

only by directing the mind of all metaphysical enquiries, and approaching the discussion in a spirit of strict loyalty to the established principles of criticism. The universe is not "a mental phenomenon," as Schopenhauer would call it, nor is speech the deliberate product of conscious will. It is an organism which, like all other organisms, had its origin in a germ, and its slow growth and slow development in suitable surroundings, independently of all conscious action. Yet in dealing with a subject of this sort one still feels how much easier it is to refute than to establish truth. "*Chimie des Solis* sera inventée *Avant qu'on sache inventer*!" A. H. KEENE

OUR BOOK SHELF

Easy Lessons in Science. Edited by Prof. F. W. Harvey. I. *Easy Lessons in Heat.* By C. A. Marrison. II. *Easy Lessons in Light.* By Miss W. Awdry. (London: Macmillan and Co., 1880.)

There is excellent little lesson books deserves a wide circulation. Well and clearly written, they are at the same time strictly of the "scientific" rather than of the so-called "popular" style of exposition; these being some of the objectionable conventional elements with which certain French works in light science have too greatly familiarised us. The ease with which the volumes before us are illustrated are numerous, appropriate, and many of them original. In each case the reader is instructed in the simple apparatus needed to repeat the experiments described; so that a teacher who desires to give to young pupils a few elementary lessons in the sciences of heat and light will find here the very text-books most suited to his requirements. Miss C. A. Marrison's "*Lessons in Heat*" follows the usual order of text-books in that science. The first lesson deals with expansions, the second with various of temperature, the third with "how heat spreads," and so forth, and in the concluding chapters some of the fundamental facts of the relation between heat and mechanical work are neatly shown. One experiment which we do not remember meeting with before in the shape in which it is given deserves to be cited. It is a variation on Davy's old experiment with flame and glass. "Put a bit of tumbler on the wire gauze, and hold a light candle in it. The vapour of the candle passes freely through the gauze, catches fire, and burns with a blue flame till the whole of the tumbler has been turned into vapour and burned. But the flame does not pass through the gauze to set fire to the solid tumbler."

Miss Awdry's "*Lessons on Light*" are no less felicitous in their treatment of the subject. The usual popular text-book on Optics demands in description of different optical instruments, telescopes, microscopes, kalamoscopes, and the like, without much trouble being expensed a few dry principles. But in these lessons the principles claim the prominent place; the first point expounded is the law of inverse squares, and the second the geometrical laws of reflection and refraction—and the explanations are admirably yet quite simply done. A most interesting feature is that the latter half of these may be said to be devoted to physical optics. One chapter on the wave-theory, and two entitled "Miscellaneous" compare the way for a capital lesson on Diffraction. A lesson on the Spectrum and one on the Rainbow close the work.

We do not say that there is no room for criticism in judging these little volumes. A professed teacher of Natural Philosophy might possibly at the conclusion of certain things that claim prominence in all the older text-books and in many of the volumes of contemporary examinations. Yet we would challenge such critics to produce a more useful, or suggestive, or accurate set of

lessons, or one more entirely free from the two besetting faults of unscientific popularisation and educational error. It is to be hoped that Prof. Harvey will continue his labours in adding to the series to his so ably aided.

Outline of a Course of Natural Philosophy, with Special view Examination Papers. By Gerald Muller, Esq. (London: Simpkin, Marshall, and Co., 1880.)

THE work of 112 pages contains a syllabus-outline of the course of lectures in Natural Philosophy by Dr. Holey, at the Catholic University of Ireland, and is arranged chiefly to meet the wants of teachers in intermediate schools. To the syllabus, which is remarkably full and complete, is appended an extensive series of examination papers on all branches of physics except light, electricity, and magnetism, which are promised to follow. These questions, though chiefly elementary, have been carefully prepared, and are a valuable part of the work. In an appendix Dr. Holey writes in a paper giving an account of his particular form of *Microscopic Lectures*, which appears to be particularly suited to the needs of schools and colleges, where a powerful battery of microscopes has to be in readiness for occasional use.

LETTERS TO THE EDITOR

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Mr Wyville Thomson and Natural Selection

I am sorry to find that Mr Wyville Thomson does not understand the principle of natural selection, as explained by Mr. Wallace and myself. If he had done so, he could not have written the following sentence in the Introduction to the Voyage of the Challenger:—"The character of the deepest fauna seems to give the best support to the theory which refers the evolution of species to extreme variation, guided only by natural selection." This is a standard definition not ungenerally received by biologically-minded naturalists, when they write scientific subjects, but is something new as coming from a naturalist. Prof. Huxley denotes it in the last number of *Nature*; but he does not touch on the suggestion of extreme variation, nor on that of evolution being guided only by natural selection. Can Mr Wyville Thomson name any one who has said that the evolution of species depends only on natural selection? As far as concerns myself, I believe that no one has thought forward so many observations on the effects of the sea and distance of parts, as I have done in my "*Variation of Animals and Plants under Domestication*," and these observations were made for this special object. I have therefore formulated a considerable body of facts, showing the direct action of external conditions on organisms; though no doubt since my books were published, much has been learnt on this head. If Mr Wyville Thomson were to visit the yard of a teacher, and see all his cattle or sheep almost studiously tamed, that is, almost tamed, he would exclaim: "Oh, I see here an extreme variation; but can I find any support to the belief that you have followed the principle of selection in the breeding of your animals?" From what I formerly saw of breeders, I have no doubt that the man thus exalted would have smiled and said not a word. If he had afterwards told the story to other breeders, I greatly fear that they would have used emphatic but irrelevant language about naturalists. CHASLES DARWIN

Down, Beckenham, Kent, November 5