chairman of the Ford Foundation. This body, on which industry is well represented, late this year will recommend to the President a comprehensive oceanography program for the United States. It will emphasize, one may safely predict, that any legal regime for the deep seabed should allow private enterprise the profit incentives for the large investments which exploitation of the seabed's resources will require.

This objective of encouraging investment is by no means necessarily in conflict with internationalization, however. Indeed, some economists believe that, without international control over the allocation and development of deep-sea mineral resources, chaos will reign and the markets for particularly abundant minerals, such as manganese, will collapse from overproduction.

An arms control agreement should accompany, if not precede, an internationalization of the seabed, but already there are signs that, for the moment at least, U.S. military people are wary of proposals for such an agreement. For instance, in testifying before the Fascell subcommittee, Rear Admiral Wilfred A. Hearn, Judge Advocate General of the Navy, questioned whether, in the absence of greater technical knowledge, a treaty putting the seabed off limits to nuclear weapons would serve the national security. An interagency study of the possibility of an arms-control agreement for the seabed has been underway for some months. If this effort has produced any firm conclusion it is that the arms-control problem under the sea is vastly more complex than the problem in outer space.

The Fascell subcommittee last month recommended that the U.S. actively discourage any action "at this time" with respect to the vesting of authority over the seabed in any new or existing international organization. Although two liberal Democrats on the subcommittee criticized the report's "negative tone," the strong sense of caution that it expressed represented well enough the attitude with which the United States and most oher U.N. member nations are examining the question of the seabed.—LUTHER J. CARTER

Education Reform: British Reorganize Secondary Schools

London. Current British efforts to reorganize secondary education on lines of the comprehensive school strike the American bystander as remarkably familiar. The prescription for achieving both educational and equalitarian ends by consolidating into larger units and catering "for virtually the whole range of ability" might be taken directly from the Conant report on the American high school at the end of the last decade. Ideal results may be as hard to achieve in Britain as in the United States, but current plans for comprehensive schools imply a much more radical reorganization here.

State education in Britain has been rigorously selective. Secondary schools, attended by children aged 11 through 18, tend to be segregated according to sex, ability, and, in effect, social class. In the typical local school system, two sorts of secondary schools have been provided. Grammar schools accommodate the academically talented, preparing them for university entrance or white-collar jobs. So-called secondary modern schools provide general commercial and industrial arts courses. Something over 50 percent of British young people leave school when compulsory education ends at age 15.

Assignment to secondary school in the past has depended primarily on a child's performance on examinations taken when he is about 11. These "11-plus" examinations, combining IQ and achievement tests, are now being abandoned by most education authorities as part of the movement away from "selection" (*Science*, 1 Dec.).

While the demise of the 11-plus means a revision of what one American observer calls the doctrine of infant damnation, the trend toward comprehensives still affects only a minority, if a rapidly growing one. In 1966, the number of students in comprehensive schools rose from 240,000 to 312,000 of the total 2.8 million in state secondary schools. Of the rest, under 25 percent are in grammar schools and the majority are in other secondary schools.

The shift to comprehensive education is a matter of national policy endorsed by the House of Commons and expressed in a directive from the Department of Education and Science in July 1965 stating "It is the Government's declared objective to end selection at eleven-plus and to eliminate separatism in secondary education." Local authorities were requested to prepare plans for reorganizing secondary education and to submit them to the department.

Methods and timing may be varied to meet local circumstances. The Secretary of State for Education and Science at the time the order was issued, Anthony Crosland, promised legislative action if authorities did not comply and his successor, Patrick Gordon Walker, has affirmed the pledge.

The Labor party is ideologically inclined and politically committed to education reform, particularly to ending selective education. At the party conference earlier this year, one speaker said "To be branded as a secondary modern was a handicap carried throughout one's life" and went on to insist that "We must make it clear as a movement that there are some things money cannot buy, and the foremost among them is privilege in education."

To many reformers, privilege in education means the public schools, the independent schools educating boys and girls aged 13 to 18. Demands for integration of the public schools into the state system as part of comprehensive reorganization have been heard. The government so far has not taken action on the public schools, deferring a policy decision until a government-appointed committee reports.

As a party issue, comprehensive education up to now has not had explosive force. Both Crosland and Gordon Walker have had relatively polite deal-

ings on the floor of the Commons with Sir Edward Boyle, the Conservative party shadow minister for education. On the comprehensive issue Conservatives have stood for "choice," which means retention of grammar schools. Conservative leader Edward Heath, however, has said his party must not be afraid of changes in grammar schools and favored experiment with "sixth form colleges" for the final 2 years of secondary education.

A Political Clash?

Likelihood of a clash between the two major parties was increased, however, when Conservatives made heavy gains in local elections last spring. They even won a majority in the Inner London Education Authority (ILEA) which had been dominated for years by the Labor party. London, which is the largest education authority, has been a pioneer in establishing comprehensive schools. Shortly before the election, the ILEA committee submitted plans to push ahead on conversion. The new Conservative majority decided to revise and resubmit the proposal. In its original form the Tory plan would retain selection at age 11, and keep 40 of the present 58 grammar schools until 1975, with 10 percent of total children attending them rather than the present 19. The revised scheme is scheduled to be presented this month and provide something of a test case. The government can reject the proposal and be faced with "total resistance" promised by the ILEA.

