

that by 1967 one in eight children was at a private school. The steady decrease in number and increase in size of the public school systems, which has been one of the outstanding changes in primary education in the US since 1945, have, however, continued; there are now 22,000 systems compared with 101,400 in 1945. The total expenditure on public and private education at all levels from kindergarten to graduate school amounted to \$54,600 million in 1967-68; this is just six times the 1949-50 total and 6.9 per cent of the US gross national product.

There are now 2,374 institutions of higher education in the US of which 61 per cent are private, seven are controlled by the Federal Government and the rest by state, city or town. They offer an extremely wide range of instruction, from two years at junior college level to fully fledged university education with all the trimmings. The number of college students has tripled since the early fifties, when there were 2.1 million students or roughly 24 out of every 100 people aged 18 to 24 years. In 1967 there were 6.3 million at college or 47 per 100 of the age group. The number of university staff, of degrees conferred and of post-graduate students has increased concomitantly. The annual crop of PhD's has risen from 8,800 in 1957-58 to 17,900 in 1965-66 and should reach 25,000 a year by 1969-70. Twenty-five universities conferred more than half of all the new doctorates between 1959-66; the top five in the league were the Universities of California at Berkeley with 3,228 followed by Illinois, Wisconsin, Harvard and Columbia with 2,698 doctorates in the eight years.

#### CIVIL SERVICE

### Patents Office Autonomous?

THE British Patents Office, at present a sub-department of the Board of Trade, may find itself reconstituted as an independent body before very long if the committee which is now looking into its role and functions throws its weight behind one of the guiding lights of the report of the Fulton Commission on the Future of the Civil Service. This would be in keeping with the trend towards greater autonomy for government controlled institutions set in motion by the freeing of the General Post Office from its Whitehall tether, now well under way.

Where the Patents Office is concerned, the possibility of autonomous existence depends on the income which the Patents Office derives from fees for patents. In 1967 it was about £3 million. The suggestion in the Fulton report that some of the civil service departments should be hived off from their parent bodies is one that should be borne in mind by any specialized committee like the one in question. There is little doubt that the conformism demanded of any department by being under the auspices of some larger more monolithic administration is bound to cramp the style of those who see the role of the sub-department as essentially independent of its parent body. This applies just as much to the Patents Office in relation to the Board of Trade as it did to the Post Office and the Civil Service structure in general. Where there is a difference between these two cases, however, is in the ends that are being sought.

One of the questions the investigating committee

will no doubt be thrashing out is the desirability of having a function so closely linked to the law further removed from the sure hands of the established civil service. Would the chance of greater efficiency be worth the risk of slackening the justice of the patents system? There are already many anomalies in patenting, and none more glaring than the lack of efficient international arrangements. If the Patents Office is set up in a new form, will it be as easy to institute the radical changes which may become necessary in the years ahead? These are questions that no doubt exercise the investigating committee.

One of the benefits of autonomy is usually the freedom to draw up salary scales appropriate to the particular needs of the department. This is not likely to prove as strong a motivating force for changing the status of the Patents Office as it was for the Post Office, however. Employees at the former are normally reckoned to be well paid, whereas the shortage of scientists and engineers at the Post Office is at least in part attributable to the rigid salary structure that exists at present.

#### ROYAL SOCIETY

### Encouraging Research in Schools

ONE way to encourage scientists to take up school teaching is obviously to show them that it does not necessarily require the sacrifice of all hopes of making some original contribution to knowledge. With this in mind, and in the hope of perhaps offsetting the swing away from science in sixth forms of British scholars, the Royal Society's Scientific Research in Schools Committee has supported during the past year ninety-six projects ranging from radio astronomy to the ecology of slugs. The eleventh annual report of the committee has just been published.

The society provides the money to support the projects, and it comes from the society itself, from the Atomic Energy Authority and from several industrial companies. This money buys any equipment that may be needed, and occasionally it may be as much as £300, but the grants are usually small—the sum disposed of in a year is usually £3,000-£4,000. An important aspect of the scheme is the fact that the teachers have expert advice with their projects. A teacher with an idea for a project is introduced by the Royal Society to a scientist working on the same or a related topic. The teacher and his adviser discuss the project and if it seems feasible and valuable they work out a plan of research. The Royal Society provides some money if equipment is required.

The society is at present trying to encourage more applied science projects, and is particularly anxious to give women teachers the opportunity of research in engineering, physics and mathematics. Of the ten women listed in the report, eight are engaged in biological research. The other two are Mrs M. H. Hayes of the City of Worcester Grammar School for Girls, who is working on the shape of macromolecules in solution with advice from Professor J. C. Robb of the University of Birmingham, and Mrs M. S. Barrett of Walkden Girls' County Secondary School, Manchester, whose topic is work study in the home, with advice from Miss J. E. Walley of Queen Elizabeth College, London.

