co-ordinate measuring apparatus, a spectrograph, several objective prisms, a Blink comparator and an astro-wedge-photometer, as well as a new refractor-mounting for an existing telescope objective. The domes will each be equipped with an observation platform of the latest type, the so-called tilting platform, which is moved by electric motors controlled by switches within easy reach of the observer. On these sliding platforms the observer can easily follow any movement of the telescopes. The instruments and apparatus are to be supplied within two years.

Crystals of the Living Body

THE first Friday evening discourse of the new session was delivered at the Royal Institution on January 20 by Sir William Bragg, who chose as his subject "The Crystals of the Living Body". Growth and purpose require directed arrangement of the protein or other molecules of which the body is made. The protein of a silk fibre is a long chain-like molecule consisting of a sort of backbone in which two carbon atoms and one nitrogen make the regularly recurring links, and this structure is common to the various forms of protein. Of every pair of carbon atoms one has, so to speak, a spare hook to which other atoms or strings of atoms may be attached, like pendants to the links of a mayor's chain. In the case of silk these pendants are very simple, consisting alternately of a hydrogen atom and a group containing one carbon and three hydrogens. The new methods of X-ray analysis enable us to prove the arrangement of these chains, and to measure the dimensions of the links. They show that the chains tend to group themselves into bundles, and they find the forms which the bundles take. This arrangement is obviously appropriate to the functions of the silk fibre, to its flexibility and its tenacity. The fibre is spun, in fact, just as we spin a rope on a far grosser scale, laying the vegetable fibres side by side. Such a parallelism is no surprise, for in all our examinations of organic substances in the laboratory, physical, chemical, or biological we have always found that our best practice is foreshadowed. A particularly interesting comparison can be made with the structure common to hair, wool, horn, feathers and the like. These are built on the same principle as the other proteins, from which they differ only in the nature of the pendants. The latter in this case attract each other strongly, and in drawing together give the chain a wavy or crumpled form : the process has lately been explained by Astbury. The in-curled proteins, with their internal attractions satisfied, are not susceptible to many reagents which bring about the dissolution of proteins of the extended form. Thus hair long outlasts other parts of the body in their decay.

Synthetic Sound Films

ACCORDING to a report in the *Times* of January 11, an interesting curiosity has been on exhibition in Germany in the form of a sound film "Die Tonënde Handschrift" in which the sound part was originally prepared without the use of sound. Details are not available but from the illustrations it appears that the film uses the contour method of sound recording in which a constant density of blackening is produced over varying widths of the film. Normally this is produced by light reflected on to the moving photographic film from an oscillograph operated by electric vibrations transformed from the original sound vibrations. Herr R. Pfenninger in the new process makes templates each containing several sound waves and photographs a reduced image of these in turn on to the stationary film. Both the preparation of the templates and their photographing naturally take much longer and the object is not to reproduce graphically the tones of well-known musical instruments but to construct music of new timbre. The report states that the laboriousness of preparing the templates is to be reduced by the use of a typewriter which uses wave-outlines instead of letters, a separate sound-wave typewriter being used for each timbre. It would be interesting to know if the characteristic wave-forms of singing or string playing of exceptionally good quality could be successfully copied so as to give reproductions of melodies which had not been actually performed. This might make possible the performance of a new musical work by the voice, or playing, of an artist no longer living.

Migration from and to Great Britain

A PAPER by Mr. H. Leak and Mr. T. Priday on the subject of migration from and to Great Britain was read at a meeting of the Royal Statistical Society on January 17. Factors affecting post-War migration, of which the chief are social insurance, national assistance to emigrants, and the United States quota system, were fully considered and also the main features of post-War migration, particularly in regard to the inter-censal period 1921–31. A comparison of pre-War and post-War migration shows that the annual average of the net outward movement of British subjects from the British Isles to places out of Europe was about 193,000 in the ten years 1904–13 and 112,000 in the years 1921–30. In 1931, however, there was a change from net emigration to net immigration, the excess inward in that year amounting to 37,000, while for 1932 the figure is estimated to be about 50,000. Although, in the future, emigration may be on a considerably smaller scale than in pre-War days, it may still, within the next one or two decades, be on a scale commensurate with the ability of Great Britain to release population of the ages which the Dominions require, regard being had to the diminishing numbers of new entrants into the labour market.

