gineer has a mechanism to question that decision in a procedure ending in peer arbitration. Now that engineer either stays on the job and builds the death trap or he gives up his job. That's a terrible thing to do to a person."

On the basis of several interviews, it appears that many scientists and engineers believe that union organizing is a radical, even corrupt, activity, which conjure up the specter of George Meany, AFL-CIO president, laughing at President Nixon, or of labor-backed city pols passing out free Thanksgiving turkeys and half a ton of winter coal in return for votes. Neither picture is something the technical professionals care to identify with.

However, in the last 3 years these professions have been faced with the most ominous economic situations—fund cuts, inaccessible pensions, and plant shutdowns—since before World War II. These perilous conditions may yet have the effect of driving scientists down from their ivory towers and to the bargaining tables.—DEBORAH SHAPLEY

French University Reorganization: Voilà, Thirteen Universities of Paris

The University of Paris after World War II was a splendid anachronism. Its immense prestige, the brilliance of many of its graduates, even its medieval origins and Left Bank setting made it particularly resistant to change. Paris, in fact, was a university very much as Napoleon had conceived it. The traditional *facultés*—letters, law, medicine, pharmacy, science—coexisted as essentially independent entities. In each *faculté*, the dean and senior professors exercised nearly absolute control and negotiated directly with officials of the Ministry of National Education on major policy issues and budgets.

Paris and the provincial universities continued to give rather narrow professional training as physicians, lawyers, scientists, and teachers to students who emerged from the rigorously competitive national school system. That system emphasized the amassing of factual information and the development of reasoning, verbal, and literary skills. It was heavily biased toward classics—that is, mathematics, Greek, Latin, and French philology, literature, and history. Science and technology were treated as being of secondary importance. After World War II, it became increasingly evident that the goals of French educational institutions were incongruent with the needs of a technological society.

It is true that higher education since Napoleon has had a dual structure. Top managers for industry and administrators for government have been drawn primarily from among the graduates of the *grandes écoles*, elite professional schools that evolved from the engineering schools established to produce technically trained officers for the armies of Revolutionary France. In fact, in the era of the technocrat, alumni of the *grandes écoles* have, if anything, increased their ascendancy over graduates of the universities. The *grandes écoles* themselves have had their weaknesses, notably lack of a research tradition. But the universities failed even more conspicuously to evolve patterns of teaching and research like those appearing in other countries. France lagged, for example, in establishing a strong link between basic science and medical education.

The French were acutely aware of the shortcomings of higher education in the 1950's, but it was not until the De Gaulle regime began to solve deep political and financial problems that serious efforts to alter the education system were possible. Between 1956–57 and the present, enrollment in higher education rose from about 150,000 to nearly 700,000.

By the late 1960's, enrollment at Paris was higher than it had been in the entire university system at the beginning of the period. For centuries, of course, Paris had exerted such a powerful centripetal force on scholars, students, and money that, figuratively in the university system, as almost literally with the highways, all roads led to Paris. Under De Gaulle, an attempt was made to build up the provincial universities and deemphasize Paris, but the attractions of the capital and biases in the system prevailed, and Paris continued to grow.

The result for the old University of Paris was a bad case of overstress. If anything could have been worse than the huge, overflow lecture classes in antiquated buildings, it was that curriculum and teaching methods had changed hardly at all. An attempt was made to relieve the pressure on the Latin Quarter *facultés* by establishing new university "centers" on the fringes of Paris at places like Orsay and Nanterre. Orsay acquired a reputation as a rather successful transplant of a science campus; Nanterre, established primarily as an outpost for law and the social sciences, gained notice for other reasons. It was students from Nanterre who ignited the explosion of May 1968 when they rallied the Latin Quarter students in the streets of central Paris.

The May outbreak was the catalyst for a major effort at reform of the university system. A reform movement had gained momentum through the early 1960's and in 1966, at a colloquium at the university at Caen, had reached a consensus on main principles. In the summer of 1968, the government backed a concerted effort to fashion a reform package in which students, graduate students, and younger faculty members, as well as senior professors and ministry officials, participated. In the autumn of 1968, an orientation law for higher education was enacted, codifying the reforms. Under the law, universities would be autonomous, which meant that they would be self-governing, with students, teachers, and staff given a share of authority. They would also be "pluridisciplinary," which meant, in the language of the law, that the universities would "associate wherever possible arts and letters with sciences and technics." Size was set at between 8,000 and 15,000 in each university.

The real key to the reorganization was to be the replacement of the *facultés* with *unités d'enseignement et de recherche*, or units of teaching and research (UER). Groupings of these

UER's were to be formed into new universities. The UER's were made in various ways. Some are, to all intents and purposes, the old *facultés*; others are based on a single discipline—mathematics, for example, or English. Still others might focus on particular interdisciplinary studies, such as environmental sciences. Or a small engineering school might be designated as a UER.

