up a mass of cold rock as against one that has long felt the influence of the sun; hence unusual precipitation follows on the new land-surface, and an Ice age sets in. Stanislas Meunier ("Les Theories Glaciaires," *Revue des Idées*, 1910, p. 207) affirms, as usual, that no general and contemporaneous refrigeration has been proved; but he also asserts that the scratches of stones in boulder-clay are produced by the infiltration of rain and consequent settling of the mass. M. Yokoyama ("Climatic Changes in Japan since the Pliocene Epoch," Journ. Coll. Sci., Tokyo, vol. xxxii., 1911, part v.) cannot accept the evolution of carbon dioxide as a cause of warmer climates, since in Japan the output must have been considerable during glacial times. He prefers, from local palæontological evidence, to account for the difficulties by a shifting of the poles. This is, of course, seriously opposed by the evidence of contemporaneous world-wide refrigeration. R. Speight ("The Post-glacial Climate of Canterbury," Trans. New Zealand Inst., vol. xliii., 1911, p. 408) finds no local cause in New Zealand to account for the succession of climates that he records, a moist climate following the glacial, and modified steppe conditions preceding those of the present day. The author points out that the sequence is so similar to that in Europe as to suggest some cause that affected the whole earth, though changes in the grouping of land and water in the southern hemisphere might account for the former conditions in New Zealand.

G. A. J. C.

THE WORK OF THE PHYSIKALISCH-TECHNISCHE REICHSANSTALT, CHARLOTTENBURG, IN 1911.

THE following notes describe some of the more important researches, &c., undertaken at the above institution during 1911. They are compiled from the annual report of the Reichsanstalt, appearing in *Zeitschrift für Instrumentenkunde*, April, May, and June, 1912.

The comparison of platinum resistance thermometers with various gas thermometers has been completed between 0° and 450° C. It was found that the hydrogen thermometer and the helium thermometer of constant volume with an initial pressure of 620 mm. mercury indicated about 0·1° higher at 450° C. than the nitrogen thermometer under the same conditions. With the accuracy attained, the hydrogen scale may be at once identified with the ideal scale, since, according to Berthelot, these only differ by about 0·01° at 450° C. in the present case. The data for the following fixed points, which were determined afresh, refer to the ideal gas scale :—

Freezing points		Boiling points	
Tin	231·8$_3$°	Naphthalin ...	217·9°
Cadmium ...	320·9$_2$°	Benzophenon...	305·8$_9$°
Zinc	419·4$_0$°	Sulphur ...	444·5$_1$°

In connection with an investigation of the mean specific heat of gases at high pressures, the specific heat of air between 20° and 100° C. at 1 and 11 atmospheres was measured with a new calorimeter. It was found that when the pressure was increased from 1 to 11 atmospheres the specific heat increased by about 2·1 per cent. This result must not, however, be considered as final at present.

The investigation into the specific heat at constant pressure of air by the Callendar and Barnes continuous-flow method was concluded. The values found for the specific heat at constant pressure of carbonic-acid-free air under atmospheric pressure are given below. The method gives the results direct in electrical measure (watt-seconds); and the values converted into heat units (Cal.$_{15°}$) are also given.

Temperature °C.	c_p In electrical measure	c_p In calories
+ 20	1·009 ...	0·240$_8$
− 78	1·019 ...	0·243$_2$
-183	1·058 ...	0·252$_5$

The experiments were extended to carbonic acid gas, oxygen, and nitrogen. For the pure, dry gases, at atmospheric pressure and 20° C., the following results were found in electrical and in heat units respectively :—

Carbonic acid gas	c_p=0·846 and 0·202	respectively.
Oxygen	c_p=0·917 „ 0·219	„
Nitrogen	c_p=1·041 „ 0·249	„

For carbonic acid gas at −78° C. and atmospheric pressure the respective results were, c_p=0·76$_8$ and 0·183. The decrease in specific heat of CO_2 between +20° C. and −78° C. is, when calculated per degree, only slightly less than that between +100° C. and +20° C. determined by Swan.

