for by the council in February, to investigate these same matters. These council actions helped relieve the faculty's confusion, which had been all too evident. Some two dozen professors had joined the student demonstrations; others had been circulating petitions urging faculty members to be tolerant of missed quizzes and even to hold special classes for vigil participants; and many professors had been wondering out loud whether the university would not soon be in chaos.

On Wednesday night the vigil participants, wanting to keep faculty support, followed the recommendation of their adviser, John Strange, and elected to suspend the vigil but to continue to support the strike by boycotting campus cafeterias and by picketing. As a warning to the trustees, the demonstrators indicated that, if the collective bargaining issue were not settled within 10 days, they would resume their protest. But the significant thing is that the students had chosen to deescalate the conflict, rejecting suggestions that they occupy the administration building.

Although as of this writing the Duke crisis has not been finally resolved, most students and faculty members appear optimistic. A special committee of university trustees and administrators, appointed on 17 April, is expected to devise an acceptable scheme for collective bargaining, though the new arrangement may be described in elaborate euphemisms. Local 77, an independent union unaffiliated with the AFL–CIO, alone will decide whether to accept whatever the committee proposes. Early last week the workers returned to their jobs, though serving notice they might strike again if further progress were not made toward meeting their demands during the next few weeks.

No university-wide committee of the kind students and faculty had hoped for has yet been set up for study of the problems of the nonacademic workers. But the new trustee-administration committee has consulted all interested parties, and a trustee-liaison committee which was first created in 1960 during an earlier university crisis is being reactivated.

For their part, the students decided not to resume their protest when the trustee-administration committee acknowledged that the university's relations with its nonacademic employees were "inadequate" and promised to work with "all speed" to remedy them. On the other hand, some faculty members who had indicated through a published petition 2 weeks ago that they might resign if the faculty were not given a greater voice in deciding policy concerning the nonacademic employees are still troubled. They continue to regard the Academic Council and other university channels through which the faculty seeks to be heard as inadequate.

However this may be, Duke appears to have come through its crisis unhurt and with the morale of many students and professors higher than before. The Duke experience has, in fact, been exceptional. The student demonstrations were directed to unselfish goals, were joined in by a substantial part of the student body, and, except for the occupation of President Knight's home, were conducted with restraint and deescalated at every critical juncture.

—LUTHER J. CARTER

France: Universities Face Era of Reform by Decree

Paris. Napoleon gave France the first great national system of higher education, and the university has seemed as immutable an institution as the metric system. Today, however, the system is under attack because it has proved resistant to changes demanded by a changing society, and, despite the brilliance of many of its products, it is simply not producing enough scientists, engineers, teachers, and administrators.

Since World War II and particularly in the past decade, higher education in France has expanded rapidly. The pressure of numbers on the university has come from two familiar sources—the postwar baby boom and the rising percentage of young people preparing for entrance into the university. Enrollment grew from 148,600 in 1956–57 to more than 500,000 this year, and a level of 750,000 in 5 years is predicted.

France, like most European countries, has accepted the importance of science and technology to economic growth and social development, and, particularly in the 10 years of the de Gaulle regime, has given high priority to education in science and engineering.

Awareness has been growing, however, that inbred characteristics of the French university system inhibit development of both fundamental and applied research and of engineering studies within the university. And at least since the early 1960's the government has accepted the view that more than mere expansion of the system is needed and that serious structural changes have to be made.

The government exercises direct administrative control over France's centralized system of higher education and has, in fact, been carrying out its own program of reform, if at a rather measured pace. Early in April, however, the government took what in France amounts to a radical step by announcing that, after next year, success in the baccalaureate examination will no longer guarantee automatic access to the university. The baccalaureate is the tough national examination taken by secondary school students who complete university preparatory studies at French lycées.

The open-door policy for *bacheliers* has been a hallowed principle, which the government was obviously reluctant to modify. The government's hand may well have been forced by the hard-pressed faculty of science in Paris. In November the science faculty received some 31,000 students and, even when current construction programs are completed, will have only about 20,000 places to accommodate them. The science faculty warned the ministry of education that it would employ its own system of selection if the government did not act.

Academic scientists have probably been most affected by problems of university growth, and most strongly reformist. The recommendations coming out of a "national colloquy" at the

University of Caen in 1966, although aimed at scientific and medical teaching and research, have become a classic prescription for the reform of the "statutes, structures and functions" of the French universities.

The dominant theme of the Caen conference was that France must face up to the fact that providing mass education at the university level requires a new kind of institution. The conference recommended that the size of universities be limited to 20,000 students and that each university be granted much greater autonomy, with the faculty sharing authority. The "feudal" system of professorial "chairs" should be abolished; departments in the American style should be created, as well as parallel, separately financed research institutes.