The latest figures show that 74 education authorities in England and Wales, have had comprehensive schemes approved for all or a greater part of their systems, 27 have schemes approved for part of their areas, 21 have schemes under consideration, 12 have had proposals rejected, and 24 have not yet submitted proposals. Four local authorities have declined to submit schemes and the government, presumably, will take action if the delinquents persist.

Such statistics, of course, provide limited information. Institution of a fully comprehensive system does not necessarily solve the difficulties already facing secondary education in Britain and may, in fact, raise some new problems.

One by no means wholly unsympathetic critic, the headmaster of Rugby School, has been quoted as saying that an educational revolution is being forced through without adequate resources at a time of extreme financial stringency and without serious research being conducted into its probable effect.

It is hard to make new ideas work, say the critics, when there is a shortage of funds for buildings and teachers. Existing British secondary school buildings, even those put up since World War II, are in many cases too small to be used as "all through" comprehensives accommodating a large number of students aged 11 through 18. In many places it has been necessary to use two or three buildings, often some distance apart, in adopting the comprehensive plan. Some authorities have adopted a two-tier system with junior and senior schools and automatic transfer at the age of 13 or 14. But limitations of plant will make it difficult for some systems to profit from the advantages of scale which make it possible for a big school to have specialized facilities and specialist teachers.

Raising of the minimum age for leaving school from 15 to 16 is scheduled for 1970. The timing is objected to by some on grounds that proper provision cannot be made in time. School planners are working to insure that there are space, curriculum, and teachers for the additional students. But the change will add to the difficulties of schools already embroiled in the transition to comprehensives. Over the past decade the student-teacher ratio in secondary schools has fallen from 20.7 to 18.4, but an estimated 20,000 teachers will be needed to handle additional students staying on when the school-leaving age is raised, and a setback in the ratio is anticipated.

Teacher Qualifications

Qualifications of teachers are another subject of concern. Nearly two-thirds of the teachers in secondary schools do not have university degrees. Most of these qualified by attending the 3-year teachers training colleges which are roughly similar to American teachers colleges. Teachers with university degrees have tended to concentrate in grammar schools. A principal aim of the comprehensive system is to prepare a greater proportion of students for higher education. The lack of teachers with university degrees is regarded as a handicap in teaching students with university ambitions.

The trend in the recruiting of graduates is not encouraging, particularly among those with degrees in mathematics and in the sciences. Expansion of the university system has provided opportunities for science and math graduates, and industry also beckons warmly.

Shortage of science and math teachers certainly affects the question of whether the comprehensives can cure the so-called "swing from science," which is hitting Britain as it is other industrial nations. In Britain the desertion is said to be most marked in physics. Criticism of textbooks is prevalent, curriculum revision has come more slowly than in the United States and the scientific leadership, represented by the Institute of Physics and the Physical Society, has been charged with having slow reflexes.

The Scientist as a "Square"

Theories abound on the reasons for the drop in interest in science. Some suggest that the teenage subculture is antipathetic to science and that young people see the scientific life as unexciting and the scientist as "square." So concerned are the British that they have a government-appointed committee inquiring into the phenomenon. That committee is sure to note that British young people have had specialization forced on them at what seems an excessively early age. At 14 the grammar school student has typically had to choose between history and geography on the one hand and physics and chemistry on the other. If he chooses science and proceeds to the university, he is almost certain to spend his 3 undergraduate years on work that excludes everything not directly related to his specialty. British students, therefore, specialize 7 years earlier than American students; many British young people seem to be reluctant to take the plunge.

There has been considerable discussion and some attempts to broaden the interests of sixth-formers (those in the sixth and seventh year of secondary schools). But such attempts are still inhibited by the necessity of preparing students for the A-level (advanced level) examinations which are crucial in the stern competition for university places. (Ironically, there have been a number of empty places in science in recent years.) The sixth-form atmosphere in many places is far from ideal for students who stay on but don't expect to proceed to higher education. Selection by examination still governs university entrance and suggestions that the system be modified by a considera-

tion of students' overall records and scholastic aptitude tests have not progressed very far.

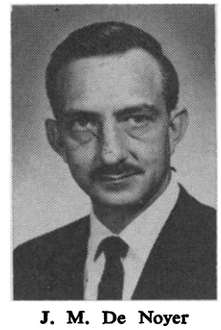
Comprehensive organization is represented as an alternative to selection. Evidence is available to show that a number of well-established comprehensive schools are successful in holding more young people in school and preparing a greater percentage of them for university entrance than would have been the case under the old binary system. And comprehensives have underlined a point by turning 11-plus "failures" into university material.