Specific Heat of Water between 0° and 100° C.—A precise determination of the calorie in electrical units on a trustworthy basis appears very desirable. The bases of the measurement, viz. the unit of resistance, the e.m.f. of the standard cell and the temperature scale, have now been fixed internationally to such a degree of certainty as to appear to render possible a determination of the calorie in international watt-seconds to within 1 part in 10,000. This research was commenced at room temperature, and a description of the various apparatus and of the experimental arrangements is given in the report. No results are, however, recorded.

Weston Normal Cells.—A number of these were constructed, using new mercurous sulphate preparations, with the view of seeing whether all freshly precipitated samples yielded the same e.m.f. as the older preparations, and for the purpose of discovering whether the method of washing the precipitated mercurous sulphate had any influence on the e.m.f. of the cell. The results show that the method of washing has no appreciable influence on the e.m.f. Other extensive investigations were undertaken on Weston cells, and the general results arrived at indicate that both the reproducibility and constancy of the cell can be guaranteed internationally to within a few parts in 100,000.

In connection with some experiments on resistance thermometers, it was found that the differences shown between fused silica platinum resistance thermometers and the ordinary type may be ascribed to a reaction of the quartz glass on the platinum—probably of a chemical nature. Experiments were also made with the view of comparing the behaviour of the quartz glass resistance thermometer at the highest temperatures at which it can be used with the ordinary resistance thermometer. Full details of these experiments are given.

Electrolysis of Glass.—The investigation of the badly conducting layers discovered by Warburg in the electrolysis at 300°–350° C. gave the following result :—

Platinum or graphite anodes are not soluble in glass. On electrolysis, a layer of high resistance occurs at these anodes, sodium migrating from the glass to the kathode and oxygen to the anode. With mercury as anode, quantitative migration takes place. The metals lead, bismuth, antimony, tin, iron, and copper, when oxide-free, appear to migrate quantita-

tively into the glass. Anodes of lead oxide or copper oxide are insoluble, and exhibit the same phenomena as platinum or graphite anodes.

Among other investigations, either completed or in course of progress, the following may be mentioned:—Anode rays, the Doppler spectrum in canal rays, determination of the constant c of the law of black-body radiation, the thermal expansion of metals at high temperatures, electrolytic valvular action, influence of chemical composition and heat treatment on the magnetic and electric properties of iron alloys.

E. S. HODGSON.

AWARD OF BEIT MEMORIAL FELLOWSHIPS.

THE trustees of the Beit Memorial Fellowships for medical research have elected the following to fellowships. Each fellowship is of the annual value of 250*l.*, payable quarterly in advance. The usual tenure is for three years, but the trustees have power in exceptional cases to grant an extension for one year. The general character of the research which each fellow proposes to follow, and the place of research, are indicated.

Dr. Ida Smedley, the processes involved in the formation of fat in the organism (the Lister Institute of Preventive Medicine). Dr. R. A. Chisolm: An investigation into the production of experimental nephritis by various methods, and the problems arising therefrom (the Pathological Department, Guy's Hospital). Dr. D. V. Cow: (1) Investigation of the diuretic action of certain tissue extracts, especially of an extract obtained from the intestinal mucous membrane; (2) investigations of certain bacterial diseases with the object of ascertaining any possible beneficent action thereon of organic compounds of a non-toxic nature (the Pharmacological Laboratory, Cambridge). Miss Elsie J. Dalyell: Investigation of gastro-enteric diseases in infants, with reference to etiology (bacteriological research), influence of diet (chemical and bacteriological research), vaccine therapy as a protective and curative measure (Lister Institute of Preventive Medicine). Dr. C. Funk: An investigation into the nature of the so-called deficiency diseases (beri-beri, scurvy, &c.), with special reference to the chemical nature and physiological properties of the substances concerned in their etiology and prevention (the Lister Institute of Preventive Medicine).

