other abounding in fresh-water shells together with turtle and crocodile remains in the Jurassic Dinosaur beds. On the basis of the fossils collected this summer, the Carboniferous of Shirley Basin and the Grand Canyon of the North Platte are to be correlated with the Madison limestone of the Yellowstone Park. The Carboniferous at 'Specimen Hill,' near the ranch of John Burnett in the Little Medicine settlement, is, however, of Upper Carboniferous age.

Game at times was plentiful. On the plains, we saw daily from a few to as many as fifty antelope, but we rarely got nearer to them than a half mile. Sage hens were also abundant. In the mountains, two species of grouse were seen. Beaver dams we saw only in the region of Larmie Peak. Coyotes were noticed daily and nightly we never failed to hear their broken-voiced barking. Bears and mountain sheep were not seen, but occasionally we came across their tracks. Jack-rabbits were not common, eagles very scarce, and but four rattlesnakes were killed.

In conclusion, it is believed that the sentiment of the members of the Fossil Field's Expedition is voiced when it is stated that we were particularly fortunate in having Professor Knight as chief geologist, leader, and quartermaster. He did his work well, and we are the gainers in making his acquaintance.

"The Dinosaur, King of the mountains,
The largest of all vertebrates;
When he drank he exhausted the fountains,
And no one can tell what he ate.
He went about in the Jurassic,
And he'll never come back any more;
His bones lie here in Wyoming.
Three cheers for the old Dinosaur."

Vincent, Coe College.

Charles Schuchert.

U. S. National Museum,
October 26, 1899.

SCIENTIFIC BOOKS.

THE 'THETA-PHI DIAGRAM.'

The Entropy-Temperature Analysis of Steam-Engine Efficiencies. By Sidney A. Reeve. New York. 1897. 8vo. Pp. 20, with folded diagram.

The Theta-Phi Diagram practically applied to Steam, Oil, Gas and Air-Engines. By Henry A. Golding. London, Manchester and New York. 1898. 12mo. Pp. 127.

The Entropy-Diagram and its Applications. By J. Boulvin. Translated by Bryan Donkin. London and New York. 1898. Pp. 70.

The 'temperature-entropy diagram,' the 'theta-phi diagram,' as some recent writers, following Macfarlane Gray, are coming to denominate it, was suggested, somewhat indefinitely and without illustration of its applications, by Belpaire, in 1872; by J. Willard Gibbs, in a very definite form and with clear statement of the uses to which such a diagram may be applied, in 1873–1878, and by later writers in increasing numbers and with as steadily increasing extent and usefulness of application, particularly in the treatment of the theory of the ideal heat-engines and in their comparison with the real engines of daily life. About 1889 Macfarlane Gray presented papers to the British Institutions of Naval Architects, of Civil and of Mechanical Engineers, in which he employed the diagram in 'the rationalization of Regnault's experiments on steam' and other work so skilfully and effectively that the attention of his profession was then called to the then novel device, with the result of its permanent introduction into the current methods of thermodynamics, pure and applied. It was subsequently used very extensively by Willans in the discussion of the efficiencies of his engines, as exhibited by a series of famous trials which were brought to an abrupt termination by the early death of that talented engineer; although supplemented with great ability by his coadjutor, Captain Sankey. Boulvin, Ewing, Donkin and Cerry have since introduced this method of discussion of efficiencies and wastes of the heat-engines into treatises on those machines and their theory, and it may be now safely assumed that the system of Gibbs and his contemporaries in its development has become fully established

as a correct and a fruitful method of discussion of thermodynamic problems and phenomena.

A number of books and papers in elaboration of this system have recently appeared, and of these we take up several for review together. The titles of papers in the list given in the footnote* are added as containing the earliest and most important applications of this method of study of the efficiencies of the heat-engines, and the latest addition to the algebraic discussion of the abstract theory of entropy-diagrams.

