of incalculable value regarding the merits of the new designs, and would enable the flights to Egypt and to India to be planned with greater confidence. Both airships are experimental, and the experiment ought not to be hurried at any cost in added risk.

As matters stand, comparison is still possible, but it must be made with care: relative figures, if given without full explanation, may be entirely misleading. Thus, in regard to speed, the measured performances of the two ships must be 'corrected' (according to the cube law which expresses the power-speed relation) in order that their hull resistances may be compared on a basis of equal power; the fact that they carry widely different power plants is (speaking scientifically) an irrelevant circumstance which this procedure will serve to eliminate. Similar remarks apply to the question of useful lift, or 'pay load'; the heavier engines carried by 'R 101' must not be allowed to detract from our estimate of her structural design, nor from this point of view is she entitled to credit for the fact that 1 ton of heavy oil represents a wider radius of action than 1 ton of petrol. *Either ship might have been fitted with either power plant*; therefore the hulls must be compared for efficiency, as engineering structures, on a basis of the total weight which they can carry, for the same quantity of hydrogen, in passengers, crew, furniture, engines, and fuel combined.

Finally, the comparison must be made on a basis

of figures ascertained in actual flight, not on estimates. How easily the latter may be in error is indicated by the remark that at least a ton of dust had settled on 'R 101' during her time of waiting in the shed.⁵ Useful lift can be *estimated* only as a (relatively) small difference between two large quantities: when the hull is air-borne it can be *measured* with certainty. Estimates, it is safe to say, have been the curse of airships: so hard to check, when airship flights are as infrequent as solar eclipses; so easily modified to suit the thesis of the moment, whether sanguine or condemnatory.

The enthusiast, whose millenium is always five years ahead, can seldom resist the temptation to detract from actual achievement, in order that the advantages of his new project may be displayed in stronger light; he forgets that it is only on achievement that the outside world, with sound instinct, will base its expectations and its support of airships. To those who have the progress of airships most at heart, it is a relief to pass from a period of words and 'estimates' to a period in which the new ships must stand their trial. Very soon now we shall know with certainty the relative merits of 'R 100' and 'R 101', and how they compare with the airships of other countries; then, but not until then, can future projects be based on sure foundations.

⁵ *Times* of Oct. 14.

The British Association in South and East Africa.¹

By Sir RICHARD GREGORY.

WHEN the Prince of Wales was president of the British Association at the Oxford meeting in 1926, he made particular reference in his address to the value of meetings of the Association overseas in creating interest in science and co-ordinating the work and results of scientific investigators throughout the Empire. "Nothing but good", he remarked, "can follow from personal contact between scientific workers in different parts of the Empire. Nothing but good can follow from their researches if they add, as gradually they must add, to the wider knowledge of the Empire not only among the workers themselves, but ultimately among the whole body of informed Imperial citizenship; not only in the overseas territories, but also at home."

As one of the main functions of the British Association is to bring home to the public the significance and value of science to human life, nothing now would seem more natural than to extend these activities occasionally to fields of the Empire overseas and not to confine meetings to the British Isles. More than half a century elapsed, however, from the foundation of the Association before the first overseas meeting was held at Montreal in 1884. Since then meetings have been held twice in South Africa, once in Australia, and in Canada again in 1897 and 1909, and every meet-

ing has had very decided influence in stimulating scientific work in the country visited as well as engaging the interest of the visitors in the solution of new problems. There is no longer any doubt as to the importance of acquiring first-hand knowledge of our overseas territories, or need to emphasise the good that results from personal contact between workers in various parts of the Empire. Co-operation and co-ordination are essential to avoid waste of effort and secure rationalisation in science, and the British Association is greatly assisting progress towards this end by its overseas meetings.

The world has to look to tropical agriculture for a large part of its food supply and raw materials in the future, and to ensure that this will be forthcoming it is essential that the fullest scientific knowledge should be available and used to protect crops from the pests which continually assail them in tropical countries. In Africa in particular, the facts to be faced and the problems to be solved are set forth most convincingly in the Report of the Parliamentary Commission of Inquiry to East Africa in 1924 and in Mr. Ormsby-Gore's report on the four British West African territories in 1926. One of the most gratifying features of the former report was the recognition of the economic value of scientific guidance to such countries. Mr. Ormsby-Gore was chairman of the East African Commission, and he had the advantage of co-

¹ From an address on "Science and the Empire" given on Dec. 3 at a meeting of the Royal Empire Society in co-operation with the British Association, following upon the recent meeting of the Association in South Africa.

operation with a scientific colleague, Major A. G. Church, secretary of the Association of Scientific Workers. The two reports emphasise the urgent necessity for applying the methods and results of science to the problems of tropical development, both in administration and production.