The recommendations give the inescapable impression of having been inspired by American models. It is significant that the minister of education at the time of the conference, Christian Fouchet, rejected any implication of Americanization but did endorse in principle the Caen statement, with its stinging criticism of the status quo.

It is important to note that French higher education is a dual system. Before Napoleon created his Imperial University, the Ecole Polytechnique had been established to train military engineers for France's Revolutionary army.

NSF: Senator Warns against Budget Lobbying

The National Science Foundation last week was subjected to as ill-tempered a budget hearing as has ever occurred in the agency's 18 years of congressional appearances. The monetary outcome of the hearing, which was held before the Senate Independent Offices Appropriations Subcommittee, is yet to be revealed. But if the subcommittee's mood is any measure, NSF is not destined to receive even the slimmed-down budget that it brought to Capitol Hill. Furthermore, Colorado's Senator Gordon Allott, who is ranking Republican on the subcommittee, took the extraordinary step of warning NSF to refrain from repeating the lobbying campaign that helped retrieve part of the Foundation's budget last year (*Science*, 20 October 1967). Though there was no evidence that NSF directly inspired that campaign, Allott charged that NSF turned its clients loose on the U.S. Congress—in direct violation, as he took pains to stress, of the Crimes and Criminal Procedures provisions of the U.S. Code. "I would say every Senator in the United States Senate was absolutely besieged and lobbied by his college people in his own state . . .," Allott declared. "I believe that the members of the NSF may have utilized to a considerable extent or to a lesser extent moneys of the Federal government in contacting various institutions throughout the country. . . . If we have a recurrence of a situation like that again, I assure you that there is going to be a long and prolonged and detailed investigation into the situation."

No discussion was held on why NSF should be barred from even discreetly playing a game that is blatantly engaged in by virtually every other federal agency. Allott was the only member of the subcommittee to discuss the issue, and NSF officials prudently let the matter pass without comment.

The rest of the hearing, which was on NSF's request for obligational authority totaling $527 million, was mainly either neutral in tone or downright hostile. Thus, when the subcommittee came to NSF's social science programs, Chairman Warren G. Magnuson (D–Wash.) asked for details about some of the research that is supported under a $1.5-million item for various projects in political science. Referring to a project at the University of Michigan on the formation of political interests, Howard H. Hines, division director for social science, replied, "They are interested in studying to find out how it is, for example, that children get interested in politics and develop their early ideas about politics."

Replied Magnuson, "Are you kidding me?"

Hines replied that he was not, and added that the Michigan project was only one of a number that came out of the $1.5 million. To which Magnuson answered, "I don't quite understand that. I think maybe we can help you out and save $1.5 million."

"Or maybe more," said Allott.

The dialogue was joined by Senator Allen J. Ellender (D–La.) who said, "If you go down the list, you will save more than that."

Magnuson, author of the bill that created NSF in 1950, observed of NFS's social science activities, "In the first place, this was hardly the intention of the Science Foundation. You don't have explicit authority to go even into social sciences, although I am not objecting to it. . . ."

When NSF director Leland J. Haworth argued that it is important to study "the whole theory and practice of how political systems work," Magnuson dismissed this with, "That is history."

Allott took up NSF's social science role by observing, "I am inclined to think that if this came to the floor of Congress today, that these things would be eliminated."

Haworth responded by noting that the House passed a bill [H.R. 5404, introduced by Representative Emilio Q. Daddario (D–Conn.)] that, among other things, would give NSF explicit authority to support the social sciences. Haworth noted the bill has been reported out of the Senate Labor and Public Welfare Committee and will shortly come to the floor. To which Magnuson responded, "You are in for some trouble."

Last year, when the subcommittee cut up the NSF budget, a rescue party was led by Senator Fred Harris (D–Okla.), with the assistance of Senator Edward Kennedy (D–Mass.). This year, both are heavily engaged in the presidential campaign—Harris in behalf of Vice President Humphrey and Kennedy in behalf of his brother. Furthermore, though budget-cutting fervor was in ample supply last year, it is nothing short of frenetic this year. On the basis of Allott's warnings, those in the direct employ of NSF would be well advised to stay aloof from a new rescue attempt. But there is nothing to prevent private citizens from exercising their constitutional right to petition.

—D. S. GREENBERG

A number of other professional schools were subsequently created with the same orientation toward military engineering, and these so-called *Grandes Ecoles* were to grow into incubators of a technically trained administrative elite for government and industry.

French higher education has been divided between these highly selective professional schools, which educate a top-level administrative cadre, and the university *facultés*, which, besides being training grounds for lawyers, physicians, and pharmacists, were open institutions devoted to preserving and transmitting culture.

A high proportion of talented students aspiring to technical or administrative careers have been traditionally attracted to the *Grandes Ecoles*. Perhaps as a result, the university arts and sciences faculties have specialized in producing university scholars and lycée teachers. The outsider is likely to find the plan of French higher education labyrinthine and the hierarchy of degrees hard to interpret unless he remembers that what is involved is qualification for teaching at the various levels.

