with collective violence; its current emphasis on racially related occurrences may be expanded to include college and other disturbances. The Center will not study war, revolution, extremist groups, or the various types of individual violence. Spiegel says that his Center cannot begin to handle all the requests for information which it now receives.

It is obvious that a major difficulty, for the Center and for any similar institutions which may be established, will be to create conditions where violence can be studied with scholarly calm while attempting to withstand public pressure for instantaneous answers to questions posed by the nation's swelling urban conflict.—BRYCE NELSON

France: After the Storm, Elite Schools Face Change

Paris. The red and black banners have been struck, the boulevards of the Latin Quarter repaved where necessary, and the wall posters are fading. The government is "organizing its victory" at the polls and, although some foresee trouble in the autumn, President de Gaulle might say "Après le déluge, moi."

Efforts to reform the universities have moved from the streets to the committee rooms and while it is too early to predict the extent of change to come, the government seems prepared to go some way toward granting the militants' demands for greater university autonomy from rigid central control and for *cogestion*, or student participation in university government.

French voters seem to have reacted strongly against the spectacle of public violence and the prospect of political instability, but the impression remains that the reformers remain in the ascendant. In the case of the universities, the majority of Frenchmen have rejected what appeared to be anarchic protest, but have accepted the critics' charge that the institutions are archaic.

A clue to the underlying feelings which influenced the course of the protests in May and June may be found in the failure of militants, who profess deep reservations about the character of modern industrial society, to mount a direct assault on the institutions which train that society's elite. Government and economic life in modern France have been heavily influenced by men trained in the *Grandes Ecoles*, the state-sponsored professional schools which are separate from the universities and at least their equals in prestige.

The *Grandes Ecoles* have given France a corps of technically trained administrators who kept the country functioning through times of political weakness, who ably managed postwar economic development, and who made themselves a reputation for looking after France's interests in the Common Market with uncommon skill.

Paradoxically, however, the system that produced this scientifically educated elite has proved a source of national weakness in the sector of scientific research, and particularly in the production and use of scientific and technical manpower. Changing the system is a formidable task because the *Grandes Ecoles*, within their own terms of reference, have been so successful and their stock with the public remains so high.

There is a saying that France's prewar Third Republic was the republic of the professors while de Gaulle's Fifth Republic is the republic of the technocrats. To the foreigner the distinction is a rather finely shaded one, since "professors" translates to graduates of the Ecole Normale Supérieur and "technocrats" means primarily products of the Ecole Polytechnique, both of which are *Grandes Ecoles.*

In fact the ascendancy of the Ecole Normale and Ecole Polytechnique has been challenged since World War II by the Ecole Nationale d'Administration (ENA), whose top graduates move into key jobs in the *grandes corps*, the upper echelon of civil service administrators. The ENA was established after the war, in part with the democratic aim of breaking the Paris bourgeoisie's grip on the *grandes corps*, but so thoroughly has the old group adapted to the new system that now there is talk of further reform. The first generation of "*enarchists*" now dominate at the policy level of government in the same way that "*polytechniciens*" for generations have held sway over top posts in industry and finance. The point, however, is that the *Grandes Ecoles* are rooted in the same technocratic tradition.

It is a tradition that traces back to Revolutionary France and draws on the St. Simonian ideal of a state founded on scientific principles and governed by men rigorously educated in science. The practical needs of an embattled country put a premium on military engineering, and the Ecole Polytechnique provided a model for an engineering school which produced officers superbly grounded in basic science. A score of *Grandes Ecoles* were established, and the most illustrious of these produced technocrats who could expect to make brilliant careers not in the army but in the civil service, industry, and finance. And the *Grandes Ecoles* became the goal of many of the brightest and most ambitious students.

