

proof of which fact is furnished by the liberty which each of these excellent works takes with Euclid's Prop. 19, Bk. vi.—“similar triangles are to one another in the duplicate ratio of their homologous sides”—mysterious but high-sounding to countless generations of schoolboys. Here it is, in identical words in both books, “the ratio of the areas of similar triangles, or of two similar polygons, is equal to the ratio of the squares on corresponding sides,” brought down to definiteness and intelligibility at last!

There are certain time-honoured propositions in the treatment of which teachers will take a special interest, and none more prominent than Euclid's Prop. 1 of Bk. vi. Messrs. Barnard and Child prove it by assuming that the bases of the triangles are multiples of some common length, while Messrs. Godfrey and Siddons (p. 175) treat it as a mere result of the fact that the area of a triangle is half the product of a base and the corresponding perpendicular—both proofs, of course, resting on the same ultimate assumption. In justification of such proofs it may be said that no useful purpose will be effected by an early discussion of incommensurable quantities.

There are many things—such, for example, as the constancy of the product of the radii vectores from a fixed point to a circle, the nature of a tangent as a limiting position of a chord, &c.—in which we have an agreeable and useful variety of treatment in these two works, but the limitation of space renders further reference to them here impossible.

G. M. MINCHIN.

“SEMI-DARWINIAN” SPECULATIONS.

Doubts about Darwinism. By a Semi-Darwinian. Pp. vi+115. (London: Longmans, Green and Co., 1903.) Price 3s. 6d.

THE pre-ace of this work informs us that its author has endeavoured to conform strictly to the principle laid down by Lord Kelvin, as follows:—“If a probable solution, consistent with the ordinary course of nature, can be found, we must not invoke an abnormal act of Creative Power.” Unfortunately the “Semi-Darwinian's” practice is not in accord with his profession. Whenever he meets with a problem in evolution which appears to him inexplicable on the lines of natural selection, so far from seeking for “a probable solution, consistent with the ordinary course of nature,” he resorts at once to the intervention, by a direct creative act, of “a Being possessing intelligence, intention and power.” This is bad science, and we much doubt whether it is good theology.

Opinions have differed, and will doubtless for a long time continue to differ, as to the extent of the influence of natural selection as a factor in evolution. Darwin himself, as is well known, thought that its operation might be supplemented by that of the factors adduced by Buffon and Lamarck. Whether in view of the increase of knowledge since Darwin's day, and of the numerous cases of difficulty which have lately been satisfactorily explained on the basis of natural selection, he would have been led to discard those hypotheses that involve the hereditary transmission of

acquired characters, it is, of course, impossible to say. But it certainly seems probable to those workers in whom the Darwinian tradition is strongest that their leader, were he living now, would attribute more rather than less importance to his distinctive principle of natural selection. However this may be, the fact remains that if by “Darwinism” be meant the natural selection of “accidental” variations, the doubt as to its claim to be the sole factor in evolution is a doubt that was felt by Darwin himself. Hence we demur to the title of the present work.

A matter of greater importance is the author's attempted demonstration of the impossibility of explaining certain phenomena on Darwinian principles. It is true that some of the facts he adduces have been felt as difficulties, but not, as a rule, in the way that he supposes. To answer his objections point by point would be lost labour, for he shows on almost every page that he is unacquainted with the conditions of the problem. His remarks on the subject of vision, of reproduction, of embryology, to take a few instances, are those of a disputant who has entered the lists without the necessary equipment. Argument with such an opponent is unprofitable. As an example of the failure of the “Semi-Darwinian” to master the present-day aspects of the subject, we may take his treatment of the caterpillar and beetle-stabbing instincts of *Sphex* and some other genera of fossorial Hymenoptera. He quotes Romanes's expression of a desire for further investigation of the facts, but appears to be quite unaware that the need has been to a great extent supplied by the labours of two industrious and accurate naturalists in America, who have put an entirely new complexion on the case as it was known to Darwin. We have no wish to detract from the merits of so zealous and patient an observer as Fabre, to whose writings those who have discussed the habits of *Sphex*, *Ammophila*, and their allies have generally been indebted for their facts; but it is impossible to study the recent work on the subject without recognising that Fabre's inferences are sometimes unwarranted. Even before the new facts had been brought forward by G. and E. Peckham, the difficulties of explanation on the lines of natural selection, though great, did not seem insuperable; they may now be said to have disappeared.

But it is not only on such points of detail as the foregoing that the author shows his absence of qualification for dealing with the modern phases of the evolutionary problem. To say nothing of other omissions, the whole series of considerations specially associated with the names of Baldwin, Lloyd Morgan and Osborn is entirely ignored by him, nor does he give any sign of being acquainted with recent views on the subject of heredity. In short, as an attack on the adequacy of natural selection, his book, besides being ineffective, is hopelessly belated.

