the People of England from Earliest Times to the Norman Conquest," N. Ault. The new list of *Messrs. George Routledge and Sons, Ltd., and Kegan Paul and Co., Ltd.*, includes:—"The Social Maladies: Tuberculosis, Syphilis, Alcoholism, Sterility," Dr. J. Héricourt, translated, with a final chapter, by B. Miall; "Agriculture and the Farming Business," O. H. Benson and G. H. Betts; "Wonders of Insect Life," J. H. Crabtree; "Germination," A. E. Baines; and "Bakery Machinery," A. W. Mathys; "The Clay-working Industries," A. B. Searle; "Direct-current Dynamos and Motors," Prof. W. B. Griffith; "Electric Cooking and Heating," W. A. Gillott; "Engineering Instruments and Meters," E. A. Griffiths; "Manufacture and Installation of Electric Cables," C. J. Beaver; "Reproduction and Utilisation of Sound," H. O. Merriman; "The Turbo-Alternator," Dr. S. F. Barclay; and "The Utilisation of Natural Powers," E. L. Burne (in Routledge's Industrial Supremacy Books).

ARRANGEMENTS have been completed for the amalgamation of the business carried on by Mr. Robt. W. Paul at New Southgate, London, with the Cambridge Scientific Instrument Co., Ltd. Mr. Paul will join the board of directors, and the manufacture of instruments will be continued both at Cambridge and at New Southgate. On January 1, 1920, the name of the company will be altered to the Cambridge and Paul Instrument Co., Ltd., and as soon as possible the head office and showrooms will be transferred to London.

THE South-Eastern Union of Scientific Societies was established in 1896, and includes more than seventy affiliated societies. A correspondent writes to point out that the union was omitted from the list given last week. The list was not intended, however, to include unions or federations of societies, but rather individual societies which meet periodically throughout the year.

OUR ASTRONOMICAL COLUMN.

THE LEONID METEORS.—Though no special display of these objects is to be expected this year, the sky should be vigilantly watched on the nights from November 13 to 16, and particularly during the hours following midnight. The moon will be at the last quarter on November 14, being visible in the morning hours, but her light will be feeble and cannot materially interfere with the aspect of the shower. The radiant point in Leo does not rise until about 10.20 p.m. If any of the usual bright, streaking meteors are observed from this system, their apparent paths amongst the stars should be carefully recorded. There is no doubt, from the observations obtained in past years, that the stream of November Leonids is continuous in all sections of the orbit, and that there are considerable differences in the apparent strength of the shower witnessed from year to year. The maximum may be expected on the morning of November 15 or 16.

The shower of meteors connected with Biela's comet is due to return a few nights later than the Leonids, and, as the moon will then have waned to the crescent shape, observations may be favourably made should the atmosphere be suitable and free from the clouds and fogs so common to our climate at this season of the year.

THE GROUP OF HELIUM STARS IN ORION.—There has for long been a natural curiosity to find the distance of the great nebula in Orion. The problem became more hopeful when it was found that the group of helium stars was probably connected with the nebula, as appeared both by their configuration and by identity of radial motion (about +22 km./sec.). Dr. Bergstrand, of Upsala, has published (Nova Acta Reg. Soc. Scient. Upsal , ser. iv., vol. v., No. 2) an attempt to find this distance. First, he made a careful re-examination of proper motions in order to find the rate of closing in on δ Orionis, owing to increasing distance from us; he found for the parallax 0·0044″, with probable error 0·0049″. The second method was based on the assumption that the scattering of individual proper motions is comparable with that of the radial velocities; he thus obtained 0·0076″, with probable error less than 0·002″. It will be seen that the two determinations are of the same order of magnitude, and are also comparable with some other values; thus Dr. Charlier, in his memoir on the B stars, gave figures for the Orion group of which the mean is 0·0118″, and Prof. Kapteyn by another method found 0·0058″. Also four of the stars are binaries, and the mean of their hypothetical parallaxes, as given by Messrs. Hertzsprung and Stebbins, is 0·0078″.

From the large area that the group covers in the sky there is reason to expect a corresponding range in the individual distances. Hence we may look on the various determinations as satisfactorily accordant, and conclude that in putting the distance of the nebula as 400 light-years we are not very far from the truth.