The schoolboy who aspires to the *Grandes Ecoles* must cap an outstanding record in a lycée course emphasizing mathematics and physics with impressive results in his baccalaureate examination. Once past that hurdle he must compete for a place in the special preparatory classes in Paris lycées which candidates for the *Grandes Ecoles* attend for at least 2 and often for 3 or 4 years to study for the savagely competitive entrance examination.

Only about 1500 first-year students are admitted to the *Grandes Ecoles* each year. Competition is keenest for the Ecole Polytechnique, the Ecole Normale, and a few others. (Candidates for ENA must offer the equivalent of a university degree from the Institut d'Etudes Politiques de Paris.) Students work very hard for admission to some of the less prestigious *Grandes Ecoles*, but then may find the going comparatively easy. The failure rate for the *Grandes Ecoles* is very low compared to that for the universities which have been open to all holders of the baccalaureate.

Hard work is expected of the student at the Ecole Polytechnique, but this is only one element of the special

experience the institution provides. A group of very able students sharing a sense of belonging to a privileged minority live in close association under semi-military discipline and follow a single, very demanding course of study. Teachers are very good, and the staff-student ratio is much better than that in the university faculties—perhaps 1 to 3 or 4, as compared with 1 to 15 in the science faculties. A small percentage of graduates follow army careers, but the rest are assured a fine entrée to industry and can expect alumni of the Polytechnique to provide the same sort of assistance that the public school "old-boy network" does in Britain.

The *Grandes Ecoles* tradition of producing a managerial elite means that a high proportion of France's most talented students in mathematics and the natural sciences are lost to research and teaching. The Ecole Normale, whose historic role is that of providing teachers for higher education, is the only one of the *Grandes Ecoles* where some students concentrate on the humanities. It has also attempted to redress the balance in fundamental research. Alfred Kastler, Nobel prize winner in physics, is associated with the physics laboratory of the Ecole Normale, and the institution's laboratories in such fields as optics, radio-astronomy, nuclear research, and geophysics have a reputation for high-quality advanced research.

The parallelism in the structures of the universities and the *Grandes Ecoles*, and the mutual reserve this engenders, has made crossovers difficult. Moreover, the fact that the universities are administered by the Ministry of Education and the *Grandes Ecoles* are administered by a variety of other ministries inhibits integration.

Most of the *Grandes Ecoles* engineering courses, which take 3 years, on the average, put heavy stress on theoretical subjects, but the schools are not organized to provide graduate training in the sense of work for research degrees. Many *Grande Ecole* graduates do go on to the equivalent of university third-cycle study, but in the advanced schools linked to the *Grandes Ecoles* and providing a year or 18 months' further training for graduates in their specialties.

It is generally conceded that the attraction of the *Grandes Ecoles* for top students has retarded the development of university science and engineering. Because the graduates of the *Grandes Ecoles* have flowed into managerial jobs, research and engineering are inevitably deprived of some of their potentially best people.

Weakness in applied research and the problems in engineering education are often cited when the state of French technology is discussed. Recently there have been some well-publicized technological embarrassments. The government has had to undertake a rescue operation of the computer industry with its Plan Calcul, and the French

Sonic Boom: Regulation Left to the FAA

The Senate last week completed congressional passage of legislation to have the Federal Aviation Administration (FAA) measure and attempt to control noise generated by civil aircraft. Besides being addressed to the existing problem of aircraft noise, the new legislation is concerned with a major problem of the future—the sonic booms which will be generated by the commercial supersonic transports (SST's) when these vehicles are put into operation in the 1970's. A few senators, chiefly Clifford P. Case of New Jersey and William Proxmire of Wisconsin, felt that Congress itself should simply ban all nonmilitary supersonic flights over U.S. territory. The ban could be lifted, they said, once there was scientific evidence that such flights would do no harm.

But the Case-Proxmire proposal was voted down 55 to 12, and the question of whether supersonic flights overland are to be permitted was left to the FAA. Leading the opposition were Senator Mike Monroney of Oklahoma and Senator Warren G. Magnuson of Washington, sponsors of the noise-abatement bill and key supporters of the U.S. supersonic transport project. The Boeing Company of Seattle will develop the SST, and Magnuson clearly has a political stake in this project's success.

