

old association had ceased to exist. The proposal was made at Paris that a section of the union should deal with meteorology, and this has now been confirmed, Sir Napier Shaw being nominated president, and Dr. Marvin, of the U.S. Weather Bureau, secretary. There has been for many years an International Committee of Directors of Meteorological Services, by whom administrative and technical questions relating to their work were discussed and international co-operation in that work was arranged. There is, however, ample scope for an organisation to co-ordinate work in meteorology, and to direct international work in the subject which does not fall within the administrative requirements of the meteorological services.

International work in terrestrial magnetism has hitherto been looked after by a sub-committee appointed by the International Meteorological Committee, but there was a general agreement that this subject and the electrical phenomena of the atmosphere should be dealt with by a special section which would co-operate with that dealing with meteorology and with the Physical Union in its work. Of this new section Prof. A. Tanakadate and Dr. Bauer, of the Carnegie Institution of Washington, were appointed respectively president and secretary.

To these sections were added two new ones—that of physical oceanography, to deal with tides, currents, temperature, density, salinity, and other physical phenomena of the oceans; and that of vulcanology for the study of the chemical and physical phenomena of volcanoes. In oceanography no president was nominated, but Prof. H. Lamb was elected vice-president, and Dr. Magrini, of the Hydrographic Service of Venice, secretary. In vulcanology the president is Prof. A. Riccò, of the Etna Observatory, and Dr. Maladra is secretary.

The executive committee of each union consists of a president, the presidents of its sections as vice-presidents, and a general secretary. In the Geodetic and Geophysical Union M. C. Lallemand, director of the Service de Nivellement de France, was elected president, and Col. H. G. Lyons general secretary.

The Mathematical Union was formed with Prof. Ch. de la Vallée-Poussin, of Louvain University, as president. In this union no sections have been formed, but it was agreed that the union should meet in Strasburg next year, when the further organisation of the union might be considered.

A Chemical Union was also formed, but the representation of this subject at Brussels was not sufficient to proceed further with its organisation there. The delegates representing physical science decided to form the Physical Union, leaving its complete organisation to a later occasion. An organising committee was nominated and charged with making arrangements for the next meeting as well as for forwarding various projects of importance for the progress of physical science.

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In biology Prof. Yves Delage was elected president, and M. C. Flahault secretary. Sections were established for general biology, physiology, zoology, botany, applied biology, and medical science, but here, too, it was recognised that the arrangements made could only be provisional.

Though the practical success of the International Research Council and the unions associated with it cannot be fully demonstrated until the next meeting, when three years' work will be available for report, and there will have been time to prepare projects for international working in each group, the organisation is now established on a working basis, and the meeting at Brussels showed that there was a large amount of work to be taken up, for the organisation of which the executive committees of the unions and sections now exist. The meetings in London, Paris, and Brussels form successive stages in this important achievement, and the members of the executive committee who have guided the Research Council through the first stages of its existence may well be satisfied with the result.

The legal domicile of the International Research Council will be at Brussels, and the periodical meetings of the General Assembly will take place there. The secretariat will continue to be in London, where the Royal Society has placed a room at its disposal. Unions and sections will meet at such times and places as their general assemblies or executive committees may decide.

On the day of their arrival the delegates were received at the Hôtel de Ville by M. Adolf Max, and receptions were given by the Minister of Science and Arts on July 26, and by the Minister of Foreign Affairs on July 28, at their official residences. On July 26 M. G. Lecoq, director of the Royal Observatory, invited the delegates to visit the observatory at Uccle, where they were shown over the buildings and its ample instrumental equipment.

H. G. L.

THE BOURNEMOUTH MEETING OF THE BRITISH ASSOCIATION.

IT is now possible to give further details of the meeting of the British Association to be held at Bournemouth on September 9-13. As already stated, practically all the meetings and discussions will be held in the Municipal College. This building, it is anticipated, will provide ample accommodation for all the activities of the association, with the exception of the very large assemblies—the inaugural general meeting, the discourses, and the conversazione (or, as it is now termed, the civic reception). It will readily be seen that in this respect members will find the arrangements far more convenient than at many previous meetings, when various buildings scattered over the town have had to be utilised.

The large hall of the college will be fitted up as the reception room. Other parts of the building will be converted into section rooms, staff rooms, luncheon and tea rooms, writing and smoking rooms, telephone room, etc. Members

may be assured that they will find every convenience and comfort immediately at hand. Only in the problematical case of an exceptionally large sectional meeting will it be necessary to make use of another building.

