

knows the history of attempts to classify the elements as it is set forth in Professor Venable's 'Development of the Periodic Law,' can fail to admire supremely the wonderful discovery of Mendeléeff. But in physical inquiries it often happens that the student notices a regularity which, upon following it up, continues to be fulfilled, but only in a roughly approximate sense. This state of things shows that there really is some such regularity, but that it has not been correctly formulated. There must really be such a law, or it would not continue to be fulfilled at all. It cannot be correctly formulated, or it would be fulfilled more exactly. Such a law often goes on very satisfactorily for a long time, if one is not too particular, and then suddenly goes quite to pieces, though perhaps later it may come out clear and definite again. This is what we ought to expect in the case of Mendeléeff's law; for throughout it is quite wanting in anything like numerical definiteness. It should be regarded as proved that the relations between the metals of the rare earths are not represented at all in Mendeléeff's table; and if its lower lines can be regarded as fitting the facts at all, the fit is a mighty loose one, a sort of ready-made fit that would suit very different facts just as well. We

ought to add that any complete discussion of the evidences of the periodic law ought to take account of several other considerations which we have not space to notice here.

It is a serious fault in Professor Hinde's work that it treats the law as if it were perfect. It not only teaches what is not proved to be true, but even what is proved not to be true. It may be said that the table, at any rate, lends a support to the memory. So it does; but it would do so all the better if its inadequacies were pointed out. They would forcibly strike the student's attention and serve as landmarks, so to speak, in what otherwise might appear to him as a desert of uniformity.

BOOKS OF THE WEEK.

Cannan, Edwin. Theories of Production and Distribution. London: P. S. King & Son. 10s. 6d. net.
Carpenter, J. E., and Wicksteed, P. H. Studies in Theology. Putnam's. \$2 net.
Cooke, J. A. A Text-Book of North-Semitic Inscriptions. Oxford: The Clarendon Press; New York: Henry Frowde. \$5.35 net.
Duff, Rt. Hon. Sir Mounstuart E. Grant. Out of the East. 2 vols. E. P. Dutton & Co. 5s. net.
Hammer, William J. Radium and Other Radio-active Substances. D. Van Nostrand Co. \$1.
Heermans, Josephine W. Stories from the Hebrew. Silver, Burdett & Co.
Hilton, Harold. Mathematical Crystallography. Oxford: The Clarendon Press; New York: Henry Frowde. \$4.75 net.

Hulbert, Archer B. Boone's Wilderness Road. (Historic Highways of America, Vol. 6.) Cleveland, O.: The Arthur H. Clark Co. \$2.50 net.
Jastrow, Morris, Jr. Die Religion Babyloniens und Assyriens. Part III. Giessen: J. Neumann, Neudamm: Verlagsgesellschaft (Alfred Töpelmann). M. 1.50.
Jones, L. H. The Jones First, Second, Third, Fourth, and Fifth Reader. Boston: Ginn & Co.
Kingsley, Charles. Westward Ho! 2 vols. J. F. Taylor & Co.
Learned, Marion D. A New German Grammar. D. Appleton & Co. \$1.15 net.
Leake, Sir Oliver. Modern Views on Matter. (The Romance Lecture, 1903.) Oxford: The Clarendon Press; New York: Henry Frowde.
Lupke, Robert. The Elements of Electro-Chemistry. Second English Edition. Philadelphia: J. B. Lippincott Co.
Miller, Joaquin. As It Was in the Beginning. San Francisco: A. M. Robertson.
Pelgrave R. H. Inglis. Bank Rate and the Money Market in England, France, Germany, Holland, and Belgium: 1844-1900. E. P. Dutton & Co. \$3.50 net.
Quarterly of the Texas State Historical Association. Vol. VI. July, 1902, to April, 1903. Austin, Tex.: Published by the Association.
Representative Art of Our Time. Part VIII. "The Studio" Library. John Lane. \$1 net each part.
Ruskin, John. Letters to M. G. and H. G. Harpers.
Sunday, W. Sacred Sites of the Gospels. Oxford: The Clarendon Press; New York: Henry Frowde. \$4.50 net.
Sinclair, Samuel B. The Possibility of a Scientific Education. Chicago: The University of Chicago Press. \$1 net.
St. Augustine. The City of God. Translated by John Healey. 3 vols. Macmillan. 50c. per vol.
Stevenson, Robert Louis. Strange Case of Dr. Jekyll and Mr. Hyde. Printed in the Pitman style of phonography. Cincinnati: The Phonographic Institute Co.
Swift, Lindsay. Literary Landmarks of Boston. Houghton, Mifflin & Co.
The Burlington Magazine. Vol. II, Number IV. London: The Saville Publishing Co.; New York: Samuel Buckley & Co.
Van Zile, Edward S. A Duke and his Double. Henry Holt & Co. 75c.

