institutions may be approached to contribute annually towards the upkeep of any particular table.

In conclusion, the importance of the establishment of a Marine Biological Station in Bombay cannot be over-emphasized and special attention is to be paid to scientific research as a basis for economic exploitation of the Indian Waters.

The British Association—York Meeting, 1932.

THE Presidential Address of Sir Alfred Ewing at the York Meeting of the British Association is a very human document. Full of years and honour, Sir Alfred has known the Association almost from its very inception and gives a graphic account of the early days and the state of science then, contrasting it with the present conditions and outlook. He shows how a proud sense of scientific certainty has given place to a more humble, questioning spirit which recognizes that we are yet groping very much in the dark and that "to understand is to draw one incomprehensible from another incomprehensible" as Einstein put it. This humility has brought science nearer to the layman who shares in the desire for truth; the social and economic problems of the day make him look wistfully to science for a satisfactory solution. The British Association has helped the advance of science by providing a common meeting ground for experts in different branches of science and Sir Ewing gives a famous instance of this in the fruitful association it brought about between Joule and Thomson. He also shows how the British Association was the first to try and give a sound scientific basis to British Engineering practice, mostly empirical before. The standardization of electrical units is another of its services.

After mentioning the most recent advances in our knowledge of nuclear structure due to the work of Chadwick and Cockcroft and Walton, Sir Alfred Ewing passes in review the many wonderful inventions whose birth he has witnessed, such as the dynamo, the motor, the internal combustion engine, the aeroplane and airship, the turbine, the gramophone and wireless. He emphasizes that modern invention has had such rapid progress because it built upon sure scientific knowledge and not on accidental discovery. This rapid increase of inventions has brought many amenities to the lives of men, but the consequent change in the methods of production and distribution has also upset the balance of human relations so that unemployment, competition and war have become a standing menace. Sir Ewing rightly concludes by a note of warning against allowing such a condition to develop; as he says, we can only hope that man will not encompass his own destruction by wrong application of his God-given understanding, but that science will help him to enjoy the luxuries which science creates, in a manner leading to the elevation of his soul.

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The Presidential Address to the Section of Mathematical and Physical Sciences deals with the application of physics to a problem of economic and national importance, namely, the discovery of valuable deposits such as minerals or oil, without actual digging or boring. It is a subject which, for its development, requires the co-operation of physics and geology, involves team-work in the field and is costly to pursue. Yet judicial application of the methods developed by workers in this field often leads to a considerable decrease in relative costs, and further improvements may in future lead to greater reliability and cheapness. Being an infant science which cannot attract public attention through sensational discoveries such as are being made in atomic physics, it is likely to languish for want of support: Prof. Rankine justly emphasizes the need for Government help at such a critical stage of its life. Leaving aside such appliances as the divining rod, whose action, even if real, is not based on known scientific principles, the methods at present available are four, *viz.*, gravitational, seismic, magnetic and electrical. In the first method, the extremely sensitive torsion balance invented by Baron von Eötvös, is used to study the variations in gravity due to variations of the density when layers of different minerals are present in any locality. The instrument though costly, is very reliable, and its indications will lead to valuable results, unless topographical irregularities are so large as to mask the effect of mineral deposits. The seismic method is particularly suitable when there is a horizontal separating layer between two extensive deposits in the lower of which the seismic wave travels faster than in the upper. In such a case the disturbance due to an explosion travels to the separating layer and being refracted or diffracted along this, reaches the surface at a large distance earlier than the direct pulse travelling along the upper deposit. Hence a delicate portable seismograph will be able to record it so that it is not masked by the larger perturbations due to the direct wave. When iron-bearing deposits are concerned, the magnetic method, which depends on measuring the variations of the horizontal and vertical components of the Earth's magnetic field by means of a portable magnetometer, is most suited and is least costly. The method will be even more useful when the magnetometer is improved as suggested by Prof. Rankine by utilizing the torsion principle used in the Eötvös balance and thus making it more sensitive and at the same time less liable to disturbances due to daily and temperature variations of the magnetic field. The possibilities of the electric method, in which the variations in the electrical conductivity of different layers are measured, have not yet been fully explored. In fact, the method was shrouded in mystery before the publication of the Report of the Imperial Geophysical Experimental Survey. But in future, when other nations besides the Germans, who have so far been almost the sole cultivators of this science, devote their attention to the problems of Geophysics, the electric and other methods may confidently be expected to be enormously improved and the science firmly established among other branches of applied physics.