It is unnecessary in this article to describe in detail the long programme of work, a copy of which can be obtained from the headquarters of the association. The journal, giving full particulars, will, as usual, be issued daily throughout the meeting. The general public will probably be most interested in the papers and discussions relating to scientific work in the war, on such subjects as tanks, submarine mining, the paravane, air photography, the progress of aviation, airships, and directional wireless. Of special topical interest will also be the discussions arranged by the Economics Section on the National Alliance of Employers and Employed, price-fixing, with special reference to Australian experience, transport, finance and taxation, and the gold standard; by the Agriculture Section on war-time food production; by the Physiology Section (jointly with that of Economics) on the influence of the six-hour day on industrial efficiency and fatigue; by the Education Section on various problems of modern education; and by the Geography Section on long-distance air routes, the geography of Imperial defence, frontiers in the East of Europe, and the colonisation of Africa.

Following the precedent set in Birmingham in 1913, citizens' lectures will be delivered in outlying parts of the town during the week, in co-operation with the Workers' Educational Association. These will comprise lectures by Prof. H. H. Turner on "Modern Astronomy," Prof. S. H. Reynolds on "Purbeck Isle and its Geology and Scenery," and Prof. J. L. Myres on "Woman's Place in Nature from an Anthropological Point of View."

Numerous excursions will be made to places of interest in the neighbourhood. The Engineering Section will, by special permission of the Admiralty, visit the Royal Naval Cordite Factory at Holton Heath, a vast organisation which has sprung up during the war, and will also inspect the Bournemouth and Poole Gas and Water Works and the power stations of the tramways and electric light undertakings. The Geology Section will journey each afternoon to points of geological interest in the locality, including such favourite haunts of geologists as Lulworth Cove and Kimmeridge. The Botany Section will find much material for work and discussion in the New Forest, at Shell Bay, and elsewhere. The Agriculture Section is arranging a visit to Iwerne Minster, in the neighbouring county of Dorset; while the Anthropology Section will organise an excursion to the Channel Islands if sufficient names are received before the meeting. Communications on the last-named subject should be addressed to Dr. R. R. Marett, Exeter College, Oxford, who is to read a paper on recent discoveries of archæological interest in the Channel Islands.

It may also be mentioned that Lord Montagu of Beaulieu, president of the Conference of Delegates of Corresponding Societies, has offered to show members and their friends over the beautiful Beaulieu Abbey, with its thirteenth and fourteenth century remains; and Sir Merton and Lady Russell Cotes have consented to throw open to them the East Cliff Hall and its fine collection of art treasures.

From the social point of view, those attending the meeting will find the Bournemouth week a very pleasant one, even though official functions on a large scale are not contemplated. Various local clubs and institutions will be ready to receive them as honorary members during the period of the meeting, and in other ways a great deal will be arranged in the way of hospitality and entertainment.

SUBMARINE ACOUSTICS.

THE war has been responsible for great developments in many branches of science. As a consequence of the submarine menace, close attention has been given to the subject of marine physics, with the result that notable advances have been made in several directions, especially in that of submarine acoustics. Much of what has been accomplished is still regarded as confidential information, but some interesting disclosures have recently been made by Prof. W. H. Bragg in the Tyndall lectures delivered before the Royal Institution, and in a lecture at the British Science Guild's Exhibition at Westminster.

The singular property which distinguishes a submarine from other ships is its capacity of rendering itself invisible when pursued or when seeking and attacking its prey. Robbed of this power, it is an extremely vulnerable craft, and falls a ready victim to more heavily armed and armoured surface ships when once its presence has been detected and its position located.

The acoustic method of detecting a submerged submarine moving in the open sea was found to be far more sensitive and to give a much longer range than all other methods. Instruments used for this purpose are called hydrophones. Many varieties of hydrophone have been evolved and perfected, but by far the largest class consist essentially of a microphone attached to a diaphragm which forms one wall of a watertight cavity. The microphone is connected through a suitable electrical circuit to ordinary telephone receivers, the complete installation resembling a unit of an ordinary land telephone system. In use the hydrophone is suspended from the bulwarks of a stationary ship, or mounted in tanks attached to the hull, or trailed behind in a suitable "fish" body in the case of a moving ship. The range of a hydrophone depends upon the size and speed of the source of sound, the depth and state of the sea, the presence of other sources of sound, etc., and may vary from a few hundred yards to several miles.

The difficulty of ascertaining the *direction* of