Institute of Medicine: Broad-Spectrum Prescription

The origins of the new Institute of Medicine within the National Academy of Sciences (NAS) were thoroughly mixed. First, there was pressure for the creation of an academy of medicine to give medical men the sort of national recognition available to their peers in science and engineering. There was also the growing feeling among health professionals that they should seek joint solutions to pressing problems in the financing and delivery of health services.

Although the institute was formally chartered less than a year ago and its first president, John R. Hogness, left the top health post at the University of Washington to take over the new job only in August, the organization has been developing along lines laid down in the middle and late 1960's. The institute currently faces uncertainties caused by the embattled relationship between the National Academy of Sciences and the National Academy of Engineering (NAE) and the resulting delay in the reorganization of the National Research Council (NRC), the operating arm of the academies (*Science*, 27 April). But at its first annual meeting, held last week in Washington, the institute seemed to be satisfactorily en route toward establishing an identity of its own.

Although it would be extravagant to describe the Institute of Medicine as a cuckoo in the nest, the new organization does represent an interesting hybrid in the Academy setting. The institute is not an honorary society of top doctors. By design, the membership includes, as Hogness puts it, "people in the health professions who have made a major contribution to the health field." Nurses, dentists, hospital administrators, and researchers as well as physicians are represented. More to the point, a quarter of the members are to be drawn from outside the health professions, principally, it appears, from the law and economics and the natural and behavioral sciences.

Unlike the NAS, the institute apparently expects every member to do his duty, basing membership, among other things, on an "expressed willingness to commit a significant portion of time to work, within the Institute," on health problems.

To reinforce these aims, the charter provides that a member not be elected in perpetuity, but for a 5-year term, with one additional term possible. At the end of the terms for which a person is elected, or when he reaches age 66, he becomes a "Senior Member" and may participate in institute activities but may not hold office or vote in institute affairs.

Maintaining a Mix

To what extent the institute will build and maintain a creative mix of members remains to be seen. The charter provides for a maximum of 400 members for the institute, and so far about 110 members have been named. As might be expected, the membership list reveals a preponderance of prominent medical school administrators and faculty members, health administrators, government officials and foundation officers, and a lighter sprinkling of nurses, private practitioners, and laymen connected with health care problems. There has already been some sniping at the predictability of the membership, as well as specific complaints from the biomedical research community that it is too thinly represented on the 21-member executive committee. It is expected that new members will be elected at the rate of about 50 a year, and Hogness indicated at the meeting that action would be taken to correct geographical or professional imbalances or what might be interpreted as discrimination against minorities of various kinds.

The institute intends to be more unabashed than the Academy in deciding what sort of advice to render. Hogness says he expects the institute will be "more aggressive than the Academy has been in the past" in choosing subjects on which to provide advice and believes that the institute "has an opportunity to do definitive studies on issues which affect health policies."

Examples of the issues that the institute is inclined to tackle are to be found in two major studies it is likely to undertake this year. The first is one on problems implicit in universal health care entitlement under an expanded federal health insurance program. Such factors as management capability, financing options, and manpower needs would be examined.

The institute is virtually certain to be asked to undertake a study of the costs of education in the health professions, a study called for in the Comprehensive Health Manpower Act signed into law last week by President Nixon. Hogness says that the plan is to build a central staff of the institute to about 20 persons and to add special staff to carry out individual studies.

An obvious question is how the institute will relate to the NRC's Division of Medicine, which performed the ambitious drug efficacy study over several years in the 1960's. At the start, at least, a division of labor is anticipated, with the Division of Medicine concentrating on more technical subjects, such as the toxicity of halothane anesthetics, and the institute concerning itself with broader policy issues. At the meeting last week, however, Hogness said that the institute and the Division of Medicine "may come closer and closer together and become one organization."

A lot depends on how the differences between the NAS and NAE are disposed. The subject at this point is one of maximum delicacy within the Academy. Last week, NAS President Philip Handler sketched the situation briefly in one of the few portions of the institute meeting closed to the press. Apparently the long process of proposal and counterproposal between the councils of the two academies is likely to produce a crucial decision within the next few weeks, and, with luck, a peace treaty will be submitted to the membership of both academies at their meetings next spring.

At present, the Institute of Medicine is obliged to obtain the Academy's approval before undertaking studies and to submit its reports for review for policy implications. These arrangements seem unlikely to be altered in the near future, but the outcome of the present negotiations could ultimately cause the institute to reconsider the possibility of going it alone.