THE SECULAR ACCELERATION OF THE MOON.—In a recent paper Mr. Nevill claimed to have shown that the observations of the last three centuries prove that the acceleration does not differ from its theoretical value. Prof. E. W. Brown, in the Proceedings of the Royal Society (Series A, vol. xcvi.), shows that, by making suitable changes in initial longitude and mean motion, a change as great as 5·4″ in the acceleration will make changes in the longitude that are less than 1·6″ for the whole interval between 1620 and 1950. Quantities so small as this cannot be evaluated from the observations, so long as the large inequality with period of the order of three centuries remains unexplained by theory. Hence, apparently, the ancient eclipses, unsatisfactory as the records of them are, supply the only material available for determination of the acceleration.

THE GLASS RESEARCH ASSOCIATION.

IT is now widely known that among the industries which have been profoundly influenced by the war the glass and glassware industry of the United Kingdom occupies a foremost place. Not only have the pre-war products of this industry, as they existed in this country before the war, been found essential for a wide range of national purposes during war-time, but the necessity has also been forcibly realised of creating certain special sections of this industry, previously non-existent in the country, to supply glass and glassware, glass instruments, and glass apparatus directly necessary for the prosecution of the war, as well as similar articles equally vital as being indispensable for the efficient operation of other industries. The importance of the glass industry to the economic life of the nation is to be measured largely by its effect upon, and indispensability to, other industries. This has been fully recognised by the Government in the inclusion of scientific glassware and illuminating glassware, as well as optical glass, in the schedule of unstable "key" industries.

But the revolutionising effect of the war upon the glass industry is not alone manifest in the creation of these "key" sections which previously were monopolised by Germany and Austria, whose glass manufacturers had attained great strength and reputation,

and certainly dominated the markets of the world, or even in the resuscitation of other sections (*e.g.* the so-called "flint" glass sections) of the industry, which, though long established in this country, were rapidly declining as the result of unfair foreign competition. The feature even more significant than either of these, and the ground of the future hope that a stable and prosperous British glass industry will be firmly established, is the shedding of the old spirit of isolation and exclusiveness which possessed the manufacturers of this country. Invariably in each works there existed a policy of secrecy, together with an unwarranted satisfaction with old-fashioned rule-of-thumb manufacturing ideas and an absence of scientific method. This inevitably resulted in inability to organise for production upon progressive modern lines. During the war there has been a wonderful awakening to the new possibilities of glass production in this country, and there is now happily evidenced among the manufacturers a new spirit of co-operation combined with an enthusiasm for investigation and research, and a desire to adopt new methods and equipment involving the scientific control of manufacturing operations.

The establishment of the Glass Research Association, which after nearly twelve months' spade-work by an earnest provisional committee was launched on its career on October 14 at the first general meeting held at the Institute of Chemistry, when the first council of the association was elected, well illustrates the changed aspect which the industry has assumed. This association has been formed on the lines approved by the Department of Scientific and Industrial Research for the encouragement of research. During the next five years the association will expend at least 100,000*l.* upon investigations into the many problems of glass and glassware manufacture.

There is a vast and difficult field to cover, as will appear from the consideration of the following groups of main problems to be attacked:—Chemical and physical properties of glasses; fuels, refractories, furnaces, treatment of glass-making materials, glass-founding, temperature measurement and control; glassware-forming operations (hand and mechanical), glassware-making machinery; annealing, lamp-blown work, and other finishing operations; design, lay-out, and equipment of glass factories; and scientific methods of storing, packing, and transit. These are but the general problems. When they are considered in relation to the enormous varieties of types of glass articles, from common bottles, food and beverage containers, chemical and medical bottles, on one hand, to the elaborate products of the lamp-blown glassware bench-worker (*e.g.* condensers, gas-analysis apparatus, thermometers, artificial eyes, X-ray tubes, syringes, etc.) on the other; from window-glass and plate-glass to beakers, flasks, and accurately calibrated and graduated glassware; from tumblers and the numerous domestic and fancy articles of glassware in common use to electric lamps, miners'-lamp glasses, and a host of articles essential for illuminating purposes; and, in addition, the varieties of special glasses required for scientific instruments, for decorative purposes, for machinery, and for building, it is easy to realise that the problems are not lacking in number, variety, or fascination.