Essentially, the Case-Proxmire argument was that, as the agency responsible for promoting the SST's commercial development, the FAA would be biased in favor of keeping restrictions on supersonic flight to a minimum. "In the circumstances, to place upon the FAA the responsibility for restrictions on overland flights is like putting the fox in the chicken coop," Senator Case said.

Sonic booms are disturbing to many people, and their potential destructiveness was ironically demonstrated not long ago when one shattered windows at the Air Force Academy. The FAA's study last year of the SST's economic feasibility was predicated on the assumption that the SST would be essentially a transocean aircraft which, insofar as it operated overland, would fly at subsonic speeds. Although the FAA concluded that an SST designed for such service would find a profitable market, a study made for the agency by the Institute for Defense Analyses indicated that sales would fall short of the break-even point.

In Case's view, Congress "must make the final decision on overland flights because it is the only institution of government which can integrate all the needs of society into such a profound policy decision. Such decisions cannot," he added, "be left to the agencies of government which are understandably prone to a philosophy of project-success and self-perpetuation, and also vulnerable to pressures by narrow and parochial interests."

Many of the senators who voted against the Case-Proxmire proposal may have been persuaded by Monroney's argument that the fear of damage suits, if nothing else, would keep airlines from conducting supersonic cross-country flights. Monroney acknowledged the problem of the sonic boom, but discounted the possibility that SST's would ever be scheduled to fly or permitted to fly at supersonic speeds over populated areas.—L.J.C.

rocket program has had operational setbacks. The French SECAM color television system has run into trouble. France and the Soviet Union adopted the SECAM system, which provides an excellent picture but is incompatible with the German-developed PAL system chosen by other Western European countries. And now the French are well behind schedule with SECAM because of difficulties in manufacturing the color picture tube. Perhaps most vexing of all have been recent major breakdowns in three nuclear power stations.

And French industry shares the managerial weaknesses which many analysts have stressed in diagnosing the technological gap. As managers, graduates of the *Grandes Ecoles* seem to be strong in finance and production methods and weak in modern sales and marketing techniques and personnel administration.

The picture is certainly not all unfavorable. Dassault Mirage jets have been a conspicuous international success and, despite the question marks hanging over the Anglo-French Concorde supersonic transport project, the French aircraft industry is perhaps the healthiest in Europe. In high technology, French engineering certainly cannot be written off. The big machines at the European nuclear research center (CERN) are a triumph of sophistication, and the engineering staff at CERN has a heavy French representation. The nuclear-power-plant breakdowns may well be due less to engineering than to a political decision by the de Gaulle regime—the decision that natural uranium fuel be used in the reactors to avoid dependence on supplies of enriched uranium from the United States. Strained relations between the French atomic energy authority and the nationalized electricity industry may also have contributed to the breakdowns.

When all allowances are made, however, it is fair to say that basic reforms in university research and engineering education are needed, and the French in fact are acting on this assumption. There have been many attempts at amelioration since World War II. The National Center for Scientific Research (CNRS), which serves many of the same purposes as The National Science Foundation in the United States, has bolstered the ranks of researchers with a corps of about 5000 professionals. About a fifth of these work in CNRS laboratories, the rest in university laboratories. The French atomic energy commission finances its own institute in postgraduate nuclear research.

Universities and the independent engineering schools will have to assume a much wider role in educating scientists and engineers. An obvious question is whether the dual system of university and *Grandes Ecoles* will continue as it is.

