Frank H. Westheimer

spectrometers. From the number of use-citations per 100 papers, the committee found that the total use-rate of the seven rose from 44 in 1952 to 119 in 1964; it also noted that the older instruments, such as the ultraviolet spectrometer, which was available commercially even before World War II, held at a constant use-rate of 22 for the 12 years reviewed. And it concluded, "The use-rate of 119 shows that, on the average, more than one piece of expensive chemical equipment was needed for each of the research problems reported. Besides the threefold increase in the use-rate of instrumentation, there has been a more than twofold increase in the number of papers published per year in the 12-year period. Therefore, the total reported frequency of instrument use in chemistry research has increased more than sixfold in 12 years."

Comparing the national patterns of uses of these instruments, the committee found that the relative use-rates are similar, and that the infrared and ultraviolet spectrometers are the most commonly used instruments. In total use rate, however, it found that the Soviet Union lags far behind the other major nations, and that the United States runs far ahead of all others in the use of computers. (The chemistry study, like many of its counterparts in the science study field, also extracts some mileage from the Soviet scene, noting that "the Soviet Union has announced a 7-year program for a $46 billion expansion of Soviet chemical industry. Presumably such a massive effort in industry will require added emphasis on basic research as well." Presumably, too, when the Soviet chemists make their pitch, they will cite *Chemistry: Opportunities and Needs.*)

How well equipped are the university chemistry laboratories? To get an answer, the chemistry committee made what is probably an unprecedented inventory of instruments throughout the institutions under study, and they came to the conclusion that the accumulated investment in major equipment, homemade or purchased between 1954 and 1964, totals about $55 million; or, as the report notes in another interdisciplinary comparison, the total, covering 4100 instruments acquired by 125 departments over 10 years, "is an amount intermediate between the estimated cost of a single high-resolution radio telescope and the amount budgeted for oceanographic ships in 1962 and 1963; it is less than half the amount allocated for the Stanford linear accelerator. Yet the latter is a single instrument for research in high energy physics." As demands grow and the overall budget for research fails to keep pace, the sounds of strife grow in the once-sedate scientific community.

How much do the chemists say they need for new instruments? Again, the sums are relatively small. In a survey conducted 2 years ago by NSF, 121 departments said they needed a total of $20 million to make up the "deficit" beyond their regular spending, which now totals about $11 million a year. The chemistry committee estimated, on the basis of replies to its questionnaires, that the deficit now totals about $300,000 per department, and suggested that the total needed to cover this deficit may be as high as $35 million.

If the committee has, in fact, developed an accurate assessment of chemistry's financial plight, it is useful to ask why, in an era of affluent science, this relatively inexpensive and highly important basic field has fallen so far behind. The answer offered by the report is that no one agency in the U.S. government is charged with looking after chemistry, and that therefore it has been neglected principally because of oversight. The committee does not propose establishment of a new agency to correct this, but suggests rather that the Office of Science and Technology use its influence to correct the matter.

If oversight is the cause, it is interesting to determine why it has occurred. Chemists, it should be noted, have ranked high in the government science advisory apparatus that is charged with looking after the health of science. George B. Kistiakowsky and Donald F. Hornig, two of the four men to serve as White House science advisers, are chemists; Glenn T. Seaborg, chairman of the AEC, is a chemist; and chemists are well represented on the President's Science Advisory Board and the National Science Board of the NSF.

Even if cool analysis were the prevailing force, it would be difficult to determine how much should be allocated for research and how this amount should then be allocated among the various disciplines. But in searching for the sources of chemistry's plight, it is worth considering whether fascination with the new and esoteric has something to do with the current financial situation of this valuable, but old, brand of science.

—D. S. GREENBERG

NDEA Fellowships: Expansion Doubles and Redoubles Number

The Office of Education is scheduled to award more new National Defense Education Act graduate fellowships for the next 2 academic years than the total awarded since the NDEA was passed in 1958. This big increase is one result of congressional action to extend and expand the act late in the preelection session of 1964.

Until then, new NDEA fellowships were being awarded at the rate of 1500 a year. Under the amended law the number jumped to 3000 in the current school year. This 3000 brings to some 11,500 the total number of awards made under the program since its inception.

The Office of Education recently an-

nounced it has allocated 6000 new NDEA fellowships to be awarded for study beginning next fall. The authorized number goes up to 7500 in the 1967–68 academic year. And in the fourth year covered by the extension (1968–69) the number is also to be 7500.

If Congress appropriates funds for the full number of fellowships authorized, it will mean that by the beginning of the 1968–69 academic year some 21,000 doctoral candidates could be studying under NDEA fellowships.

