taken to insure that no further grants are made to individuals whose public statements and actions are clearly intended to give aid and comfort to the enemy." To which Haworth replied, in a letter dated 27 September, that, on the basis of a policy formulated in 1957, the Foundation does not give grants to Communists, officially certified subversives, or advocates of unconstitutional change of government. Concluded Haworth:

> I have discussed the facts involved in the Smale situation, insofar as they are now established, with the Executive Committee of the National Science Board, with particular reference to the above policy. After careful consideration, we reached the conclusion that the principles on which the policy is based remain valid, and that while this policy may, on rare occasions, permit support of the research of an individual who can be considered to have acted improperly, the policy provides a sound frame of reference for the support of unclassified research by the National Science Foundation. Under this policy, the known facts regarding Professor Smale provide no basis for termination of support to the University of California with respect to next year's summer salary to Professor Smale.

Hall responded by dispatching Haworth's reply to Secretary of State Dean Rusk, with the comment: "I cannot believe that the Department of State would take the same attitude on the grant as the National Science Foundation, and I would appreciate your comments on the matter." That is probably a reasonable speculation, but then Congress, in its wisdom, did not make the Department of State responsible for supporting basic research.

On 30 September Berkeley decided that Smale had properly accounted for his summer research activities and sent him his pay. And that is the end of the chapter, and possibly the end of the story.

However, persons associated with the uppermost policy level of NSF remain quite unhappy and even a bit sore about the whole business. They point out that Smale gets his money from NSF, but, to get that money, NSF officials have to go before a congressional committee that regularly slaps them around. As one of them put it, "It's getting tougher and tougher to get money for basic research, and we are probably going to have to pay a stiff price for defending Smale's right to sound off on Vietnam." He agreed, however, that it was a vitally important right, and ended up sounding quite tired about the whole affair.

—D. S. GREENBERG

Scientist-Astronauts: Only the "Perspicacious" Need Apply

The National Aeronautics and Space Administration, which had often been accused of failing to give proper emphasis to the scientific aspects of space exploration, 2 years ago began—as one answer to its critics—an effort to recruit scientist-astronauts. While this effort resulted in the appointment last year of six scientists for training as astronauts, it fell short of its goal. NASA had hoped to appoint as many as 20 such trainees. Now NASA is recruiting again, this time giving the National Academy of Sciences a larger role in order to take advantage of the long-established lines of communication between the Academy and the scientific community.

The Academy has agreed to spread the word about the scientist-astronaut program among university science departments, and to do all but the final screening of candidates. In the last recruitment campaign NASA sent announcements to the universities, but in many cases these notices seem to have received scant attention.

Results of the new recruiting effort are likely to be disappointing unless promising young scientists are convinced that the manned space flight program offers them opportunities for important scientific work. Conscious of this, the Academy's Space Science Board, which serves as NASA's scientific advisory body, has promised to keep an eye on the program and to help the scientist-astronauts continue their growth as scientists.

In simultaneous announcements on 26 September, NASA and NAS said that applications for the scientist-astronaut program will be received through 8 January 1967.* Successful candidates will be notified of their selection before 30 June and told to report to the Manned Spacecraft Center at Houston on 15 July. As many as 20 candidates may be accepted if that number survive the rigorous screening.

To quote an Academy brochure, the quality most needed by a scientist-astronaut is "perspicacity." He must, the brochure says, be able to quickly pick out, from among the thousands of things he sees, those that are significant, and to synthesize observations and develop and test working hypotheses.

Some 1400 persons applied to NASA after the first recruitment effort was announced in October 1964. NASA screened out about 1000 candidates, whose applications showed that they did not meet the minimal criteria. The applications of the remaining 400 candidates were submitted for further review to an *ad hoc* NAS panel. The panel, which is to screen candidates again next year, was (and is) chaired by Eugene M. Shoemaker, chief of the U.S. Geological Survey's astrogeology branch. Harry H. Hess, head of Princeton's geology department and chairman of the Space Science Board, was among its members. Only 16 of the candidates were recommended to NASA by the panel. Of these, NASA selected six (one later resigned) after the candidates had been given a physical examination and put through a space simulation program to test their ability to withstand the stresses of launch, space flight, and reentry.

The extremely low survival rate among the 1400 applicants was due to a variety of reasons. A high perspicacity quotient does not, of itself, assure one of being chosen as a scientist-astronaut. The minimal criteria for selection are difficult to meet. An applicant must have a doctorate in the natural sciences, medicine, or engineering, or be assured of completing all requirements for a degree by 15 July 1967, or, if he lacks

* For further information, prospective applicants should write to Scientist as Astronaut, National Academy of Sciences–National Research Council, 2101 Constitution Avenue, NW, Washington, D.C.

a doctorate, he must have the "equivalent in experience"; he must be a citizen of the United States on or before 15 March 1967, have been born on or after 1 August 1930, and be no more than 6 feet tall; also, he must meet the physical requirements which apply in the case of pilot crew members.

