American Institute of Biological Sciences (AIBS) can only be regarded as relatively minor aberrations when viewed against NSF's achievements over a dozen years, but a thousand well-chosen grants for basic research gain scarcely any public recognition while the AIBS story was amply reported by the Washington press. As a consequence, NSF was in the position of seeking its largest budgetary increase at a time when (i) the impression was growing on Capitol Hill that the foundation's administrative practices needed revision, and (ii) a new and unknown director was due to take office in a few months.

By themselves, these factors probably would not have been enough to account for last year's axing of the appropriations request, but they coincided with a number of others that contributed to the committee's parsimonious attitude.

First of all, the NSF budget ran directly into a surge of congressional uneasiness about the size of the overall federal research and development budget. It has taken a lot of congressional hearings over the past year to drive home the point that development —in which NSF plays no part—takes the lion's share of R & D expenditures, and that basic research is very different from developmental research in personnel, costs, and objectives. Congress now seems to have absorbed that lesson, but last year the general sentiment was that R & D had gotten out of hand, and that it would be best simply to hold everything fairly steady while the situation was appraised. Thomas's committee, after years of dealing with NSF programs, had a clear appreciation of the distinction between basic research and the large-scale and costly engineering programs that come under the heading of development, but the mood of "wait and see" was in the air, and it dovetailed with the committee's general sentiments.

Further contributing to last year's decision was a good deal of irascibility over the geographical distribution of research funds. When NSF sought funds for what has since become its Science Development Program (*Science*, 10 Apr. 1964), the committee angrily declared that NSF had failed to achieve an equitable distribution of its funds. NSF argued that the development program was intended to promote the growth of centers of excellence in areas outside the mainstream of federal research support, but the committee was unimpressed and, in effect, decreed that if funds were not being evenly distributed, additional funds would not be made available to correct the situation. The committee subsequently directed NSF to refrain from starting new programs, thus barring the start of the science development program and a $25-million training grant program for graduate training in engineering, mathematics, and the physical sciences.

It isn't too much to say that the committee's treatment of witnesses, as well as its financial verdict, had a traumatic effect on the leadership of the scientific community. On several occasions, at hearings before other congressional committees, scientific witnesses spoke out—sometimes bitterly—about the fate of the foundation's budget. And, though it was late in the game for NSF's constituents—the universities—to come to the foundation's support, numerous letters and personal visits to members of Congress made it clear that the committee's decision was viewed with deep concern by a good many responsible people.

Second Thoughts

It is difficult to pin down just what may have transpired in conversations with members of the committee itself, but it appears that the outcry that followed the budget action led at least some of them to conclude that they may have been unduly harsh in their treatment of NSF.

This appraisal is supported by the fact that, before the committee completed its hearings on the latest NSF budget, it informally gave the foundation permission to go ahead with planning for the Science Development Program. The foundation, in turn, recognized that in this tight budget year it would not be prudent to seek too large an increase. Last year, starting from a base of $322 million, it sought an increase of $236 million, and ended up with an increase of only $31 million. This year the requested increase was $134 million. The House verdict is $67 million, but when the final decision is in, it is likely that the sum will be close to $100 million. That's still far short of what the foundation could usefully spend, but considering the situation that prevailed only one year ago, it appears that the foundation and its friends have grounds for a bit of cheer.—D. S. Greenberg

Engineers: Plans for Playing Broader National Role Include National Academy of Engineering

Current efforts to bring into being a National Academy of Engineering can be viewed as one aspect of a growing movement among engineers to render public service and to exert influence on national affairs in a more organized and more effective way.

The proposed engineering academy would not only provide a means for granting high-level recognition of achievement in engineering but would also furnish basic machinery for giving advice to the government and for conducting authoritative studies on problems in which engineering is important. The model, obviously, will be the National Academy of Sciences and, as a matter of fact, NAS president Frederick Seitz late last month appointed 25 leading engineers to a committee to formulate plans for the new academy.