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In his presidential address to the Section of Agriculture Prof. R. G. White gives a succinct history of the growth of Sheep Farming in England. From very early times, dating as far back as the Norman conquest, sheep farming has always remained a substantial source of the British farmer's agricultural income and statistics for the year 1930 show that except for New Zealand, Great Britain holds the eighth rank in the sheep population of the world and a third of the world's sheep are from the British Empire.

The importance of sheep farming is no new feature of British Agriculture. Throughout the middle ages and upto the middle of the fifteenth century, England was the most important source of the supply of wool required by the continental manufacturers. The export duties levied on these outgoing supplies were among the most important sources of revenue available for the mediæval equivalent of the present Chancellor of Exchequer. The industry received a definite stimulus by the various enactments which prohibited the export of wool with a view to have all the British wool for the British looms. Legislation was not the only means to foster woollen manufacture. Definite encouragement and attractive inducements were offered for foreign weavers, particularly Flemish, to come and settle in different parts of England.

The development of woollen manufacture, the consequent heavy demand for wool and the increase in the industrial population contributed not a little towards the rapid strides in the agriculture of the country, particularly sheep farming. To meet the growing demand for wool and to provide food for the growing industrial population, the population of sheep had to be increased which brought in its train the necessity for converting arable land into sheep pastures and the development of mountain sheep farming.

Discussing the present status of the sheep industry in England, Professor White suggests directions in which the future developments are possible. His first suggestion is to increase the return per unit of flock, particularly when England has to depend for its supply of meat from January to May on outside countries. He further suggests methods to make better use of the ewe's capabilities of production by an increase in the lamb crop. With some more useful and economic suggestions for the improvement of sheep farming in England, the President makes a definite case for regarding sheep farming as a distinctive feature of British Agriculture.

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Lord Rothschild in his Presidential Address, makes out a very vigorous case for the Systematic Biologist whose work, unlike the common prevalent notion, is really one of great difficulty yielding results of equally great importance. Applied Biology would be helpless without the assistance which Systematic Zoology constantly renders it. The identification and distinction of species is a matter of paramount importance, for not only structural differences are implied in such a distinction but differences in their behaviour as well. It should not be forgotten that it was a systematist that made the very important discovery that while *Xenopsylla cheopis* is the rat flea that carries plague, the allied *X. astia* is a very inefficient carrier of the disease. The bearing of this distinction on the determination of the history of the disease was found to be very close.

The work of the systematist does not merely consist of a study of species and their varieties only. The grouping of species "into genera and then into higher categories, all according to relationship" is the more important part of his work. He must enter upon Geography also throwing light on the affinities of species and genera with regard to their Geographical distribution. He must take into account ancient forms and must be able to determine their relationship with the History of the Earth. Though the systematist is more concerned with the organisms produced by Nature than with the active forces that created or evolved them, for a definite and real understanding of the diverse processes going on in Nature, the systematist with his large collections of organisms and his expert knowledge at the grouping and determination of these organisms into their different classes is of inestimable value.

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In his Presidential Address to the Section of Archæology, David Randall MacIver says that the advent of the science of archæology in England is almost contemporaneous with the announcement of the "Origin of Species" by Darwin and Wallace. It was in 1850, a few years prior to this great epoch-making discovery, the subject of Archæology was founded and in the succeeding years definite steps were taken to unravel the hidden mysteries. It is usually accepted that the scientific aspect of this interesting subject drew its inspiration from the subject of antiquary, and like anthropology, archæology is a very young science both of them being closely allied. They deal with man, but from different aspects. Anthropology which is the wider of the two deals not only with "man's material works but also his mental, moral and sociological developments", while the "interests of archæology is solely in those works which can only be produced by man when he has become more or less sapiens". This is rather a conservative definition, for certain remains of flints antidate any actually known remains of man,—the researches of this science extending as far back as the tertiary. After that it is only about 3500 B.C. that inscriptions and documentary evidences are found. The organization of the subject consists in the collection of the material, conservation and exhibition and then popularizing it. For the collection of material an able body of scientists with the consent of Government authorize an expert to be in sole charge of an expedition. As soon as the exploration is over a publication incorporating the various aspects of the exploration must be made in a suitable manner. The findings must be properly arranged and exhibited in a museum. Such a scientific collection need not be further amplified by decorations. Having described these aspects of archæology the President discusses in a lucid manner the principal problems like the application of a time scale and the dissemination of a culture. A relative chronology has been established from earliest times and these culture periods require proper definition in terms of years. Thus the products of Egyptian civilization have been dated and with reference to this the others are measured.

