in aid from the public treasury. But even were it literally true, the public would still have a right to know something about the policy of a great institution, chartered by the state, which performs so vitally important a function in the formation of public opinion and in the creation of an intelligent understanding among the people of the problems of science and government. They have the right to inquire as to motives and actions of those who presume to limit the boundaries of research, to define what is and what is not truth, and to put the brand of uniformity upon the teaching body.

There is something peculiarly Prussian in the assumption that because Mr. A., representing great corporation interests, and Mr. B., appointed to the board by reason of his wealth and his willingness to invest it in university buildings and endowments, have thereby acquired a vested right to design and apply their own peculiar brand of orthodoxy to the teaching of an institution which proclaims in its motto that "culture without character is vain." What sort of "character" will be imposed upon the student body by teachers compelled under threat of summary dismissal to take an oath of conformity to the views of men who can not bear to hear a frank discussion of political, social or economic reform? The public has every right to know whether its greatest teaching institution is free to seek the truth and to proclaim it without fear, or whether it is compelled to suppress every opinion on economics or politics that is for the moment distasteful to trustees whose sole responsibility is discharged when they appoint able and fearless men to its faculties and attend to the business details of university management.—The Philadelphia *Public Ledger*.

SCIENTIFIC BOOKS

Nature and Science on the Pacific Coast. A Guidebook for Scientific Travelers in the West. Edited under the auspices of the Pacific Coast Committee of the American Association for the Advancement of Science. Paul Elder & Co., San Francisco. 1915.

This is a happily conceived and creditably executed enterprise by the Pacific Coast Committee of the American Association for the Advancement of Science. Its many chapters, individually and severally, are chart and compass to the natural attractions and scientific wealth of the west coast and will make an effective guide to the traveler of this and future years. All the world is on the way to the Fair, and it is certainly appropriate that the organized body of scientific men of the west have joined hands in preparing this useful and attractive exposition of what that part of the country is prepared to and does contribute to the scientific treasury of the world.

Probably the old-time breed of eastern folk who entertained the notion that the Pacific ocean washes the western foot of the Alleghany Mountains is now pretty nearly extinct, but there is still something of this psychological attitude in the east toward the west which needs the infusion of just such a serum as a book of this kind, presented in inviting form and popular dress, may produce. Dwellers in Manhattan say they can identify a Brooklynite by his psychology; likewise the dwellers in the east have been wont to look upon the great propositions of the west as not seriously entering into their lives. This is merely by way of expressing an inherited mental attitude. Tides and winds, ocean currents and climate zones, different fauna and other flora, newer mountains, younger rocks, unlike opportunities for economic development, and dissimilar production, all certainly do tend to make the Pacific states unlike, in natural factors and product, to those of the east. As woman can not be expressed in terms of man, so the west can never become fully comprehensible in terms of the east; but the readjustments in ideals and idolatry which invasion of the west by the east requires, are essential to the making of the full-fledged American.

So the present occasion affords every excuse for such an authorized production of these chapters on the natural aspect of the Pacific coast, all of them prepared by men

whose names and activities are familiar and impressive. The worth of the chapters can in no wise be measured by the fugitive character of the occasion that has brought them into existence. The fairs will soon be over and we may hope that before long the great world will again be opened to the traveler, but the scientific men of the west have erected a monument here which will serve not alone as a present guide to the coast but will retain its worth even while its own trees of knowledge continue to bear more fruit.

The scope of the book is rather extraordinary. Dedicated to the late John Muir, it seems, as one might say, to cover every theme into which that genius of the west came into active contact. The chapters begin with a historical approach to the country, touching upon the Spanish occupation; then passing through the meteorology and physiography, reach the solid foundations in a series of important essays on the geological features. The foundations being thus laid, biological chapters follow, the flora and fauna of land and sea being taken up, each after its kind; then ethnology and the skies which bend themselves about the Pacific coast to give it its cosmic individuality. In the sequence come the practical applications of these scientific factors, in agriculture, in irrigation, in chemistry; much on the out-of-doors, something on the literature, a little on the special mode of juridical and political development, and, in fine, a chapter on things to see and how to see them.