The meetings at Cape Town and Johannesburg afforded an opportunity for comparative study of man in Africa and Europe, and resulted in valuable discussions on material archaeology and physical anthropology of Africa. The resemblance of the Stellenbosch type of stone implement to the Acheulean type in south-west Europe, of the majority of the rock paintings in South Africa to those of eastern Spain, and of skulls like those recently obtained by Mr. Leakey in Kenya, approaching the European in type, suggest that early man reached Europe from Africa. Though the peoples represented by these cultures and characteristics may have had some part of Asia as their primeval home, there is evidence that north Africa or south-west Asia was at any rate a secondary centre from which they diverged to south-west Europe, to south India, and to equatorial and south Africa. The continuation of Mr. Leakey's work promises to lead to new interpretations of movements of early culture in Africa, and may throw light on the evolution of modern African types of man. There is urgent need for support on a large scale for research of this kind, and investigations into related ethnographical problems in Kenya and the rest of East Africa. If a generous benefactor could be found to endow an anthropological research institute in East Africa, a very valuable service would be rendered to mankind as well as to the British Empire.

Of the value, and indeed the necessity, of a practical application of the science of anthropology in native administration there can be no question. Without anthropological knowledge it is impossible to predict what will be the effect of interference with any native custom, even though on one hand it may seem repugnant to European ideas, or on the other of so trivial a character that its repression may seem a matter of no importance. Anthropology, studying each custom and each belief as it functions in a given social environment, traces it through its various ramifications in the whole cultural complex, and is thus able to show the consequences throughout the whole social fabric when any attempt is made to modify or suppress that particular custom. The attempt to advance the status of native women in South Africa by abolishing the 'bride price' failed through misunderstanding and imperfect knowledge of the facts. Until the custom was reinstated there was no stability in family or tribal life. Another example of a measure introduced with the best of intentions and having only the well-being of the native in view, but which failed through lack of knowledge, is afforded by the order issued in one of our dependencies to destroy all rats with the object of stamping out plague. To carry out this order effectively the roofs of native huts had to be taken off. To the surprise of the officials of the health

service, this was the cause of great resentment among the natives. On inquiry, however, it was found that as a matter of religious custom the unroofing and re-roofing of each hut made the sacrifice of a goat incumbent upon the owner. A knowledge of anthropology would have averted the creation of what might have been a serious situation. It must indeed be understood that the development of a backward people along natural lines demands from an administrator an intensive study of their customs, their religions and modes of thought, guided by a training in the methods of anthropological science.

Another aspect of the 'native problem' is that of agricultural development. South African agriculture is essentially based upon unlimited supplies of cheap native labour, and the implements and methods, for example, bullock waggons for transport, reflect this condition. In a sense, the period of development corresponds to British agriculture in the middle of the eighteenth century, but superimposed on this are the resources of modern agricultural science through the introduction of new varieties, animal breeding, marketing, and cold storage facilities, and these have enabled it to carry on and even to develop an export trade. If the native problem becomes more acute, and a higher standard of living leads to demands for higher wages, it will necessitate a complete reorganisation of South African farming. The great difficulty of running a farm successfully at present, except in a few favoured spots, is due almost entirely to climatic conditions, or in other words, the supply of water. This involves the problem of irrigation; and here it may be said incidentally that the excellent soil survey work that is being carried on has provided the irrigation department with most valuable information upon which to base irrigation projects. As irrigation is costly, only luxury crops can be grown in such districts with hope of financial success; hence the concentration on citrus fruits. It is improbable, however, that South Africa can ever export enough to control our markets, and attention should therefore be devoted to high-grade supplies, which means drastic grading of fruit prior to export. The wine industry is most promising, and the Empire Marketing Board should do more to make its products better known in Great Britain.

The afforestation schemes in different parts of South Africa, and the rapid development of sugarcane and wattle growing in Natal, are particularly noteworthy. As the recent debate in the House of Commons showed, one of the subjects with which almost every country is at present preoccupied is the question of the future supplies of softwood timber, and foresters are in consequence interested in all efforts to increase softwood production. In South Africa the percentage of land under forest is very low, and the indigenous softwoods, although they produce good timber, are slow growing, and difficult to establish on the veld, hence of little value in the extension of forest area. South African foresters, however, have shown enterprise in seeking for tree species which will grow well

under the various conditions in their country, and from the large number which they have tried, they are now carrying out extensive afforestation with pines from the Monterey Peninsula in California, the Mediterranean Basin, the slopes of the Himalaya Mountains, the Canary Islands, Mexico, and Central America. For hardwood production Australian species, particularly *Eucalyptus*, are being used. The results of this work will be of assistance to foresters who have to deal with similar conditions in different parts of the Empire, and the publication of the papers prepared by the South African foresters for the British Association meeting will disseminate the knowledge so far obtained. This experiment on the creation of an entirely new forest complex raises forest problems of great diversity and interest in soil biology, pathology, and methods of tending the plantations, and the discussions between the European and South African foresters resulted in the pooling of the knowledge at present available, and suggested lines for future investigation.