The future of the *Grandes Ecoles* in a reformed system is not clear. During World War II. Resistance planners advocated abolition of the *Grandes Ecoles* because they were "too aristocratic." Such revolutionary action was never taken, and today's planners seem set on evolutionary change. The trend toward more research in the *Grandes Ecoles* will certainly continue. Curriculum changes are also on the way. Although controversial, it is likely that revision of the curriculum at the Ecole Polytechnique will follow a pattern already being discussed. Major changes recommended are a move away from a single curriculum for all students and a mitigation of the *"encyclopédisme"* of *Grandes Ecoles* studies. The Ecole Polytechnique is scheduled to move from its historic Latin Quarter location in the early 1970's to a site south of Paris, where it may well develop a new sort of contract with the univer-

Private Education Aid Reaches All-Time High

Private gifts and grants to American universities reached an estimated all-time high of $1.6 billion last year, according to a nationwide survey by the American Alumni Council and the Council for Financial Aid to Education (CFAE).

But, though the total was up, the rate of increase is down in the last 3 years by 20 percent. Holgar Johnson, CFAE president, said that the decline is occuring at a time when higher education is confronted with greater expenses. Other significant trends pointed out by the report were that growth of voluntary support for public institutions is increasing at a much faster rate than growth of support for private institutions, though private colleges and universities consistently receive more overall support.

Nonalumni individuals were the largest single source of voluntary support while general welfare foundations, once the largest source of gift support, were reducing their contributions. Johnson said that one reason for this may be that a number of major foundations have announced intentions to shift some of their funds away from higher education toward problems of civil rights and urban development.

The survey totals show that unrestricted gifts continue to account for most of the overall support. Gifts for physical plants are the next highest, followed by gifts for student financial aid. The survey is based upon responses from 1094 institutions.

Institutions reporting the largest amounts in gift support for 1967 are: Harvard, $38.3 million; Yale, $33.2 million; University of California (10 campuses), $25.0 million; Cornell University, $23.1 million; New York University, $22.5 million; University of Michigan, $22.4 million; University of Chicago, $22.1 million; Stanford University, $21.6 million; Columbia University, $20.4 million; Brigham Young University, $19.5 million; Vanderbilt University, $19.4 million; University of Pennsylvania, $18.6 million; University of Rochester, $18.5 million; University of Southern California, $17.9 million; Massachusetts Institute of Technology, $17.8 million; Brandeis University, $14.2 million; Georgetown University, $13.6 million; Northwestern University, $13.4 million; Johns Hopkins, $13.4 million; University of Wisconsin, $13.1 million.

Copies of the report are available at a cost of $4 from the Council for Financial Aid to Education, Inc., 6 East 45 Street, New York 10017.—M.M.

sity science faculty at Orsay and the government nuclear research complex at Saclay. Certainly efforts are afoot to build more "bridges" between the universities and the *Grandes Ecoles.*

Students of the *Grandes Ecoles* were not conspicuous at the barricades. They were not, however, immune to the ideas that brought students and teachers into conflict with the police. *Polytechniciens,* for example, have been working with reform-minded professors on proposals for change in the Ecole Polytechnique. These proposals are soon to be made public and similar work is going on inside other schools including the National School of Mines. The results of these efforts will show, in the months and years to come, whether there really was a "May revolution". . . .