The chapters of this book can, of course, be referred to only in the briefest way in a notice of this kind, but it may be said that the text throughout is supplemented with effective half tones and useful maps, 29 of the former and 14 of the latter, in addition to which is a considerable number of text diagrams and sketches. The maps are, for the most part, of the greater cities and their vicinity, but there are double-sheet maps, one of the geology of the west coast and one of the life zones of California.

I. *The Approaches to the Pacific Coast. By Frederick J. Teggart.*—The early outpourings of Asia; the advance of Spain from the victorious armies of Cortes at the south; the individual initiative of the English explorer coming through from the north; the persistent endurance and final triumph of generations of frontiersmen pressing overland in defiance of natural barriers, constitute a romantic adventure in settlement which, somehow, seems to laugh at "gateways" and "geographic control" and to trifle with some of the most sacred dogmas of "human geography."

II. *Spanish Settlements on the Pacific Coast. By Charles E. Chapman.*—A valuable record of the Spanish occupation and of the Mission Fathers—"California under Spain, beside which Acadia and Utopia were unattractive, a dream life for over half a century." With a map locating the missions, pueblos and presidios of California.

III. *Historical Sketch of the Panama Canal. By Rudolph J. Taussig.*—For the contemporary reader somewhat gorged with recent history of the canal, the early dreams of the "Secret of the Strait" and the birth of the idea of the Canal, "which is almost as old as the discovery of America itself," will present a singular attraction.

IV. *Weather Conditions on the Pacific Coast. By Alexander McAdie.*—Premising that we know little of the causes of "weather" anywhere, the accomplished author of this chapter explains how very much that little is by a series of temperature charts and statistical records of weather variations, sunshine, wind, fog, rainfall, etc. Some interesting statements are found in these paragraphs, interesting at least to those who have become used to the glowing réclamé of California weather. "The amount of sunshine received at San Francisco is not as large as might be expected, but nevertheless compares favorably with that of other cities of the United States." "One of the most marked climatic features of San Francisco is the prevalence of fog. . . . the summer afternoon sea fog shuts out 50 per cent. or more of the possible sunshine between 3 and 7 P.M. during June, July and August." "In addition to the summer after-

noon sea fog moving from west to east and the land or tule fog of winter mornings, there is a third kind of fog which may be called smoke fog. Under certain atmospheric conditions the smoke of the city moves seaward during the forenoon and returns about 1 P.M. as a dense black pall."

V. *Physiographic Geography. By Ruliff S. Holway.*—Outlines the remarkable contrasts in the upstanding geologic expressions of the coast.

VI. *Geology of the West Coast Region of the United States. By C. F. Tolman, Jr.*—A summary of the results of an army of workers in this field; outlining the geologic succession up to the Cordilleran Revolution, giving its history since, a correlation table of the entire rock column, a summary of the mineral production and a *vade mecum* to the principal mining districts of California.

VII. *Earthquakes. By J. C. Branner.*—A succinct statement of seismological principles and factors, covering an actual two and one half out of a possible three hundred and two pages; an obviously inverse proportion. Pneumatologically and strategically the gem of the collection.

VIII. *Mines and Mining. By H. Foster Bain.*

IX. *Petroleum Resources and Industries of the Pacific Coast. By Ralph Arnold.*—Further and more detailed statements of production of the basic minerals with which the west coast enters the market. California, no longer first in gold production, is now first in the production of petroleum, and perhaps no feature in the development of the mineral industry of America has been so extraordinary as the California output of oil. Notice is taken of the various oil districts and the fundamental relation of oil storage to monocline structures. Referring to the origin of the oils, the following paragraph is an excellent contemporary expression:

"The oils of the California fields are believed to have been derived largely from the organic shales which are associated with the oil-bearing beds in all fields of the state. It is believed that the oil originated from the organic matter, both vegetable and animal, which is contained in these beds. Probably the principal source of the oil has been the diatomaceous deposits which make up a large percentage of the Tejon or Eocene formation in the Coalinga district and the Monterey or Lower Miocene formation throughout the balance of the districts. Other organisms that may also be the source of some of the oil are plants, Foraminifera, Bryozoa and possibly mollusks and fish. A great deal of evidence can be advanced favoring the organic origin of the oil in California and enough demonstrating the impossibility of its inorganic origin locally to practically prove the former theory by the process of elimination."