Farther north, for example in Northern Rhodesia, forestry is only beginning to be developed. The first step is the survey and stock-taking of the indigenous forest resources, and this necessitates the identification of the many different tree species. Even in a country such as Nyasaland, where a forestry service has been developed for some time, owing to pressure of administrative duties, work of this kind remains to be done. Assistance in both colonies was given by a systematic botanist, Dr. J. Burt Davy, during his visit to Africa.

In both South and East Africa the crying need of the moment is for workers to name the plants. The visitors were told in South Africa, and the same thing is true of East Africa, that if a botanist set to work on any square mile of the country, probably he would find at least one new flowering plant that had no name, and probably more than one. Certainly it is true that whatever interests the botanist may start with when he leaves the mother country for Africa, he is soon driven by circumstances to turn aside from a primarily physiological or other inquiry in order to ascertain what is the correct name of the plant with which he is working. This is the first need on the scientific side, but it is also true on the practical side. It is of prime importance in relation to problems in regard to poisoning of stock. Veterinary officers in Northern Rhodesia took visitors to districts and pointed out probably the plant itself, certainly the group of plants, which are responsible for producing certain symptoms in the stock grazing in that area. This they have been able to do for several years past, but they were still unable to give a name to the plant that is the cause of their trouble, and as a consequence they are no nearer an understanding of the means of eradicating the trouble, and they have no idea of the extent of the plant's distribution, its season, etc. One of the crying needs of the botanical side is more help on the systematic side.

One thing that the home botanists ought to do, therefore, is to supply the workers in this systematic field in the new country. Africa with its own

active university departments, all of which have heads alive to the botanic needs of the country, will soon supply its own workers in this field. At present it needs the resources, however, of the old country. As a matter of fact, one of the ironies of the situation is that as nearly all the original work upon the Cape flora has been done by European botanists, the only places where the African plants can be named with certainty at present is in the home country in touch with the big British and European herbaria. There is, quite possibly, room for a greater development of systematic work on this type of plant material in connexion with Kew or with the Natural History Museum at South Kensington.

There are thirteen separate sections of the British Association concerned with different departments of science, and each of these held meetings at Cape Town and Johannesburg. Mr. O. J. R. Howarth, secretary of the Association, has been good enough to furnish me with the following summary of the scientific programme of the meetings:

"In Cape Town and Johannesburg there were some 350 addresses, lectures, papers, and discussions in all. Of these, fully one-third were on specifically South African topics, and many of them were contributed by South African scientific workers. To mention only a few as examples—the chemists dealt with essential oils from South African plants, with recently discovered nitrate deposits in South-West Africa, and with the chemistry of gold extraction. The geologists were concerned in very large measure with the geology of the sub-continent: they not only heard papers on it, but studied it widely in the field, co-operating with the International Geological Congress (which coincided with our own meeting) in order to do so. Geologists, zoologists, and botanists combined to discuss the debatable subject of the lost continent of Gondwanaland.

"A large part of the zoological and botanical programmes had a definitely South African bias, and both sections benefited by exhibits and demonstrations arranged for the instruction of the visitors. The discussion organised by the Sections of Zoology, Botany, and Physiology on 'The Nature of Life' was opened by our most distinguished South African member, General Smuts. The Section of Geography, under the presidency of the Director-General of the Ordnance Survey, Brigadier Jack, devoted an important part of its programme to the progress of surveying and cartography in South Africa; and it studied a whole series of aspects of human environment, such as the effects of relief of the land upon settlement, economic development under desert conditions, water-supply, soils, and so forth. It also joined the Section of Education in discussing the teaching of geography, with special reference to South African schools and universities.

"The Economics and Anthropological Sections united to consider economic competition between advanced and backward peoples, and covered a wide field of South African economic problems. The Engineering Section dealt appropriately with

refrigeration, road and rail transport, town planning, irrigation, and mining machinery. The Anthropological Section, it need scarcely be said, was in its element: chief among many features of topical interest it received Miss Caton-Thompson's report upon her excavations at Zimbabwe and other sites in Southern Rhodesia, carried out at the instance of the Association, and confirming the medieval origin of the buildings in the face of romantic ideas as to their much greater age. The physiologists and engineers jointly considered problems connected with the ventilation of deep mines on the Rand and elsewhere. The psychologists contributed their results associated with some of the population problems of South Africa. The Educational Section devoted itself almost wholly to South African topics: and lastly, the Agricultural Section had the unique opportunity of meeting jointly, in Pretoria, with the Pan-African Agricultural and Veterinary Congress."