These criteria are much the same as those used last year, but with one possibly significant difference: strict observance of the age, height, and physical requirements may be waived in the case of applicants who are otherwise outstandingly well qualified. Some promising candidates were eliminated last year because they were slightly over age, or were a fraction of an inch too tall, or did not have 20/20 vision.

(Women scientists are not ineligible, but, as one NAS panel member put it, they have a strike against them. An astronaut's training is long and costly, he observed, and there will be "no time off for having babies.")

A third or more of the candidates considered by the NAS panel had no doctorate, and nothing in their applications was found to support their hope that they had the equivalent in experience. And although the panel's mandate was to judge the applicants' scientific qualifications, it also considered their fitness to take part in hazardous space missions.

The confidential questionnaire filled out by the five "referees" selected by each candidate contained such questions as, "Does the applicant keep his head in an atmosphere of confusion?" and "Have you ever observed him in field or laboratory situations under conditions involving fatigue, strain, or danger?" The panel was looking especially for people with extensive field ex-

Grand Canyon Dams: Interior To Ask, "Are They Necessary?"

As conservationists have long urged, the U.S. Department of the Interior is now undertaking a review of the controversial proposals to build hydropower dams in the Grand Canyon as a means of financing water supply projects in the Colorado River basin (*Science*, 17 June 1966). The review, first mentioned publicly at a press conference last week by Secretary of the Interior Stewart L. Udall, may be one of the early signs of a major new departure in water resource planning. Thorough consideration of such alternatives to the canyon dams as nuclear and coal-fired steam generating plants is supposed to be the primary purpose of the review.

The Bureau of Reclamation, an Interior Department agency, never has built such plants and does not want to provoke a fight with private utilities by proposing to build some. Both the bureau and the politicians of the Southwest favor hydropower, traditionally used to produce revenues for reclamation and water supply works, as the most politically expedient means of earning money for a large aqueduct to bring water to Phoenix and Tucson and for other projects. Members of Congress from the Southwest propose building two dams in the Grand Canyon, at the Bridge and Marble canyon sites. The Johnson administration has advocated only one dam, which would be built in Marble Canyon.

However, some economists believe that steam plants would prove more profitable than hydropower dams for the bureau's Colorado "basin account." The dams would serve no water storage function. With the existing Hoover and Glen Canyon dams, storage capacity on the Colorado is more than ample.

The canyon dam proposals are part of a large, complicated bill which contemplates, among other things, a study of the feasibility of importing water to the Colorado basin from the Northwest. For the moment, the bill is stymied. Conservation groups are bitterly opposed to construction of the canyon dams, the reclamation states are sharply divided over the importation study, and California is fearful that the legislation might be adopted in a form that does not recognize the priority of her claim to a certain share of the Colorado's waters. Sponsors of the legislation have virtually given up hope of obtaining its passage before the 89th Congress adjourns. Thus, plenty of time is left for Interior's review of the canyon dam proposals and the available alternatives.

In a speech last July the then Under Secretary of the Interior, John A. Carver, Jr., who recently left Interior to become a member of the Federal Power Commission, indicated that Interior was changing its approach to water resource development planning. The speech, which reflected Secretary Udall's own views, amounted to a frank admission that the traditional approach was faulty.

Carver said that Congress and the public should be informed of the alternatives to hydropower as a means of financing water projects. "Present procedures," he said, "do not provide an adequate comparison of such alternatives. . . . Classically, legislation, whether it be for a project or a government policy, has been presented by the executive branch to the legislative branch as an act of advocacy, the best possible case for a particular course of action or a single project. The process of identifying alternatives—indeed of discovering whether any exist—is left to the arena of countervailing powers in the political process."

The Under Secretary said he was worried by the "headlong incursions" of public and private decision-makers into complicated resource development schemes. He had observed that one of the proposed Colorado dams would detract from the beauty of the Grand Canyon's inner gorge.

The budgeting–program planning methods which originated in the Pentagon and are now being adopted by Interior and other government agencies will allow more objective appraisals of water projects, Carver indicated. The new methods, he said, require the "examination in detail of alternative goals and alternative programs which would . . . meet the same basic needs." Carver said that these procedural reforms won't be accomplished overnight; this probably was an understatement, for resistance within the Bureau of Reclamation and within Congress to attempts to break old and cherished habits no doubt will be strong.—L.J.C.

perience. The more promising candidates also were judged on the research papers and essays (containing their ideas on space research, for example) which they submitted at the panel's request.