Although the proportion of women participating



in the scheme is so small, there are more involved than in previous years when there have been only one or two or none at all. By publicity, however, the Royal Society hopes that more teachers will come into the scheme. Although the projects are chosen and carried out by the teachers, there are hopes that pupils will be involved whenever possible. This should be an opportunity for them to find out what research entails. From the teacher's point of view this is obviously a way of keeping themselves in the scientific world while doing a worthwhile job of teaching.

The quality of their research is exemplified by the increasing number of papers they are publishing. Among those published last year was that by Mr W. H. Dowdeswell of Winchester College, who is well known for his contributions to ecological genetics. With advice from Professor E. B. Ford and his colleagues at Oxford, Mr Dowdeswell and Mr J. C. L. Day have investigated natural selection in the snail *Cepaea* on Portland Bill (*Heredity*, **23**, 169; 1968).

#### NUCLEAR POWER

### Exchange of Information

AN agreement on the exchange of nuclear information was signed last month between the governments of France and Japan. The agreement is the latest in a long series which the Japanese are using to set the stage for a rapid expansion in nuclear power capacity. So far, Tokai Mura, one of Britain's few successes in the export of complete power stations, is Japan's largest nuclear power station, but it will be rapidly overtaken by others if Japan's ambitious nuclear power programme goes according to plan.

By 1975, Japan intends to increase the existing nuclear capacity to more than 9,000 MW; in 1985, this will have been further increased to between 35,000 and 55,000 MW, providing almost a fifth of the country's electricity. This represents the commissioning of at least two nuclear stations each year until 1985, an ambitious programme by any standards. Even if this rate of development is not achieved, it is clear that for the next ten years or so the Japanese market is going to be one of the most lucrative in the world. For this reason alone, Japanese industry is certain to develop its own systems, and the agreement signed with the French seems to be designed to speed up the process. The six reactors approved or under construction in Japan at the moment are all of American design.

Another reason for the agreement is the parallel work on fast reactor systems which is in progress in Japan and France. The French experimental fast reactor Rhapsodie began operations in 1967, and a prototype reactor is expected to be operating in 1973, the same year as the Japanese prototype comes on to power. It is this accident of timing which has made the possibility of collaboration attractive. The Japanese fast reactor prototype will be a 100 MW (thermal) reactor, cooled by liquid sodium, and a similar reactor with a capacity of 100 to 300 MW (electrical) will follow, to be brought on power in 1976. The recent agreement provides for exchange of basic information on the behaviour of liquid sodium and the materials used, as well as some collaborative research in the same areas.

But Japan is not limiting its nuclear agreements,

and sensibly seems to be using them to get the most out of other countries. In March last year, Britain and Japan signed a thirty-year agreement which provides for collaboration on the peaceful uses of atomic energy and, more specifically, for the supply of fuel to Japan for any British reactor sold there. Agreements have also been signed between the UKAEA and the Japanese Atomic Energy Research Institute for the exchange of basic data useful in the development of fast reactors; the information is likely to stop well short of the commercial secrets necessary for building marketable systems. Information about the fuel used in the steam generating heavy water reactor programme has also been sold to Japan, and an agreement has been reached between the AEA and the Furukawa Electric Company for the manufacture in Japan of AGR fuel if an AGR is built there.

#### EURATOM

### Biology Soldiers On

EURATOM's Biology Division has just issued its second report (*Euratom's Biology Programme 1964-1967: Report, Perspectives and Bibliography*). Euratom's involvement in biology started in 1961 with a programme which, to begin with, concentrated on problems of radioactive contamination. Since then, the division has had more than its share of financial difficulties—in 1964 it faced budgetary cuts that amounted to a reduction of forty per cent in its uncommitted funds—but it has managed to soldier on. Not surprisingly, the report is peppered with splenetic asides about the limitless costs of space research, although it is silent about the French machinations which are currently threatening the future of Euratom itself. France recently proposed that Euratom should abandon its communal research programmes altogether.

Politics aside, the report conveys a picture of vigorous and wide-ranging research. Most of the division's projects are contracted out to universities and institutes throughout the six, although the division has fifty professional research staff on its own account, and its budget runs at about \$5 million a year. The biological effects of radiation continued to be a main interest, with projects ranging from the ecological—the accumulation of Mn<sup>54</sup> in the bivalves of Lake Maggiore—to the molecular—the role of hydroxyl radicals in the gamma ray inactivation of the phage  $\Phi$ X 174.

Any evaluation of the genetic risks associated with radiation exposure requires some assessment of spontaneous mutation rates. Cavalli, a contractee, has attempted to do this for a category of human genes (sex-linked recessive lethals) in an intriguing way. He examined a 1/200 sample of the Italian population for signs of correlation between sex-ratio of offspring and the age of the maternal grandfather at the birth of the mother. Results so far apparently hover on the brink of statistical significance, and the survey is being continued.

In other research topics, the biology division has strayed some way from its original radiobiological brief into such fields as immunity, phage biology, crop improvement and the growth of pathogen-free animals. The topics covered seem intelligently chosen, though most of the work being done seems perhaps of less than