To consider only one problem for a moment: the manufacture of glass tubing. All scientific workers understand the essential importance of being able to obtain varieties of glass tubing having definite chemical and physical properties, and at the same time satisfying stipulated degrees of dimensional accuracy within narrow limits. Few realise the enormous difficulties involved in the production of such tubing, the wastage caused by the careful selection necessary to obtain satisfactory quality, and how much depends upon the high degree of individual skill in the worker engaged in glass tube-drawing. The Glass Research Association will not rest satisfied until, by securing the concentration of engineering genius upon this problem, glass tubing can be turned out with dimensional accuracy comparable with that secured in producing tubing of brass or other metals, and at the same time possessing such specific chemical and physical properties as are necessary for workability in the blow-lamp. This problem affects vitally a whole section of the industry—the lamp-blown scientific glassware section—for glass tubing is the raw material of this section, and the problems involved in making many precise and important instruments (*e.g.* butyrometers, clinical and other thermometers, hydrometers, etc.) are nearly all solved when the proper tubing can be accurately and consistently produced.

There are at the present time approximately four hundred firms engaged in glass and glassware manufacture in the United Kingdom, employing about 50,000 workers. It is anticipated that the research work of the association will commence in earnest at the beginning of next year. Before that date the council of the association hopes that every one of these four hundred firms will have applied for membership.

The report of the provisional committee to the general meeting on October 14 showed that a membership of 107 had already been reached; that a promise had been secured from the Committee of the Privy Council for Scientific and Industrial Research to pay to the association a total grant not exceeding 75,000*l.* within a period of five years on condition that during this period members of the association contribute an aggregate sum of not less than 5000*l.* per annum in subscriptions. The financial statement also revealed that towards this sum of 5000*l.* per annum promises from the 107 members had reached 4625*l.* 10*s.* (subscriptions from members are on a voluntary basis from 10*l.* to 1000*l.* per annum, according to ability to pay), and, in addition to this, the association had received a handsome donation of 1000*l.* from a well-known firm of glass manufacturers.

In addressing this first general meeting of the Glass Research Association, Sir Frank Heath, Secretary of the Department of Scientific and Industrial Research, who with his colleagues has rendered invaluable assistance to the promoters of the association, congratulated the members upon having brought together in this scheme of co-operative research such diverse sections of a complex industry, and also upon the particularly high financial contribution secured from the Government, due to the inclusion of unstable "key" industry sections of the glass industry, and the recognition that, in spite of the great things already accomplished in the production of these special types of glassware, an enormous amount of research and experimental work is still necessary to place these sections on a firm foundation.

Referring to various phases of the future activities of the Glass Research Association, Sir Frank Heath suggested that existing facilities such as those available at the National Physical Laboratory and the Sheffield University Department of Glass Technology should be used to the utmost, at any rate in the initial stages; that a bureau of information should be established; and that very careful efforts should be made to obtain the right director of research. The importance of his being able to win the best from his research workers by "team-work" was mentioned. In this connection the council of the association wishes it to be widely known amongst scientific workers that it is anxious to secure that the best available scientific brains and ability shall be devoted to the

problems of this industry. There can be no doubt as to the value of the opportunity offered for research, the attractiveness of the subjects for investigation, and the huge difficulties to be surmounted. The ideal director for this association is not an individual research worker whose glory is to work in splendid isolation, but is he who will bring expert knowledge of the methods of scientific research to bear upon these complex problems, who possesses such personality as to attract promising young research workers to his side, and who is also an administrator qualified to secure the carrying on of a large volume of research work along a broad front touching the various sectional interests concerned, and to co-ordinate the efforts being made through the various laboratories, institutions, and works to which specific research and experimental work will be allotted.

In an advertisement which has appeared for a director of research a lower limit to the salary has been mentioned, but it may here be stated that the council intends to pay a salary commensurate with the qualifications of the candidate selected to fill the office, and it will be very considerably higher than the figure mentioned if the council can obtain its ideal director.

There are brilliant opportunities in this field of scientific investigation for the chemist, the physicist, and the engineer. Glass engineering in particular is in its infancy in this country, and the modern problems of glass manufacture are rapidly resolving themselves into those to be solved mainly by the highly trained engineer who specialises in the study of glass-making processes.