There is little question that irredentist sentiment is fairly widespread among engineers because of a feeling that scientists in the past two decades or so have moved into places of status and power formerly occupied by engineers on the national scene and, particularly, vis-à-vis the federal government.

A vigorous expression of the view held by many engineers is to be found in the spring edition of the *Engineer*, the quarterly news tabloid published by the Engineers Joint Council (EJC), the leading national federation of engineering professional societies, which devotes itself to manpower and engineering education problems and other policy matters which concern engineers.

William R. Marshall, Jr., associate dean of the University of Wisconsin's engineering college and a newly elected vice president of EJC, the *Engineer* said, "would like to see a reaffirmation of the importance of engineering to the nation. He believes that science to an unwarranted extent has been accorded recognition for achievements which rightly belong to the engineers. Moreover he thinks that scientific leadership, in taking on essentially engineering projects, has caused unwitting mismanagement and unwarranted allocations of large sums of public money. As illustrations he cites Project Mohole, Project Vanguard, and the Sugar Grove National Observatory.

" 'Large so-called scientific projects of national scope require an engineering overview and direction,' he says. This overview consists of getting the project done with available information and a minimum amount of research as opposed to the academic and research point of view of waiting to acquire more and more detailed research results.

" 'Engineers must also understand the limitations of science as well as its potential and they must develop the judgment and courage to extrapolate science in solving engineering problems. Engineers must recognize their potential role as administrators of science and scientists. This will require engineers to keep knowledgeable on the developments of science, both natural and social.' "

The disgruntlement of the engineers appears to result from the turn government-science relations took in World War II and its aftermath. While engineers were heavily engaged in war production and military engineering work during the war, it was scientists from the university laboratories who moved into new and then esoteric fields—radar and atomic energy, for example—to unite theory and application to produce the novel and decisive weapons of the war. It is true, for example, that probably more than 60 percent of the professionals involved in the Manhattan project were engineers, but it was the chemists and physicists and mathematicians who dominated, or, at any rate, got the credit.

During these same years the seeds of federal dependence on university scientists and university laboratories for basic research and much development work were planted, and after the war this dependence burgeoned.

To be sure, engineers have by no means been shut out either as consultants or as holders of key posts. To cite only a few of those who have been elected to the engineering section of the National Academy, Vannevar Bush is generally recognized as the chief organizer of the scientific research and development effort during the war and a main architect of the National Science Foundation; Harvey Brooks and E. R. Gilliland have been influential members of the President's Science Advisory Committee; H. L. Dryden is deputy administrator of the National Aeronautics and Space Administration; and Jerome B. Wiesner was science adviser to President Kennedy and first director of the Office of Science and Technology.

But it tends to be those who are known by the hyphenated title of scientist-engineer or hold dominating positions in the better-known engineering schools who have achieved recognition and the invitations to serve on the prestige federal panels.

The anatomy of the engineering profession differs distinctly from that of the sciences, and this in part accounts for the engineers' past restraint in participating in public affairs. Far more engineers than scientists make careers in private industry, and engineers are much less involved in the advisory and consulting traffic in Washington than university scientists because of conflict-of-interest implications. Also, whether deservedly or not, engineers as a group are depicted as not only hard-headed but conservative types who might look sourly on any entanglement with government.

Within engineering there are a host of specialties which differ widely in subject matter, as, for example, electrical engineering, industrial engineering, agricultural engineering, and sanitary engineering differ.

Conflict Breeds Indifference

Engineering specialties are fairly tightly organized into professional societies. The aims of these different societies sometimes conflict, and these conflicts have contributed to the relative indifference, until recent years, of the engineering profession as a whole toward organized effort in public affairs.

