

of its application in the third section on kinetics, but special attention is devoted to harmonic motion, a matter of great importance to engineers engaged in the design of valve gears, and the investigation of the valve motion due to any type of gear. In the introductory chapter to kinetics, the author discusses fully the difficulties due to the two systems of units adopted in dealing with "mass"; he realises that the gravitation system, or so-called "engineer's system," is not likely to be displaced in spite of the constant endeavours of reformers; it is, in fact, too convenient and enters too constantly into the ordinary engineer's everyday work to be lightly given up. He suggests a name for it—the gee-pound or the gee-kilogram—but we are afraid such names are never likely to be adopted generally; the present method of explaining it as the "engineer" unit is sufficient for all practical purposes, and the names suggested seem to us only to add to the existing confusion. This section is an exceedingly good one; the practical applications are well chosen, such as inertia of reciprocating parts in engines, vibration of springs, moments of inertia of solids of revolution, governors, balancing of rotating bodies, friction of pivots, &c.

In a series of appendices the author treats briefly of vectors, rates, dimensions of units and second moments of areas. The book will be useful to the private student of engineering who is striving to get clear ideas of the fundamental principles on which so much of his work is based, and will probably be adopted in many technical colleges as one of the standard text-books on mechanics.

T. H. B.

THE GROWTH OF A FEDERAL EMPIRE.

Geographic Influences in American History. By Albert Perry Brigham, A.M., F.G.S.A., Professor of Geology in Colgate University. Pp. xii + 366. (Boston, U.S.A., and London: Ginn and Co., 1903.) Price 6s.

PROF. BRIGHAM, already known to geologists by a concise and clearly written text-book, here makes an appeal to the historian and the geographer. He does not start with generalisations as to the arrival of the first men on the American continent, or as to its situation between the two ends of the Old World; but he brings us at once to the adventures of Columbus, of Cartier, and then of the English settlers, who found Spaniards south of them and Frenchmen to the north, and who thereupon colonised the central seaboard. "America," in this compact treatise, is wisely limited to the United States, with so much of Canada as is inevitably mingled with their history. The style is direct and even vigorous; in Prof. Brigham's crisp sentences there is a continual mental stimulus, and it would be hard to find a redundant word. We do not like the poetry that is quoted in the book, for the benefit of the general reader, half so much as the author's own admirable prose.

The rise of New York is traced to the formation of the Erie Canal in 1825, whereby the grain of the central plains was brought through the Mohawk gap

and floated down the Hudson. The Appalachians have long proved hard to traverse further south, the railways, some of them quite recent, crossing the range at heights of about two thousand feet. The story of the decay of agriculture in New England (p. 47) throws a somewhat melancholy light on the competition between east and west. The author (p. 64) believes that the decay is temporary, and that much of the farm-land in the east will relapse into beneficial forests. The possibility of a balance of mutual utility between districts one or two thousand miles apart affords a pleasant contrast with our tariff-bound Disunited States of Europe. When, however, Prof. Brigham asserts that North America was meant to be owned by one great nation, we think that he is reasoning backwards from the feelings of the present day. A strong Spanish race might long have held the west, a strong French federal republic might conceivably have occupied the plains, and a chain of custom-houses might have existed in the twentieth century on the rim of the Alleghany plateau. We suffer daily in the Old World from violations of geographical propriety, which far surpass anything that would have arisen from such a partition of America.

Prof. Brigham is, however, always willing to lay a proper stress on human enterprise and human individuality. The eastern States became divided (p. 75) as much by differences of "breeding" and ancestral habit as by geography; and the men whose modes of thought allowed them to work hard with their hands have naturally come best out of the struggle.

We have some suspicion that the author prefers Pittsburg to the blue-grass meadows of Kentucky, even when he pictures so charmingly (p. 102) the primitive backwoodsmen, brought up amid a "stable environment in a remote region." After all, the development of machinery has been the making of American agriculture, and it may be difficult, in such a country, to perceive that the growth of cities beyond a certain size and standard is as inimical to social development as is actual isolation in the fields. In the Old World we have so many interests, unconcerned with material prosperity, that we view the growth of Glasgow or Duluth (p. 137) with concern rather than exultation. There is plenty of romance, however, in the story of the capture of the French area on the Mississippi (p. 147) from its English overlords, and abundant cause for national fervour in the map given opposite p. 314, showing the progressive expansion of the United States. The most striking feature, perhaps, in this graphic epitome is the extent of the Louisiana territory, obtained by purchase from Spain in 1803, and stretching west from the Mississippi to the head-waters of the Missouri.

"The West," says Prof. Brigham (p. 308), "is the cosmopolitan part of America. A thousand miles is a short excursion, and across the continent is not an undertaking. Men who could not change their horizon without homesickness did not go west; they are independent of distance, they are accustomed to looking up to find their mountains, and their children are born into their wide, free life."