It seems rather appropriate that, in connection with this very positive expression, the author has inserted in his chapter, on the reverse side of a plate showing the oil derricks in Santa Barbara county, a picture of a group of trilobites and other oleaginous Cambrian crustaceans collected by Mr. Walcott at Mt. Wapta, British Columbia.

X. *Significant Features in the History of Life on the Pacific Coast. By John C. Merriam.*—Paleontologic science on the west coast has had remarkable development in late years, and aside from the well-known discoveries from the older rocks, the life records of the Pleistocene caves and of the asphalt pool of Rancho La Brea are among the amazing things of the earth. Of the latter Doctor Merriam says: "Literally hundreds of thousands of specimens have been obtained from these deposits," and the victims of these tar-traps are of considerably more than 100 species, from saber-toothed tigers to thousand-legged worms. Such a snare as this indicates most impressively what tremendous faunas have roamed the earth and air in past ages and have escaped untrapped.

XI. *The Vertebrate Fauna of the Pacific Coast. By Joseph Grinnell.*

XII. *Fishes of the Pacific Coast. By David Starr Jordan.*—Exceedingly interesting résumés, the latter with much useful data regarding the fisheries production.

XIII. *Marine Biology of the Pacific Coast.*

By Charles Atwood Kofoid.—This presents the invertebrate life, gives some account of the aquaria and research stations along the coast, notes the collecting grounds, takes special note of that characteristic Californian, the Abalone, and of the seals, sea lions and whales of these waters.

XIV. *Oceanic Circulation and Temperature off the Pacific Coast. By George F. McEwen.*—An empirical and theoretical consideration of the causes of present oceanic circulation on the west coast.

XV. *Insects of the Pacific Coast. By Vernon Kellogg.*—A very inviting chapter, as far as it goes, closing with the equivocal remark: "The Pacific coast will match its insects against the equivalent fauna of any other region."

XVI. *Flora of the Pacific Coast. By Harvey Monroe Hall.*

XVII. *Forests of the Pacific Coast. By Willis Linn Jepson.*

XVIII. *The Deserts and Desert Flora of the West. By LeRoy Abrams.*

XIX. *The Marine Flora of the Pacific Coast. By William Albert Setchell.*—A great variety of climatic and soil conditions has given birth to diverse and variable flora, and whether one considers it from the "esthetic, the systematic, the genetic or the ecologic" standpoint, his impressions will be compelling. These chapters present the flora by its geographical provinces and give lists of localities of special botanical interest.

The stories of the Big Tree, "the most remarkable member of the earth's silva," and of its groves; of the coast redwood, "the tallest tree on earth," and of other members of this profuse coniferous flora, are of delightful, if brief, interest.

Into the floral assemblages have been intruded the plants of the desert. As far back as the close of the Cretaceous the Mexican plateau began to grow arid, and here and thereafter "drought resisting plants were taking form." "Here originated the cacti, yuccas, dasylirions" and most of the American desert fauna, and thence they spread north after the glacial period and the increase of arid conditions. The Grand Canyon, the Petrified Forests, the Mohave and Painted Deserts and their floras are considered in Professor Abrams's absorbing chapter, which closes with the assurance that "to come upon any understanding of the strange fascination of this land of little rain . . . one must move out into their open spaces; become a part of their boundless silence; face their trackless sands and bare mountain reaches in the wonderful opalescent light of sunsets and sunrises; gain an insight into the significance of the curious adaptations of plant and animal life, and of the page of earth's physical history laid bare in their reft gorges."

In the account of the marine flora special note is taken of its "chief glory," the kelps; numerous in species, often of enormous size, vastly surpassing those of the Atlantic; their forests, the nests of peculiar fishes, and their commercial possibilities still largely unexploited.

XX. *Burbank's Gardens. By Vernon L. Kellogg.*—Essentially a personal tribute happily without advertising matter.

XXI. *Ethnology of the Pacific Coast. By T. T. Waterman.*—With maps of the southwest and north showing the present location of Indian tribes, the distribution, history and tribal customs of the aborigines are passed in condensed but effective review.

