

lation of up to 5,000. Ancillary buildings, sports fields and further expansion are going to be developed on the other section of the site—about 284 acres on the other side of the Guildford by-pass. The architects for the university, Building Design Partnership, have also allowed for great flexibility. This must be useful both at present, when there is restricted space, and for later expansion.

The whole programme has been based on the need to move the entire university from Battersea to Guildford by the end of next year, the end of phase 2. At a press conference last week, Dr D. M. A. Leggett, the Vice-Chancellor, described the move "as a calculated risk". From all accounts, it appears to have been a risk worth taking.

Parliament in Britain

University Building

THE University Grants Committee informed the Government on September 26 that as a result of its letter of August 1 to the vice-chancellors, university building programmes had been cut back from £28.7 million to £18.7 million. Mr Edward Short declared that the Government had asked for the reduction in the 1968-69 building programmes after the normal review of public expenditure and not because of changes in the economic situation. (Oral answer, October 24.)

Science Teachers

AN advertising campaign aimed specifically at attracting science and mathematics graduates into school teaching will be launched shortly. In addition Miss Alice Bacon announced that the Department of Education and Science is collaborating with university

appointments boards and faculties of science in arranging a series of discussions with students about prospects in science and mathematics teaching. (Written answer, October 24.)

Noise Research

IN the past three years the Government and industry have together spent £1.5 million on noise research. Mr J. P. W. Mallalieu said the Government's contributions had been £283,000 in 1965-66; £395,000 in 1966-67; £484,000 in 1967-68. The estimate for this year is £600,000, but the rate of expenditure for the next two years has not yet been decided. (Written answers, October 21 and 25.)

Public Health

IN the nine months to July 1, the number of general practitioners in England and Wales rose by 86 to 19,935. Mr Kenneth Robinson said this could be compared with a fall of 505 in the three years to October 1, 1966, and a rise of only five in 1967. He admitted that although the trend this year is encouraging, many areas still have too few doctors. (Written answer, October 25.)

Power Subsidies

PAYMENTS to the Scottish electricity boards, compensating them for using coal-fired instead of oil-fired generators, amounted to £1,031,671 between September 1967 and July 1968. Dr Dickson Mabon said the payments vary from year to year according to electricity load factors, fuel prices and so on. The payments will continue to be made until April 1, 1971. Replying to another question, Dr Mabon revealed that the power stations forming the Lanarkshire Hydro Scheme generate the cheapest electricity per unit in Scotland and the gas turbine station Townhill "B" at Dunfermline, using distillate gas oil, is the most expensive. (Oral and written answers, October 23.)

Who Wants to be a Scientist?

ACADEMICS, schoolteachers and industrialists, meeting at the Royal Society last week, took a close look at that extraordinary and disturbing phenomenon, the swing away from science in British schools. As Professor O. E. Lowenstein said in his introduction to the one day symposium, at a time like this, when the success of our technological society depends on the efficiency of scientific effort, the young might be expected to be enthused with the fervour of their social mission. But this is not the case; a decline in the general esteem for science is demonstrated by the steady decrease in the number of applicants and entrants to science and technology faculties since 1962.

Dr F. S. Dainton, chairman of the committee of inquiry that reported this trend last January, said that at the moment the swing does not represent a great loss of scientists and technologists, but it is a social phenomenon that should arouse concern.

The age at which pupils have to choose the subjects that will eventually lead to A-level and university entrance was picked out as an important factor by the principals of four schools, who assessed the motivation

behind a pupil's choice for or against science. Mr H. F. Broad of the Cedars School, Leighton Buzzard, pointed out that four-fifths of grammar school pupils have often made their choice of subjects by the age of fourteen or fifteen, when there is a restriction on the number of subjects they can study.

Mr A. R. D. Wright of Shrewsbury School suggested that less restricted courses and good teaching at all levels have contributed to the continuing popularity of science in his school, where no swing has been experienced. At Shrewsbury all boys take chemistry, physics and mathematics at O-level. The School Mathematics Project has contributed to the sustained popularity of this subject. In answer to a questionnaire, thirteen and fifteen year old boys chose mathematics as the subject they would most like to study throughout the school, with English as the next most popular.

At Shrewsbury the pupils are of a higher than average intellectual quality; the range of IQs is from 107 to 140. Often standards required by O-level courses are too high to sustain the interest of less able pupils, who

lose confidence in their abilities when they find work too difficult. As Mr Wright said, school science courses are too difficult too early—the universities are asking the schools to do their early work for them.