JUST PUBLISHED:

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P. 01020

valid the rest of his days. These topics lead, in natural chronological sequence, to a description of the provincial and self-centred Boston of Channing's early ministry and of the circumstances of his settlement over the Federal Street Society in the busy town of 25,000 inhabitants. The stipend of \$1,200 seemed large to him in that frugal age; and Channing's Puritan conscience made him "afraid as ever of self-indulgence, and hence [he] took for his study the smallest room in the house, while a much better one was crying to be used, and for his sleeping-room the attic, which was ill-furnished, cheerless, cold, and every way ill suited to the condition of his health"—an asceticism which has almost wholly passed away in New England, but which continued, in a measure, even amid the extremely comfortable external surroundings of Channing's life after his marriage.

No portion of Mr. Chadwick's sketch is better drawn than that which pictures Channing's religious development during his early ministry and his relation to the Unitarian division. The author makes it evident that

"he arrived at liberal principles sooner than at Unitarian doctrines; that his larger and more characteristic thoughts anticipated the minor Unitarian expression. A noble confidence in reason, a fear of worse results from its repression or neglect than from its free exercise, distrust of theological precision as making for sectarian division, the insistence upon character as superior to creed, a lofty faith in the Eternal Fatherhood and in the dignity of human nature—such was the warp of his religion."

He justly lays emphasis on Channing's "devout biblicism." "It was because the Bible had no 'clear word of prophecy' about the nature of Christ and the Atonement that the liberals were vague and hesitating as to these matters; and Channing was so to a remarkable degree his whole life long." "He attained to liberality of temper while still semi-orthodox in thought. It was far less his intellectual, or even his moral, revulsion from Calvinism than his belief that new restraints were being forged for religious thought, that carried him into the Unitarian controversy." But though the author's sympathies are naturally and strongly with Channing's side of that great debate, it is evidence of our distance from the conflicts of that hour that he speaks with so full appreciation of the earnestness and seriousness of the "orthodox" reaction which drove Channing into the field of controversy in 1815. Controversy was, for Channing, always a painful experience. He had in his make-up none of the delight of battle. Mr. Chadwick well says of him:

"He was not, I think, a man of natural courage, but one of delicate and shrinking flesh and corresponding mind. His sermons and addresses abound in praises of moral courage, and he exemplified the trait he praised. But it was hard for him to do it. These praises were exhortations to himself to keep right on. They burned his ships; they cut off his retreat; they made any flinching on his part impossible. The things he said and did required of him a great deal of courage, however much or little they might have required of a quite different man."

What one misses, perhaps, in this sketch of Channing's theological development is due appreciation of the non-permanent and divisive effect of his extreme individualism, and of the degree in which conditions essentially local and provincial affected his

religious thought. If the modern religious world has reached many of the conclusions at which Channing arrived, it has reached them not wholly by his road.

Channing's reformatory spirit, of which he gave such noble manifestation, sprang, as Mr. Chadwick shows, from his conviction of "the dignity of human nature." That conviction was to him so fundamental as to lead him to take, probably, the most positively sectarian position he ever assumed, when he held that in certain types of endeavor for the elevation of "the depressed classes" it would be a fettering compromise to be associated with those of other beliefs regarding this, to him, vital element of his creed. This conception of the dignity of human nature drove him into the anti-slavery conflict—a struggle, his part in which revealed his intense devotion to principles and his slight interest in individuals. His absence of all personal relation with Garrison, Mr. Chadwick points out as one of the curious manifestations of this trait of Channing's character. But his position towards the anti-slavery movement was, as Dr. Leonard Bacon of New Haven described a similar attitude, one of "betweenness." For slavery itself he had nothing but opposition; but his recollections of Newport and his acquaintance with the South had convinced him that not all slave-owners deserved denunciation for their connection with a system which, in itself, merited only condemnation. Nowhere more than in his opposition to slavery was his moral courage manifested; and nowhere did his principles cost him more hostility. From this same source of confidence in the dignity of human nature all of Channing's strong humanitarianism and reformatory interest sprang.

