

excite his curiosity. In considering the fact that the Cat-bird (*Mimus carolinensis*) has a strongly marked antipathy against the animal whose name it bears, he says, "I have often wondered if this inherited distrust of the cat could be explained in any way with reference to the imitative peculiarities of the bird. In other words, is it possible that some ancestor began to mew like a cat whenever it saw the wild cat in his haunts, and that in process of time it came to be an established habit?" Again, the answer given to the question, why such migratory birds as the ruby-throated Hummer (*Trochilus colubris*) are not content with the eternal summer of the south? is equally inconclusive: "All that we can say is that some inherited instinct is at work, perhaps to them as precious as is the longing for the holidays to the schoolboy, full of pleasant reminiscences, which of course would grow by experience." And we do not feel any nearer the truth as to the reason why the peculiarity of the beak of the Cross-bill is so well marked, when we know that in the bird's attempts to extract the seeds from the red spruce and other cones, "the bill, which is not so strong and conical as that of the pine bullfinch, became curved, until at length the condition became hereditary and transmissible."

An interesting remark is made, which illustrates how very susceptible the animal body is to the influence of slowly-acting external circumstances. For it is the popular belief in New Brunswick that the severity of an ensuing winter may be predicted by the amount of fat present on the intestines and omenta of animals, whether wild or domesticated; and as the coldness of the winter must depend on the previous climatic condition, that may reasonably be supposed to affect the constitution in a manner favourable to the individual.

In conclusion, we think that both sportsmen and naturalists will find this work replete with anecdote and carefully recorded observation, which will entertain them; at the same time they will not put down the book without feeling that they have acquired much new information on the physical geography and natural history of New Brunswick.

HOEFER'S "HISTORY OF PHYSICS AND CHEMISTRY"

Histoire de la Physique et de la Chimie. Par Ferdinand Hoefér. (Paris: Hachette, 1872.)

MORE than twenty years ago M. Hoefér published a History of Chemistry, the first which had appeared since the publication of Dr. Thomas Thomson's History. M. Hoefér has since been known to us as the author of the biographies of various scientific men in the *Nouvelle Biographie Générale*, and of a small work entitled *La chimie enseignée par la biographie de ses Fondateurs*. The volume before us is one of a series which treats of universal history, and is published under the direction of M. V. Duruy. The works which it comprises are intended to be used in colleges and schools, and M. Hoefér's volume has no doubt been included, because the promoters of the series have wisely considered that the history of matter, and of motion, are as worthy the atten-

tion of the rising generation as the history of languages, numbers, peoples, faiths.

Out of the 553 pages which the work contains, no less than 314 are devoted to the history of Physics, while the remainder contain in a condensed form the substance of M. Hoefér's larger *Histoire de la Chimie*. The History of Physics is divided into two books, entitled respectively "Matter" and "Motion," the former including—1. The immediate properties of matter (weight, volume, density, elasticity, compressibility); 2. The terrestrial atmosphere; 3. Liquefaction and solidification of gases; 4. Hygrometry; 5. Acoustics.

The second book on Motion includes—1. Gravity; 2. Heat; 3. Light; 4. Electricity and Magnetism.

We feel bound to take exception to this arrangement, which is both immature and ill-considered. For why has M. Hoefér classed *weight* with *matter*, and *gravity* with *motion*? and why *liquefaction* and *solidification of gases* with *matter*, when they are operations distinctly connected with motion? But, worse than all, why has he classed *acoustics* with *matter*? Again, he has omitted all mention of certain sciences which were among the earliest—Statics, Dynamics, Hydrostatics, Hydrodynamics. These sciences, from their antiquity, lend themselves with great facility to the apt illustration of the various phases of the history of science. Archimedes has received an altogether insufficient amount of notice: we may not forget that several of our sciences actually owe their origin to him; and how M. Hoefér, with Peynard's fine edition of the works of Archimedes in his own language, can have overlooked him, we are quite at a loss to understand. Then the Archimedian screw, the pumps of Ctesibius, the *Avvapeis* of Hero of Alexandria, should all have full mention in the work. And if it be urged that space did not permit mention of these things, we would reply that they are of far more importance than Hygrometry, which finds mention in the book. Also such sections as "Pèsequi-liqueur d'Hypatie," "Manomètre," "Hygromètre condenseur," "Porte-voix," "Clavecin et carillon électrique," "La beatification de Bossé," might all have been replaced with advantage by more important matters.

We notice with regret a tendency to attribute discoveries to men who were not first in the field. Thus, although Boyle discovered his law of the compression of gases, no less than *fourteen years* before Mariotte, it is called *Loi de Mariotte*. Again, M. Hoefér says, "Gas sendi paraît s'être le premier occupé de la question de la vitesse du son, sans préciser les résultats auxquels il était parvenu." But if M. Hoefér will read Lord Bacon's *Historia Soni et Auditus*, he will find a good deal of valuable and suggestive matter, among other things, a suggestion for determining the velocity of sound.

Let us turn to the comprehensive little treatise on the history of chemistry, beginning with Hermes Trismegistus, nay, with Moses, and ending with Wurtz, Williamson, Frankland, and Kölbe. This part of the work, as derived from M. Hoefér's larger treatise, is altogether more matured than the preceding; yet it is not without evidence of hasty selection and ill-considered statements. We cannot agree with M. Hoefér when he tells us that the word chemistry was used in the fourth century, and that we are to trace it to *χημεία* and *χίω*. Neither, for various reasons, which we have stated elsewhere, can we

accept the Greek MSS. attributed to Zozimus, Pelagius, Olympiodorus, Democritus, Mary the Jewess, and Synesius, as exact evidences of date or knowledge. In regard to more modern matters we regret to find no account of Robert Hooke's important theory of combustion. We are glad to observe that M. Hoefler does not echo the Wurtzian aphorism: "La chimie est une science Française, elle fut instituée par Lavoisier d'immortelle mémoire." More liberally our author says, "Tout en suivant chacun une route différente, trois chimistes ont fondé, vers la fin du dix-huitième siècle, la chimie moderne: Priestley, Scheele, et Lavoisier, un Anglais, un Suédois, et un Français."