As a new organization with virtually no old business to transact, the institute last week devoted much time and attention during its meeting to speak-

ers. The evolution of the institute was the subject of a talk by Walsh McDermott, chairman of the department of public health at Cornell Medical School and chairman of the Board of Medicine, the precursor of the institute, established in the academy while Frederick Seitz was president.

Other speakers dealt with more general topics, and, considering the academy setting, there was some incidental irony in the talk by Victor W. Sidel, chief of the department of social medicine at Montefiore Hospital in New York, on medicine in the People's Republic of China. Sidel discussed his experiences on a recent, month-long visit to China, which he said was arranged under the auspices of the Federation of American Scientists, of which Sidel is a board member.

It was not lost on many in the audience that none of the relatively small number of scientists and physicians who have visited China since the selective lowering of barriers began this year have made the trip under the

Nuclear Physics: Does Competition Breed a Monstrous Game?

"You must realise that the ethics usual in the scholarly pursuits, literary and so on, do not apply to high energy physics. Outright dishonesty is prevalent, and there's not much stigma attached to being caught at it. I suppose the referee system is not too bad, but it also is definitely used immorally—to delay your competitor." So says a British nuclear physicist, one of 200 interviewed in a sociological study of competition and its effects on a scientific community. Corollaries of the fight for priority in the British nuclear physics community are suspicion of theft or fraud by other scientists, hasty publication, and reluctance to discuss unpublished ideas or results with potential competitors.

Such at least is the picture put on record by Jerry Gaston, a sociologist at Southern Illinois University, and described in the current issue of *Minerva* [**9**, 472 (1971)]. The study is based on a year's worth of interviews with more than 90 percent of Britain's 220 nuclear physicists. Gaston chose the British section of the nuclear physics community because of the advantages of studying people in another country, but the American section "is very much the same, except probably in this country the competition is much keener," he told *Science*.

As a measure of competition, Gaston chose the percentage of his subjects who had had results of theirs anticipated by other scientists. Nearly two-thirds of the British nuclear physicists reported having been beaten into print. Twenty-six percent of the physicists had had their results anticipated more than once, and 3 percent more than four times. British scientists competing chiefly with Americans were more likely to have their results anticipated than were colleagues working on problems primarily of interest to continental Europeans. Of scientists who said their work was influenced by American and European scientists, 83 and 57 percent, respectively, had been scooped on their research results. This may reflect the larger volume of work turned out by American physicists or the position of leadership in physics that the United States had held for much of the post-war period, Gaston says.

The likelihood of having one's work anticipated turned out to be related not to productivity, but to a scientist's habits of communication. Those who tended to rely chiefly on the spoken word for knowing what was going on were anticipated significantly more often than those who cited conferences and publications as their main sources of information.

What is the reaction to being beaten in a priority race? Besides a certain amount of demoralization, especially among younger scientists, Gaston was often told of plagiary. Whether or not instances of theft were common —Gaston's impression is that they were not—the fear of having one's ideas stolen was real enough. "The theft of ideas was felt to be a major threat to almost all the high energy physicists I interviewed," he reports. Failure to refer to the work of others, a form of petty plagiarism, was also rife, or felt to be rife. Half of the scientists interviewed knew of cases where their work did not receive a clearly merited reference, and 35 percent of these believed the omission was intentional. "It very often happens that people who haven't published much will not refer to your work because the only way they can get their paper into print is by not referring to the preceding paper that has done the same thing," one scientist told Gaston.

The risk of plagiary, whether real or imagined, makes nuclear physicists reluctant to discuss their work. Some three-fifths of the physicists interviewed said they would be secretive about discussing their results, though Gaston notes that natural reticence, as well as fear of being anticipated, may contribute to this attitude. One interviewee told Gaston: "If you have some result which is tentative, you obviously don't want to speak about it if you're not sure; you don't want to make a fool of yourself. I know that while we're supposedly grown men, you get childish rivalries coming in. Physicists are certainly a human lot, there's no doubt about that. They can even be a ruthless lot. I think you will find as much of this here as in industry."

In Gaston's opinion, the fear of plagiary often reflects a scientist's overinflated opinion of himself, and in any case is largely unfounded. "As in the culture of many groups, if something like this happens once or twice, it becomes part of the culture," he says. Gaston was also impressed with the pace of the competition and the ability of individuals whose work had often been anticipated to withstand it.

"It turns out to be a monstrous game," Gaston told *Science*. "I was amazed that, given this amount of competition, people hold up to it so well. In fact, people often change their specialty to less difficult problems, or become administrators. But the effect of anticipation is mitigated by a scientist's colleagues and superiors knowing how the game is played."—NICHOLAS WADE

good offices of the NAS, the traditional agent for international scientific trips and exchanges. The Chinese have indicated that they will not deal directly with the Academy until China-U.S. relations are "normalized," which apparently means not until formal diplomatic relations are established.