The little book issued by Professor Reeve contains one of the clearest and most complete explanations of the temperature-entropy diagram that we have met with. The purpose of the publication is the presentation of a new diagram in which the author has introduced some modifications of the form proposed by Boulvin and, as it is thought, thus made the work of preparation for entropy-temperature analyses much less troublesome than formerly; obviating the necessity of detailed computations for each analysis. With this diagram at hand, it is thought that "the entropy method, once understood, will be found to reveal with surprising speed and facility factors in steam-engine economy hitherto only to be estimated, at best, and that only at the expenditure of tedious labor." This paper was originally published in the interests of the engineers; but it cannot fail to have equal interest and value for those engaged in the study of mathematical physics and abstract thermodynamics. The diagram is well made, its explanation is admirably satisfactory, and the text is printed with equal excellence. The diagram consists of a sheet divided into four quadrants, of which one is devoted to quantities involving pressure-temperature determinations, the second to those related to entropy-temperature problems; the third gives entropy-volume quantities, and the fourth pressure-volume measurements. On these four sections of the sheet are laid down with care and accuracy the corresponding curves for water and steam, unity-weight in each case, and printed upon the sheet are also the heads for entries of all necessary data from observation at an engine trial, in the reduction of which this method is to be employed. The method of use of the system and of the diagram in its applications to heat-engines is very fully and lucidly described and illustrated.

The chart and its text will, unquestionably, be found to be very useful and helpful to every engineer seeking to enrich his work by the results of this system of exploration of the thermodynamic and the thermal and the dynamic phenomena of heat-engine performance.

Mr. Golding's 'Theta-Phi Diagram' and its illustrations of practical application of the Gibbs system of treatment of thermodynamic problems also find place in the work of the engineer employed in the investigation of the performance of engines, whether the working fluids be steam, gas, air or oil-vapor. The author employs geometrical rather than algebraic methods, where choice is allowed; illustrating the fact which will probably be observed by all familiar with the matter, that the designer and constructor, the mechanic in whom the art is inborn, is almost invariably a geometrician rather than an algebraist. The utility of the method presented is considered beyond doubt, and, as Mr. Robinson remarked in discussing a paper by Mr. Willans, whose disciple, Mr. Golding, evidently is, "Up to a certain point, the practical man might ignore the present paper and others like it; but if he aspires to design economical engines, he might derive more good from the study of, say, Mr. Macfarlane Gray's 'Theta-Phi Diagram' than from many portfolios of working drawings." In fact, the study of current practice, in working drawings, simply reveals the relative forms and proportions of well- and ill-designed engines and throws little light upon the causes and remedies of faults of construction or defects of practice. The author acknowledges indebtedness to the earlier writers, Boulvin,

* Belpaire, Th., 'Bulletin de l'Academie royale de Belgique,' 1872. Gibbs, J. Willard, 'Trans. Conn. Academy of Arts and Sciences,' 1873. Linde, C., 'The Refrigerating Machine of To day'; Trans. (Munich, 1875), A. S. M. E., 1893. Gray, Macfarlane, 'Trans. Inst. Naval Archts.,' 1889; Inst. C. E., 1889; Inst. Mech. Eng'rs., 1889. Willans, P. W., 'Steam-Engine Trials'; Minutes Proc. Inst. C. E., 1888–1893. Sankey, H. R., Proc. Inst. M. E., 1891; Proc. Inst. C. E., 1895–6. Durand, W. F., Jour. Am. Soc. Naval Engineers, May, 1898, Sibley Journal, 1898.

Gray, Willans and others; but he is himself certainly entitled to the thanks of the scientific and the practical worker in the field of thermodynamics, pure and applied, for the extent to which he has developed his theme, and for the excellence of his own work. The information given by Mr. Golding had hitherto been scattered through various technical periodicals and transactions of learned societies, often quite inaccessible to the average practitioner, and its collection into a formal and logical treatise is a veritable boon to the student of heat-engine-efficiencies, whether as scholar, simply, or as practitioner of the art of engine-design and construction. The text is clear and well-written, and the profuse illustration and excellent engraving throughout the book are worthy of all praise. The tables, so far as we have checked them by differences, seem accurate and the diagrams are remarkably well-selected as illustrations of the facts and principles involved in the discussion. Boulvin's diagram is introduced as the 'complete entropy-diagram' and its use is well-explained and illustrated.

The entropy of water and of steam are computed and tabulated; the standard engine-cycles and their details are discussed; the effects of jacketing and compounding the steam-engine and those of superheating and of initial condensation are studied; the conversion of indicator to entropy-diagrams is shown and the thermodynamics and physics of the steam-engines are treated at ample length. Similarly complete discussions of the air, gas and oil-engines are presented and many novel applications of the system are shown. The book, as a whole, is an admirable presentation of its subject. A valuable feature is a new table of the weights of saturated steam per cubic foot, for each one-tenth-pound pressure, up to 219, with differences computed for each one one-hundreth or a pound per square-inch.

