of the use of axioms appears, according to our author, in the fact that the learner, from long habit (not, as Mach thinks, from any *a priori* insight), has come to expect instinctively, and so to conceive very economically, certain simple sequences of facts. Purely for economic reasons, and not on philosophic grounds, nor for that matter with any philosophic justification, the teacher is disposed to seize upon these elementary facts as the constituents into which more complex facts can be analyzed, and by which these cases can be easily described. These simpler sequences are chosen simply because the learner already knows of them, and can more readily grasp them. When one calls them *a priori*, one forgets how easily a puzzling question can confuse us about their meaning, and even about their truth. Their self-evidence is the self-evidence of instinct, and they are in no philosophical sense *a priori*.

After the foregoing summary, we may fairly assert that in one respect, at any rate, Mach's method is praiseworthy; and that is, in its tendency to get rid of the mysterious element of his science. Whatever one may hold about the *a priori* in general, there is no doubt that we have had enough and too much of the purely mystical *a priori*. If there is any fundamental rational truth at the bottom of science, if science is more than a mere aggregation of facts, this rational basis, when we come to state it, must be as frank and honest and manly a principle as the most commonplace adherent of the empirical philosophy could desire. The old-fashioned *a priori*, in science, in morals, in religion, used to be represented as an arrogant and intolerant thing, mysterious in its manner of speech, violent and dogmatic in its defence of its own claims. The English empiricists used to hate this aristocratic *a priori*, and they shrewdly suspected it to be a humbug. What they gave us in its place, however, was a vague and unphilosophic doctrine of science, that you could only seem to understand, so long as you did not examine into its meaning.

Mach's view avoids the mystery of the old *a priori*. He leaves us still the mystery of the correspondence of external nature to our fundamental interests in the simplicity of its phenomena. Yet this mystery has the look of the genuine philosophic problem. The new empiricism is not and can not be final; but it promises to prove an excellent beginning, and one can at least commend it to those instructors in elementary mechanics who still puzzle their pupils with their use of the old-fashioned, mystical *a priori*. Mach's fundamental principle of the economy of thought is one that any intelligent pupil, with a few empirical facts before him, could be got to understand. But, as many not extraordinarily stupid pupils have so often felt, the mysterious way in which such axioms as the 'principle of sufficient reason' used to appear, aimlessly wandering to and fro in the text-books, could not but perplex, without in any wise helping, the young mind. That even to-day, when the empirical methods in elementary mechanics are so well developed and so generally used, the 'principle of sufficient reason' is occasionally called in to help teachers and text-books out of difficult places, — this fact is surely a 'sufficient reason' in itself for a careful study of such books as Mach's. There are many teachers of elementary mechanics to-day, who, while abhorring metaphysics, and constantly glorifying experience, never know or can tell just what ought to be done with that 'principle of sufficient reason,' which, however, as it used to be applied when it held sway in elementary mechanics, was the most miserably 'metaphysical' of all confused statements. The most ardent believer in the rational *a priori* must therefore delight to find, in such a book as Mach's, the foundation laid for future philosophic inquiry in the clear and sensible empiricism of the author, tentative and transient though this doctrine itself may prove. Only when the vague and mystical have been banished from the mere terms and axioms of the science, can a philosophic student hope successfully to grapple with the question, "How is empirical science, with certain and fixed results, possible at all?" Every one is therefore interested in such undertakings as our author's, whether one is student of mechanics or of logic, or teacher of either; for every one is interested in plain and frank thinking, free from appeals to merely mystical principles.

In concluding, we must call special attention to our author's discussion of the question of absolute and relative motion, which he seems to us to have treated with marvellous skill; and thus we are obliged unwillingly to leave a book that is so full of learning and suggestion.

THE SNAKE-DANCE OF THE MOQUIS.

Capt. Bourke has given us here a most interesting account of his experience among the

The snake-dance of the Moquis of Arizona; being a narrative of a journey from Sante Fé, New Mexico, to the villages of the Moqui Indians of Arizona, with a description of the manners and customs of this peculiar people, and especially of the revolting religious rite, the snake-dance. By John G. Bourke, captain third U.S. cavalry. New York, *Charles Scribner's sons*, 1884. 371 p., 31 pl. 8°.

