in 1964–65, 18 applications were funded, and 12 rejected, for awards totaling $360,206; in the current academic year, 21 were funded and 22 rejected, for a total of $409,843. Most of the witnesses from the small schools agreed, however, that the federal agencies now seem much more interested in them and that it still may be too early for the presidential directive to have taken full effect. Harris, however, concluded that while the statistics got better, "the only other hard result I have seen in the President's memorandum has been the idea that we would simply overlay the present program; there is not any real change in the present program. . . ."

Thus, with the "establishment" in a state of dismay, Harris recessed the hearings. According to his previously announced schedule, they were to be followed this week by a closed seminar with representatives from federal research agencies, complementing the earlier seminar with nongovernment participants. But, without any publicly stated explanation except, "We're not ready for it now," the subcommittee called off the seminar. A subcommittee source, however, privately offered a very different explanation. "The people running the government agencies were handpicked by the bunch we had in for the last seminar. They're not going to tell us anything we didn't hear last time. There's no use getting the party line all over again, so we've called it off for the time being."

Just where Harris is bound with his subcommittee is not certain, but a few things are certain: whatever the merits, hostility to OST and regional discontent are live political issues with ready-made constituencies. Furthermore, the Senator is operating from a political base that cannot be ignored—a tactic that the scientific leadership has found tempting in the past. Harris' parent committee, chaired by Senator John L. McClellan (D–Ark.) contains a few members from states that are more or less in the mainstream of federal research support—such as Kennedy and Javits of New York, Ribicoff of Connecticut, Montoya of New Mexico, and Jackson of Washington. But purely on economic lines, they are outweighed by McClellan and Harris, Ervin of North Carolina, Gruening of Alaska, Muskie of Maine, Metcalf of Montana, Mundt of South Dakota, Curtis of Nebraska, and Simpson of Wyoming. There's not a Californian in the lot; furthermore, the subcommittee is loaded with have-nots: Harris, McClellan, Mundt, and Simpson, with Ribicoff and Montoya the only members from states that rank reasonably high in the R&D totals.

Now, how have the targets of Harris' interest reacted to the events of the past few weeks? Publicly, they are silent, but inquiry among those involved reveals a mixture of pain and puzzlement. One administration staff man pointed out that Hornig and Harris actually share the same goal—good science throughout the country. But, this same aide added, "We can't be expected to strip MIT in order to build up others. What we need is massive amounts of money for institutional development, but with Vietnam in the picture, we can't get it." This observation is quite possibly at the heart of the matter. Harris is not in favor of stripping MIT, but neither is he in favor of short rations for the University of Oklahoma and other institutions that feel deprived. If one may speculate on his feelings, they probably add up to the belief that if the pie can't grow to keep pace with the cries of the have-nots, then perhaps the rich will have to tighten their belts for a while. Which may be what he had in mind when he remarked that the funds designated for development were simply an "overlay" on the present program. Of course it is an overlay, because that is precisely how the scientific governors of the system intend to meet the pressures—with new and separate funds, not by redirecting money now going to support research in the major institutions. For the scientists running the system, it all seems quite logical—more money is the answer to the problem. But politics is often no more than a struggle over scarce resources, and Fred R. Harris is very political.

—D. S. GREENBERG

Space Science: Congressmen Want Larger Voice

Representative Joseph E. Karth of Minnesota and his colleagues on the Space Science and Applications Subcommittee of the House Science and Astronautics Committee are among the latest members of Congress to discover that, in some circumstances, success eludes those who try harder. Karth, who is chairman of the subcommittee, has worked diligently at understanding the programs entrusted to his review, only to find that his recent attempt to second-guess the program planners has cast him in the role of a meddler.

His experience illustrates the classic frustration of Congress in an era of deep government involvement in science and technology. How does it pass judgment on highly technical programs without being either a rubber stamp or an incompetent intruding upon the affairs of experts?