(NDEA fellowships are for 3 years of full-time study leading to a doctoral degree or its equivalent. Fellows receive stipends of $2000 for the first year, $2200 for the second, and $2400 for the third, plus allowances of $400 a year for each dependent. In addition, an "institutional allowance" of $2500 a year is paid by the government, in lieu of tuition and other fees, to an institution for each of its NDEA fellows. Last summer, for the first time, NDEA fellows could qualify for an additional stipend of $400 for summer study plus $100 for each dependent.)

The National Defense Education Act, which combines programs affecting both elementary and secondary schools and higher education, was in a direct sense Congress's answer to Sputnik I. In the case of the section on fellowships, the Office of Education was to administer the act in ways that would encourage an expansion in enrollment of full-time graduate students and increase the number and size of graduate study programs "of excellence."

Three specific objectives of the program are as follows.

1) To increase the number of persons interested in and trained for professional careers as college or university teachers.

2) To encourage the development and full utilization of the capacities of new expanded, as well as ongoing, graduate study programs leading to the doctorate.

3) To promote a wider geographical distribution of graduate study programs leading to the degree of doctor of philosophy or its equivalent.

Although no hard-and-fast rule was applied at first, regulations soon required that NDEA fellowships be given only for programs in new or expanding graduate departments.

With the recent expansion of the program, the rule has been modified. The general policies affecting the fellowships stipulate that not less than half of the 3000 new fellowships awarded this year be held by graduate students in new or expanded programs. The figure is to be 2000 of the 6000 in the coming school year and 2500 of 7500 in the following year.

Office of Education officials say the emphasis in administering the fellowship program is now on "use of unused capacity" rather than solely on support of graduate students in new or expanded programs.

The NDEA fellowship program has been regarded with particular fondness by universities interested in a share-the-wealth policy on graduate education. From the beginning, NDEA fellowships have been granted to universities for award to students chosen by the university. Under other federal fellowship programs—the National Science Foundation's, for example—fellowships by law are awarded to individuals selected through national competition. Winners of these awards could pick their institutions and tended to congregate in a relatively small number of prestige universities. This made it difficult for aspiring universities with limited resources to expand their own graduate programs and to attract high-caliber graduate students.

Stress on Programs

In the Office of Education the stress is really on graduate programs rather than on fellowships. Universities submit applications giving details on graduate programs for which they are requesting fellowships. These applications are reviewed by panels of scholars in appropriate disciplines. Their findings are passed on to an advisory committee also made up of nongovernment members. This committee's recommendations go to the Commissioner of Education and provide the basis for the awards. There are, of course, more applications than recommended programs, and more recommended programs than can be supported with the funds available. The OE staff, therefore, inevitably plays a strong role in the work of balancing and cutting to produce the final list of awards to support fellowships.

Congress has grown steadily more anti-monopoly-minded where federal programs of research and graduate education are concerned. The total number of institutions with NDEA fellows in residence is large. (Some 172 institutions shared in the allocation of the 6000 new fellowships for study beginning next year, a number which comes close to the total for institutions with accredited doctoral programs. Every state was represented save Alaska, from which no application was received.)

But the pattern of distribution reveals a concentration of the NDEA fellows in the better-known institutions and a scattering in the rest.

The circumstances of the current year's awards, however, seem to have exaggerated the pattern. Congress authorized the increase to 3000 fellowships late last year, and half of these had to be awarded in what amounted to a crash program. As a result, say officials, many of these were given to a relatively few institutions and the many were unhappy.

Office of Education figures for next year, which should be a fairer example, show that institutions in New York State get a total of 624 fellowships; in California, 537; in Illinois, 333; in Massachusetts, 279; and in Texas, 209. No single institution was assigned more than 95 fellowships.

The regional distribution is as follows. Northeast, 532 fellowships; Middle Atlantic, 1292; Great Lakes, 1084; Plains States, 601; Southeast, 962; Rocky Mountain States, 259; Southwest, 432; and Far West, 838.

Policies for distributing the fellowships have not been seriously questioned in Congress. A few years ago, however, there was a mild flap over the awarding of fellowships in fields such as folklore and music. Fellowships for graduate study in ceramics were also questioned, until it came out that missile nose cones happened to be involved.

The point was that some legislators felt the fellowships should be awarded for work only in programs directly related to national security.

Statistics on the awards over the life of the program show that a sort of middle-of-the-road policy has been followed. NDEA fellowships have gone to almost all fields normally viewed as legitimate sectors of graduate education (except for theology), but the stress has been on fields which might be called strategic.