Moqui Indians. It is a fascinating book, both to the scientific and general reader. With a graphic pen he carries you with him on a long trip replete with thrilling incidents, over regions seldom visited. The book savors rather of a conglomeration of detached notes, than a compilation. Perhaps too much was attempted in trying to give a popular account of his trip, and yet preserve the flavor of the note-book written on the spot, which is so valuable for scientific purposes. He seems also to have fallen into the mistake of supposing his readers to be cut off from books, as he unfortunately was, and has filled the larger part of three chapters (pp. 196–225) with quotations which it would have been sufficient to give by reference. The minuteness of detail with which he describes every circumstance seems unnecessary while his travels were in not unknown regions; but they become invaluable when he describes the snake-dance, and his visits to the various Moqui villages. The book consists of an account of a dance in one of the pueblos on the Rio Grande, which is curious from its mixture of old heathen ceremonies with the Roman forms introduced by the Spanish priests; then of his trip through a corner of the Navajo reservation to the Moqui village of Hualpi (pronounced Wolpi), where the snake-dance was witnessed; and then of visits to the other pueblos of the Moquis. These Moquis occupy several isolated *mesas* in north-eastern Arizona, and are by far the most primitive of all the Pueblo tribes. They were not affected even by the Spanish civilization, as were all the other tribes, including the closely related Zuñis, and are to-day almost what they were four hundred or more years ago. Their life, habits, costumes, and industries are described with an accuracy and minuteness which renders the book invaluable to the ethnologist, and yet so entertainingly that no one can fail to be interested. The snake-dance seems to be the last remnant of what was once an almost universal worship among the tribes of North America. Owing to fortunate circumstances and his own coolness and untiring perseverance, Capt. Bourke was able to see even the secret ceremonies of this dance, which no white man has seen before, or will be likely to see so thoroughly again.

The plates accompanying the work are admirable reproductions of the artist's paintings. It is sufficient to say that the paintings are by Moran, and are accurate in color and drawing, as well as spirited and realistic. — a quality generally absent in illustrations of Indians. They alone are worth the cost of the book.

NOTES AND NEWS.

THE meteorological observatory at Tokio has recorded 546 Japanese earthquakes in the ten years ending Dec. 10, 1884. Of these, 334 (or fifty-six per cent) have occurred during the six colder months, and 212 (or thirty-five per cent) during the six warmer months, of the year. Professor Milne's compilation of 387 earthquakes observed in northern Japan in the two years ending October, 1883, however, shows a still greater proportion for the winter months; the percentages being seventy-two for the months from October to March inclusive, and twenty-eight from April to September.

— Prof. J. P. O'Reilly has recently published in the Transactions of the Royal Irish academy a map of Great Britain and Ireland in which he has attempted to graphically represent the earthquakes of the United Kingdom relative to their frequency. It would appear that Ireland has been less subject to shocks than Great Britain; that the points of more frequent action in Ireland lie near or on the coast; and that the south coast of England presents a number of points of activity situated approximately on the same line, in all probability connected with a system of jointing corresponding to the general direction of the coast.

— Dr. M. Eschenhagen writes to *Nature* that the earthquake shock of Dec. 25 last was registered by the magnetograph at the imperial marine observatory at Wilhelmshaven; the Lloyd's magnetic balance, the instrument for vertical intensity, being set in oscillation first at 9.52 P.M., local time.

— The earthquake wave of Jan. 22 last in England appeared to the vicar of Bampton to pass directly under his house. A letter from Mr. Edward Parfitt in *Nature* states that it occurred at 8.42 P.M. In the drawing-room at the vicarage it appeared as if a heavy traction-engine was passing close to the window: the window faces eastward. In the kitchen the servants were greatly alarmed by a rumbling noise and a shaking under the floor. Some of the vicar's neighbors say they heard a report; and houses with cellars under them, and higher, felt the shaking more. Some persons who were up stairs, thinking that it was some explosion, rushed down stairs and out of doors. The effects were also felt at Shillingford, two miles distant; and also at Combehead, one and a half miles distant. The porters at the station describe it as like a heavily-laden mineral-train passing. The only damage done at Bampton was that a piece of wall was thrown down.

— It is suggested by the Seismological society of Japan that the system of telegraph-stations around Tokio and Yokohama may be utilized in warning the inhabitants of either city of the approach of an earthquake. This might be accomplished by causing such a shock, felt at any of these stations, to complete an electric circuit which could be made to fire a gun almost instantaneously. The inhabitants would receive from two to six minutes' warning, which would give them sufficient time to extinguish their fires,