Professor Boulvin's work, as translated by Donkin, is that of a master in the new art. Its author was one of the first to appreciate and to take up the Gibbs' system of thermodynamic discussion and incorporated it into his work on the steam-engine, published in 1893. The present work appeared in the *Revue de Mécanique* in 1897, and, at the request of Mr. Donkin, who offered to make the translation into English, the author consented to reproduce the discussion in book form. It is, as the translator says: "A short syllabus of the principles of thermodynamics as applied to heat-engines and its chief claim to originality lies in its systematic method of using temperature-entropy diagrams." The author deduces a 'heat-balance' from the data of a steam-engine trial, by the employment of the theta-phi chart in a very simple and direct manner, and avoids the lengthy and troublesome computations necessary in the algebraic system of Hirn. The older systems were incomplete; the present is practically perfect in many points in which the others were defective. The 'complete entropy-chart' of Boulvin is especially useful in this work. The Boulvin diagrams and chart afford a means of not only making a heat-balance, but also of following the movements of heat throughout the cycle, and this without other computations than those required in reducing to scale the quantities to be dealt with. As observed by the translator: "The best standard of efficiency for the steam-engine has been much discussed and the question would be practically solved if, for every steam-engine, we had entropy-diagrams, all traced to the same scales of entropy and temperature for a unit-weight of steam coming from the boiler. These diagrams could be compared with each other, and in any country, and the smallest variations in the work of each engine graphically shown without any explanation being necessary." In this publication, Professor Boulvin has added a new method of dealing with clearances and throttled steam; ascertaining the action of the walls of the cylinder in heat-exchanges, and representing it in all cases independently of the extent or character of compression. The weights and measures employed are in this work entirely metric and the student can thus find in the last-named two treatises opportunity to compare the same methods, employing these different symbolic and measuring systems for similar purposes.

The plan of the book is thoroughly systematic, commencing with a study of the funda-

mental laws of thermodynamics, giving the relations between temperature and entropy, the study of cycles, entropy computations, applications to vapor and gas-engines, and closing with elaborate illustration in discussion of the results of a steam-engine trial. The discussion of the physics of steam by this method is particularly complete and valuable and the tables appended will be found useful on many occasions. Within the sixty-six pages of text there are to be found abundance of suggestions and instruction and the whole is written in a thoroughly scientific and systematic manner, without waste of words or loss of energy in diffuse explanation.

It should be noted by the readers of these little treatises that, occasionally, in the diagrams, an error will be noted in the assignment of a quantity of entropy to a mixture of steam and water less than that of water alone.

The interested reader of this collection of brochures should complete his work, if not already familiar with them, by examining the added list of papers. Professor Gibbs, as the real pioneer in the use of this interesting method, Linde as the first to apply it to the refrigerating machine, Gray as the writer whose enthusiastic and painstaking elaboration of the system first brought it to the attention of engineers in such a manner as to insure its careful examination and later general use, Willans, the pioneer in its application as a regular process of reduction of observational data to form for deduction, and Sankey, his co-laborer, also, are entitled to distinction only less than that accorded to the founders of the science which this system illustrates. Professor Durand, illustrating talent as an instructor as well as familiarity with the state of the art to date, presents the most complete and intelligible exposition of the theory of the entropies—for he shows that there may be an indefinite number —and, availing himself of suggestions by Ancona in a very notable paper in the *Zeitschrift* of the German Society of Civil Engineers for 1897, produces diagrams which are read with great ease and interpreted as readily. This is a luminous and clear as well as concise exposition of the subject.

R. H. THURSTON.

Alternating Currents of Electricity and the Theory of Transformers. By ALFRED STILL. Whittaker & Co. 8vo. 1898. 179 pages.

Alternate Currents in Practice. Translated from the French of Loppé and Bouquet by F. J. MOFFETT. Whittaker & Co. 8vo. 1898. 372 pages.