French university education is organized into three "cycles." The first cycle, which normally takes 2 years, is viewed as a transitional phase between the baccalaureate and work for the university degree, and here, traditionally, a heavy weeding-out process occurs.

The second cycle takes most students 3 years and, for the successful, ends with the granting of the *licence* or basic university degree. The rate of failure is very high, and, despite the unsuccessful examinee's option of sitting for exams in several successive years, it is estimated in some faculties that as few as one in three or four of the students who start the course ever end up winning a degree.

The third or postgraduate cycle includes work for such essentially nonresearch degrees as a Secondary School Teaching Certificate and the Agrégation. Agrégés start off teaching in lycées but very often, especially in the case of science graduates, move to higher education. Faculties of science award four types of doctoral degrees. The so-called "3rd-cycle doctorate," a 2-year research degree, is the route by which most scientists enter fundamental research. The state doctorate is required for appointment to a university chair. Two theses are required for the state doctorate, which is really a 4th-cycle degree similar to the German *Habilitation*.

The higher-education system has been geared to the training of elites. The government has accepted the view that the system must be changed to provide a more diversified education to students drawn from a broader social base. A number of measures aimed at democratization of the schools were put into effect in the 1950's, and in 1964 the council of ministers approved a plan presented by Fouchet which contained the broad lines of reform for higher education.

Secondary education was to be reorganized so that the baccalaureate would become more like a high school diploma, instead of the first hurdle in higher education. Under the new system professional training is to be stressed and the functions of the three cycles are to be more clearly defined, with emphasis given successively to fundamental knowledge, specialization, and research.

Forms are important, particularly since the formal structure of higher education in France has proved particularly inflexible. Great effort has been made in the past, for example, to keep the organization of the faculty of letters and that of the faculty of science in exact parallel, even if this might be inappropriate. As one civil servant wryly observed, "the passion for symmetry is a French perversity."

An overriding purpose of the reforms is diversification. In a sense, an attempt is being made to accomplish what American state higher education systems have achieved with their range of institutions—university, state college, junior college, and technical institute.

Soviet Party Ousts Four Scientists

The Soviet Communist Party has reportedly expelled at least four of Russia's leading scientists for participating in a protest against the detention of mathematician Aleksandr Yesenin-Volpin. According to the New York *Times* and official U.S. government sources, the expelled scientists were among 99 Soviet scientists and mathematicians who recently signed a statement criticizing their government's action against Yesenin-Volpin (*Science*, 22 March). In February, Yesenin-Volpin was committed to a mental hospital for protesting the trial of four dissident Soviet writers.

It is not yet known how many scientists were expelled. However, four were identified by the *Times*. These are Izaak Gelfnd, biologist and winner of the Lenin prize; Sergei Romin, head of Moscow University's cybernetics department; Yuri Manin and I. R. Shfarevich, both mathematicians and winners of the Lenin prize. Shfarevich and Gelfnd are both reported to have been involved in earlier protest activities. Although U.S. government sources maintain that expulsion from the Soviet Communist Party usually entails the loss of one's job and attendant prerogatives, it is not yet certain whether the full penalty will apply to the expelled scientists, at least some of whom are engaged in military-related research.

The expulsion of the dissident scientists was reportedly approved at a recent meeting of Communist Party officials within the Soviet Academy of Sciences. According to *Pravda*, a stern warning against further protest activities also was issued during the meeting. News reports quoted *Pravda* as saying participants at the meeting said that all scientists should "show high political consciousness and uprightness in the ideological struggle between capitalism and socialism and rebuff any attempt by our enemies to . . . subvert socialist society from the inside."

Soon after the letter was issued criticizing the confinement of Yesenen-Volpin, it became evident that the Communist Party was not inclined to accept further dissent even among members of the scientific community. According to U.S. officials, eight of the signers of the letter were summoned in March by Party officials and asked to issue a statement "modifying their protest." On 23 March a letter appeared in *Izvestia*, signed by four of the eight, deploring the use of their protest as anti-Soviet propaganda by the Western press. Later, in a speech at a Party conference in Moscow, Mstislav Keldysh, president of the Soviet Academy of Sciences, expressed regret at the immaturity of the signers of the Yesenin-Volpin statement. Keldysh's sister, a mathematician, is reported to have been one of the signers.—F.C.

What is seen as needed is a new type of instruction providing a shorter period of specialized instruction leading directly to a job. Prestige, however, still attaches to the traditional university training (the longer and more theoretical the better) leading to a teaching degree at the highest possible level.