Karth, who by general agreement is an intelligent and unusually hard-working committee chairman, has just retreated from his position that the money the National Aeronautics and Space Administration plans to spend for a Mariner "flyby" of Venus in 1967 would be better spent for a probe of the Martian atmosphere in 1969. The probe would have supplemented the two Mariner flybys of Mars planned for that year. The Senate Aeronautics and Space Sciences Committee supported NASA's plans for the Venus flyby, and its position prevailed in the meeting that was held by House and Senate conferees last month to reconcile differences in the space-authorization bills passed by their respective bodies.

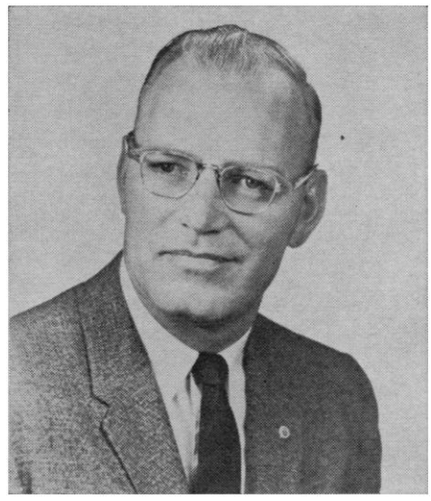
The Senate Committee's review of NASA's space science program is far less thorough than that conducted by the Karth subcommittee. Indeed, when Karth and other conferees from the

House meet with their Senate counterparts they find that the Senators let their professional staff do most of the talking for them. Moreover, the Senate committee has shown no disposition to make the kind of program changes attempted by the Karth subcommittee. In fact, the attempt to sacrifice the Venus flyby in favor of a more ambitious investigation of Mars is regarded as an unprecedented step by a congressional group to set priorities in outer-space exploration.

In upholding NASA on the Venus flyby, the Senate committee noted that NASA's plans were supported by the Space Science Board of the National Academy of Sciences. In May the chairman of the board, Harry H. Hess, head of the geology department at Princeton, wrote to the committee, saying that the Venus flyby could produce significant scientific results. "Furthermore, it is the only planetary flight for which the U.S. has a capability in the next 3 years, a period in which we expect there will be a number of planetary flights by the U.S.S.R.," said Hess in a statement elicited by Senator Clinton P. Anderson of New Mexico, who chairs the space committee.

Hess said that the Venus flyby in 1967 as well as the Mars flights in 1969 would be useful preparation for the ambitious Voyager program of planetary investigation, which is to begin in 1973 with a flight to Mars and the landing of a capsule on that planet. The National Academy's report "Space Research—Directions for the Future," published after the Space Science Board's Woods Hole summer study last year, had given first priority to the investigation of Mars and a strong second priority to the investigation of the Moon and Venus.

Measurements derived from the Mariner II flyby of Venus in 1962 supported the view that the planet's surface temperature may be as high as 800°F. Alluding to this, the NAS report said, "Venus, in spite of an allegedly high surface temperature, nevertheless retains some limited biological interest, for the following reasons: the lack of complete certainty regarding the interpretation of the radio emission as thermal radiation from the surface, the possibility of elevated topography at lower temperature, and the possibility of development of life-forms suspended in the atmosphere. Furthermore, as a sister planet to the Earth, with a



Joseph E. Karth

dense atmosphere of considerable meteorological interest, Venus ranks high in its relevance to terrestrial problems. Finally, the interior of Venus and its rotational and dynamical characteristics are of great interest in connection with the evolution of the solar system."

Moreover, last August before the Senate Space Committee, Gordon J. F. MacDonald, U.C.L.A. geophysicist and chairman of the Space Science Board's working group at Woods Hole on planetary and lunar exploration, indicated that the results of the Mariner IV flyby of Mars in July had raised the possibility that Venus may be of greater interest even than Mars.

