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THE CONTINUOUS ADVANCE OF ELECTRO- CHEMISTRY.

THE field of electrochemical activity covers three distinct lines of endeavor: First, the investigation and classification of electrochemical phenomena—scientific progress; second, the formulation of a satisfactory and all-comprehensive electrochemical theory—intellectual progress; and third, the application of these facts to industrial ends—industrial progress. We purpose to discuss briefly this evening the past achievements in each of these lines of endeavor, in order to determine therefrom and to discuss more at length the present bent and probable future direction and extension of each.

I. THE INVESTIGATION AND CLASSIFICATION OF ELECTROCHEMICAL PHENOMENA.

This is, properly speaking, the real corner-stone of progress in electrochemical science. What has been accomplished in this direction in the century and a half since Beccaria 'revivified' several metals by Leyden-jar discharges may be found scattered through the files of our technical journals and compiled from time to time into compendiums of electrochemical literature. The most pretentious, and in many respects the most timely, of all these works is the 'ausführliches Handbuch,' which our German friends are at present patiently compiling. A careful study of this work causes surprise both at the large amount of investigation which has been done and at the large gaps which exist in our experimental knowledge. Alongside of splendid researches into the most obscure phenomena of the science exist *lacunæ* in

and the size of the images. The 'Dioptrische Untersuchungen' 'in words of one syllable' is hardly attainable, but that of it which is indispensable seems here to have been presented in the simplest possible manner. Systems are compounded and equivalent lenses calculated by the aid of Newton's formula, ' $cc' = ff'$,' in which the principal foci of a system are used as coordinates from which conjugate foci are measured by a symmetrical notation. In this way a good working theory is obtained, and is so illustrated by examples chosen from the eye itself, that the student becomes familiar with the constants with which he will be subsequently concerned. Chapter V., the following, is on 'visual acuity.' From this on the science is not very much separated from the useful art by which it is likely to be applied in practise. Most of the subject matter which comes to us by or through Tcherning and Landolt appears here and is in general very well presented. The author does not hesitate to express an opinion of his own occasionally. Among other things he says the Morton ophthalmoscope is the best for refraction purposes, from which we judge the hole in the small mirror is made larger than it was in the earlier instruments. The horopter has been robbed of half its interest. This devilish contraption which kept Helmholtz awake nights and which lesser men have dodged as 'un problème de mathématiques assez compliqué et sans grand intérêt' floats in from somewhere this side of the Rocky Mountains bearing a brand new name and shrunk to nothing more or less than a toric surface. We prefer it with its old euphonious title and complicated contour.

Near two hundred pages of the book are taken up with normal and abnormal refraction. Included in this part is a chapter on optometers of some historic and theoretic interest; also a chapter on retinoscopy well presented. Retinoscopy is a *sine qua non* to a few men who paralyze all cases and do a rough-and-ready refraction practise among infirm patients. But retinoscopy is also a necessary part of the modern oculist's equipment and deserves the space here given to it.

Dr. Gibbons in common with most other

oculists thinks there is no place in the world for the 'refracting optician.' He does not devote much attention to his natural enemy, but he offers him no quarter. From a purely medical standpoint the oculist may have the best of the argument, but the refracting optician is abroad in the land and is not likely to be preached out of existence. There are economic conditions which contribute to his success and justify his claim to recognition.

It is of course quite proper that the author should give a list of cycloplegics and their peculiarities and the method of procedure to be adopted by those who habitually use them in the fitting of glasses. The number of such is so great that they can not be ignored, but why so many oculists still think it worth while to acquire the useless and irrelevant information that comes from fitting glasses to a paralyzed eye is hard to tell. It may be gathered from the text that the author thinks such a course should be the rule rather than the exception.

In the line of petty fault finding it might be said that Holmgren's color test is rather meagerly given, that the description of a Rochon prism is made to do duty for a Wollaston, that it is a little dogmatic to assert in an unqualified way that lens and vitreous opacities are caused by eye-strain. The algebra has suffered in one or two places from clerical errors, and the table at the top of page 386 seems to have been obtained empirically under conditions which, if well understood, have certainly not been accurately described.