The description which the author gives of Channing's personal characteristics is admirably graphic, and sets the man as a sharply defined figure before the reader. One sees the constant care which his invalid health necessitated, the physical disability under which most of his labor was accomplished, and which limited his preaching to only occasional sermons during the latter part of his life. "It is hard to conceive that Channing was ever a good pastor, and he did not improve in proportion to his increasing engrossment in the large, social aspect of religion. 'I am strong,' he said, 'before the multitude, but weak before the individual.' He had no skill to meet his visitors halfway or to come down to the level of their interests."

Possessed of the respect and reverence of the community to a degree such as few men have enjoyed, his intimates were but a handful, though their attachment was lifelong. One of the closest of these few friends, Jonathan Phillips, remarked, with amusing moderation of judgment, regarding Channing, "I have known him long, I have studied his character, and I believe him capable of virtue." Certainly New England fear of exaggeration could not go further than this. Mr. Chadwick's characterization of Mr. Channing as a man deserves to be read as a whole. The conspicuous physical note he finds that of an "ill-constituted body":

"Intellectually, Channing has enjoyed the eminence which, like that of an isolated mountain, is relative to the low-lying plain. His measure was taken at a time when Boston was emerging from an intellectual mediocrity to which Fisher Ames

bulked as another Burke or Cicero or Demosthenes, while denominational pride did much to aggravate the miscalculation and to pass it on. But, compared with the great intellects of the centuries, his intellectual ability makes as modest an appearance as his intellectual acquirements compared with those of the great scholars."

"Channing's preëminence in his own generation, and his abiding claim upon our admiration and our reverence, are far less intellectual than moral and spiritual. It is, in fact, the moral temper of his mind, its openness to fresh conviction, that is its most impressive trait. The moral uses of the intellect were to him subjects of his constant interest. . . . He was a man of the beatitudes, so many of them found abundant illustration in the habits of his life. The blessing of the peacemakers was upon him; the blessing of the pure in heart. But his peculiar blessing was that of those who hunger and thirst after righteousness. If Channing did not do this, no man ever did. And, according to the promise, he was filled."

Viewed as a whole, Mr. Chadwick has given us a compact, graphic, and satisfactory portrait of a leader who has grown to be generally recognized, outside of the Unitarian fold where he has always been revered, as one of the most lofty and admirable personalities of the New England of the first half of the nineteenth century—an age that seems in many of its aspects so remote from the present time.

CLERKE'S ASTROPHYSICS.

Problems in Astrophysics. By Agnes M. Clerke. London: Adam & Charles Black; New York: Macmillan. 1903. 8vo, pp. 567. With 31 plates and 50 figures in the text.

The signal merits of this work will be recognized at once, nor will it cease in future to be esteemed as a breathing portrait of youthful twentieth-century science in the department of the physiology of suns. It is a book needed by all persons who endeavor to keep up an all-round intelligence of the advances of human knowledge, and will soon be found lying well worn on the tables in all observatories. Executed with a laborious thoroughness that never tires, it is brought to the polish of a popular style—if anything, too much so. It is not a book of popular science: it is a popular book on professional science—a thing seldom to be found and quite otherwise enlightening. It is not with knowledge, organized or not, that the active thoughts of the man of science are busy; but on the contrary with all sorts of hypotheses, the most dubious things in the world. To be acquainted with science as it lives in his mind will not help one to build a flying machine, a yacht, or a wireless telegraph, but will educate one in the conduct of inquiry. It is this side of astrophysics which is presented in this volume, by an author who, if not a very eminent astronomer, has participated in the life of an observatory, and who mingles with the ablest astronomers of England and of the world, recognized by them as one of their guild. No little astronomy can be learned by merely looking through the admirable illustrations to the volume, which, now that observation is so largely conducted through the medium of the camera, are in many cases as near the real thing that the astronomer uses as single prints can be to multiplied negatives.