We should be glad to see in our own country the history of matter and of motion studied side by side with the history of languages and of numbers. Prof. Kopp lectures on the History of Chemistry in the University of Heidelberg, and no doubt his example is followed in other of the German universities. M. Hoefler's work is in many ways suitable for use as a text-book; it is cheap, it is anything but dull, and whatever the errors of arrangement may be, it contains a great deal of information.

G. F. RODWELL

OUR BOOK SHELF

An Essay on the Physiology of the Eye. By S. H. Salom. (Published by the Author.)

THAT the study of formal logic is not in itself conducive to sound reasoning will be acknowledged by many, but it is seldom that the truth of the statement is so fully illustrated as in the short work before us. The author has studied the writings of Hamilton, Mill, Bain, and others, and with a creditable enthusiasm endeavours to employ the new powers he thinks he has thereby acquired, in developing a hypothesis of his own to account for the phenomenon of vision more satisfactorily than those already accepted. An outline of the arrangement, which is partly disguised at first sight by the many technicalities and circumlocutions employed, will be almost, if not quite, sufficient for most of our readers. Commencing with a notion broached by Erasmus Darwin, that visual perception ensues from retinal motion derived through the motile force of light, the author hopes, "by turning the light of modern histological discovery on Darwin's theory of involuntary animal action, to succeed in convincing associational psychologists that this theory must henceforth be included in the creed of *a posteriori* thinkers." With this as a basis, the doctrine promulgated may be thus summarised. The eyeball being in a constant state of reflex action on account of the light acting dynamically on the retina, the motion thus produced exerts in the muscles surrounding the eye feelings of muscularity similar to those excited when we voluntarily determine ocular direction, and consequently without any voluntary effort, we are constantly aware of visual space properties. To prove this novel hypothesis the structure of the retina has to be fully entered into, and in a most ingenious manner solid fact is distorted to satisfy unsubstantial theory. Taking a single example of the reasoning employed, we find that it is necessary for the theory that the fovea centralis of the retina should be elastic; that it is so is evident from the following considerations:—"In the copious index of that exhaustive anatomical work, 'Quain's Anatomy,' under the heading 'yellow,' we find, in addition to 'yellow spot,' four substances *only*, namely—

Yellow cartilage,
" fibres of areolar tissue,
" ligaments of the vertebræ,
" tissue.

And on referring to the pages of the book in which these subjects are treated, we discover that *they have the common property of being elastic.*" From this on one of Newton's rules for philosophising "we are bound to frame the following physiological induction,—*all yellow anatomical substance is elastic.*" We can hardly think that the author is not attempting to fool us.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

Atoms and Ether

ATTEMPTS to dispense, in physics, with the ideas of direct attraction and repulsion, however interesting, lead generally to a *petitio principii*, and I fear Prof. Challis's view, to which attention is called in NATURE of August 7, cannot be received as an exception.

For an ether of which the density can be varied is a substance that can be compressed and expanded, and what idea is in our minds when we speak of compression and expansion in a really continuous substance? Continuity implies space, and space that is full. Can space be more than full? When we say that a fluid is compressible and elastic, do we mean anything else than that it is made of parts which can be pushed closer together, and which, being so pushed, will push each other back? But this is repulsion and action at a distance. We do not alter the fact by calling the substance ether, and relieving it from the influence of gravitation.

Is a continuous substance, which is capable of compression, conceivable? I think not; or if it is, the conception is at once more difficult and more opposed to sensible experience than that of attraction and repulsion.

The substance of a bar of iron is not continuous. If I draw one end of it towards me, why does the other end follow? What can be the relation between the movement of my end of the bar and the ethereal vibrations which must propel the other end and all intermediate parts in the same direction?

Liverpool, Aug. 9

ALBERT J. MOTT

Instinct

Sense of Direction

THE perusal of the correspondence published in the February and March numbers of NATURE now to hand, and also your article on "Perception and Instinct in the Lower Animals," in the number of March 20, has induced a belief in my mind, that I may perhaps be able to contribute some evidence bearing upon the question at issue; and also that it may have some value from having been obtained from a field of observation not generally accessible, and from the fact that cattle and horses in Australia are subject to very different conditions to those obtaining in England.

I may commence by stating that the question, whether animals have or have not a peculiar power of finding their way from place to place, suggested itself to my mind very shortly after I first went into the Australian bush, now more than twenty years ago. It was not long before I satisfied myself that in many horses this faculty was strongly developed, but yet unequally in different individuals. I afterwards ascertained that it also existed in cattle.

Not only did I find that horses had extensive memories for places, being enabled to recollect a track they had followed some time previously, but also to remember the way from one place to another where no track existed. I found that not only had horses this exact memory, but that they possessed another gift which at first appeared to me inexplicable. This was, that when ridden through the bush, many horses would never, for a moment, as it were, lose the recollection of home, but "bear away" in its direction. I remarked this not only in a district with which the horse might be acquainted from grazing in it, but also when travelling and absent for the day from my camp, and from the other horse or horses, the "mates" of the one I rode.