XXII. *Astronomical Observatories. By R. G. Aitkin.*—This is a history of the progress of astronomical observation and of the development of observatories.

XXIII. *Museums of the Pacific Coast. By Barton W. Evermann.*—A brief directory of museums of science, art and history.

XXIV. *Agricultural Development of the Pacific Coast. By E. J. Wickson.*—Beginning with the agriculture of the prehistoric peoples, these activities through the Spanish occupation and into the "American period," the author devotes his chapter largely to enumerating factors fundamental to the future development of agriculture; among them he argues with strong reason the essential superiority of the soils of the arid regions when brought under irrigation.

XXV. *Some Notable Irrigation and Hydro-electrical Developments. By C. E. Grunsky.*—Here the actual achievements of irrigation referred to in the preceding chapter are the subject matter. The projects of the U. S. Reclamation Service and a large number of private undertakings for irrigation and power are taken into account. No irrigation bonds are offered for sale.

XXVI. *Chemical Resources and Industries. By Harry East Miller.*—A review of the chemical industries, based largely on natural mineral and agricultural products.

XXVII. *Mountaineering on the Pacific Coast. By Joseph N. LeConte.*—For the man or woman who accepts no challenge from any upturned angle of the earth, this chapter is a suggestion of things to do.

XXVIII. *Outdoor Life and the Fine Arts. By John Galen Howard.*—A pleasant account of the development of the Forest Theater and Mountain Plays, of the combination of out-of-doors with the drama, to which the western climate has lent the guarantee of success.

XXIX. *Literary Landmarks of the Pacific Coast. By S. S. Seward, Jr.*—Bret Harte, Mark Twain and Stevenson, in passing; Ambrose Bierce (lately discovered by the East), Joaquin Miller, Edwin Markham, Edward Roland Sill, John Muir, Jack London, make a pyramid of "land-marks" of which the capstone is only laid when we add the name of Gelett Burgess.

XXX. *Legal and Political Development of the Pacific Coast States. By Orrin K. McMurray.*—A suggestive account of the development of the legal code from the unformed code of the miners' camps and frontier civilization, a few permanent effects of the Spanish procedure and a brief sketch of the later history of jurisprudence and its controlling conditions.

XXXI. *Scenic Excursions. By A. O. Leuschner.*—A condensed Baedeker of the out-of-doors to a multitude of delectable spots, with the price per spot.

The form of the book, 12mo, makes it handy for the pocket, but as for the paper and typography, these meritorious essays must feel strangely indecorous in their black-and-tan dress of fat, round, gray-black type on yellow paper, most unhappily tiring to the eyes.

JOHN M. CLARKE

Catalogue of the Freshwater Fishes of Africa in the British Museum. Vol. III. By G. A. BOULENGER. London, 1915.

It was originally intended to complete the account of the freshwater fishes of Africa in three volumes, but so many new species have accumulated during the progress of the work, that a fourth volume has become necessary. The third volume, now issued, is principally concerned with the Cichlidæ, but also includes a number of smaller families. In all, 394 species are described, the great majority also figured. No less than 231 of these species have been first described by Dr. Boulenger, whose labors on African fishes far exceed in magnitude and importance those of any other writer, or perhaps all other writers combined.

The Cichlidæ are of particular interest because of their abundance in Africa and South America, suggesting to some minds a former direct land connection between these continents. In this case we fortunately have positive evidence of a former more northern distribution, a genus of these fishes (*Priscacara*) being found in the Eocene of Wyoming. Boulenger recognizes no less than 41 genera of African Cichlidæ, all distinct from the 26 genera which Eigenmann catalogues for the neotropical region. No less than 21 genera are confined to Lake Tanganyika, so far as the records show. In the large genera *Tilapia* and *Paratilapia* we are told that the scales are "cycloid or ctenoid," but there is some confusion in the use of these terms, owing to the fact that weak and minute ctenoid structures are overlooked, and the scales pass as cycloid, as for example in *Tilapia nilotica*. For a correct understanding of the scale-structure of all these genera, the scales must be removed from the fishes and examined microscopically.

The Cyprinodontidæ or Pœciliidæ present a very different case from that of the Cichlids, having still a northern distribution, and pos-