Having thus had the pleasure of recording

the principal merits of the book, we are in duty bound to acquaint our readers with such of its apparent shortcomings as will chiefly concern them if they read it. One of these, we feel quite sure, is an error of judgment in the matter of style. Tables and algebraical formulae are avoided almost entirely. Now tables and formulae may be dry and hard to comprehend, in the sense that the relations that they are fitted to express are so; but when it is precisely such relations that must form the substance of the discourse, and not for a paragraph only, but for five hundred closely printed octavo pages, by all odds the least fatiguing way of apprehending them is the way that exhibits visual analogues of them—as tables and formulae do—and then points out in these icons the special features upon which attention must be directed, with a measure of emphasis proportionate to the effort required. Instead of endeavoring to do this, our author painfully searches out ornamental ways of stating abstract relations, with a view to literature. If she has occasion to mention that the parallax of Procyon, as determined with the Yale heliometer by the admirable skill of its manipulator, is 0".325, she will say that "Dr. Elkin has measured for it a parallactic shift of 0".325." The idea of a shift of any kind being measured for the little dog! If she wants to suggest that every star presumably turns on an axis, the word "rotation"—not, after all, quite rustic—will not be half elegant enough for her. She must say "it has a movement of gyration." So it is in countless cases. In short bits to be read one at a time, like those of Smyth's "Celestial Cycle," such roccoco expressions will merely excite a smile; but when it comes to five hundred solid pages of detail to be read consecutively, they add to the labor of lading the mind with it all. For at each such novel expression the reader has to stop and consider what can be meant; and it is often a little enigma.

The only other fault of the book to which we shall advert is a mere matter of individual opinion, provided logic is a matter of individual opinion, as some hold that it is, and some even that it ought to be. We might give a graded series of examples of what we mean. We are told (p. 204) that "Canopus may be no further off, but cannot be nearer than a light-journey of 296 years." The foundation for this statement is that an attempt to determine its parallax gave zero as the result, with a probable error of 0".011, which parallax, according to Euclidean geometry (whose applicability to such vast triangles is open to question), corresponds to a distance of 296 light-years. But what is meant by the "probable error" of a determination is that value of the error (or rather of such part of the error as the method of least squares can take account of) which is equally likely to be greater or less than the real value. Therefore the inference (so far as any is justified) is that were the same inquiry pushed indefinitely it would be just as likely to make Canopus more than 296 light-years from us as less. It may be added, however, that such result would in all probability not be many times less.

Again, we are told that, "upon Doppler's principle" (or words to that effect), a cer-

tain star must be approaching or receding from the sun. In a memoir intended exclusively for professional astronomers such an expression would be innocent enough, but in writing for a larger public one has to guard against literal interpretations. Doppler's principle does not necessitate any such thing, but only that if the star were approaching or receding, then, so long as no unknown cause acted, the spectral lines would all be shifted toward the red or toward the blue, as they are observed to be. But it is to be remarked that there is some reason to suspect that unknown causes do occasionally interfere with the effect.

Having had our scold at Miss Clerke's style, it will be but fair to give our reader a bit or two of it. Very likely in such doses its flavor will please:

"Sun-spots are not simply rents in a shining veil, exposing an obscure substratum. They are not superheated regions, where the processes of condensation are suspended. The photosphere is screened, not perforated, by them. Moreover, the screening is by interposed vapors. Umbral absorption is mainly, if not altogether, of the gaseous kind. It is essentially linear and banded. No part of it can be safely attributed to the action of a foggy precipitate such as modifies elsewhere the 'surpassing glory' of the disk. They probably differ in this respect from 'pores' and 'velled spots,' but specific inquiries on the point have yet to be made. There are strong indications that spot-spectra originate under conditions of increased pressure and diminished temperature. Still, the coolest umbras must be hotter than the reversing layer, for otherwise the Fraunhofer lines would show bright against them, and, as we know, they cross them in dusky array. This circumstance is fundamental in solar thermal relations, yet has been generally overlooked" (p. 96).