Anomalous Eskimo Vertebræ

SOME suggestive results, which may possibly turn out to have a bearing on the question of the existence of evolutionary tendencies in modern man, emerge from an examination by Dr. T. D. Stewart, of the Smithsonian Institution, Washington, D.C., of skeletal material brought back by one of the Institution's recent expeditions to Alaska. The material consists

of some two hundred Eskimo skeletons, which were obtained by excavation. Dr. Stewart's observations point to the possibility that they may prove an exception to the generally accepted view that the human body has attained a high degree of specialisation, which shows little tendency to vary. Approximately 12 per cent of these Eskimo skeletons have 25, instead of the normal 24, presacral vertebræ. The anomaly is present in nearly sixteen per cent of the males, but in only less than one per cent of the females, and it is considerably more frequent in skeletons secured north of the Yukon. In a preliminary report on these results, which has been issued by the Smithsonian Institution, it is pointed out that this frequency is nearly twice as much as the maximum previously recorded among the northern Eskimo. Among Europeans it runs to only 3–6 per cent; but one study notes 7 per cent among the Japanese. In the material examined by Dr. Stewart, the tendency seems to be towards a lengthening of the spinal column from the sacrum. There is no variation in the cervical vertebræ to show a tendency towards the lengthening of the neck. The predominance of the anomaly among males is held to give some indication of a hereditary character. Dr. Stewart's material will appear in full in the *American Journal of Physical Anthropology*.

Research Work of the Metropolitan-Vickers Electrical Co. Ltd.

NOTWITHSTANDING the industrial depression the activities of the Research Department of Metropolitan-Vickers have not been in any way curtailed. The research on the properties of steel at high temperatures is being continued, particular attention being paid to an examination of the combined influence of time and temperature on the changes of physical properties. The investigations of carbon steels have raised difficult problems in connexion with carbide spheroidisation as well as the obscure phenomenon of embrittlement shown by some of them. The results already obtained have been useful in determining suitable working stresses in advance of present practice. The general problems of the corrosion of metals and methods for their protection have been under continuous investigation. Experiments have been made on the corrosion of aluminium alloys when in contact with beverages and food stuffs. The importance of studying engineering noise problems is shown by the fact that the acoustics laboratory has been more than doubled in size. Using the methods of continuous evacuation developed in the Metropolitan-Vickers laboratories, rapid progress has been made in the technique required for the production of high vacua and its many applications to engineering problems. An X-ray set specially adapted for studying engineering problems has been developed and standardised and is now on the market. Progress has been made in inventing methods of protecting zinc and zinc base alloys by means of electro-deposited coatings. Special solutions have been discovered for cleaning, pickling and plating base metals of this kind. Accelerated corrosion tests have been devised which enable the protective value of different thicknesses of deposit to be rapidly determined.

Tariff of Electricity Supply

THE Central Electricity Board in conjunction with the National Consultative Technical Committee has prepared a form of tariff laying down the principles under which electricity will be supplied directly to authorised undertakings. This form of tariff applies to the whole of the supply given to undertakings which do not own 'selected' stations. It applies also to that part of the supply to selected stations which they do not generate for themselves. The new tariff consists of three parts. The first is a service charge in respect of each point of connexion to the grid, the second a fixed annual power charge based on the maximum demand for power during the year at each point of connexion, and lastly, a running charge for each kilowatt hour supplied. No service charge is made for the first point of supply. The kilowatt charge is based on the maximum demand for the year. This maximum demand is taken to be twice the largest number of kilowatt hours supplied during any half-hour in the months of January, February, November and December. This tariff has been agreed with the District Committee for mid-east England and the central Scotland tariff will be decided shortly. The tariff system, although at first sight complicated, is based on sound principles and should prove practical. Various modifications have to be applied when the energy supplied is less than the product of the volts and amperes, that is, when the power factor of the load is low. The application of the Act has necessitated the evolution of instruments which will measure both kilowatts and kilovolt amperes respectively. Accurate instruments of this type are now available. It will be interesting to see the magnitude of the reductions in price to the consumer in mid-east England.

Restoration of Prosperity to Transport

AT the present time the industry of transport seems to be far from flourishing. In the aggregate, statistics show that road, rail, air and water transport are losing money. We welcome therefore the paper by W. Rees Jeffreys, chairman of the Roads Improvement Association, on transport problems of the Empire, which was read to the Royal Society of Arts on November 29. He takes a world-wide view of the whole problem, pointing out some of the causes of the depression and making many helpful suggestions. All forms of transport are the servants of the community. They serve trade and industry, and so long as they are serviceable they are entitled to a fair remuneration. They are not entitled to place a burden upon trade or industry by excessive charges or by dictating to the producer and the manufacturer what kind of transport he shall employ. Anti-road transport legislation within the Empire for the purpose of protecting State investments in railways has failed to bring prosperity to the railways concerned. Railway finance has often failed because