

working on advanced materials and developing micro-electronics. It is thought that a few workers will be offered posts at Wembley, where fundamental work in this line is carried out, but GEC already has a well established group working on materials science. There is also a group at Harlow which is just getting going onto production engineering and automation, and it is feared that the GEC is just not interested in this.

It is highly likely that a similar story would emerge from the Blackheath laboratories, but GEC is trying to restrain comment. The statement that the company is to build up powerful research teams, particularly at Wembley, is being received with scepticism by some of those affected.

New Man at Harwell

DR WALTER MARSHALL is to succeed Dr Robert Spence as director of the Atomic Energy Research Establishment at Harwell on April 1. One of his principal tasks will be to supervise the practical and commercial assistance which the establishment hopes to give to industry in Britain.

Dr Marshall, who is 35, joined the AERE in 1954 and became head of its theoretical physics division in 1960. He was appointed deputy director in 1966. Dr Spence became head of the chemistry division at Harwell in 1946 and has been director since 1964. He now goes to the University of Kent to take up the mastership of the new third college, as yet unnamed, and the chair of applied chemistry.

New Man in France

THERE is great pleasure in France that the new head of the Délégation Générale de la Recherche Scientifique et Technique is Dr Pierre Aigrain, until this week in charge of higher education at the Ministry of Education. Dr Aigrain is 43 and is a physicist by origin and since 1959 has been secretary-general of the French Physical Society. His career has alternated spells in government departments with intervals of academic life. He has, for example, held scientific positions with the French navy, the atomic energy commission (CEA) and, most recently, the army. He was at the Collège de France for a brief spell in the early fifties and has been connected with the universities of Lille and Paris. He has won himself a high reputation as an energetic and sensible man.

Physics Information

THE American Institute of Physics has landed the first instalment of a grant from the National Science Foundation which is likely to amount to more than a million dollars in the next five years and which will be spent on the study and development of new techniques in the dissemination of information in physics. Work has already begun on the project, which was described at the New York meeting of the American Physical Society at the end of January by Dr H. W. Koch, director of the American Institute of Physics. Like the American Chemical Society, the American Institute of Physics, which is a federation of several learned societies ranging in size from the American Physical Society to the Society of Rheology (with a few hundred members), has come to occupy a central position in the

publication of original material in physics. Dr Koch said that the institute's journals have been publishing more than 50,000 pages in aggregate each year for several years now. The total size of all its journals seems in fact to be doubling every five years. The American Institute of Physics is perhaps more outspoken than other similar organizations in its belief that there would be benefits in devices which could replace formal publication.

The plan for the information study now begun will cover several aspects of this problem. For one thing, there is to be a thorough study of the uses of computers in the storage and retrieval of information. In this sense, the Institute of Physics will be following the Chemical Abstracts Service, which is now publishing lists of titles on magnetic tape. It seems, however, to be acknowledged that physicists may not be as well served by computer storage as are the chemists—for one thing the costs of tape retrieval seem to be high and informal exchanges of preprints among interested groups of physicists have been well developed. But the Institute of Physics is also hoping to tackle directly the qualitative problems of the scientific literature, and the programme of work ahead is to include a serious attempt to decide what part formal articles in the scientific journals should play in the dissemination of information. A convincing answer would be well worth a million dollars.

Doctorates in the United States

A STATISTICAL report on the education and subsequent employment of PhD students and their equivalent in the United States has been published by the National Academy of Sciences for the Office of Scientific Personnel of the National Research Council (*Doctorate Recipients from United States Universities, 1958-1966*). The source of all the information is the Documents Records File which is compiled from extremely detailed surveys of graduates completing doctoral degrees. This file goes back to 1920 and must surely be the envy of higher education authorities in other countries for its thoroughness. All subjects are covered in the report, though there is no doubt about the predominance of science and technology. In 1966, a total number of 17,865 graduates received doctorates, of which 6,077 (34.02 per cent) were in physical sciences and engineering, and 2,869 (16.06 per cent) were in biological sciences. A further 2,666 (14.92 per cent) were awarded doctorates in the social sciences. Altogether there has been an average growth rate of 9.2 per cent over the period 1958-66. Engineering has had the most spectacular increase—in 1966, four times as many doctorates were given in this field as in 1958. Corresponding to the growth in numbers of PhDs are figures for the growth in numbers of colleges and universities. There is also a detailed analysis of the pattern of doctoral education—the time taken to register for higher degrees after completion of first degrees, transference from one course to another and from one institution to another during the period of study and so on.