The comprehensive principle seems to have gained wide acceptance; most opposition takes the form of rearguard actions. One significant trend is the conversion to state education of increasing numbers of the middle class, a conversion brought about both by conviction and financial pressure. To provide equal opportunity it is agreed that the comprehensive school should be socially as well as educationally nonselective. In achieving the first goal the comprehensive faces a stiff test.

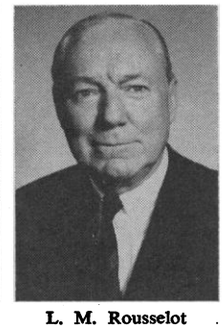
Comprehensive schools in Britain have been conceived from the first as "neighborhood" schools. There are fears that, particularly in big cities where there are huge and growing concentrations of publicly subsidized "council" housing, comprehensives will become one-class schools attended by working-class children exclusively. Despite many forces intended to make British young people classless, Britain remains in many ways a "2-nation" society, split among class lines as the United States is split along racial lines. In the working-class culture there is a very strong tradition enforced by home and neighborhood that school is to be left behind at the earliest possible moment, and that earning, not learning, is the real concern.

Selectivity dies hard. Grammar schools survive in many school systems, and where they do, comprehensive schools have problems in attracting their share of the academically talented students. It is not only the middle class which defends the *status quo*. For all classes, the grammar school has been the portal for the bright child to higher economic and social status. The British education system has been dedicated to producing a meritocracy and the habit is deeply ingrained. The comprehensive school with its doctrine of nonselection is counted on by its partisans to maintain the standards of the old system but to overcome its social wastefulness. But schools do reflect the society and the British are still literally divided by class and tolerant of elitism. In some of the best comprehensive schools, observers have noted that a pecking order develops with the academically talented at the top. Much the same thing happens, of course, in the United States, but it would be ironical if the British made the great effort of reorganization only to see the old system reemerge inside the comprehensive schools.—JOHN WALSH

APPOINTMENTS



J. M. De Noyer



L. M. Rousselot

John M. De Noyer, deputy director for nuclear test detection, Office of the Secretary of Defense, Advanced Research Projects Agency, to assistant director for research of the Geological Survey. . . . **Louis M. Rousselot,** director, department of surgery, St. Vincent's Hospital and Medical Center, and professor of clinical surgery, New York University School of Medicine, to deputy assistant secretary of defense (manpower) health and medical . . . **W. Lewis Hyde,** director of the Institute of Optics, University of Rochester, to provost of the University Heights campus of New York University. . . . **S. David Freeman,** partner in the private law firm of Swidler and Freeman, to director of the newly established energy policy staff, Office of Science and Technology. **L. E. Roth,** professor of cell biology and assistant dean of the Graduate School, Iowa State University, to director of the newly established division of biology, which combines the former departments of botany, bacteriology, zoology, and biophysics, at Kansas State University. . . . **James M. Sprague,** professor of anatomy, Institute of Neurological Sciences, University of Pennsylvania School of Medicine, to chairman of the department of anatomy at the university's School of Medicine. . . . **Harvey J. Stiffler,** assistant professor of microbiology, School of Medicine, Western Reserve University, to professor and chairman, department of microbiology, Ohio College of Podiatry. . . . **John M. Richardson,** chief of the Radio Standards Laboratory, National Bureau of Standards, Boulder, to director of the newly established Office of Standards Review, NBS. . . . **Edgar L. Piret,** scientific attache, U.S. Embassy, Paris, to counselor of embassy for scientific affairs. . . . **Paul C. Cross,** trustee and vice president for research, Carnegie-Mellon University, to director-at-large, American Chemical Society. . . . **J. D. Ives,** chief of the Canadian Geographical Branch, to director of the Institute of Arctic and Alpine Research, University of Colorado. He succeeds **John W. Marr,** who will return to research and teaching at the university. . . . **Harvey J. Brudner,** director of research and development, Westinghouse Learning Corporation, to vice president of the corporation. . . . **William L. Haney,** head of the Data Systems Section, Radio and Electrical Engineering Division, National Research Council, Canada, to liaison officer, in charge of the London, England office of the National Research Council. He succeeds **Harry Williamson,** who has returned to Canada to assume the position of manager of the *Canadian Journals of Research*, published by NRC. . . . **Stephen Williams,** professor of anthropology, Harvard, to acting director of the Peabody Museum of Archaeology and Ethnology, Harvard. He succeeds **John O. Brew,** who will devote his time to research. . . . **Clair L. Gardner,** program planning officer for the National Institute of Dental Research, to associate director for special programs, NIDR. He succeeds **F. Earle Lyman** who recently retired. . . . **F. Merlin Bumpus,** scientific director of the cardiovascular research program, Division of Research, Cleveland Clinic Foundation, to an additional post of chairman of the Division of Research at the foundation. . . . **Charles R. Greene,** clinical instructor in medicine, Downstate Medical Center, to local program coordinator for the Regional Medical Program at Downstate. . . . **Peter L. Auer,** professor of aerospace engineering, Cornell University, to director of the newly established Laboratory of Plasma Studies, Cornell.