In his Presidential Address before the Botany Section, Prof. J. H. Priestly laid stress on the importance of the botanical study of trees which do not receive adequate attention from the botanists. Trees do not form a special botanical category, but they are often regarded as the special study of the forester rather than the botanist. Utilitarian side gave the first impetus to the scientific study of botany and botany still finds in agriculture and forestry its contribution to make in the service of mankind. He felt that the recognition of this practical significance would vitalize botanical teaching. He agreed with I. B. Balfour that the study of growing trees throws fresh light upon its form, structure and vital functions and gives new meaning to the practice of the forester and horticulturist whilst details of structure which attract the attention of the worker in wood are also seen in new perspective. The tree is characterized by prolonged vegetative growth and delayed reproduction. In the growing season growth takes place radially in the woody axis and in length in all the branches. These two are not separate functions but are inseparably and casually connected. In dicotyledons and gymnosperms growth process continues to thicken the axis after it has extended in length. The address gives a detailed account of the shoot apex, the development of the leaf primordia, the vascular connection with that of the axis, the formation of the cambium, and its continuity with the apical meristem of the basipital cambial activity from the buds suggested by Hartig so long ago as 1862, along with its practical bearing in forestry and horticulture. The varied details of this phenomenon have proved exceedingly interesting and there is no doubt that the new technique followed to study the above process has much to tell us of the characteristic of the radial growth in different trees like the ring-porous type and diffuse-porous type of woods of oak and beech respectively. Further, the fact that the tree-form and structure is dominated by this causal link between bud development and radial growth has been very well treated with common examples. The subject of vascular differentiation in the soft and hard woods has been dealt with in detail. As the cambium cylinder grows wider the relative readjustment of position in the cambial cells takes place by "Symplastic" movement of the common frame work of walls of the fusiform initials. Then the surface of the wood comes to be clothed throughout its entire length with a new layer of wood which originates and spreads from the base of the extending foliage shoots. If the buds on the lower branches fail to grow, cambial activity also fails in these branches. It is from this point of view, the movement of food and water in the tree must be interpreted. Water movement through the tree is associated with the growth of the tree. The mechanism of movement is inseparable from the process of growth and differentiation, and the movement is not equivalent to the passive flow of water, the sap wood acting as a reservoir of water. So long as the cambium is still growing, the downward movement of organic materials in the tree must be clearly connected with those growth processes. There is very general agreement that the phloem plays a role in this movement. It may be that subsequently in fully differentiated sieve tubes, companion cells, etc., translocation of food still takes place, but on the other hand, the structural features of the adult sieve tube may rather be analogous to those features in a dry river bed which supply evidence that it was once a channel for rapid flow of current. These statements show that the intriguing problems of the growing tree are not only of interest to the students of science but also of profit to the forester and the horticulturist. When we see the wooden materials fashioned to our service which surround us on every hand, a knowledge of the story of the way in which they came into being will surely add to our pleasure in them.

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In his Presidential Address to Section C. (Geology) Prof. P. G. H. Boswell has given an admirable account of the relationship of early Man to well-established geological phenomena in the Ice Age—a very fascinating field of study on the border line of Geology and Archæology. The earlier part of his address deals with the intrinsic value of a study of the subject of Geology and the position which this subject should occupy in any curricula of studies in our schools and colleges. It is needless to say that, coming from such an eminent educationist and well-known geologist, these ideas are worthy of serious consideration by all people interested in the cause of true education. "For the breadth of view which it engenders and the enthusiasm it inspires", Prof. Boswell considers that Geology ought to find a place in the curriculum of every university student (as it used to in the Royal College of Science and still does in at least one American university)—a view that has been even more emphatically expressed recently by the Prime Minister when he said: "If any one of the sciences were selected as the key to all the other sciences, as that which in its subject-matter and its history, the history of its evolution, enforces the true scientific method, Geology might be selected as that science. For it touches all the fundmental sciences; it teaches the young how things become, how age merges into age, how species merge into species, how generation merges into generation, institution into institution—in short, how to approach that problem of a working and progressive society by making them acquainted with the processes of earth structure and of life lived on that structure."

