C3H/HE, in which the incidence of spontaneous breast cancer is high. His funding is to begin in a few months as soon as he arranges for an adequate animal laboratory for his institute, which recently moved to a new location in Palo Alto, a few miles from its previous quarters.

Since 1973, at least four of Pauling's grant applications have been approved, including his latest application. The other three that passed were never funded because of their low rating or "priority score" assigned by a study section. Pauling has requested grants for various vitamin C projects, ranging from a low of $100,000 in 1973 to a high of $1 million in 1977, which was to finance both animal and clinical studies.

Pauling says, "We live a hand-to-mouth existence here." But despite the lack of NCI funding, his research in vitamin C has continued with money provided by private donations and the Hoffmann–La Roche Foundation. A spokeswoman from Hoffmann–La Roche says Pauling received a grant for his "interesting theories, but more data needs to be generated to support his ideas."

Unlike many other scientists, Pauling has taken a public and political approach to drum up support for his own grant proposals and vitamin C research in general, but seemingly without much success. During the past decade, his outspoken statements on the virtues of vitamin C have received wide attention. In addition, Pauling has lobbied for himself by writing or speaking to congressmen, senators, and Administration officials, who

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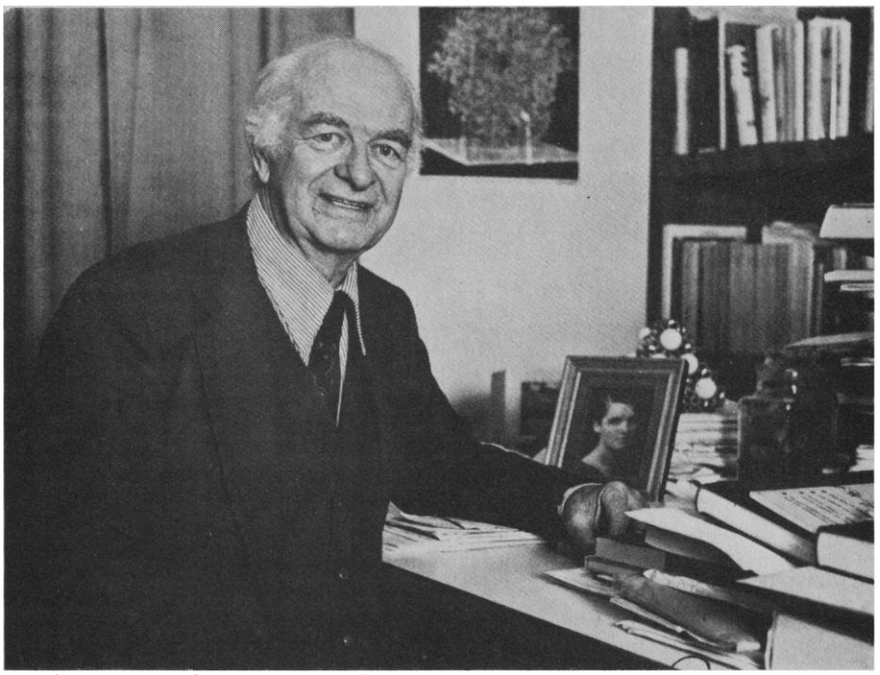
in turn asked the NCI about the extent of federal funding in the field. "It was meant to badger us," says John Kalberer, assistant director of the National Institutes of Health and former NCI program planner for the division of cancer research resources and centers.

It was badgering for good reason, according to Pauling. "There are so few new ideas in cancer research," he said in a telephone interview. 'We're trying to make discoveries, not elaborations on old breakthroughs." The medical establishment "doesn't know how to recognize new ideas that are worthwhile."

Pauling cites several reasons why most in the medical community have not been persuaded of the worthiness of vitamin C. "First of all, the leaders in nutrition decided 20 to 30 years ago that vitamin C in large doses didn't have much value." Second, "ordinary physicians," he says, believe vitamin C has no value in preventing or treating cancer. "They don't have the time or the background to review the literature. They don't have an independent opinion." Even researchers, Pauling says, "have been careless in checking the literature. They've misinterpreted it." Most of the medical community cannot believe that vitamin C "can have value in fighting this terrible disease. They can't believe it can be controlled in an easy and cheap way."

Some board members and NCI officials suggest that Pauling's strong personality made the approval process, if nothing else, quite bumpy. "Professor Pauling has a mind of his own," says Harold Amos, a member of the National Cancer Advisory Board and chairman of Harvard's microbiology department. At times, Pauling protested that he had to detail experimental procedures that were routine for him. "The study sections are pretty tough on everybody—major and minor figures," Amos says. "It reached a point where there was a contest." Some individuals were offended that he refused to yield, Amos says. William Morrison, NCI assistant director, points out, "It wasn't that his ideas were bad. Vitamin C is a legitimate study."

NCI paid extraordinary attention to Pauling to help him obtain his grant, but the treatment was not unique, cancer institute officials say. Between February 1979 and August 1980 Pauling's most recent proposal was bounced back and forth four times between study sections and the National Cancer Advisory Board. Each time, the study section disapproved the application. The board disagreed twice with the study sections' decisions. The second time, the board's subcommittee on special action, which is designed to weigh the merits of novel proposals, made a site visit to Pauling's institute and concluded that the study was worthy. It then formed the ad hoc group led by Ames to make a site visit.



What to do with oddball ideas?

Pauling and other Nobelists favor the creation of a special research fund.

A persistent problem with the current funding system at NCI is whether the approval process allows enough offbeat ideas to be pursued. Both former NCI director Frank Rauscher and current director Vincent DeVita say that they wish more "oddball" ideas could be examined. The suggestion that a special fund for unorthodox ideas be created has been floating around for several years but has never gotten very far. Apparently, the only current mechanism to review novel ideas is the cancer board's special action subcommittee, which considers about seven to ten applications per year. In Pauling's case, it took two long years to reach the panel's purview. Says Kalberer of NCI, "Sometimes we're victimized by our own [peer review] system and we lose out."

Linus Pauling and fellow Nobel laureates Albert Szent-Györgyi and Donald Glaser all favor the idea of a separate money pool that would be set aside for scientists with distinguished records of achievement. Szent-Györgyi, now at Woods Hole, received the prize for his work in the synthesis of ascorbic acid. Like Pauling, he too was denied funding by NCI for vitamin C research. "I had to go begging to private individuals," he said. Glaser, a professor at the University of California at Berkeley, won a Nobel Prize in physics for his invention of the bubble chamber. Last year, after having invested almost $10 million in a cell biology project by Glaser, NIH withdrew its funding because of a low priority score on a grant renewal.

Pauling suggests that 2½ percent of the NCI budget be devoted to fresh ideas. A special committee would choose the recipients. But he conceded that such a program would be difficult to administer "given people like Senator William Proxmire around."

Glaser says that when government money is tight, it is even more important to have a mechanism for funding riskier research ventures. "When there's a shortage of money, as in recent years, the government wants to get the maximum mileage out of the dollar." At the same time, scientists must compete even harder for less money. Together, the two situations "lead to a dangerous conservatism in funding [only] for research that is guaranteed to pay off. There needs to be some mechanism for research that may not [immediately] pay off," Glaser says.

Pauling, who takes 10 grams of vitamin C a day, has campaigned long and hard to push his beliefs that vitamin C benefits cancer patients and sufferers of the common cold. Perhaps NCI should have showered Pauling with the attention he received on his latest application much earlier. In any event, Pauling is anxious to begin the study. "The money will be helpful in achieving our goals," he says.—MARJORIE SUN