

inheritance and regard the broad head as a dominant masking the long-headed Nordic element. A new theory has been put forward, or rather an old theory revived, in Germany, making the shape of the head fortuitous and eliminating its significance for the Nordic theory. Prof. Kruse of Leipzig, according to the *Times* of November 19, argues that the shape of the head depends upon whether babies are laid on soft or hard pillows. On soft pillows they lie on their backs and hence, he maintains, although originally long-headed, come to have broad heads as they grow. A broad head, therefore, is no disproof of Nordic ancestry. In the middle of the sixteenth century, Vesalius noted the difference between the rounded head of the Turk and the broad flat head of the German. The former he explained as due to the swathing of the head and the action of the midwife, and attributed the latter to the fact that German babies slept on their backs in their cradles, while the Belgians, sleeping on their sides, had longer heads. It is interesting to note that in Dürer's representations of German peasants at about the same date, the broad flat head is very marked.

Academic Assistance Council

LORD RUTHERFORD'S progress report of the Academic Assistance Council in a letter to the *Times* of November 16 is a statement in which the whole academic body of Great Britain may take legitimate pride. The Council, indeed, has not accomplished everything it would have wished; but its efforts nevertheless have effected much. Of the German scholars and men of science displaced since April 1933, Lord Rutherford says that 200 have found permanent places and 325 have been provided with temporary facilities for continuing their research outside Germany. In other words "at least two thirds of the whole number who were justified in looking to continue their scientific work have been assisted to remain in the academic world". Emergency grants have been given when needed and are still being given to 71 scholars and men of science while they are seeking posts. This is a remarkable achievement for an undertaking which was initiated in a period in which the whole world, and more especially the two countries which might be relied upon to respond generously to such an appeal, namely, Great Britain and the United States, were in a state of economic depression without a parallel. The need for effort, however, still remains, for the funds available for meeting present commitments will be exhausted in July 1935. Further, while Lord Rutherford is in a position to state that the work of the Council has now attained a basis of international co-operation, this announcement, unfortunately, coincides with a report of the financial collapse of national committees on the Continent.

LORD RUTHERFORD goes on to outline a further objective. The size and nature of the problem with which the Council has had to deal hitherto is now definitely known; and it is proposed to add to the functions of the Council the formation of a trust for creating a number of research fellowships which will

be available for scholars and men of science of special distinction, who are debarred from carrying on their work in virtue of their race, religion or political opinions. These fellowships will be awarded irrespective of nationality. It will be remembered that, although the work of the Academic Assistance Council has necessarily been directed to the alleviation of the difficulties of those who have suffered through the political situation in Germany, the purpose of those by whom the Council was founded is to assist any, of whatever nationality, who might be dispossessed on such grounds. The same principle will be applied in the award of the proposed research fellowships. Already Lord Rutherford has been able to announce the prospect of a contribution from America which will provide for 36 research fellowships tenable for a period of three years in any of the universities within the British dominions. This generous offer will no doubt stimulate other contributions. Should the proposal of the Council come to full fruition on a pan-national basis, it will confer upon it a unique position as a permanent international rallying point for the defence of academic freedom—a consummation eminently to be desired in the present trend of world conditions.

University Education

IN his inaugural address to the Royal Statistical Society on November 20, the president, Prof. Major Greenwood, discussed the "Recent History and Function of University Education". Speaking of the statistical changes in the proportion of males in England and Wales who have entered upon a university course since 1801, Prof. Greenwood estimated that at the beginning of the nineteenth century, when Oxford and Cambridge were the only English universities, about one-half per cent of males had a university education, a very slightly larger proportion at the middle of the nineteenth century and now about 2 per cent. In Germany, before the Nazi regime, it was estimated that not more than 3 per cent of university students came from working class families. It is unlikely that the proportion is more than 10 per cent in England and Wales. An author writing in the first volume of the Society's *Journal* estimated that the universities of Great Britain had a total revenue in 1831 of £800,000 per annum; in 1931-32 their total income was £5,874,778, of which more than £2,000,000 came from Parliamentary grants.