Out of the several contacts of Geology with other sciences, Prof. Boswell's address on the "Ice Age and Early Man in Britain" deals with field where Geology is able to help in the spirit of pure investigation, without any practical applications or utilitarian reward. In the light of recent evidences, it is obvious that the older idea of the advent of Man on the earth's surface being considered a post-glacial phenomenon must be abandoned, and we must realize that Man was a contemporary of the mammoth and the straight-tusked elephant of glacial and inter-glacial times. It must, therefore, be possible to co-ordinate the evidence of Man's activities with that of the advance and retreat of the glaciers; and it is with this interesting subject that Prof. Boswell's address essentially deals. For this purpose he has selected a number of areas in Britain where a thorough investigation of post-tertiary geology has furnished evidences for the contact of early Man with stratigraphical horizons. He begins with East Anglia where

he considers we get the standard succession of glacial and other deposits associated with the remains of early Man. Other areas like Lincolnshire, Yorkshire, Northumberland and Lake District, the Irish sea and Cheshire basin, the Avon-Stour area, and the Upper and Lower Thames are next considered, and in each case, a very detailed account has been given of the several horizons of deposits in their stratigraphical order, together with the nature of the associated stone implements. Most of this descriptive account of local geology will be considered rather dull reading by the average layman, although to the serious student of the evolution of early Man, the wealth of information embodied in these descriptions is of utmost interest and value. An attempt at correlating the observations made in these different areas so far as Britain is concerned, has been made and the author feels that it is impossible to go any further in this line of work for "it would be premature to attempt world-wide correlations of the geological and climatic phenomena accompanying human industries". A fact of general interest that emerges from these studies is that according to Prof. Boswell "whatever the cradle of Man may have been, Asia or Africa, the evidence of prehistoric stations shows that the waves of his successive migrations advanced north-westwards across Europe. * * * His advance was determined by the extent to which the country was ice free; for we find that successive human industries extend farther northwards and north-westwards as the ice retreated, although the readvances of the glaciers and flooding of the country temporarily drove the invader back." By studying the several areas in the particular order which he has followed Prof. Boswell has shown that the sequence of human industries—pre-Chellian, Chellian, Acheulian, Mousterian, Aurignacian, Solutrian, Magdalenian, Tardenoisian, and Neolithic when traced north-westwards across England display, as must be expected, the phenomena known to geologists as overlap "the newer deposits and human waves would extend farther than the older, as the area was opened up by the retreat of the ice."

In view of the fact that the field covered by the address is one in which pioneer work is still being done, there is no doubt that an address like the present one embodying all the recent work carried out in a country which has provided exceptionally valuable information in the study of early Man, will be of very great value to all future workers in this line.

Two Convocation Addresses.

MYSORE UNIVERSITY.

DEWAN BAHADUR SIR C. V. KUMARASWAMY SASTRY'S Address, delivered last month at the Convocation of the Mysore University, is in several respects an important and interesting public utterance on some of the Educational topics which are usually omitted on such occasions. It is true that, as is common to all Convocation addresses, there is in this also a fairly generous appeal to the graduates to develop their character, to maintain their religion and morals and not to forget their own language and the glorious heritage of India. But so far no one has had the candour to dwell on and vindicate the eminent learning and usefulness of the Pandits, who, on the other hand, are generally condemned, chiefly through prejudice and ignorance. Sir Kumaraswamy Sastry is a conservative by constitution and in the course of his long public service, has developed a cautious attitude towards all public questions. But his condemnation of the uneducational practice of frequently changing the text-books in the different grades of instruction whose character and content provide neither information nor intellectual discipline, is at once refreshing and timely. He pleads with the ability and skill of an advocate, the cause of the poor and middle-class students who, on account of the excessive cost of education, are unable to participate in its advantages. But by far the boldest utterance in the address relates to the utterly stupid curriculum of studies pursued by Indian women students. His views on the ideals of womanhood apparently belong to a bygone age and he has no sympathy with those who advocate equality and liberty for women. His reference to the failure of scientific education to promote peace and goodwill among men is, we are sorry to be obliged to say, proceeds from an inadequate conception of the purpose and ideals of science. Science ought not to pretend to promote human happiness or to destroy it though its results might be used or prostituted for either purpose; but its main ideal is to give its votary a strict discipline of truth and open out new visions of the ultimate reality. In spite of a certain lack of what critics might call modernism in the views of Sir Kumaraswamy Sastry, on some major questions of education, the address taken as a whole, is a most notable pronouncement.

M. S. M.

THE ANNAMALAI UNIVERSITY.

The Second Convocation Address of the Annamalai University was given on the 27th October by Mr. R. Littlehailes, Director of Public Instruction in Madras. It may be said at once that it is a clear pronouncement on some of the subjects with which he has dealt. He says, "I could considerably expand this (the old educational policy) as well as other aspects of educational administration, but I do not consider the present to be either the time or occasion to develop at length views on education in India." If, instead of imposing upon himself the self-denying ordinance, he had pursued the course of his natural impulse to expound the progress of education and achievements of his department, we should doubtless have gathered much valuable and authoritative information. Everyone who is interested in the growth and expansion of education and the output of the right type of men from the educational institutions, will be grateful to Mr. Littlehailes for calling public