In the application of science to engineering the scientific principles involved have usually been very fully developed beforehand by the student of pure science. In the engineering applications of alternating currents, however, our educational and scientific men have been behindhand. The fundamental mathematical principles of alternating currents have indeed been developed mainly by men outside of the engineering profession, as exemplified by the epoch-making book of Bedell and Crehore, but the theory of actual engineering apparatus, such as the transformer, the rotary converter, the induction motor, etc., has been developed mainly by the engineer, and during the past few years our electrical engineering instructors have been looking eagerly to the manufacturing electrical engineer, not only for the details of design and construction, but also for the full and complete theory of their machinery as well. The engineer who has contributed most in this line is perhaps C. P. Steinmetz.

The electrical engineering instructor has now access to literature containing very complete developments of fundamental principles and very complete theoretical analysis of actual engineering machinery, and the problem which confronts him is to adapt this wealth to the requirements of instruction.

Instruction in electrical engineering should consist of two parts, as it seems to us, namely, an elementary part in which the general principles of the various branches of the subject are systematically developed, and a more practical part devoted to the design, construction and operation of machines, appliances and installations. In some branches of electrical engineering, indeed, the elementary part is little more than a course in theoretical electricity, but in alternating currents a great variety of principles arise which are not properly included in any general course in electrical theory, and it seems proper for the student to

be taken through a course of study in the analytical theory of the alternator, the transformer, etc., before beginning the practical study of alternating current appliances.

The separation of theoretical and practical treatises seems to us to be highly desirable, for our experience is that nothing obscures an elementary treatise (that is, the elementary part) so much as the introduction of practical matter not needed for purposes of illustration, and we conceive that nothing is so annoying to a well instructed engineer as to have his engineering literature highly diluted with elementary matter.

Alternating Currents, by Alfred Still, is an excellent, clean cut, elementary treatise. Pages 1 to 116 are devoted to the general principles of alternating currents and the remainder is devoted to the theory of the transformer. In reading this book one has a desire to know what the author might have to say of the synchronous motor and rotary converter, and of the induction motor, so simply and satisfactorily is the theory of the transformer worked out. One cannot of course judge whether or not the author realizes the paramount importance of these machines and the need for a simple exposition of their theory.

In speaking of the expression $B = \mu H$ the author says that "the point which is not generally clearly explained is that there is no necessity whatever, to consider the iron core removed, or even to imagine longitudinal holes drilled through the mass of the iron in order to understand what is meant by H in the above relation." However, we do not know what actually takes place *in* magnetized iron and in the specification of the state of magnetization of a rod we can, and do, specify only what is happening outside the rod or in holes drilled through the rod.

In speaking of magnetic leakage the author devotes his attention mainly to that case in which the *trend* of the useful magnetic flux would be but little altered by the removal of all iron parts the flux being, of course, reduced in value. In this case the magnetic leakage generally decreases with increasing excitation. The most frequent case in practice, however, is that in which the *trend* of the useful flux would be greatly altered by the removal of the iron parts, as for example in the dynamo. In this case the magnetic leakage increases with increasing excitation.

Mr. Still's book "has been written not only for engineering students, but also for those engineers who are but slightly acquainted with alternating current problems." We cannot agree with the author that for this class of readers analytical methods are unsuitable for the solution of alternating current problems. The engineer who attempts the graphical method soon finds it to be impracticable except only as an aid in the formulation of analytical solutions. Steinmetz' method seems to us to be the simplest method for obtaining numerical results and the only method to be called practicable.

Alternate currents in practice, translated from the French by Francis J. Moffett, is a good discussion of a great variety of practical alternating current apparatus with comparatively little useless or misplaced elementary matter. Mr. Moffett says that to the best of his knowledge there is no work in existence in England at the present time which treats in a practical manner the whole range of alternating currents of electricity and we do not know of any such work in America for the admirable works of Bedell, Jackson and Steinmetz are distinctly theoretical.

W. S. Franklin.

Das Tierreich Sporozoa. By Alphonse Labbé. Eine Zusammenstellung und Kennzeichnung der rezenten Tierformen. Herausgegeben von der Deutschen Zoologischen Gesellschaft. 5 Lieferung. Protozoa, Sporozoa. Berlin, Friedländer & Sohn. 1899. Pp. xx + 180.