Perhaps the boldest gamble of the reformers has been to create an entirely new sort of institution, the *Institut Universitaire de Technologie* (IUT). These IUT's are designed to correct the serious French shortage of well-trained technicians and, not incidentally, to cut the wastage of able people lost in the university crush. The IUT's offer diplomas in such specialties as various types of engineering, electronics and automation, chemistry, and applied biology. The 2-year course is intended to prepare graduates to qualify directly for jobs in production research or administration.

Admission to the IUT's is open to baccalaureates and others who demonstrate they can profit from instruction at the higher-education level. The government's high hopes for the IUT's are indicated by its forecast that nearly a quarter of all students in higher education will be in the IUT's in the 1970's. There are perhaps 10,000 now.

Because the reform requires a restructuring of the universities, the creation of new categories of instruction, and a redirection of students—as exemplified in the IUT's—its success will depend on how faculty and students react.

The predicament of unreformed higher education was colorfully described by Education Minister Alain Peyrefitte last year in a speech at Besançon when he said, "It is as if we organized a shipwreck in order to pick out the best swimmers who would be the only ones to escape drowning." The difficulties of persuading professors and students to participate in the rescue will be discussed in another article.

—JOHN WALSH

Shannon Postpones Departure from NIH

On 25 April, James A. Shannon, director of the National Institutes of Health (NIH), said at the weekly meeting of the directors of his individual institutes that he had agreed to postpone his scheduled 1 September departure from NIH. This meeting was apparently the first occasion on which Shannon had announced his intentions in a semipublic situation, but he had, reportedly, made up his mind to stay on well before the meeting.

One event which seems to have delayed Shannon's departure was President Johnson's announcement that he would not seek another term. Johnson's forthcoming exit means that any new NIH director would soon have to deal with a new President and a new Secretary of Health, Education, and Welfare (HEW). It is more difficult to attract a top candidate to the directorship if he does not know the men to whom he will soon be answerable. Second, there has always been anxiety among top federal health officials that President Johnson would succumb to pressures to appoint an NIH director who was not fully acceptable to a large portion of the research community. Some have feared that health patron Mary Lasker would be successful in her reported attempts to obtain the appointment of one of her candidates; most often mentioned is Michael E. De Bakey, the noted surgeon at the Baylor University Medical School in Houston. With Shannon staying on for a few more months, there will be less worry about President Johnson's succumbing to such pressures.

Shannon was urged to remain at NIH by both the present HEW Secretary, Wilbur J. Cohen, and the former Secretary, John W. Gardner. One reason Shannon was asked to stay on is that there has been difficulty in finding a suitable candidate to replace him. A factor which complicates this search is President Johnson's intention to slice $6 billion from the 1969 federal budget. Although it has not yet been announced where this large cut will be made, NIH is a likely candidate to share a place at the budgetary chopping block, a prospect which serves to make all concerned more cautious.

Shannon has agreed to remain only until a suitable replacement can be found. At this point it is plausible to speculate that Shannon will continue to serve at NIH at least until the transition at the White House next January.

—BRYCE NELSON

RECENT DEATHS

Harold D. Babcock, 86; retired member of the staff of Mount Wilson Observatory and Mount Palomar Observatory; 8 April.

Firman E. Bear, 83; professor emeritus of soils, Rutgers University; 6 April.

Charles O. Beckmann, 64; professor and former chairman of the department of chemistry, Columbia University; 9 April.

Harry H. Keefan, 64; retired physicist, National Bureau of Standards; 19 April.

Edward F. Kohman, 83; former consultant for Campbell Soup Company; 5 April.

Charles C. Lauritsen, 76; professor of physics at the California Institute of Technology and one of the developers of the atomic bomb; 13 April.

Frederic W. Lincoln, 69; retired chairman of the board of trustees, New York Medical College and Flower and Fifth Avenue Hospitals; 7 April.

Harry M. Linnette, 64; physicist at the Navy Electronics Laboratory and former professor of physics at Virginia Union University and Virginia State College; 5 April.

James D. Luckett, 76; former editor at Cornell University's New York State Agricultural Experiment Station; 9 April.

Eugene A. Markush, 80; former president of the Verona-Pharma Chemical Corporation; 21 April.

Jacob Perlman, 69; retired head of the Office of Economic and Manpower Studies, National Science Foundation; 8 April.

Arnold R. Rich, 74; professor of pathology at Johns Hopkins University School of Medicine; 17 April.

George A. Talland, 51; assistant professor of psychology at Harvard Medical School; 2 March.

David Tilles, 34; geophysicist and associate professor, department of oceanography, Oregon State University; 30 March. Dr. Tilles and one of his sons were killed on the Oregon beach by a large boulder dislodged in a rock slide from a 20-foot cliff near the beach.

Vladimir Vand, 57; professor of crystallography, Pennsylvania State University; 4 April.

William H. Wolf, 53; associate chief engineer of the Bureau of Reclamation, U.S. Department of Agriculture; 13 April.