The Martian atmosphere was known to be quite thin. But before Mariner IV, atmospheric pressure at the surface of Mars was believed to be somewhere between 10 and 80 millibars, compared with pressure at Earth's surface of 1000 millibars. But now scientists believe that the pressure at the Martian surface is about 10 millibars. Such an atmosphere provides little shielding against ultraviolet radiation, which is a factor to be considered in weighing the possibilities of life forms or ancient biological activity, MacDonald suggested.

Thus, by its decision in April to recommend that the $18 million budgeted in fiscal 1967 for the Venus flyby be applied to a Mars probe, the Karth subcommittee was flouting the judgment of the scientific establishment on a scientific matter. But the spending of $18 million of the people's money is also a political matter, and Karth construed it to be so.

When at one point during the subcommittee hearings a NASA official reminded him of the Space Science Board's priorities, Karth replied: "I do not agree that we ought to leave all decisions bearing on science to the scientists, or that all political decisions should be made by politicians. . . . I don't think we can allow the scientific community to dictate the nature, *in toto*, of our scientific space program, and I don't think that you would want that either, although it appears that that is the trend.

"I sometimes feel the reason we have a many-faceted scientific program is to satisfy the total scientific community," Karth added. While granting that it is important to have the scientific community's support, he indicated that its total support could be obtained only by a diffusion of effort that would make it impossible to concentrate resources on the most promising or important investigations.

The Karth subcommittee is perhaps more prone than most congressional groups to second-guess the experts because three of its members have had technical training, though in varying degree. Karth himself attended engineering school until his education was interrupted by the war. Representative William R. Anderson of Tennessee is a graduate of the U.S. Naval Academy, and was commanding officer of the *Nautilus*, the first nuclear-powered submarine and the first submarine to make the transpolar voyage under the ice. Representative Weston E. Vivian of Michigan holds a Ph.D. in electrical engineering from the University of Michigan, and, until his election to Congress in 1964, he was vice president of an Ann Arbor electronics firm.

The subcommittee, in trying to eliminate the 1967 Venus flyby, had not concluded that Venus had no important place in planetary investigation. On the contrary, it had concluded that the Venus mission was an ill-advised "makeshift and afterthought." No Mariner missions were planned for either Venus or Mars until late last year when NASA learned that budgetary constraints imposed by the Vietnam war dictated a slower development pace for its Voyager program, which is estimated to cost $1.5 billion (Karth says it will cost twice that).

The Voyager mission planned for 1971 would have to be delayed until 1973, NASA found. In order not to let all of the launch opportunities of

the ensuing 6 years go by without a flight, NASA decided to build two new Mariner spacecraft for Mars flybys and to adapt a spare Mariner, left over from the 1964–65 Mars flight, for a Venus flyby.

Karth and his subcommittee noted that NASA had only vague plans for investigation of Venus beyond the 1967 Mariner flight and that even a back-up spacecraft was lacking in case of a flight failure. Also, it was recalled that last year NASA officials had indicated that investment of money and effort in the adaptation of the Mariner IV spacecraft, designed for flight away from the sun, for a Venus flight toward the sun would not be the best use of resources. In recommending cancelation of the Venus mission, the subcommittee said that NASA's concentrated efforts should be directed toward achieving successful Voyager missions to Mars. "We must all accept the fact that the attainment of one goal sometimes requires sacrificing others," it added.

However, the fact is that Karth and his colleagues ultimately abandoned this position and gave the Venus flight at least their reluctant blessing. Why? The awkwardness of upholding their judgment against that of the scientific establishment undoubtedly encouraged the retreat, but there were other factors as well.

Preparations for the Venus flight already had begun, and cancellation of the mission would have meant a loss of considerable time and money. Moreover, there is general agreement that time is now too short to permit development of the instrumented probe proposed for Mars in 1969.