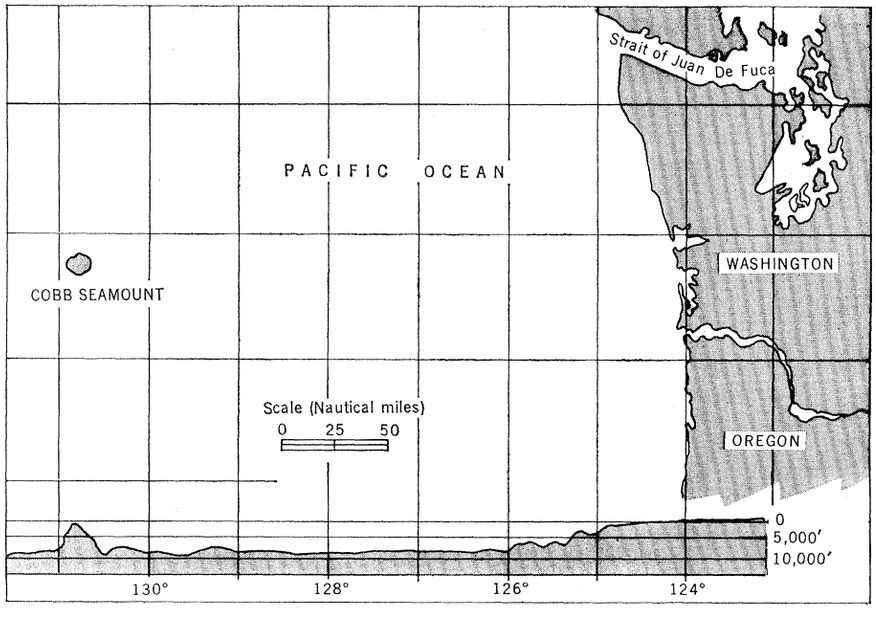
—JOHN WALSH

Oceanography: Who Will Control Cobb Seamount?

A civilian consortium is promoting, with the personal interest of the Navy's top antisubmarine warfare officer, an oceanographic research project that calls for establishing U.S. jurisdiction over a piece of the ocean bottom located in international waters. Although the project is described as basically scientific in intent, one of the arguments advanced by the consortium is that the legal claim should be firmly established in anticipation of efforts at the United Nations to internationalize the sea bottom.

The object of this interest is Cobb Seamount, an extinct submerged volcano located 270 miles (435 kilometers) due west of the state of Washington. Discovered in 1950, Cobb Seamount is a scientifically important and geologically unique form which rises from a 9000-foot-deep (2743 meters) basin to within 112 feet (34 meters) of the surface. Of the known and extensive seamounts in the northeastern Pacific, Cobb rises closest to the surface, well within the photic zone, also close to the contiguous United States, and yet still retains a basically undisturbed deep ocean environment.

Claiming that Cobb Seamount is strategic to our national security and rich in scientific data and research possibilities, the consortium, consisting of the University of Washington, Honeywell Inc., Battelle-Memorial Institute, and the Oceanic Foundation of Hawaii, is now proposing to establish a U.S. claim of exclusive rights to Cobb by occupation; historically this has been the method by which nations have established sovereignty over unclaimed land areas. As stated in a brochure prepared by the consortium, "It is conceivable . . . that . . . occupation may at some point be considered sufficient to establish a limited claim of exclusive rights. At least it would seem to be sufficient to stop other nations from claiming such exclusive rights."



Vice Admiral Turner F. Caldwell, Jr., director of U.S. Navy Anti-Submarine Warfare Programs, before a recent meeting of the Undersea Technology Industry Clinic, also expressed particular interest in Cobb Seamount. Stressing that he spoke as an individual rather than reflecting official Navy views, Caldwell called it an "ideal" location which "would furnish an excellent means for developing legal concepts of utilization and occupation of real estate at the sea floor." Besides the interest expressed by Caldwell, the Naval Underwater Warfare Center has also made a preliminary evaluation of the Seamount for a possible manned-in-bottom base, and a number of similar studies have been proposed.

General attitudes toward the legal issues involved in Cobb Seamount vary. While a number of government officials have said that the question of jurisdiction over the sea bottom is "premature," there are those who are anxious to set precedents now. Some groups claim that present government thinking would create a policy of "giving away" the oceans. They point out that the Malta Resolution, a proposal submitted to the United Nations by the Republic of Malta to internationalize the seas, would give the UN exclusive jurisdiction over the resources of the deep seabed, including seamounts; thus they urge the United States to stake its claims now, before the final enactment of this proposal.

Although there are defense-oriented groups within government that wish to see Cobb Seamount and other such sea formations close to American soil under U.S. jurisdiction, official government policy has been one of "open occupancy." The United States recently has been in the process of organizing a 10-year international ocean exploration