There can be no question as to the stimulus which consideration of these and other subjects has given to science in South Africa, or in the

interest which has been created among the visitors in the scientific and economic problems of the country. Everywhere the scientific staffs, research workers, and planters were eager to get into touch with visitors possessing intimate knowledge of their subjects, and to seek advice as to deductions to be drawn from work in South Africa or suggestions for further activities. The foregoing general survey represents not only personal conclusions as to the place of science in the development of the Empire, but also the views of competent authorities upon specific problems in South and East Africa. Among those with whom I have had conversations or correspondence, and to whom I am indebted for information, are Prof. H. J. Fleure, Mr. E. N. Fallaize, Dr. B. A. Keen, Dr. H. M. Steven, and Prof. J. H. Priestley. We all aim to advance progress and promote human welfare, and many of us are convinced that this can be attained only by scientific guidance. Upon statesmen and administrators is the responsibility of seeing that this guidance is rightly regarded and effectively used.

Obituary.

DR. J. C. MELVILL.

DR. JAMES COSMO MELVILL, of Meole Brace Hall, Shrewsbury, well known as a conchologist and botanist, who died on Nov. 4, was born in London on July 1, 1845, and was the son of James Cosmo Melvill, Under-Secretary of State for India, and the grandson of Sir James Cosmo Melvill, F.R.S., chief secretary of the East India Company. He was educated at Harrow and Trinity College, Cambridge, and entered the business of his uncle, Edward Hardcastle, travelling in North America, where he had opportunities for studying natural history and making collections. He later joined the firm of Messrs. G. and R. Dewhurst, of Manchester and Preston, serving as a director for many years.

While at Harrow Dr. Melvill published, in conjunction with the Hon. F. Bridgeman, "The Flora of Harrow". In later years he accumulated and arranged three-quarters of the known plants of the world. The greater part of this fine herbarium, containing many valuable plants and including some obtained by Charles Darwin during the voyage of the *Beagle*, was presented to the Manchester Museum in 1904. The remainder, which consist of the grasses and ferns of the world, together with about a third of the known seaweeds, will shortly be added to the others at Manchester.

Dr. Melvill began to collect shells at the early age of eight, and during his lifetime this collection grew to be the largest known in private hands, comprising 22,500 species. He described more than 1000 new species of mollusca, by himself or in collaboration with others, including the late Robert Standen. His conchological contributions are very numerous, and comprise descriptions of species from South Africa, the Persian Gulf, the Arctic and Antarctic regions. He joined the Conchological Society in 1880, and was president in 1889 and again in 1895-96, on each occasion delivering an excellent address.

He was an original member of the Malacological Society (founded in 1893) and was its president at the time of his death.

In addition to botany and conchology, Dr. Melvill took a keen interest in British insects and made quite a large collection. He was a member of the Linnean, the Zoological, the Entomological, and the Manchester Literary and Philosophical Societies, being president of the last in 1897-99. For many years he was on the Court of Governors and the Council of the University of Manchester. He was a member of the Manchester Museum Committee, being chairman for several years. During his residence at Meole Brace Hall, he was honorary curator of the Shrewsbury Museum and served as president of the Caradoc Field Club.

An all-round naturalist, Dr. Melvill's knowledge of the mollusca was masterly, and on the occasion of the Victoria University conferring upon him the D.Sc., Prof. Lamb remarked: "It is chronicled of Solomon that he spake of trees, from the cedar that is of Lebanon, unto the hyssop that springeth out of the wall, but it is not recorded that he also knew by heart all the shells from the Arctic Circle to the Persian Gulf. That double weight of learning was reserved for the accomplished systematist, Mr. Cosmo Melvill, and those who know him will testify with what gracious modesty he sustains it."

J. WILFRID JACKSON.

WE regret to announce the following deaths:

The Hon. Sir John Cockburn, K.C.M.G., president of the Child Study Society, who was premier chief secretary in 1889-90 of South Australia, on Nov. 26, aged seventy-nine years.

Mr. Francis A. J. Fitzgerald, head of the Fitzgerald Laboratories, Niagara Falls, and president in 1916 of the American Electro-Chemical Society, on Oct. 26, aged fifty-nine years.