The concluding speaker of the meeting was John H. Knowles, general director of Massachusetts General Hospital, a member of the institute, and the next president of the Rockefeller Foundation. Knowles gave an iconoclastic analysis of medical education, physician manpower, and health insurance and challenged the institute to come to grips with such problems lest it become merely a "status organization."

The new institute has set out to influence major decisions in the health field. Hogness himself has reportedly made a start by contributing, along with representative of the Association of American Medical Colleges (AAMC) and others, to Representative Paul G. Rogers' (D–Fla.) development of the House alternative to the Senate's version of the big new cancer research program (*Science*, 22 October). The institute plans to cultivate cooperative links with other national organizations in the health field, such as the AAMC and the American Medical Association, but obviously expects that the spectrum of professions represented in its membership will give it important advantages over more narrowly based organizations. Only the next few years will tell, however, whether the institute will be just, as one member of the audience surmised, "another competitor for funds," or whether it will really carve itself a special niche in the burgeoning ecology of health policy and politics.

—JOHN WALSH

APPOINTMENTS

Robert G. Layer, chancellor, Southern Illinois University, Carbondale, to president of the university. . . . **Edward J. McCarthy**, former president, Biscayne College, to president, Villanova University. . . . **Stanley E. McCaffery**, president, San Francisco Bay Area Council, to president, University of the Pacific. . . . **John H. Ehrenreich**, chairman of watershed management, University of Arizona, to dean, College of Forestry, Wildlife, and Range Sciences, University of Idaho. . . . **Merle L. Borrowman**, dean, School of Education, University of California, Riverside, to dean, School of Education, University of California, Berkeley. . . . **Joseph M. Pettit**, dean, School of Engineering, Stanford University, to president, Georgia Institute of Technology.

RESEARCH TOPICS

Molecular Biology: Gene Insertion into Mammalian Cells

The problem of inserting specific genes into human cells has intrigued molecular geneticists, and the prospect of the successful solution of this problem has concerned everyone. Both the excitement and the concern have grown now that the armchair speculations—and exploratory results—of a few years ago have matured into hard experimental work. The current results of that work indicate that animal viruses, bacterial viruses, and cell fusion techniques are all capable of introducing new functional genes into mammalian cells, although many of the fundamental genetic and regulatory processes in mammalian cells remain unknown.

Much has been learned about the genetic code and the mechanisms of the replication of DNA, the transcription of DNA into RNA, and the translation of RNA into protein, especially in bacterial cells. A clever and sufficiently industrious molecular geneticist can often produce a specific mutation in any of a large number of genes in the bacterium *Escherichia coli*, can delete genes or add new ones from outside the cell, and can then regulate the expression of genetic traits inside the cell. But the extension of these techniques from bacteria and bacterial viruses (bacteriophages) to nucleated (eukaryotic) cells, especially human cells, awaited new tools and more knowledge.

Several biologists have studied the interaction of foreign DNA with nucleated cells. Among these, Pradman Qasba and Vasken Aposhian at the University of Maryland School of Medicine in Baltimore, have recently shown that one type of animal virus can be used to transport DNA from mouse cells into the nuclei of human cells. At the Roswell Park Memorial Institute in Buffalo, W. Munyon and his coworkers have shown that another type of animal virus may have inserted a specific gene into mouse cells without harming the cells. These workers found that the enzyme specified by this gene was made by the cell and that the new gene seemed to be replicated as the cells divided.

Munyon and his group infected mutant L cells (a line of mouse tissue culture cells) that lacked the enzyme thymidine kinase with the animal virus herpes simplex. The virus had been irradiated with ultraviolet light to decrease its ability to kill cells (*1*). Herpes simplex virus normally induces a thymidine kinase activity during infection before it kills the cells, but in this experiment about 0.1 percent of the infected L cells were transformed by the irradiated virus into stable cells that had thymidine kinase activity and were maintained in culture for 8 months. No measurable proportion ($< 10^{-8}$) of control L cells gained the ability to express thymidine kinase when uninfected cells or cells infected with a herpes simplex mutant that does not induce thymidine kinase activity were examined.

These results are consistent with the idea that the herpes simplex virus introduced a gene for thymidine kinase into the L cells and that this gene was then maintained and replicated by the cells. However, Munyon notes the possibility that a herpes gene product may have simply induced the stable expression of a gene that was already present in the L cells.

Aposhian has proposed that pseudo-