Shrewsbury has another advantage in being well staffed. This is often not the case; it is not uncommon for the good teachers in a school to be concentrated on the sixth form, so that the thirteen to fifteen year olds, at a time when they need every encouragement in science, do not receive the high quality teaching they should. This is only a symptom of the widespread shortage of science teachers, for the quality of science is not always what might be desired. Mr D. Thompson, of The Woodlands School, Coventry, a comprehensive school, finds that scientists are not always such good communicators as their colleagues in the arts. Science is not being taught as well as many other subjects. Mr Thompson attributed his success in staving off a swing from science in his school partly to the fact that he is himself a scientist. A headmaster who is a scientist may be more concerned than an arts man to look after the interests of science in his school.

Another of Mr Thompson's suggestions was that the rejection of science by the young might be a further symptom of the general rejection of authority that is so obvious at the moment in young people. Perhaps they see the scientists as the people who have failed to solve the problems of today, which are spiritual and not material. This idea may not be so extraordinary in the light of what Miss B. Williams of the County High School for Girls, Reigate, had to say. In conversations with her sixth form she has found that social acceptability is a very important influence on the choice of subject. Girls feel that science and mathematics are boys' subjects, and find that their boy friends are incredulous when girls elect to study chemistry, physics and mathematics instead of English and history. Girls studying science are hailed as brilliant by family and friends, and as Miss Williams said, it is more important to girls to be considered attractive than brilliant.

Girls are also deterred because they feel that science and marriage do not mix; once they have spent a few years producing a family their knowledge is out of date. They also see the discipline of science as unpleasant; to them the life of a science student often seems solitary, dull, brutish, lonely and long, with insufficient time for indulging that favourite schoolgirl pastime, gossip. Careers, too, they see as a problem, for women qualified in science seem to have to work twice as hard as men to make half the progress.

Clearly one of the reasons for the lack of enthusiasm for science is the failure of teachers to make their subject interesting. One fault is with the courses which are out of touch with all that is exciting in modern science; clearly revisions of syllabuses are welcomed by the schools. Another great problem is that the teachers themselves are out of touch with the latest developments and teaching methods. There is a great need for refresher courses for science teachers, but there are many problems, not the least that it is often the best teachers who attend the courses.

Sir Harold Thompson, discussing in-service training for science teachers, said that although conscientious teachers realize that they should be aware of changes in the curriculum and new ways of teaching, many of them have not received refresher training for thirty

years. The schemes already in progress, such as those run by the Royal Society's joint education committees, which have organized courses at regional centres, and by various universities and colleges, have run into considerable difficulty. Not only is there a lack of funds, but also a lack of applicants—many courses often have vacancies which many teachers never hear about.

Refresher training is less demanding on the schools in the form operated at Nottingham. Dr Dainton said that university mathematics staff go out to teachers' centres and schools to give refresher classes. This, however, is expensive and not all universities can afford to do it. Also at Nottingham, research students have spent days or parts of days teaching in schools in place of teachers. In Dundee, however, a similar scheme fell through because of opposition from the authorities concerned.

Another level of training that needs looking into is that of primary school teachers. Professor K. W. Keohane pointed out that seventy per cent of primary school teachers have not passed O-level mathematics, and although only one in sixty-four girls take O-level physics many of them go on to teach in primary schools. Although it is not great knowledge that young children require, surely their teachers need a basic grounding to help answer questions of their pupils.

There is undoubtedly room for more of the sort of teaching described by Mr E. R. Wastnedge of Her Majesty's Inspectorate. He said that the best teaching encourages children to find the answers to their own questions. He was full of praise for a teacher who, when asked whether acorns contain starch, suggested that her pupil should try to find out. The result was that he went away and ground up some acorns to make a paste which he used to starch a handkerchief.

The shortage of science teachers is clearly reaching serious proportions, although Professor M. M. Swann, chairman of the Government committee that has just reported on the flow of scientists into employment, did not think that it is yet a major factor in the swing away from science. More serious is the tendency, revealed by the Swann committee, for many of the best graduates to stay on at the universities to do research. Professor Swann thought the universities could be more positive in suggesting to students what they might be interested in besides research. Broadening of curricula ought to help in this respect.

The most serious shortage is apparently in teachers of mathematics. A working party set up by the Royal Society and the Council of Engineering Societies sent questionnaires to three hundred headmasters, asking about their staffing difficulties. Sir Nevill Mott quoted some of the replies received so far. One headmaster said: "It's almost miraculous to find a good teacher of science or maths"; another said: "It's many years since we had a good teacher of physics". Another reply was: "Given the funds I could easily staff my school with PhDs".

Sir Nevill remarked that although small salaries are obviously a deterrent, there are other ways in which teaching could be made more attractive. More money is needed for equipment for schools, and a call for more technical assistance brought murmurs of agreement from teachers in the audience. Sabbatical terms might also be worth considering. With a situation as serious as this, anything must be worth considering.