appreciation of the relevant geological conditions. In the new era opening out, the unified coal industry, with all its potentialities and its capacity to quicken or retard the *tempo* of our whole national life, must receive all the assistance that geology can provide in planning ahead, in suggestions for economic working, in interpreting structures, in reading doubtful sequences, etc.

The task of the geologist in the coalfields is to correlate and assess all the information already available, to advise as to future developments, and to follow these up much more closely than it has been possible to do in the past. This cannot be achieved by periodic efforts or by a discontinuous service. Research in the coalfields is not a series of separate *ad hoc* pieces of investigation but a continuous service which requires a full-time staff. It is only in this way that geology can be enabled to take its proper place in the economic life of the country. It is only in this way, too, that the gaps in our knowledge of many aspects of Carboniferous geology can be filled, and a more and more broadly based synthesis built up. The coal-mining industry has now become a national trust, and it is as such that it must be regarded by all; the issues are clear-cut and indeed vital, and it is for geologists to see that geology plays its part in the difficult times ahead.

ZOOLOGISTS IN WAR AND PEACE

DR. EDWARD HINDLE, in the opening remarks of his presidential address to Section D (Zoology), mentioned that in view of the exceptional conditions under which they met, he proposed to devote his address to an account of some of the work in which zoologists had been engaged during the past few years. He first referred to war-time activities and gave a brief account of the application of the principles of animal coloration, known as camouflage, and also of some work on anti-fouling. Special attention was devoted to the contributions of zoologists to the maintenance of our food supplies, without which it is very doubtful whether the country could have been adequately fed. An important section of this work was the protection of our food stocks against animal pests, and mention was made of the work of the Bureau of Animal Population at Oxford on rodent control and the development of the Infestation Division of the Ministry of Food. The activities of the latter were dealt with at some length, since it developed as a direct result of war conditions and was staffed mainly by graduates in zoology.

Various attempts were made during the War to increase food supplies. These included extending the use of unmarketable fish which, in the English Channel alone, resulted in the production of about 1½ tons a week of excellent fish-paste from fish that was formerly wasted. The experiments at Loch Sween (Argyll) on the possibility of raising the fertility of a given area of the sea by the addition of nitrates and phosphates were also considered.

Zoologists took a prominent part in some branches of operational research. In particular, they were closely involved in the practical development of radar in connexion with gun-laying devices for anti-aircraft guns, and the development of 'H_2S', an apparatus used for the localization of targets. Eventually this was fitted in various aircraft, and its use resulted in enemy submarines being brought under control during the first half of 1943. Moreover, they did not become a serious menace again until the invention of the 'Schnorkel' in 1945.

Zoologists were found to be particularly well-fitted to cope with the early difficulties of radar, since by their training they become accustomed to handling large numbers of uncontrollable variables.

Some of the peace-time activities of zoologists were then referred to, with special emphasis on the work of entomologists in checking the serious losses in our agricultural products, stored products, and in the prevention of disease. To take only one item, the loss of grain in India, due to rodents, insects and moulds, has been estimated to amount to 12–15 per cent, and a saving of 10 per cent would be sufficient to prevent a famine. In Africa the Colonial Development Scheme, involving the expenditure of some £24,000,000 in the production of ground-nuts, would mean the use of mechanized agriculture on an unprecedented scale in that continent, and would create conditions favourable to the spread of animal pests and disease. Dr. Hindle expressed the hope that the number of professional biologists employed in this project would be commensurate with this expenditure.

The subject of taxonomy was then discussed, and the increasing difficulty of getting accurate identifications of species. An Empire Biological Service, somewhat analogous to the Fish and Wild Life Service in the United States, was suggested, as this might offer the possibility of establishing a pool of taxonomic specialists who could be attached not only to national and provincial museums in Britain, but also to corresponding institutions in the British Empire. Ultimately, this might be extended on an international basis. Finally, Dr. Hindle stressed the educational value of an academic training in zoology, which was out of all proportion to its economic possibilities; and appealed for a return to a less mechanistic training of the younger generation.

GEOGRAPHY IN WAR AND PEACE

IN her presidential address to Section E (Geography), Prof. E. G. R. Taylor points out that, while everyone admits that 'circumstances of place', that is, geography, are relevant to human history and human affairs, it remains true that geographical circumstances are normally regarded as 'accidents'; and as being, moreover, of so obvious a character that it needs no trained geographer to point them out, much less being such as to deserve analysis in detail. This over-simplified idea of geography, which can be exemplified in the writings of historians, economists, military commentators and others, is responsible for the fact that the subject receives no mention in the schemes for revised university curricula aimed at the provision of a more balanced general education embracing both science and the humanities. Nor is it included in plans for the advancement and endowment of the social sciences. The pure scientist, too, rejects geography since (except in certain limited aspects) it is not susceptible of study by the method of controlled experiment. Yet departments of geography are over-full, and chairs in geography multiply faster than they can be effectively filled. Ordinary people are recognizing that the regional differentiation of the world's surface (although they would not thus define it) lies behind some of our most crucial problems, and is at the root (for example) of the effective reduction of the number of Great Powers to two.