In the last few years, however, engineers have increasingly been feeling the pangs of unrequited merit. They have seen the space successes attributed to the work of "space scientists" and the contributions of engineers hardly mentioned. The drop in engineering enrollments compared to enrollments in science and mathematics has caused concern. And some engineers are irked because only about 50 of the more than 600 members of the National Academy of Sciences are engineers, when there are about twice as many engineers as scientists in the country.

The proposal for a National Academy of Engineering gained some momentum in 1960 when representatives from leading engineering groups and from the NAS undertook serious studies of the need for, and feasibility of, an engineering academy. Last year the National Academy voted formally to cooperate in action which would give greater recognition to engineering, and in November a firm proposal for a new academy was put before the Academy.

In January a meeting on "National Engineering Problems," sponsored by the EJC, was held in Washington. Big engineering meetings have usually been held in New York, and the change of venue was arranged by Eric A. Walker, president of Penn State and the outgoing president of the EJC. Walker has been an advocate of greater activity by engineers in national affairs, and the confrontation of engineering association officers and staff in Washington with federal officials seems to have rallied the profession to resolve to take up the challenge.

Incidentally, the engineers seem also to have been reassured by the advice of an Internal Revenue Service speaker to the effect that the tax-exempt status of their associations would not be compromised by reasonable activities in the field of public affairs.

Within the National Academy of Sciences there seem to have been some misgivings about the separatist movement by the engineers. Wouldn't establishment of an engineering academy sharpen the differences between science and engineering at a time when, in many fields, they are and should be drawing closer together? This and many questions of NAS-NAE relationships must be worked out, such as what will happen to the present engineering section of the NAS. But NAS officials have given the green light, apparently on the understanding that the two academies will maintain close liaison and that the National Research Council can be the operating arm of the academies jointly.

The new committee, which will have the job of developing criteria for eligibility and finally applying for a charter from Congress, will also propose the first 100 members of a group which is expected eventually to number 300. It was originally announced that the committee was expected to finish its work in a few months, but insiders say a year is a better guess.

Members of the committee are listed below, with the names of members of the NAS starred.

Augustus B. Kinzel*, vice president for research, Union Carbide Corporation, chairman; Eric A. Walker, president, Pennsylvania State University, vice chairman; H. W. Bode*, Walker L. Cisler, Hugh L. Dryden*, Elmer W. Engstrom, William L. Everitt, Antoin M. Gaudin, Michael L. Haider, George

E. Holbrook, J. Herbert Hollomon, Jr., Thomas C. Kavanagh, James N. Landis, Clarence H. Linder, Clark B. Millikan*, Nathan M. Newmark, W. H. Pickering*, Simon Ramo, Arthur E. Raymond*, Thomas K. Sherwood*, J. A. Stratton*, C. G. Suits*, F. E. Terman*, Charles Allen Thomas*, and Ernst Weber. Harold K. Work, associate dean, school of engineering and science, New York University, is executive secretary.—JOHN WALSH

Faculty: New Federal Survey Shows Distribution by Field and Differences in Salaries

A recently released report† on a survey by the Office of Education provides a rough and ready assessment of how the approximately 137,000 teaching faculty in American 4-year institutions of higher education are distributed according to teaching fields and what they are paid.

The survey showed that in the 18 primary teaching areas covered by the survey, median salaries for the 1962–1963 academic year were highest in law, engineering, physical sciences, psychology, and biological sciences, in that order. The five lowest-paid areas from the bottom were the health fields, home economics, English, physical education, and fine arts.

Some caveats have to be observed, however, because statisticians' methods often conceal as well as reveal. For example, the low rating on the salary scale of the health fields is partly explained by the lumping together of medicine and dentistry, in which teaching salaries are high, with pharmacy, nursing, and other health fields, in which teaching salaries are lower. High pay for senior medical school faculty no doubt accounts for the fact that the highest annual salary—by $5000—in any area noted in the survey is the $25,000 for professors at the 90th percentile of pay ranks of faculty with calendar-year contracts in the health fields.