The Glass Research Association is an earnest effort to carry out co-operative research on an extensive scale for an industry of prime national importance, and it has been launched with great promise. Everything now depends upon the support of the whole industry and upon the calibre of the scientific workers who will undertake the investigations.

It is not too much to hope that the present membership will soon be doubled, and that scientific ability and genius of the highest order will be found to energise this great undertaking and ensure its success.

EDWARD MEIGH.

THE TOBACCO BEETLE.

BULLETIN No. 737 of the United States Department of Agriculture, published last March, has for its subject "The Tobacco Beetle: An Important Pest in Tobacco Products," and on reading what its writer, Mr. G. H. Runner, has to say about the pest, one is almost tempted to believe that the "precious herbe" is fitted for nothing so much as the breeding of maggots. At any rate, Mr. Runner makes it quite clear that tobacco at every stage of its manufacture, from the dried leaf up to the finished product, is a most attractive diet for the grub or larva, and that the conditions under which the leaf is usually manufactured and stored are almost ideal for the development and reproduction of the beetle. What a pity King James did not know all this when he wrote his "Counterblaste," and was led in irony to exclaim, "O omnipotent power of tobacco!" But the tobacco beetle, *Lasioderma serricorne*, was probably altogether unknown in his days, and even now is not at all common in England. It cannot withstand exposure to extreme cold for any great length of time, and thrives best, sometimes reproducing at the unusual rate of three or more generations each year, where a warm, equable temperature, a moist atmosphere, and suitable food for the grub occur together. That is why it is so much better known in America, especially in the States bordering on the Gulf of Mexico, than it is in this country. It is well known also in India and the islands of the Far East.

Here in England the tobacco beetle is an imported species, only occasionally met with, though sometimes in very large numbers, as was the case not many years ago when it swarmed in the warehouses around one of the London docks, whither it had come in a cargo of turmeric from India. Its larvæ feed, like those of the common "biscuit weevil" or "drug-store beetle," *Sitodrepa panicea*, which belongs to the same family, on almost every kind of dried product of vegetable origin. Hence the beetle is almost as much at home with the druggist and the grocer as it is with the tobacconist. Tobacco, however, except in the green or growing state, which it does not touch, appears to be its principal food, and, according to Mr. Runner, it selects the higher grades of leaf, cigar, and cigarette in preference to those of inferior quality.

Methods to be taken for the destruction or control of the little pest, and various experiments and trials made with that object in view, are described at some length in the bulletin, which contains as well a full account of the whole life-history of the insect illustrated by figures, some of which are particularly well done, and there is also a list of special memoirs and other papers relating to the subject. The bulletin, therefore, although apparently prepared more especially for the benefit of the tobacco manufacturer and dealer, will be of considerable value to the practical entomologist, and ought, indeed, to have some interest also for every true lover of the weed.

THE BRITISH ASSOCIATION AT BOURNEMOUTH.

SECTION H.

ANTHROPOLOGY.

OPENING ADDRESS BY PROF. ARTHUR KEITH, M.D., LL.D., F.R.S., PRESIDENT OF THE SECTION.

The Differentiation of Mankind into Racial Types.

FOR a brief half-hour I am to try to engage your attention on a matter which has excited the interest of thoughtful minds from ancient times—the problem of how mankind has been demarcated into types so diverse as the Negro, the Mongol, and the Caucasian or European. For many a day the Mosaic explanation—the tower of Babel theory—was regarded as a sufficient solution of this difficult problem. In these times most of us have adopted an explanation which differs in many respects from that put forward in the book of Genesis; Noah disappears from our theory and is replaced in the dim distance of time by a "common ancestral stock." Our story now commences, not at the close of an historical flood, but at the end of a geological epoch so distant from us that we cannot compute its date with any degree of accuracy. Shem, Ham, and Japheth, the reputed ancestors of the three great racial stocks of modern times—the white, black, and yellow distinctive types of mankind—have also disappeared from our speculations; we no longer look out on the world and believe that the patterns which stud the variegated carpet of humanity were all woven at the same time; some of the patterns, we believe, are of ancient date and have retained many of the features which marked the "common ancestral" design; others are of more recent date, having the ancient pattern altered in many of its details. We have called in, as Darwin has taught us, the whole machinery of evolution—struggle for existence, survival of the fittest, spontaneous origin of structural variations, the inheritance of such variations—as the loom by which Nature