After remarking that the Pacific coast will "in coming days be commercially independent of the

East," our author endeavours, in chapter xi., to build up a theory of permanent unity on the commingling of diverse races in every portion of the union. But will the ethnographic product of these races, when immigration has been stopped by law, necessarily remain the same under all this variety of geographical conditions? If Sergi, to quote an extremist, is correct, the widespread Mediterranean race has already blossomed out into many "nations," with aspirations and rivalries of their own. It may hereafter be no loss to the great continent that diverse States, united in a federal peace, shall rival one another in an equal diversity of arts, an equal diversity of mental attitudes. Observers in Europe, who recognise the individual insight of the Latins, and the collective solidarity of the Slavs, may not regret, with Prof. Brigham (p. 329), "the decline of the Teutonic stream," and the growth of these two elements. England would be a poor country if the Teutonic stream had dominated her thought, and France owes her laws and manners to the Latins, and much of her early solidity to the Burgundian savages whom she absorbed upon the east. "The pervasive leaven of our American land and our Americanism" may be trusted to adapt the crudest strangers to their new geographical environment. If America has overcome the spirit of Cotton Mather, she will overcome the exuberance of a few Italian bandits, and the depression of the Poles, who are still seeking for a fatherland.

In conclusion, Prof. Brigham's book, allowing for some expressions in American, would be an admirable one for the higher classes of our schools. Read with a good map, and with reference to histories and encyclopædias during hours of preparation, it would provide our youth with a fine lesson in federal expansion, to lay beside those absorbed from, let us say, the intensities of Rudyard Kipling.

GRENVILLE A. J. COLE.

OUR BOOK SHELF.

A New Theory of Organic Evolution. By James W. Barclay (of Glenbuchat). Pp. vi+174. (Edinburgh and London: William Blackwood and Sons, 1903.) Price 3s. 6d. net.

THE purpose of this work, in the words of its author, is "to test by the common-sense that Huxley says is science, whether the Darwinian doctrine, that the evolution of life (*sic*) on our planet was brought about by natural selection and other secondary causes, accords with ascertained facts, or satisfactorily accounts for the natural phenomena it professes to explain, and, also, to submit a new theory that will explain satisfactorily the admitted facts of evolution." Mr. Barclay's fitness for the task he has undertaken may be judged by the following particulars. In a chapter on "Phases of the Embryo and Fragmentary Organs," he speaks of "the transformation of gills, visible at an early stage in the embryo of mammals, into lungs." In a subsequent chapter he asks, with reference to the whales, "Is it possible to conceive that transformations so great—one pair of legs into fins and the other pair into a tail—could have been brought about by natural selection, accumulation of beneficial differences, use or disuse, or changed conditions of existence? How, then, does Darwin's theory explain

these changes?" We confess that we are not prepared with an answer to this question; probably, however, the author here intends his words to bear some other than their obvious meaning. When we find, a little further on, a reference to "Professor Weissman in his '*Germinal*,'" it is easy to form a conjecture as to the author and treatise intended; but one may be pardoned for not at once recognising the co-discoverer with Darwin of natural selection under the designation of "Mr. Alexander Wallace." The author's "new theory" is simply the outworn hypothesis of special creation in a peculiarly irrational form.

No one thinks of editing a classical text without some knowledge of the language. But it seems that there are persons who are quite ready to publish their views on evolution without having mastered the alphabet of the subject.

F. A. D.

Guide du Calculateur. (Astronomie, Géodésie, Navigation, &c.) By J. Boccardi, Privat-docent à l'Université, Chef de Service à l'Observatoire de Catane. Part i., pp. x+78; part ii., pp. viii+147. (Paris: A. Hermann; Catane (Italie): J. Pastore.)

THE author takes for his motto a sentence of Liagre, "Les plus grands géomètres de l'Allemagne, Gauss, Jacobi, Encke, Bessel, &c., n'ont pas dédaigné de descendre dans de minutieux détails de calcul." Part i. deals with rules for calculations in general, degree of exactitude necessary, choice of tables, discussion of various tables of logarithms, the use of Gauss's sum and difference logarithms, tables of squares, quarter squares, &c. It also deals with practical hints to computers, the use of graphic methods and the slide-rule, and points out the desirability of commencing addition and subtraction at the left. Chapter viii. ends with the excellent piece of advice, "Enfin, c'est une règle générale de ne pas se presser." The last chapter treats of the detection of errors. Part i. may be confidently recommended to all computers. Part ii. commences with remarks and exercises on interpolation, then follow examples of the method of least squares, astronomical calculations of frequent occurrence, the ephemeris, determination of an orbit from three observations, parabolic orbits, correction of an orbit by differential coefficients, and perturbations. The bulk of this part thus appeals to the astronomer. The last chapter describes some geodetic problems, but they are mainly not of a type used by British geodesists.

C. F. C.

Penrose's Pictorial Annual. The Process Year-book, 1903-4. Edited by William Gamble. (London: A. W. Penrose and Co.)

ONCE again it must be said that there is nothing but praise to be bestowed on the present issue, the ninth, of this beautifully got up volume. Paper, printing, letterpress, illustrations, cover and binding are all alike in excellence, and it seems difficult to conceive how the book could in any way be improved.

The editor, however, is not of the same opinion, for, speaking of the standard of process work, he says "we do not consider it is by any means so high as it might be." We learn from him, further, that "the methods by which these processes are worked are by no means the most exact, nor the most careful, and process work is yet but a young industry, which has hardly yet shaken off the trammels of haphazard experiment and rule of thumb work which must necessarily precede the settled conditions of sound practice based on good theory."

It is gratifying, therefore, to know that higher things may yet be attained, but nevertheless he who wishes to make himself acquainted with the present