Special circumstances also account for teachers of law having the highest median salaries for the academic year —$12,000, compared with a $7700 median for teachers in all subjects. Only 1 percent of the total faculty teach law, and the teachers of law counted in the survey were generally senior faculty in university professional schools.

Therefore, some caution is in order in approaching the survey, but it does offer a useful look at the gross characteristics of what the surveyors call the faculty "universe." And a more detailed and highly refined version of the study is due later.

In terms of median academic-year salaries for both university and college teachers, engineers draw the highest salaries in the scientific and technical fields. The median for engineering faculty is $8700; for physical sciences, $8500; for biological sciences, $8100; and for mathematics, $7700. In psychology, which is allotted a separate category, the median is $8200, and in the social sciences, $7800.

Regional differences in salaries were marked mainly in that institutions in the Southeast paid substantially lower salaries than colleges and universities in other parts of the country. The median academic-year salary in the Southeast was $6800, compared with $8000 in the North Atlantic area, $7900 in the West and Southwest, and $7800 in the Great Lakes and Plains region.

The divergence in pay was sharpest at the professorial level. Professors' salaries were from $1000 to $6000 a year lower in the Southeast than in other regions, while at the assistant professor level the differences in several fields were not so conspicuous.

It will probably surprise few to learn that universities, private and public, pay more on the average than 4-year colleges. The figures, again for the academic-year median for all ranks, are $8400 for the universities and $7200 for the colleges.

Covered by the survey were not only colleges and universities but independently operated teachers colleges and 4-year schools of technology. Junior colleges were not included, nor were theological schools, schools of art, or independent schools of medicine, law, or business.

The Higher Education Surveys Section of the Office of Education's Division of Educational Statistics designed and conducted the survey. About 13,000 responses were used to provide a representative "sample" of slightly less than 10 percent of the total teaching faculty. The Office of Education says the survey is the first full-scale study of its kind to be made in the United States.

The survey indicates that more than a third of teaching faculty are in the fields of engineering, mathematics, and the physical and biological sciences. The most populous primary teaching area, and perhaps the broadest category, was social sciences—including anthropology, economics, history, political science and government, social work and sociology—with 12.3 percent of the total faculty.

Next came fine arts, with 9.7 percent. Both English and journalism and physical sciences had 8.6 percent of the total faculty. (Under the survey definition, physical sciences included physics, chemistry, and geology and other earth sciences.) Biological sciences had 7.9 percent of the faculty; engineering, 6.9 percent; the health fields, 4.7 percent; and psychology, 2.8 percent.

The survey also appeared to confirm the assumption that there are richer and poorer institutions, among both private and public institutions, but that the richest and the poorest are private.

At the lower end of the pay scale, for example, professors of biological sciences at the 10th percentile (in respect to salary) made $8900 a year in public universities and colleges, compared with $6700 for those in private institutions. Near the top of the scale, on the other hand, the gap closes. At the 90th percentile, professors of biological sciences were paid $13,900 in public institutions and only $400 less in private colleges and universities. In the physical sciences the professor at the 90th percentile in the private university or college was paid slightly more than his counterpart in the publicly controlled university—$15,500 as compared with $15,300—and in engineering the advantage for top men was even more pronounced—$17,000 for academic-year salary in the private sector against $14,500 in the public.

The study results seem to bear out the assumption, fairly widely held in academia, that faculty in scientific and technical fields are more affluent than faculty in the social sciences and, especially, the humanities. It is true that a comparison of academic-year salaries shows no really dramatic differences among fields. And, particularly in the case of faculty with tenure, salaries in some other fields—foreign languages and business and commerce, for example—equal or exceed salaries in the scientific and technical areas. But the academic-year contract salaries, of course, do not reflect the income which

(*Continued on page 1074*)

† *Teaching Faculty in Higher Education, 1962–63; Primary Teaching Areas and Contract Salaries*, publication OE53022, for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.; price, 20¢.