As indicated by the descriptive title of Das Tierreich, a zoological dictionary of which Franz Eilhard Schultze is the chief editor, it is no part of the undertaking to give a general account of the classes of animals considered, but merely recognizable descriptions of all known species. For the present volume—the Sporozoa—a better man than Alph. Labbé could not have been chosen, and, so far as the sporulation is concerned and the determination of species through spores, or the hosts of the

parasites, the location within the hosts, or the bibliography of each species, the book is eminently successful. Apart from the Gregarinida where the descriptions are more complete, a criticism might be justly made against the extreme brevity of the specific descriptions, especially where they deal with the adult organisms. For example, an adult form of the genus *Coccidium*, the sporulation of which is given for 17 species besides numerous varieties, is nowhere described. Of course the sporulation is the more important and the omissions are more than offset by the splendid bibliography which accompanies each specific name. One hundred and ninety-six figures, for the most part of spore-stages, accompany the descriptions.

In accordance with the rules of nomenclature adopted by the Deutchen Zoologischen Gesellschaft, the names of legions end in IDIA, the names of orders in IDA, of sub-orders, in INA, of tribes, in EA, of families in IDAE, and of subfamilies in INAE. It is a relief to feel that, in the future, there will be no excuse for such haphazard terminations and names as have characterized the Sporozoa groups heretofore.

The classification adopted by Labbé is based, in its main divisions (legions and orders) upon his classification of 1894. The two legions are the *Cytosporidia* and the *Myxosporidia* (his *Histosporidia* of 1894), the former containing four orders: *Gregarinida*, *Coccidiida*, *Hæmosporidiida*, and *Gymnosporidiida;* the latter, two; *Phænocystida* and *Microsporidiida*. *Sarcosporidia*, *Amœbosporidia* and *Serumsporidia* are placed as Sporozoa *incertæ sedis*, the terminations indicating legion-value. Delage and Hérouard's suborders of the Gregarinida are adopted (*Cephalina* and *Acephalina*), while the tribes and families are adapted from Léger. He follows his own classification of the *Coccidiida*, dividing them into two sub-orders: *Polyplastina* and *Oligoplastina*, the former into two tribes: *P. digenetica* and *P. monogenetica;* the latter into three tribes: *Tetrasporea*, *Trisporea* and *Disporea*, while family-groupings are discarded. It is to be noted that the single form in the tribe *Trisporea* is his very questionable genus *Bananella*, which Léger and others regard as an anomalous type of a four-spored (*Tetrasporea*) form, and which Labbé himself admits may sometimes (*'accidentellement'*) have four spores. The *Hæmosporidiida*, without further sub-divisions, contains the three genera *Lankesterella* (Labbé), *Caryolysus* (Labbé) and *Hæmogregarina* (Danilewsky). The *Gymnosporidiida*, without further sub-divisions, contains six genera: *Caryophagus* (Steinhaus), *Halteridium* (Labbé), *Hæmoproteus* (Kruse) *Plasmodium* (Marchiafava & Celli), *Laverania* (Grassi & Feletti *em.* Labbé), and *Cytamœba* (Labbé). For the terminology of the Malaria-organism (*Plasmodium*) which was first recognized by Laveran in 1880 and, in 1883, named by him *Oscillaria malariæ*, Labbé takes the generic name applied to it in 1885 by Marchiafava & Celli, and Laveran's specific name, thus giving the Malaria organism the somewhat unfamiliar name of *Plasmodium malariæ*. On the ground of priority this name must supplant the, in some respects better, term *Hæmamœba*, given by Grassi & Feletti in 1890, with the advantage, however, of a more descriptive specific name in *malariæ*, than has hitherto been known in Labbé *laverani*. On the whole, therefore, the new name *Plasmodium malariæ* is fully as good as the one it supersedes—*Hæmamœba laverani*. Labbé now makes two certain sub-species: *P. malariæ tertianum* (Golgi) and *P. mal. quartanum* (Golgi), and two questionable sub-species: *P. mal. præcox* (Grassi & Feletti) and *P. mal. immaculatum* (Grassi & Feletti).

Of the four families of the *Myxosporidia*, three belong to the order *Phænocystida* (*Myxinidæ*, *Chloromyxidæ*, *Myxobolidæ*) and one to the order *Microsporidiida* (*Nosematidæ*).

The volume contains a well-arranged list of the hosts of Sporozoa with the organs affected, while a key to families and genera, and in most cases to the species, will materially assist the student in placing forms.

Taken, as a whole, the volume is a very welcome addition to the literature of the Protozoa.