"Total-eclipses have ceased to be indispensable for the prosecution of chromospheric studies. Day by day the red rim of the sun, with the strange forms protruding from it, can be viewed spectroscopically; and day by day the same objects vested in violet can be photographed under the broad shelter of the Fraunhofer K-line. Nevertheless, noontide darkness, when it comes, brings very appreciable help. Differences are noticeable between what can be seen in and out of eclipse. According to the late Professor Tacchini, the chromosphere always appears deeper under cover of the interposing moon, because it is surmounted by a pink-white margin, giving continuous light, and therefore spectroscopically invisible in daylight. Some prominences are probably of analogous composition. Only their skeleton forms come out in the crimson radiance of hydrogen; they are compacted and clothed with white materials, the shining of which is effaced by the glare of common day. . . . The objects called 'white prominences' belong indeed wholly to the pageantry of eclipses. First noticed by Tacchini at Caroline Island, May 6, 1883, they showed as lucid jets about a hundred thousand miles high, with a surface like granulated silver. Attempts made, after the return of daylight, to view them prismatically proved fruitless; they gave forth no hydrogen or helium rays. Again, at Granada, 29th August, 1886, a gigantic helical structure, described by Mr. Maunder as 'of the intensest silver whiteness,' towered three hundred thousand miles above the limb of the moon" (pp. 109, 110).

The continuous reader would have been spared a pause if the author had printed *helical*, to show she simply meant eddying. She could not be expected to employ so vulgar a term as that. Another hitch in the reader's thoughts takes place when this structure is said to "tower three hundred thousand miles from the limb of the moon," though near a hundred million

miles from the moon. The limb of the moon exists only in the vision of the spectator, and distances from it are properly measurable in degrees, minutes, and seconds, not in miles.

"An eclipse, visible in the Western States of North America, 29th July, 1878, disclosed a surprising spectacle. In lieu of the ordinary radiated corona there were seen 'bristles' of light at the sun's poles, enormous 'wings' at each side of the equator. Professor Langley observed the phenomenon from the summit of Pike's Peak in Colorado, at an elevation of 14,000 feet in a stainless sky. Thus favorably circumstanced, he was able to trace one wide beam to a distance of about five millions of miles from the sun, the other fully twice as far. The direction in which they lay proved when carefully measured, to agree closely with that of the zodiacal light, and 'a faint central rib' emphasized the coincidence. . . . At the time of this eclipse the sun was in a state of exceptional tranquillity, and a search through the solar archives brought out the notable fact that a similar apparition had, eleven years previously—spots then too being nearly extinct—been described and depicted by Grosch of Santiago. . . . The concurrence of these phenomena with critical epochs in the sun's activity started the idea, due, in the first instance, to Mr. Ranyard, of varying coronal types. It was amply borne out by subsequent experience. From eclipse to eclipse, throughout the eleven-year cycle, the corona exhibits changes of form in marked conformity to spot-vicissitudes" (p. 127).

The Fundamental Problem in Monetary Science. By Correa Moylan Walsh. The Macmillan Co. 1903. Pp. 383.

What is the quality in good money that constitutes its goodness? Mr. Walsh assumes without proof that it is stability of value—that this is, at all events, the primary quality. The reason why stability of value is the prime constituent of goodness, he contends, is that money is used as a store of value for longer or shorter periods of time by lenders and hoarders. But value is of different kinds. What do we mean by that term when we say that money should be stable in value?

The author finds four varieties of value swimming in *gurgite vasto* on the sea of economics: (1) Use-value, or utility; (2) esteem-value, which he defines as "the affection or attachment we have for things—the energy with which we cling to what we possess, and the effort we are willing to put forth to acquire things"; (3) cost-value, or the effort or labor which things cost their producers; (4) exchange-value, or purchasing power. Use-value is generally ignored by economists as not appertaining to their investigations, since things may be useful but not exchangeable, or exchangeable but not useful. The author rejects it since, in the case of money, use-value is identical with exchange-value. Esteem-value cuts a large figure, and a rather confusing one, in Mr. Walsh's discussions. The best trained reader will be under the necessity of turning back frequently to the definition of this kind of value (quoted above) in order to make sure that he understands the author's meaning. On page 222 he defines it again as "exchange value in, or purchasing power over, labor alone, . . . forming the wages standard or, better, the earnings standard or the income standard." In another place (p. 295) he speaks of "the true conception of esteem-value, out of several conceptions not yet