In a word, the selection process for scientist-astronauts is such that only hardy individuals with the keenest interest in space exploration need apply. However, according to the prospectus prepared by the Academy, the rewards for the persons chosen will be great. While there seems little likelihood that a scientist-astronaut will take part in the first Apollo flight to the moon (though no one has officially ruled this out), scientist-astronauts are expected to participate in later flights.

"Concurrently with the Apollo flights, and in the post-Apollo programs, manned earth-orbiting laboratories above the earth's atmosphere will permit long-term studies in astronomy, solar physics, magnetic fields, and space radiation," the Academy brochure says. "Viewing the earth from space, investigations in meteorology, oceanography, and geology will also be possible. Biologists and physicians will be able to study life processes in the weightless environment afforded by the manned orbiting systems." The size and scope of the post-Apollo program, it must be added, will remain a matter of speculation until the administration presents it to Congress next year and receives authority to proceed.

Since scientist-astronauts will spend only a small part of their time in space, a key question is, How much of their time on earth will be devoted to scientific work? The scientist-astronauts appointed in June 1965 spent their first year in flight training to qualify as jet pilots. Most of the scientist-astronauts recruited next year presumably will undergo flight training too, although NASA is saying only that they will be given flight training as "appropriate."

Training at the Manned Spacecraft Center at Houston starts with 4 to 6 months of "academic" instruction in such subjects as geology and spacecraft systems. Following this, the scientist-astronauts will spend another 12 months becoming thoroughly familiar with the Apollo spacecraft and its subsystems.

However, during the astronaut training phase the scientist-astronauts will be encouraged to continue work in their own specialty. According to Donald Gregory, executive officer for flight crew operations at Houston, they will be allowed a generous amount of time for that purpose. They may get a week each month for research, plus a day of each of the other 3 weeks for journal-reading and other scientific pursuits. They would be free to do research at the Spacecraft Center's own laboratories, at their home university, or perhaps at one of the three local universities (Rice, Texas A & M, and Houston).

Each of the scientist-astronauts will be expected to work out, in agreement with NASA, his own program of research. Much preparatory work for the lunar and earth-orbital flights is yet to be done. For example, investigations being prepared for Apollo include lunar-surface experiments, geological exploration, and lunar-sample analysis.

Once their basic training is completed the scientist-astronauts will devote much of their time to maintaining their proficiency as astronauts and to participating, as students and as teachers, in science-training programs. They will, of course, be drawn from a variety of disciplines, and the science training is expected to increase interdisciplinary understanding. (In the present group of scientist-astronauts are a physician, a geologist, and three physicists.)

Willis B. Foster, NASA's director of manned space science programs, believes that, once trained, the scientist-astronauts will spend 2 or 3 days a week on scientific research. Again, much of this work will be done at places of their choosing. Their research opportunities will be enhanced if and when the Spacecraft Center's new space science division begins to flourish. The division's eight laboratories include facilities for research in such fields as geophysics, geochemistry, optics, and radiation.

The space science division, put together from units formerly a part of the Spacecraft Center's engineering development directorate, seems a long way from attaining the strength in scientific personnel needed for a major space research center. The division employs 68 scientists and engineers, but of those only four hold Ph.D.'s (all in geology). Nine of the 15 professionals who hold master's degrees are Ph.D. candidates.

The Space Administration, together with the Space Science Board, has been trying for several months to find a prominent scientist who will agree to accept appointment as director of the division, which is now headed by an acting chief. The Space Science Board has been urging NASA since 1962 to establish a space science division or institute at Houston. But Harry Hess, the board's chairman, predicts that, unless it is headed by the right man, the division will be a dull place.

However, with further effort by NASA and with the solicitude of the Space Science Board, the scientific component of the manned space flight program should continue to expand and improve in quality. The recruitment of scientist-astronauts may symbolize the coming of a new phase in the space flight effort. As the program's leaders gain more confidence in the rapidly developing space flight technology, their preoccupation with engineering tasks and the problem of putting men into space and getting them back should diminish.—LUTHER J. CARTER

John F. Kennedy School: Helping Government's "In-and-Outers"

Harvard University, which already maintains extensive contacts with political power, has now taken steps to become the American university most committed to increasing communication between the academic and political worlds. In recent weeks it has become clear that the institutions associated with the memorial to John F. Kennedy in Cambridge will become the principal bridge linking Harvard to practical politics.

On 19 September the Harvard Corporation and the Kennedy Library Corporation announced that they had petitioned the Massachusetts Supreme Judical Court of Suffolk County for permission to create the John Fitzgerald Kennedy School of Government by combining the School of Public Ad-