GARY N. CALKINS.
COLUMBIA UNIVERSITY,
NEW YORK CITY, October 30, 1899.

Leitfäden für das zoologische Praktikum von DR. WILLY KÜKENTHAL, Professor in Jena. Mit 172 Abbildungen im Text. Jena, Verlag von Gustav Fischer. 1898.

This guide consists of an 'Introduction' of four pages on instruments and general directions followed by eleven pages on the 'Elements of Histology' and 269 pages on the various groups and types of animals.

The list of animals named for special study represents 76 genera and 83 species—a list that indicates the author tried to live up to the statement in the preface that the zoological laboratory of to-day does not simply offer a few local types for dissection, but rather constitutes a practical 'Repetitorium' of the fundamental facts of zoology.

The work is divided into 20 'courses' distributed among the nine phyla recognized as follows: Protozoa (pages 15), Platodes (7), Echinodermata (21) and Tunicata (14), each one course; Vermes (Bryozoa, Chætognatha, Annelida) (28), Mollusca (37) and Arthropoda (29), each two courses; Cœlenterata (43) four courses and Vertebrata (76) five courses. The first course is devoted to Elements of Histology.

Each course or group of courses is preceded by a 'Systematischer Ueberblick' of the phylum in which the classification is carried out to the orders and suborders. In this systematic epitome each category is more or less briefly characterized and one or two representatives are noted under each order or suborder. This is followed by a bit of technique, this by a general survey and this by the 'special course.' The treatment of the Coelenterata may serve as illustration of the plan. In this group the order is as follows: (1) 'Systematischer Ueberblick' of courses 3–6, (2) 3 Kursus (pp. 34–43). (3) Porifera. 'Technische Vorbereitungen.' (4) A. Allgemeine Uebersicht. (5) B. Specieller Kursus. (6) 4 Kursus (pp. 43–55). Hydroidpolypen. Technische Vorb., etc., as (4) and (5). (7) 5 Kursus (pp. 55–65). Tech., etc. (8), 6 Kursus (pp. 66–73). Anthozoa, Tech., etc. The general account of the phylum is brief and the 'special course' is a running account of the anatomy of the laboratory specimen with directions for dissection introduced whenever deemed necessary.

The reviewers experience is not favorable to the introduction of systematic and general surveys into a laboratory guide, and why a general account of a phylum should be preceded by a special technique is not clear to him. There are sound pedagogical reasons for logical order and for keeping a laboratory guide to its business.

As a laboratory guide for a beginner the book is not detailed enough and can hardly stand with such guides as those of Marshall and Hurst, Parker and others in English.

The illustrations, of which there are 172, are as a rule good. Quite a number of them, about 75, are original. Some of these could be improved. Figure 152, for example, would hardly assist a beginner in his search for the uterus or the bladder of the frog. It would also be uncertain work for a beginner to identify the ovary of a young frog either by the figures or the descriptions. On the whole, however, the original figures are good and welcome. The typographical work is of course neat, clean and agreeable —for it comes from the establishment of Gustav Fischer.

Henry F. Nachtrieb.

BOOKS RECEIVED.

Leçons de chemie physique, professées à l'université de Berlin. J. H. Van't Hoff. Translated from the German by M. Corvisy. Second Part, *La statique Chemique.* Paris, Hermann. 1899. Pp. 162.

Leçon nouvelles sur les applications géométriques du calcul différentiel. W. De Tannenberg. Paris, Hermann. 1899. Pp. 192.

Recherches expérimentales sur les oscilations electriques. A. Turpain. Paris, Hermann. 1899. Pp. 152.

Biological Lectures from the Marine Biological Laboratory, Wood's Holl, Mass. Boston, Ginn & Co. 1899. Pp. 343.

Animal and Plant Lore. Fanny D. Bergen. Boston and New York, published for the American Folk-Lore Society by Houghton, Mifflin & Co. 1899. Pp. 180.

Evolution by Atrophy. J. Demoor, J. Massart and E. Vandervelde, translated by Mrs. Chalmers Mitchell. New York, D. Appleton & Co. 1899. Pp. xiii+322.

SCIENTIFIC JOURNALS AND ARTICLES.

The principal article in the *National Geographic Magazine* for November is on 'The Alaskan Boundary,' originally given as a lecture before the National Geographical Society by Hon. John W. Foster, ex-Secretary of State, and at present a member of the Joint High