The causes and consequences of regional differentiation can only be understood in relation to the globe viewed as an organic whole. The concept of 'global thinking' goes back among geographers to the late eighteenth century traveller von Humboldt. As thus envisaged, geography shares with sociology the methodological difficulties arising from the impossibility of isolating 'pure' problems, with the consequent need to call upon a number of diverse skills and specialisms. The present climate of thought is, however, unfavourable to group research (employing specialists from different fields) and even to team research (employing specialists within the same field), and successful examples of such work are few. Nevertheless archæologists, historians, economists, sociologists and physical planners have recently shown an increasing disposition to seek the collaboration or advice of geographers, no doubt because, now that a second generation of trained geographers is coming to maturity, the output of work reaching an acceptable standard of scholarship is increasing. Examples of such work with a particular social bearing include analyses of the geographical circumstances of 'problem' areas—the Italo-Jugoslav boundary, Palestine, the march-lands of Russia, the 'special areas' of Britain—studies in micro-climatology, in coastal morphology, in land-utilization, areas of urban circulation and influence, and so on. The value of maps, not merely as a means of exposition, but also as a tool of research, is also increasingly appreciated.

A world war has for the second time emphasized the need for 'terrain' geography and exposed the gaps in geographical knowledge. New methods of air photography—stereoscopic survey, colour and infrared photography—are capable of supplying data by which those gaps could be rapidly filled. The interpretation of such data occupied many geographers during the Second World War. Beach reconnaissance, involving a land, sea and air complex, as a preliminary to military landings, called for novel methods of research, and led to new knowledge of shore-line processes and coastal morphology. The use of rockets and unpiloted aeroplanes lends a new importance to exact knowledge of the shape and dimensions of the geoid. The need for popular education in world geography lays upon geographers the duty of designing maps and globes which give a world picture appropriate to an 'air age'

PROGRESS IN MODERN ENGINEERING

CIVIL engineering aspects of progress in modern engineering is the principal topic of the presidential address to Section G (Engineering) by Sir William Halcrow. An analysis of engineering evolution involves consideration of mental conditioning in the past as well as of achievement. Society as a whole did not become mechanically minded until after the First World War, and the progress was slow. American influence is considerable, and we must understand the conditions which have led to their lavish use of machines and materials. Reference to tho progress of prime movers, of constructional materials, and of some recent developments in technique follows.

The steam engine has been highly developed for many years; but the steam railways require considerable improvements to cater for modern traffic intensities. The great operational inflexibility of the system can only be relaxed by changes in track layout, signalling systems and dead weight of stock.

Steam turbines are our main prime mover for the generation of electricity. Fuel ancillaries are inherently heavy and bulky, however, and the gas turbine, which will soon be in economical operation in aircraft, may challenge the steam turbine on these grounds. At present, however, its life is too short for purely industrial purposes.

The water turbine has been highly developed for some considerable time. Intensive hydro-electric development is taking place in the Highlands of Scotland; but the great Severn Barrage tidal scheme still awaits official approval. With 800,000 kW. installed capacity, it could produce some 2,300 million units of electricity per annum at 0·2*d.* per unit and save one million tons of coal a year.

Our mechanical civilization did not attain a high rate of development until the latter half of the nineteenth century, when iron and steel could be produced in large quantities. The present century has seen the great development of alloy steels, and we may be approaching the end of the age of simple mild steel. The use of light alloys has greatly increased, and it is not generally realized that aluminium production depends entirely on large amounts of cheap hydro-electric power.

Modern cement dates from about 1850; and although its chemistry is still not fully understood, high grades are available in large quantities. A recent advance is the production of low-heat cement. The use of reinforced concrete is widespread, and latterly the technique of pre-stressing has resulted in considerable savings in materials in some cases.

Earthwork has only been scientifically treated since the early 1920's, when Dr. Terzaghi began to publish his penetrating analyses. Some problems still await solution, but we understand their limits and tendencies. Tunnelling is highly mechanized at present and rapid progress is possible. In soft ground, by use of a shield, a 12-ft. Tube railway tunnel in London clay can be advanced by as much as 160 ft. a week.

Prefabrication was used on a large scale for marine works during the War; for example, in the well-known invasion harbours and the lesser-known permanent military ports in some of the Scottish sea lochs.

We have had to develop analysis by experimental methods to a considerable pitch. Electrical resistance strain gauges and photo-elastic methods are useful. In aircraft the piercing of the sonic barrier depends greatly on model and wind-tunnel research. In hydrodynamics, models are most useful for determining hull forms, wave action, silting and erosion in harbours, spillways of dams and similar problems.

ANTHROPOLOGICAL APPROACH IN SOCIAL SCIENCE

IN his presidential address to Section H (Anthropology), Prof. C. Daryll Forde discusses the anthropological approach to the social sciences. The social sciences are often regarded as comprising all scholarly studies contributing to the portrayal of social conditions, including historical or descriptive accounts and those directed towards the solution of