Prof. A. B. Macallum: Problems in metabolism in disease, especially those concerned with the formation of urea, ammonia compounds, and uric acid and their excretion (Prof. Fredrik von Müller's Laboratory, Munich). Dr. J. McIntosh: Certain problems concerning the immunity of syphilis (Bacteriological Laboratory, London Hospital Medical College). Dr. S. W. Patterson: (1) Questions concerned with diabetes, especially the fate of lævulose in the normal and diabetic organism; (2) later, to investigate the toxæmias of intestinal origin, especially the influence of different forms of diet on the production of poisonous products, amine derivatives of amino-acids, &c. (Institute of Physiology, University College, London). Miss Helen L. M. Pixell: The life-histories of parasitic protozoa (the Protozoology Laboratory, Bedford College, and the Lister Institute of Preventive Medicine). Dr. H. L. H. Schütze: Studies concerned with the modern absorption theory of the union between bacillary antigen and the antibodies of the blood serum (the Lister Institute of Preventive Medicine).

All correspondence relating to the fellowships should be addressed to the honorary secretary, Beit Memorial Fellowships for Medical Research, 35 Clarges Street, Piccadilly, W.

ZOOLOGY AT THE BRITISH ASSOCIATION.

SECTION D, which was largely attended, presented a very full and varied programme, and the interest in the meetings of the section was well sustained throughout.

A lantern lecture, of a semi-popular nature, was given by Mr. F. Balfour Browne, on the life-history of a water-beetle. After describing his methods of keeping and rearing water-beetles, he proceeded to detail the life-history of a type of each of the two groups of water-beetles, taking *Dytiscus lapponicus* as a type of the group Hydradophaga, and *Hydrocharis caraboides* as a type of the group Palpicornia. The former, which has a very restricted distribution in the British Islands (N.W. Ireland and W. Scotland), being apparently a remnant of the fauna which in earlier and colder times occupied this area, seems to be the first species of the genus the life-history of which has been followed in detail. Mr. Balfour Browne gave an account of the egg-laying habits, the development of the larva and its escape from the egg by means of a pair of small spines on the head, the scraping of which against the shell ultimately ruptures it, and allows the larva to wriggle out. He stated that the larva, in addition to sucking the juices of its prey, from time to time reverses the action of its pharyngeal pump, so as to pour digestive juice into the prey (*e.g.* an insect larva), so that all the soft parts are dissolved and a thin pellicle of chitin only remains. He showed how the larva, after it is full grown and leaves the water, builds the pupal cell, and he referred to the winter habits of the perfect insect. He then compared the life-histories of Hydrocharis and Dytiscus, and pointed out how each type has adopted different means to attain the same end, and that it was just such differences which enabled each species to hold its own in its particular community in the great struggle for existence.

Foraminifera.

Messrs. Heron-Allen and Earland maintained that the life-history of Saccammina, as described by Rhumbler, was a composite sketch, and involved three separate organisms: (1) the early phases were stages of *Crithionina mamilla*, a sessile rhizopod, which, although often associated with *S. sphaerica*, has a wide distribution apart from that species; (2) the next phase was really *Psammosphaera fusca*, an extremely variable species, occurring both free and sessile, always without a general aperture, and found under conditions of depth, &c., in which Saccammina never exists; (3) the "Saccammina" stages, described by Rhumbler, which represent the complete life-cycle of *S. sphaerica*. Early shell-bearing stages of this species differ from the adult only in their smaller size, somewhat less finished exterior, and in the form of the general aperture, which is at first a mere fissure. The nipple-like protuberance, on which the aperture of the adult is placed, gradually develops later.

The Isle of Wight Disease of Bees.

Dr. H. B. Fantham gave an account of the causal organism of this disease—a minute microsporidian parasite, *Nosema apis*—which was discovered by Dr. Annie Porter and himself. The organism is, in the main, a parasite of the alimentary tract of the bee. Spores of the parasite, swallowed by the bee, give rise each to an amœbula, which enters an epithelial cell of the gut, becomes rounded, grows and feeds for a time, and then begins to multiply by various types of binary fission, producing clusters or chains, each individual of which is ultimately uninucleate. The presence of these parasites causes derangement of the bee's digestive processes, and may be fatal.