The letter press is as good as could be desired. The illustrations that have been made for the book are excellent. Their number is greatly increased by those borrowed from the instrument-maker, whose courtesy serves a double purpose. On the whole the author, publisher and instrument-maker should be well satisfied with the accomplishment.

WILLIAM S. DENNETT.

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SCIENTIFIC JOURNALS AND ARTICLES.

THE May number of the *Botanical Gazette* contains the following papers: Ethel Sargent has written concerning 'The Evolution of the

Monocotyledons,' the argument being in substance that which she contributed to a discussion of the subject at the Southport meeting of the British Association. It is claimed that the monocotyledons are descended from an ancestry with two cotyledons and that the single cotyledon which distinguishes them is a member formed by a fusion of the pair. Isabel S. Smith has studied 'The Nutrition of the Egg in *Zamia*,' showing that the so-called nuclei reported to pass through the jacket-cells into the egg are the ends of haustoria sent out by the cytoplasm of the egg into the jacket-cells. Mary E. Opperman has published 'A Contribution to the Life History of *Aster*,' in which she treats of the development of the embryo sac and fertilization. Among the interesting points is a discovery of an antipodal cell fusing as an egg and about to be fertilized. J. Cardot and I. Theriot publish their second paper on 'The New or Unrecorded Mosses of North America,' describing numerous new forms. B. E. Livingston writes on the 'Physical Properties of Bog Water,' and from tests he has made draws the conclusion that bog waters do not have an appreciably higher concentration of dissolved substances than do the streams and lakes of the same region. J. N. Rose publishes a biographical sketch with portrait of the late William M. Canby. Francis Ramaley publishes a short preliminary statement of 'The Anatomy of the Cotyledons' in Cruciferae and Ranunculaceae.

SOCIETIES AND ACADEMIES.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

At the 157th meeting, held on May 11, Mr. G. O. Smith presented a paper on 'Stratigraphic Problems in the Northern Cascades.'

In western Washington, the Eocene was characteristically an epoch of sedimentations, just as the Miocene was one of vulcanism. The Eocene sediments are economically important by reason of the coals of the Puget formation on the west slope of the Cascades, and of the Roslyn formation on the eastern slope.

Study of the Eocene formations has shown that the sediments were contributed from land areas possessing topographic diversity, and that most of the Eocene basins were neither permanent nor extensive. In the survey of the Snoqualmie quadrangle additional facts were collected concerning the relief of the pre-Eocene surface and the conditions of the Eocene sedimentation. Six Eocene formations were recognized and mapped—three being purely sedimentary and the others volcanic in part at least. The maps and sections of the folio which is in preparation will exhibit two main features; the importance of the present areas of pre-Eocene rocks as structural axes at the beginning of the Eocene, and the variability introduced into the Eocene section by the eruption of two distinct types of lava from different centers at different times. The structural axes in this region have a general northwest-southeast trend, which is paralleled by the trend of the pre-Eocene schistosity as well as the axes of post-Miocene folding and faulting and the later post-peneplain warping in the adjacent Ellensburg quadrangle.

The principal fact presented in this paper was that the present ridges of old schist and granite determined in large measure the boundaries of Eocene basins and retained their structural importance throughout the whole of the very eventful Tertiary period.

The next paper, by J. E. Spurr, was entitled, 'Faulting at Tonopah, Nevada.' In a small area, containing about six square miles, in which the most important mines and prospects are situated, the rocks are a complex of Tertiary volcanic rocks, lavas and tuffs, with a formation of lake-deposited white tuff beds. With the exception of some of the latest lavas, all these rocks have been violently and intricately faulted. The latest rocks are chiefly silicious rhyolite and silicious dacite volcanic necks, the plugs of late Tertiary volcanoes. The faults do not run into them, and the relations indicate that most of the faulting was accomplished before, during and immediately after the intrusion of the necks. The faulting is especially clustered around the dacitic necks, and examination of the fault blocks shows