

in Shark's Bay, Champion Bay, Geographe Bay, and King George's Sound; they collected on land, especially around Perth, Geraldton, and Albany, and travelled inland as far eastward as Kalgoorlie. They describe the south-western part of Australia as zoologically "a forgotten corner," for as Westralia is younger and larger and has a smaller population than the Eastern States, it has not been able to organise such extensive studies of its fauna and flora.

The authors regard their expedition as very successful, and their scientific results are to be issued in a series of volumes, of which the part now published is only the general introduction. It describes the authors' journey, and gives a list, with a map of their collecting stations. It consists of two reports, one by Prof. Michaelsen, describing his general observations on the geography of Westralia, including its scenery, physiography, flora and fauna, and the aborigines. Dr. Hartmeyer contributes an account of the sheep-farming, the mining industry at Kalgoorlie, and of the dredging expeditions. Both essays give a pleasant account of the country in spite of sufferings from the ubiquitous Worcester sauce. They gratefully acknowledge the ready help of the officials and people. They remark the "extravagant" width of the Kalgoorlie streets, and the difficulties of railway administration on lines where, as Prof. Michaelsen expresses it, there is no fear of collisions. Their Shark's Bay boatman seems to be a typical Australian; "he speaks not much, but he understands his business, and what he does he does with hand and foot." The report contains interesting comparisons with other faunas. Thus Prof. Michaelsen, who had previously studied the zoology of Lake Baikal, contrasts the fauna of that very ancient, perhaps pre-Devonian, deep lake, with the life of the recent, shallow pools of Western Australia.

The most generally interesting zoological result given is probably Prof. Michaelsen's conclusion as to the relations of eastern and western Australia as indicated by the earthworms (pp. 49-50). He holds that since the appearance of the ancient genus *Plutellus*, south-western Australia has been united by land only to the eastern States. There are no affinities to other lands, which are not also common to eastern Australia. Comparatively few foreign earthworms entered eastern Australia, and they arrived at different dates, and crossed subsequently into south-western Australia. There they developed into distinct though closely allied species, probably at a time when the land extended farther south-westward in separate peninsulas or had been temporarily divided into islands, which gave the worms on them complete though temporary isolation.

As the authors' journey was naturally confined to the best known areas in Westralia, there was not much opportunity for obtaining new geographical information, and the value of the work of the expedition will depend on the technical and biological memoirs which are to follow. This preliminary account gives evidence of such thorough and careful work, that important results may be expected from the work of two such skilled zoological experts.

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OUR BOOK SHELF.

Experimental and Theoretical Applications of Thermodynamics to Chemistry. By Dr. Walther Nernst. Pp. x+123. (London: A. Constable and Co., Ltd., 1907.) Price 5s. net.

Technische Anwendungen der physikalischen Chemie. By Dr. Kurt Arndt. Pp. vii+304. (Berlin: Mayer and Müller, 1907.) Price 7 marks.

THE first of the above volumes contains a series of ten lectures delivered by Prof. Nernst at the Yale University in 1906 under the Silliman Foundation. After two introductory chapters, a *résumé* is given of the experimental investigations which have been carried out by the author and his students on chemical equilibria at high temperatures. In a theoretical discussion of the results, the author develops the view that relationships exist between chemical energy and heat other than those expressed by the first and second laws of thermodynamics. From a consideration of the conditions under which the principle of Berthelot comes nearest to expressing the true relation between heat and chemical energy, the conclusion is drawn that the total and free energies are not only exactly equal at absolute zero, but that their values coincide completely in the vicinity of this temperature. In the last three chapters the practical application of the integrated equation of the reaction isochore is illustrated by calculation of the equilibrium in various dissociating systems at high temperatures, such as water vapour, nitric oxide, hydrogen chloride, carbon dioxide, and metal ammonia compounds.

Whether the reader is interested in the fundamental theoretical speculations or the practical application of the derived formulæ, Prof. Nernst's series of lectures cannot be too warmly recommended.

In his "Technische Anwendungen" Dr. Arndt presents an account of certain chapters of physical chemistry and of recent investigations which have an important bearing upon technical processes. The volume does not make any pretence to be a complete treatise on the subject, but carefully chosen examples of the application of physico-chemical principles to industrial processes are discussed in considerable detail. In the first three chapters the formation of nitric oxide from air, the equilibrium in the manufacture of generator and water gas, the manufacture of sulphuric acid by the contact process, the formation of ammonia and of ozone are dealt with, the remaining ten chapters being devoted to a less detailed consideration of catalysts, changes of state, solutions, alloys, dissociation pressures, and the measurement of high temperatures.

The book is distinctly worthy of attention, has many good features, and contains a lot of useful references, although the author—if one may judge from the very small number of references to English chemical literature—does not appear to be very familiar with work carried out in this country. This is an unfortunate circumstance, and detracts not a little from the value of the book.

H. M. D.

Die Auszeichnungsrechnung nach der Methode der kleinsten Quadrate. By F. R. Helmert. Second edition. Pp. xviii+578. (Leipzig and Berlin: B. G. Teubner, 1907.) Price 16 marks.

THE principal changes in this new edition consist in the more detailed discussion of errors of observation, instrumental corrections, interpolation problems, and the reduction of triangulations. The last chapter deals with the choice of favourable conditions in various surveying problems. In its present form the work appears to be admirably suited for those who have to make practical use of the theory of errors, especially