In addition, the Karth subcommittee was given a consolation prize. The conference agreement worked out with the Senate provided that NASA submit, by 1 September, to the House and Senate space committees a "full report on the alternative approaches deemed scientifically, technically, and fiscally feasible for acquiring fundamental knowledge about the planet Venus."

The agency is to define the relationship of Venus exploration to the exploration of other planets, doing so in terms of opportunities, mission possibilities, and scientific priorities. One high-level NASA official, who has felt that the Karth subcommittee overreached itself in trying to set scientific priorities, says that the demand that NASA clarify its objectives is all to the good. "I'd say that now the right kind of pressure has been put on us," he remarked.

In talking to Karth, however, one senses a lingering frustration and wonders how long it will be before he and his subcommittee colleagues again let NASA—and its scientific advisers—know that they intend to have a voice in the running of the space science program, too.—LUTHER J. CARTER

Ivan Bennett of Johns Hopkins Appointed Deputy Director of OST

Ivan L. Bennett, director of the department of pathology at Johns Hopkins University, was named this week to succeed Colin M. MacLeod as deputy director of the Office of Science and Technology. MacLeod, who joined OST in late 1963, will join the staff of the Commonwealth Fund in September. He previously was professor of medicine at New York University. Bennett is a member of the President's Science Advisory Committee and is chairman of the PSAC subcommittee on world food supplies. The deputy directorship, which is subject to Senate confirmation, pays $27,000 a year.

Announcements

The University of Cincinnati is planning a 7-year program to develop a Center for Study of **Human Environment**. The project will be financed through a $6.5 million grant from the Public Health Service. The center, representing areas in several divisions of the university, is to coordinate existing programs and expand activities into new areas of environmental health and to set up improved research and training activities in cooperation with local, state, and federal agencies. The university's Environmental Health Council is responsible for operating the center; its chairman is Edward P. Radford, professor of environmental health and physiology.

The headquarters and faculty of the **Food Research Institute** have been transferred to the University of Wisconsin. The institute, established in 1946 at the University of Chicago, will be a unit of the college of agriculture at Wisconsin; its programs deal with the microbiology and toxicology of foods. Its first director, Gail M. Dack, will retire from the Chicago faculty in September and will become a part-time member of the Wisconsin faculty. E. M. Foster, bacteriology professor at Wisconsin, is the new director.

New Journals

Oceanic Abstracts, vol. 1, State of the Art—Instrumentation. June 1966. E. Sinha, Editor. Abstracts of literature which appeared between mid-1964 and May 1966; includes a list of authors and a list of manufacturers. (Oceanic Library and Information Center, 7730 Herschel Ave., La Jolla, Calif. $12.50)

Respiration Physiology, vol. 1, No. 1, 1966, P. Dejours, Editor. "The body considered as a system of gas exchange"; theoretical papers, research results, methods and techniques in respiration physiology. (North-Holland Publishing Co., P.O. Box 103, Amsterdam. Quarterly; $15 a year)

Scientific, Engineering, Technical Manpower Comments; distributed on a limited basis free of charge since 1964; as of September 1966, subscriptions available. Summary of current developments affecting recruitment, training, and utilization of scientific, engineering and technical manpower; published jointly by the Scientific Manpower Commission and the Engineering Manpower Commission. (Subscriptions: Scientific Manpower Commission, 2101 Constitution Ave., NW, Washington, D.C. 20418. Monthly, $6 a year)

Scientists in the News

The Chemical Institute of Canada medal, the organization's highest award, has been presented to **William H. Gauvin**, research manager of Noranda Research Centre, Pointe Claire, Quebec, and research associate in charge of doctoral research theses in McGill University's department of chemical engineering.

William G. Craig, headmaster of the John Burroughs School in Clayton, Missouri and a former director of training for the Peace Corps, has been appointed deputy associate commissioner for higher education in the U.S. Office of Education. He will assist in administering programs in the Bureau of Higher Education which provides aid to students and support for colleges and universities.