Supposing, however, that the author's strictures were well founded; that he had really contrived to point out certain stages in the evolutionary process which are not, and apparently never can be, explained on the basis of natural selection—what then? Surely in accordance with his own canon his next step should be to search for some other natural cause of the

phenomena that baffle him. To fly at once to the hypothesis of direct "intervention" by a "higher intelligence" is as much as to say that a science of life is impossible. It is not our province to enter into the theological aspects of the matter; we would only remark that the author's language on this head appears to us to be a curious instance of survival from a bygone epoch. When, as in the eighteenth century, deistic conceptions of nature were rife, the idea of "interference" or "intervention" rose easily enough in the minds of devout persons. The only alternative seemed to be the complete banishment of the Deity from his universe. But in so far as deism is discredited by evolution, its correlative notion of "interference" must share in that discredit; and it is, to say the least of it, somewhat surprising to find the idea revived in the supposed interests of religion by one who, like the "Semi-Darwinian," professes neither to "question the general doctrine of evolution" nor to "desire to disturb the position of the 'Origin of Species' as an epoch-making book."

F. A. D.

WATER SUPPLY.

Water Supply. A Student's Handbook on the Conditions Governing the Selection of Sources and the Distribution of Water. By Reginald E. Middleton. Pp. ix+168. (London: Charles Griffin and Co., Ltd., 1903.) Price 8s. 6d. net.

THE provision of a pure and ample water supply is constantly growing in importance with the development of sanitary science and the rapid increase of the population in cities and large towns; whilst adequate and unpolluted sources of supply have to be sought at greater distances away, and in a country of limited area, such as England, will before very long become difficult to obtain, yielding sufficient quantities of water to meet the growing requirements of the inhabitants. Accordingly, water supply has within recent years become one of the most universally needed branches of engineering; whereas increasing difficulties are encountered in the execution of the requisite works. The enhanced value and interest thereby conferred on works providing supplies of water, have naturally led to the publication of several books on the subject in the last few years; but the present book differs from its more elaborate and comprehensive predecessors, in dealing with principles rather than with practice, and in being intended as a sort of introduction to those larger books, and for engineering students rather than for engineers.

The first introductory chapter gives a rapid sketch, within the limits of six pages, of the various points which have to be taken into consideration in devising a scheme of water supply, from the selection of a source to the delivery of the water to the consumer; and it provides a clear and useful summary of the questions which form the subjects of the succeeding chapters. The second and third chapters deal respectively with the requirements as to the quality and the quantity of water, the former describing the mineral and organic impurities liable to be found in water, the sources from which they are derived, and their relative importance;

whilst the latter explains the variation in the daily consumption per head of population in different localities, under different conditions, at different seasons, and according to the amount of waste; also the provision necessary for increase in population, the method of measuring rainfall, the gauging of the discharge of streams and rivers, and the estimation of the available yield from the different sources of supply.

In the following chapter, on storage reservoirs, the form and construction of earthen dams, and the various arrangements resorted to for regulating the discharge of the water from the outlet of reservoirs, are the main subjects dealt with; and under the heading "Compensation Water," concluding the chapter, after explaining this important requirement, a description is somewhat irrelevantly added of the earthen embankments of the Staines reservoirs, with which the author is professionally connected, the only definite reference to an executed work given in the book. The next chapter is devoted to the calculations of stability of masonry dams by analytical methods, but a graphical treatment of the statical problems involved would be found both clearer and simpler. An interesting description is given in chapter vi. of the purification of water by the ordinary English system of slow filtration through sand; and a brief reference is made at the end of the chapter to the American system of rapid filtration by aid of a coagulant, usually aluminium sulphate, introduced into the water.

The construction of service reservoirs for providing against fluctuations in the consumption is considered in a short chapter; and it is followed by a fairly complete investigation of the flow of water through pipes, occupying twenty-seven pages. The last three of the eleven chapters in the book, relating to distribution systems, pumping machinery, and requirements in connection with waterworks, together covering less than nine pages, add more to the number of chapters and the apparent scope of the book than to actual information about waterworks, the last chapter, more particularly, consisting simply of an appeal for the collection of additional and more detailed statistics in regard to rainfall, evaporation, the discharge of rivers and streams, and other matters pertaining to water supply. The book is illustrated by four folding plates and sixty-six figures in the text, and a short index is added at the end.

Though some subjects, such as aqueducts from impounding reservoirs, water meters, and sections of typical masonry dams are not described, and the information about springs and wells is scanty, and the book, therefore, does not provide a complete account of waterworks, it gives a considerable amount of practical information, combined with valuable suggestions for the guidance of waterworks' engineers in several of the chapters. The way, however, in which the book is written renders it more likely to be used for reference than for reading straight through; and, moreover, the number of short paragraphs into which it is broken up, even when treating of a single subject, is calculated to distract the reader. Nevertheless, the engineering student will find a considerable store of useful information and valuable hints dispersed