THE renaissance of English university education which began rather more than eighty years ago led to a discussion of the functions of a university to which Cardinal Newman, Mark Pattison and Walter Bagehot all contributed; their views, however different the expressions, were essentially similar, namely, that higher education in its highest and best sense implied segregation; "a university should be situated," said Pattison, "like the poet's garden, 'Not wholly in the busy world, nor quite beyond it'." Prof. Valentine has recently shown that in universities now, even among scholarship entrants, a sensible proportion (in the modern provincial universities) fail

to reach honours standard. Mr. Abraham Flexner also has recently criticised the intellectual standards of British and American universities. The question accordingly arises whether the standard of intellectual selection should be maintained or even raised, or whether a wider conception of the function of a university should be entertained. Prof. Greenwood stressed the new factor of increasing leisure, and referred to the serious dangers to political freedom arising from an uneducated democracy to which the Bishop of Winchester has recently directed attention. The value of education from the hedonistic point of view has been insufficiently emphasised; while the ideal of Newman and Pattison cannot be realised in a great city, an even nobler ideal might be entertained. "In a great city what one loses in intimacy may be compensated by a gain of continuity. I think of the *universitas* of a *studium generale* in London as not restricted to the enrolled teachers and matriculated students, but as comprising the *universitas* of men and women to whom study and research can bring happiness and recreation."

The Electron in Industry

A RESEARCH and Development Lecture, arranged by the Royal Institution and the British Science Guild, was given by Mr. Clifford C. Paterson, director of the Research Laboratories of the General Electric Company, Wembley, on November 21, at the Royal Institution. After the work of J. J. Thomson, electricity could be thought of in terms of the individual electron, its habits and affinities. One of the two main reasons for the practical usefulness of electricity is its ease of control. The other is its transportability. It is in the direction of the control of electricity that the free electron has of late given the engineer new and extraordinary powers. The secret of the revolution is that electricity can now be freed from conductors. A stream of free electrons, whether in a vacuum or a gas, can be manipulated with such facility that the electricity can be increased or decreased at the rate of millions of times a second, or alternatively as slowly as desired, and no limit is set to the amount of energy which can be so controlled. It was the object of the first part of the lecture to explain and to demonstrate why these extremely rapid actions of the electrons are wanted. So much of what the eye sees and the ear hears consists, if analysed, of extremely rapid happenings. The eye and the ear are unconscious of these high-speed fluctuations and vibrations although sensitive to them. In order that these very rapid oscillations and variations may be faithfully reproduced and transmitted it is necessary to make exact electrical copies of them. This is done by suitably controlling a stream of free electrons.

THE two principal electron liberator devices discussed by Mr. Paterson were the thermionic valve and the photoelectric cell. To illustrate the potentialities of these, he demonstrated experimentally how the mechanical movements of a needle on a gramophone record can be converted into electrical pulses; then impressed on to the current in a luminous

discharge lamp and changed to light pulses; the beam of light carrying exactly equivalent modulations can be passed across a room and reconverted by a photocell into electrical pulses. These again can be amplified and, by a loud speaker, reconverted into sound waves in the air. The free electron is also being used in new ways in the art of electric lighting. The many coloured luminous discharge tubes used for display purposes in the streets have led the way to more brilliant and more efficient light sources. Some of these give much more light for the electricity consumed than existing filament lamps. The effects are the result of high-speed encounters between free electrons and the gas atoms in the tubes, at speeds up to six million miles an hour. Electricity which is liberated from the metals, which in the older engineering restrained it, is having industrial applications of the highest importance.

Fuel Research

FUEL research was discussed by Sir Harry McGowan, who succeeds Sir William Larke as president of the Institute of Fuel, in his presidential address on November 12. Experience, he said, has taught him the vital connexion between research of all varieties and commercial and financial prosperity, whether it is applied to the improvement of present methods of working an existing process, to the production of an entirely new commodity as an alternative or substitute for one now in use, to the safety of those who labour in industry, or to an examination of the demands of the consumer. Research in one industry cannot ignore the results of research in others, for all economic facts are intimately connected, and a change in any part of the economic structure inevitably induces changes in other parts. Our national fuel asset is coal, and our original industrial monopoly was based upon the introduction of steam power and the development of railways. Development, though world-wide, has not, however, been uniform; it has a ragged front, and new knowledge is continually changing relative national positions. Sir Harry McGowan referred to the domestic use of raw coal, which is still preferred to smokeless semi-coke by the ladies who command the household and value a cheerful flame above the more economical and healthy use of coal. More propaganda and technical research are needed to bring home to the public what coal can do in the home. Sir Harry mentioned that whole suburbs of cities in France are heated by a high-pressure hot water ring main based on coal, and that an astonishing economy in fuel has been achieved. On the other hand, the industrial users of coal base their demands on specific requirements as to effective heat value. Sorting and grading are usual, and much better coal than was previously thought obtainable has been brought on the market.

POWDERED coal, continued Sir Harry McGowan in his presidential address, is comparatively a new-comer into the power field. It speedily affords a high temperature, permitting rapid adjustment to varying load (such as a sudden demand for electricity