Of interest to the followers of the Swann and Willis Jackson reports on scientific and technical manpower are the analyses of postdoctoral employment. Colleges and universities are the main employers of higher degree graduates in all fields, and a greater percentage

Table 1. FIRST EMPLOYMENT OF HIGHER DEGREE GRADUATES IN THE USA

| Field of doctorate | Year of doctorate | Elementary | | | Non-profit | Industry | Other | Foreign employer | Total with known employer |
|-----------------------------------|-------------------|------------------------|----------------------|------------|------------|----------|-------|------------------|---------------------------|
| | | College and university | and secondary school | Government | | | | | |
| Total all fields | 1961-63 | 18,877 | 1,722 | 2,410 | 1,305 | 4,319 | 763 | 2,828 | 32,224 |
| | 1964-66 | 27,362 | 2,082 | 2,921 | 1,760 | 5,499 | 1,127 | 3,961 | 44,712 |
| Physical sciences and engineering | 1961-63 | 4,643 | 27 | 598 | 374 | 3,521 | 345 | 912 | 10,420 |
| | 1964-66 | 7,259 | 5 | 845 | 498 | 4,540 | 597 | 1,338 | 15,082 |
| Biological sciences | 1961-63 | 3,096 | 33 | 640 | 193 | 442 | 126 | 808 | 5,338 |
| | 1964-66 | 4,255 | 4 | 776 | 289 | 516 | 184 | 1,135 | 7,159 |
| Social sciences | 1961-63 | 3,133 | 143 | 827 | 372 | 227 | 191 | 487 | 5,380 |
| | 1964-66 | 4,328 | 82 | 833 | 497 | 255 | 203 | 610 | 6,808 |

are attracted each year. This trend is especially marked in the physical sciences and engineering. Industry is the major employer of physical scientists and engineers, but it employs fewer than 10 per cent in other fields. The percentage of scientists and engineers with doctorates going into industry, however, has fallen rapidly from 44 per cent in 1958-60 to 30 per cent in 1964-66. Mathematics, physics and chemistry show especially sharp declines in industrial employment. Fewer than 10 per cent of the new higher degree graduates accepted employment overseas, but this figure should be balanced against the number of foreign graduate students (14 per cent) in the country. Brain drain enthusiasts should have fun working on all these figures.

No Merger for Engineers

THE projected merger between the Institution of Mechanical Engineers and the Institution of Heating and Ventilating Engineers is off. After discussions lasting the best part of a year, the heating and ventilating engineers finally decided that they no longer wished to press on with the merger. The decision has left the mechanical engineers slightly baffled. "We don't know why they decided against the merger" an official said this week. "It's very disappointing."

Merger talks began when the heating and ventilating engineers decided that they wanted to increase their influence. The easiest way of doing this, short of a royal charter which was very unlikely to be granted, was to amalgamate with an established body. The obvious choice was the Institution of Mechanical Engineers, and talks began. It was first agreed that the heating and ventilating engineers should enjoy a status within the combined institution much like that enjoyed by the automobile engineers. They would have been virtually an autonomous group, with their own council and their own chairman, and members in the different classes of membership in the IHVE would have been able to transfer to the equivalent classes in the combined body. The IHVE would have been able to publish its own journals and hold its own conferences and meetings. The mechanical engineers had agreed to set up joint working parties to study the problem of technician engineers, whose position the IHVE was anxious to protect. Despite all this, the heating and ventilating engineers told the mechanicals on December 20 that they did not wish to proceed.

One heating engineer suggested this week that the IHVE feared that it would be swamped when it joined the mechanicals. There does seem to have been some opposition within the profession, although the mechanical engineers say that they have received several letters from individual members of the IHVE regretting

the decision. The Institution of Mechanical Engineers denies that it ever wanted to make a takeover bid for the IHVE, and "sincerely hopes that this is not the end of the affair. The door is not closed to further talks". Meanwhile, joint meetings will continue as before. Clearly the hope is that the IHVE will eventually see the folly of its ways.

Safety in Space

by Angela Croome

SEVERE strictures on National Aeronautics and Space Administration (NASA) complacency, which it considers was responsible for the deaths of three astronauts in last year's Apollo fire, are contained in the Congressional report of its own inquiry into the circumstances of the accident. Some of the Senate space committee are doubtful if the shortcomings of the contractors' work would have come to light without the accident, and NASA is criticized for not passing on to Congress reservations on the performance of the Apollo main contractor, North American Aviation, which was the subject of a secret NASA report in 1965. In summary, "NASA's performance—the evasiveness, the lack of candour, the patronizing attitude exhibited towards Congress, the refusal to respond fully and forthrightly to legitimate congressional inquiries, and the solicitous concern for corporate sensitivities at a time of national tragedy—can only produce a loss of congressional and public confidence in NASA programmes".

In the meantime, extensive replacement of materials in the capsule and spacesuit to make these "almost fireproof" has been completed. A quick escape hatch has been substituted for the previous design. The total cost of these modifications is estimated at \$100 million. The changes have forced the forfeit of between 600-1,000 lb. in the overall weight of the spacecraft and this in turn has required the re-design of the return parachute system to support it. A fully fire-resistant material, Beta fabric, has replaced high-temperature nylon (Nomex) for the outer layer of the Apollo pressure-suit. The inflammable boot-soles and helmet (polyurethane) have been replaced by carboxy-nitroso rubber and a silicone material respectively. Nomex has been substituted for nylon as the material of the suit liner. The opportunity has been taken to make the suit more comfortable and durable. Metallized patches cover pressure points and the outside of the gloves are equipped with artificial nails or claws to assist sample collection. It is estimated that about 1,000 yards will be the walking limit of an astronaut kitted out for the first lunar excursion.

On its first flight on January 23 the Apollo lunar model acquitted itself well, and NASA authorities are