Ultimately, some 700 UER's were distributed among 65 new institutions; 43 universities in the provinces and 13 in Paris, known as Paris I through Paris XIII; and five independent, university-level institutions.

Universities in small cities generally represent a unification of the traditional *facultés*. Larger places have several universities. For example, universities in Bordeaux, Grenoble, Montpellier, and Lille are all, so to speak, divided into three parts. Some of the new universities encompass a full range of disciplines, others emphasize a smaller range of related disciplines.

In Paris, obviously, the variety is greatest and the contrasts richest. Paris I, for example, is dominated by the residue of the Paris *faculté* of law. Paris III is essentially the historic Sorbonne, with its concentration on language and literature preserved. Paris VI and VII were formed by the simple expedient of dividing the new science complex on the Seine at the site of the old Paris wine market. But other universities in Paris depart from older modes. For example, Paris XI, which occupies the former NATO headquarters at Porte Dauphine, offers a constellation of related studies in applied mathematics and economics, computer science, and management.

Inevitably in such a massive reorganization, not all has gone smoothly. There was to be a transition period during which each university was to write its own statutes and elect a governing council. The attempt to achieve *cogestion*, or comanagement, of the universities has produced mixed results. In a number of places, students lost interest after the initial effort, while junior faculty, with more at stake, were generally more active and in some places actually played a dominant role.

Administrative head of each new university is a president, replacing the rector of the old system who wielded little power in comparison with the deans of the *facultés*. In some universities, junior faculty have sided with the president in moves to trim the power of senior professors. In other places, professors have divided along disciplinary lines, and there were disputes and even walkouts en masse by departments or alliances of departments during the negotiations.

Not surprisingly, old habits have reasserted themselves. Some professors feel that the formation of the new Paris universities is akin to Solomon's having gone through with it and had the baby cut into 13 pieces. And particularly among *facultés* that became UER's intact, there have been efforts to carry on business as usual. So there is resistance to innovation in teaching, as well as to the development of interdisciplinary research.

An entirely different sort of trend is discerned by some observers who see the newly formed universities taking on distinctive political or ideological colorations. Nanterre and Vincennes, now Paris X and VIII, respectively, are usually singled out as examples. Both places were the products of earlier, tentative attempts at reform in the 1960's, and the institutional atmosphere in both places was heavily flavored by the social and behavioral sciences. As one biologist at a research institute, who is by no means a right winger, observed, "At Vincennes, sociology is Marxist sociology."

Influence of Self-Selection

A process of "self-selection" does seem to have affected the composition of disciplines and the makeup of teaching staffs within the new universities. By general assent, for example, members of the science UER's included in Paris VI tend to be more receptive to educational experiment and innovation than those now found in Paris VII. But to what extent there will be a polarization between "radical" and "conservative" universities, either politically or educationally, it is too early to tell.

What many observers do expect is a new sort of differentiation between weaker and stronger universities in France. Already there are signs that the hegemony of the old University of Paris is no longer so absolute. Provincial universities such as Grenoble and Strasbourg in recent years have established a parity with Paris in some disciplines, and it appears that the universities at Toulouse, the center of the French aerospace industry, and at Lyons may do the same. So the prospect would appear to be that, in the future, academic strength and weakness, and eventually prestige, will be redistributed.

So far, an effort to raise the status of nontraditional institutions of higher education and courses of study has had limited success. The new university institutes of technology (IUT's), which concentrate on providing 2-year courses in advanced technical education, for example, have gained enrollment more slowly than was projected. But now that IUT graduates are landing jobs while holders of conventional university degrees are unemployed in droves, the IUT's are gaining status. A new technical university to be located at Compèigne, sometimes likened to a French M.I.T., is expected to give students interested in science and technology an even more attractive option.

If the mold of French higher education is really to be broken, however, the dominant position of the *grandes écoles* will have to be radically modified. The École Polytechnique is scheduled to be moved out of Paris in the next few years, and the École Normale Supérieure is said to be in the midst of a serious effort at reform from within. But if these and other *grandes écoles* retain their advantage of highly selective admissions and almost automatic access for their graduates to the best jobs in industry and government, the universities will remain essentially training schools for the traditional professions.

The big question remains the will of the government to carry through both the letter and the spirit of the reforms. Leaving aside the role of the students (*Science*, 21 April), reformers in the university and in the government must deal with intransigent opposition from professors on both the Right and Left, and with deeply ingrained habits and prejudices. The ministry of education, for example, has dragged its feet in granting universities the autonomy embodied in the new law, and it still recoils from giving universities increased freedom in deciding how to expend funds within their budgets.

Napoleon is often blamed for the rigid structure of French higher education, but with higher education, as in the case of other French institutions, Napoleon hit on a design that suited French inclinations. Decentralization goes against the French grain, and, as for the *grandes écoles*, elitism is, after all, as French as crepes suzette.

—JOHN WALSH