

The second section of the volume is devoted to Zoology, and consists of two Reports—one of them an invaluable monograph by Mr. A. S. Packard, jun., on Phyllopod Crustacea, recent and fossil, illustrated with thirty-nine plates and a coloured map showing the zoological provinces of North America. This memoir will be welcomed by all who take interest in the investigation of genealogies and of the history of distribution in the animal kingdom. Dr. R. W. Shufeldt concludes the volume with an essay on the osteology of various American Birds, likewise copiously illustrated with woodcuts and with lithograph plates.

From this outline it will be seen how well Dr. Hayden has sustained to the last the character of the Survey under his charge. During his tenure of office he proved himself to be endowed with rare powers of organization and administration and to possess wide views of the scope of a survey which, like his, was to break ground for the first time in new and unknown territories. He might have been simply an explorer, anxious to find out the sources of rivers, the positions of passes, the heights of peaks, and the trend of mountain-ranges. He might have been a mere geologist, desirous of adding some thousand miles of new area to formations already known or of discovering formations such as have no precise parallel elsewhere. He might have been only a topographer, caring chiefly for the accuracy of his triangulations and levellings. He might have been a botanist or zoologist, eager to add new species to the known flora and fauna of the earth's surface. In one sense Dr. Hayden was none of these; in another sense he combined the functions of them all. In later years his executive duties appear to have left him little opportunity for carrying on original research himself. But he had sympathy with all the pursuits just named, and had the faculty of choosing good men for prosecuting them. He had force of character enough to succeed in battling his way and getting his appropriations from Congress, and he had the perseverance to press forward his operations, keeping his fellow-labourers together and publishing with their aid a series of volumes of which the United States may well be proud.

The consolidation of the various Surveys under one organization was an inevitable and entirely justifiable step on the part of Congress, and the United States Geological Survey could not be under more energetic and skilful direction than that of its present estimable chief, Major Powell, with the cooperation of such leaders in geological enterprise as Mr. Gilbert, Captain Dutton, and their colleagues. Nevertheless, it may be permitted to a geologist on this side of the Atlantic, who looks disinterestedly but not unsympathetically upon the progress of events on the other side, to express his regret that it should not have been possible to find a place where scope might have been afforded for the talents of one who had done such good service to geology as Dr. F. V. Hayden.

ARCH. GEIKIE

#### OUR BOOK SHELF

*Attraction et Gravitation d'après Newton.* Par Mme. Clémence Royer. Extracted from the Review "*Philosophie positive.*" Pp. 23. (Paris, 1883.)

It is very surprising to find what is, in most other respects, a really well-written and able dissertation on

the question of *action at a distance* marred at the very outset by an almost inexplicable blunder.

Madame Royer has evidently read much, and lays down with great clearness the distinction between Newton's Theory of *Gravitation* as a mode of grouping together under one simple law the whole phenomena of physical astronomy, and the assumption handed down from old Greece, of a mutual *attraction* exerted upon one another by any two portions of matter. She shows that Newton everywhere expresses himself in the most explicit terms against the notion of distance-action. But she also points out the curious distinction between Newton in the *Principia*, the pure mathematician and physicist, who constructs no hypotheses and declares that the mode in which gravitation is produced is one which he has not been able to discover from the phenomena themselves; and Newton in his *Optics*, the bold speculator, who discusses the possible characteristics and properties of the medium by which gravitation may be produced.

This is, on the whole, so well done that we are positively amazed to find the all-important property of matter, *Inertia*, absolutely and entirely ignored. From a psychological point of view, the following remarks, by such a writer as Madame Royer shows herself to be, are of the very highest interest and curiosity:—

"Qu'est ce en effet que la notion de *masse*, si ce n'est celle d'un corps déjà considéré comme pesant? Un corps sans pesanteur serait-il une masse? en aurait-il les propriétés mécaniques? Une masse, supposée absolument isolée dans l'espace, aurait-elle un poids? Evidemment non, puisque le poids ne naît que des rapports de grandeur et de distance des masses. Dire que le poids ou la masse est proportionnel à la quantité de matière ou de substance, c'est affirmer une chose que nous ne savons pas, que nous ne pouvons absolument savoir d'aucune manière. Tout ce que nous savons c'est que, considérant des corps déjà pesants, en vertu de leurs relations de quantité et de distance, leur pesanteur croît en raison de ces quantités et en raison inverse de ces distances, sans que leurs quantités, comme matière, soient altérées, de façon que des masses doubles ont une tendance deux fois plus forte à tomber l'une vers l'autre, ce qui fait qu'elles s'approchent en réalité avec la même vitesse (*sic*), et que si leur distance devient moitié moindre, elles s'approchent quatre fois plus vite l'une de l'autre.

"Mais comme l'unique moyen que nous ayons de mesurer la grandeur de ces masses est de les peser, nous restons dans l'impossibilité absolue de dire si des masses de même poids, en même relation de distance avec d'autres masses pesantes, contiennent, oui ou non, la même quantité de matière."

Evidently Madame Royer, in reading the *Principia*, has failed to notice, not only the definition of *Vis insita* but also, those important pendulum experiments by which Newton satisfied himself of the exact proportionality of weights to masses, in any one place. Here we see, in no doubtful manner, the evil effects of an education in which athletics have no part. No one, man or woman, who has had experience of Indian clubs or of dumb-bells, could for a moment doubt that we have another mode of distinguishing mass, besides weighing.

*Electrotechnisches Jahrbuch von der Electrotechnischen Gesellschaft in Frankfurt am Main.* (1883.)

ALL over Germany are springing up electrotechnical societies, in emulation of those in Berlin and Vienna, fulfilling a kindred part to that played in Great Britain by the much older Society of Telegraph Engineers and Electricians. The volume published by the Frankfurt Society—the first of its *Proceedings*—contains several papers of interest. Amongst these may be noticed two by Dr. Th. Stein of Frankfurt, on the measurement of small intervals of time by the photographic electric method; and on certain modern electro-chirurgical apparatus, especially modifications of the influence-machine of Holtz. In the first of these papers Dr. Stein describes an apparatus for photographing the pulsations of the heart, &c., as conveyed by a Marey's tambour to an apparatus which at