For the 7 years of the program's existence, starting with the 1959–60 academic year, the total number of fellowships awarded, by fields, is as follows: humanities, 2790 (788 in English, 918 in modern languages); education, 921; social sciences, 3048; biological science, 1617; physical science, 1999 (in this category there have been award-

ed 618 fellowships in mathematics and statistics, 561 in physics, and 529 in chemistry); and engineering, 1125.

The OE announcement on the 6000 fellowships for the coming year carried an estimate that 19 percent will be awarded in the humanities, 18 percent in the social sciences, 23 percent in the biological sciences, 20 percent in the physical sciences, and 14 percent in engineering.

Because other federal agencies have large science education programs, the NDEA fellowship program will provide nonscientific disciplines with a much more substantial number of fellowships than are available from other federal sources, but this will still be a comparatively small share of the total federal assistance to graduate students.

NSF, for example, will be awarding about 2200 fellowships in the sciences (about half of them renewals) and perhaps twice that many "traineeships," which have many of the characteristics of the NDEA fellowship.

The National Institutes of Health awarded only 117 new predoctoral fellowships this year but supported many more graduate students on traineeships and research assistantships.

The impact on graduate education in general in the next few years of the expanded NDEA fellowship program, obviously, should be very considerable —provided large-scale military involvement does not occur.

It is significant that, over the years, a number of important modifications to the NDEA fellowship program have been made at the instance of both logic and the program's clients, the universities.

Perhaps the most important change is the new policy of awarding fellowships in blocks to the institutions for distribution among programs which have won approval for NDEA fellowship aid. Formerly the awards were made for specific programs. The change gives the institution more latitude and, incidentally, reinforces the authority of the graduate dean, which many critics say has been infringed by departmental chairmen and grant-winning faculty members as a result of federal programs.

For the past year and a half, students awarded the 3-year fellowships have been permitted to use them in any 3 of 5 consecutive years. This enables fellows to take teaching assistantships for 1 or 2 years. Formerly, support was limited to a 4-year period and requirements for full-time study prevented many fellows from gaining teaching experience. This, it was argued, actually worked against the purposes of the fellowships.

Vacated fellowships may also be reassigned to other qualified graduate students, although for only 1 or 2 years.

No close analysis has been made of the performance of NDEA fellows as compared with that of other graduate students. Office of Education officials say, however, that the trend of attrition among NDEA fellows is downward, and they ascribe this to the greater experience of the NDEA review groups in picking programs and of the institutions in picking fellows.

Only now is the OE computerizing data on the fellowship programs, and the hope is that soon it will be possible to answer such obvious questions as, How many of the fellows actually win their doctorates and go into teaching?

One thing, however, is clear. The NDEA fellowship program, which was enacted as part of an aid-to-education bill with an emergency label on it, is now viewed as a permanent sustainer of graduate education by the universities, by the agency policy-makers, and, apparently, by Congress.—JOHN WALSH

HEW: Running the Great Society

Reportedly determined to prevent the Great Society legislation from lying fallow in the Great Bureaucracy, Lyndon Johnson and his subordinates have been studying how to administer the health, education, urban affairs, and other programs passed by the last Congress, as well as what to do for an encore. In the Department of Health, Education, and Welfare, which will run many of the new programs, almost every agency is in flux, and the pace of change is so rapid that even high Department officials are a bit confused about who is holding what job at any given moment, which committees are scheduled to report when, and what the ultimate shape of the reorganized Department will be. So far the changes are chiefly on the level of personnel, and the new people have not yet met the test of developing the new programs, but for the most part the atmosphere is one of optimistic enthusiasm.

Engineering and participating in the upheaval is the new HEW Secretary, John Gardner. In a speech delivered last month at the Lasker Awards luncheon in New York, Gardner staked out his position vis-à-vis critics, including former HEW Secretary Abraham Ribicoff, who believe the Department ought to be divided, by stressing his conviction that it has a "distinctive mission . . . to concern itself with people and with the conditions of life that prevent them from realizing their full potential. The whole movement of events in recent years," Gardner continued, "has been *not* toward the separation but toward the interweaving of the Department's various objectives. With the enactment of Medicare legislation, health and social security are inextricably linked. It is impossible to conceive of a modern welfare program without a strong educational component. Programs concerned with juvenile delinquency, mental retardation, and aging cut across the old categories. An adequate attack on poverty defies bureaucratic lines."

Gardner's efforts to unify a department which employs 90,000 people, consists of eight major agencies, and spends about $30 billion annually ($10 billion from general revenues and $20 billion from Social Security Trust funds) strike official Washington as calling for a McNamara-scale solution, and it is in fact to the Defense Department