

at the present moment some indications that before long scientific men may return to this very problem?

Let us now advance a step. When it is found that we cannot conceive the negation of a proposition—that the subject and predicate cannot be separated in thought; “then, indeed,” says Mr. Mill, “the inability to separate the two ideas proves their inseparable conjunction, here and now, in the mind which has failed in the attempt: but this inseparability in thought does not prove a corresponding inseparability in fact; nor even in the thoughts of other people, or of the same person in a possible future.” No matter for the present, how we come by our cognitions, this is surely admitting what Mr. Spencer calls the psychological necessity of thinking the proposition. In the next place, we must confess that we have never been able intelligibly to translate into the language of idealism those anti-realistic arguments that appeal to “fact” and to the experiences of “other people.” But, whatever may be meant by fact, and whatever may have a place in the minds of other people, it must for ever remain nothing to those in whose consciousness it can be neither presented nor represented. Our science of numbers is not likely to be disturbed because it can be written in words that, perhaps in some inaccessible corner of the universe, or in some mind of a different make from the human, twice two makes five. We have already examined the examples given by Mr. Mill of propositions that have, as he thinks, passed from the condition of being inconceivable to that of being both conceivable and believed, and therefore we do not think it necessary to discuss the probability of any really simple and inconceivable proposition becoming conceivable in the mind of the “same person in a possible future.”

We must pass to the next step in the argument as sketched above. Does reasoning rest on the postulate? We cannot help thinking with regret that Mr. Mill has not felt it necessary to put forth his full strength on this point; and we are by no means sure that we have grasped his full meaning. His words are:—“To say that when I apprehend that A is B and that B is C, I cannot conceive that A is not C, is to my mind merely to say that I am compelled to believe that A is C. If to conceive be taken in its proper meaning, viz., to form a mental representation, I may be able to conceive A as not being C. After assenting with full understanding to the Copernican proof that it is the earth, and not the sun, that moves, I not only can conceive, or represent to myself, sunset as a motion of the sun, but almost everyone finds this conception of sunset easier to form than that which they nevertheless know to be the true one.” This, as we understand it, seems open to the reply that, had sunset, considered as a motion of the sun, been inconceivable to begin with, no argument would have been needed to disprove it. Having followed the Copernican proof, we cease to believe that the sun moves, we remain, however, still able to conceive its doing so; for though we cannot help believing that of which we cannot conceive the negation, it does not follow that we are unable to conceive the negation of everything that argument has compelled us to believe. But, whether by following a sound argument we are or are not rendered incapable of conceiving the reverse of the conclusion, has, in reality, nothing to do with the question whether reason-

ing rests or does not rest on the postulate. To invalidate Mr. Spencer's argument by the method he has adopted, Mr. Mill would require to be able to represent in thought, not the sun moving through the heavens, in spite of the Copernican proof to the contrary but that at any step in the argument the conclusion need not follow from the premises. If he could do this he might still be convinced by argument, but we do not see how he must necessarily be so. Mr. Spencer's contention is that reasoning rests on the postulate, not because a valid argument makes the reverse of the conclusion inconceivable, but because the axioms of logic have no higher warrant.

Want of space forbids us entering further into the controversy. For the same reason we are unable to enter upon the inquiry whether we can properly be said to believe that of which we cannot form a mental representation. Mr. Spencer's opinion is that we cannot, and accordingly “that anti-realistic beliefs have never been held at all. They are but ghosts of beliefs, haunting those mazes of verbal propositions in which metaphysicians habitually lose themselves. Berkeley was not an idealist; he never succeeded in expelling the consciousness of an external reality, as we saw when analysing his language and his reasonings. Hume did not in the least doubt the existence of matter or of mind; he simply persuaded himself that certain arguments ought to make him doubt. Nor was Kant a Kantist: that space and time are nothing more than subjective forms was with him, as it has been and will be with every other, a verbally-intelligible proposition, but a proposition that can never be rendered into thought, and can never therefore be believed.”

DOUGLAS A. SPALDING

#### GEIKIE'S PRIMER OF PHYSICAL GEOGRAPHY

*Physical Geography.* By Prof. Geikie. Science Primer Series. (Macmillan.)

IT must not be supposed that this is the Physical Geography which we have been expecting from Prof. Geikie. It is a little book of 110 pages, truly a primer, and only makes us more eager to get a larger work.

The primer is written in a vivacious style; the style of a man really interested in what he is talking to his readers about; and in all respects suitably written for its purpose. It would be a little too patronising if it were intended for any but the very young, who like being taken into the confidence of the writer, and spoken to as young friends. It is to be hoped that a larger work may be equally vivacious and vigorous without this characteristic, which is, to repeat, not a fault in the primer, but would be a serious fault in the larger work intended for older boys and readers generally. It is a fault that pervades Kingsley's scientific books: it is a small annoyance at first, but finally “aggravates” one beyond all endurance. Moreover, the book is well illustrated with new, good, and unconventional woodcuts, and is thoroughly well-arranged and printed.

Now for its contents. After its introduction, which is in fact on “eyes and no eyes,” we have the shape of the earth, day and night, the air, wind, vapour, dew, mist, rain, snow; the circulation of water on the land, springs, hard and soft water, atmospheric denudation (in shorter words than these), brooks, rivers, snow-fields, glaciers;

then the sea, stratification, coral; and lastly earthquakes and volcanoes.

Now this is just right. Physical Geography ought to contain the dynamics of geology, and not be a mere description of the physical condition of the globe. A description of the plateaus and primary mountain chains, and secondary mountain chains, and plains and river systems of all the countries in the world, and distribution of birds, beasts, and fishes, used to be what was called physical geography: and in it the dynamical element, all idea of change and progress was almost entirely left out. All this description constitutes geographical knowledge, but is of the nature of information pure and simple, and has absolutely no value in education except as an exercise in memory, and as a basis for reasoning, supposing that this reasoning is ever superposed. But what Prof. Geikie gives us is the very life and soul of geological science, observation on what the natural forces around us are doing, information as to what they are doing of the like kind elsewhere, and reasoning on the effect of these forces. It is a book which will at once rouse the curiosity of a child, and train it as far as it goes in sound scientific method.

It is admirably adapted to be a reading book in elementary schools, and it is much to be hoped that it will be largely used. But for this purpose a cheaper edition ought to be published. J. M. W.

#### OUR BOOK SHELF

*Exalted States of the Nervous System.* By R. H. Collyer, M.D. (H. Renshaw.)

It can only be with a feeling of regret that anyone can see so many pages, nearly 150, occupied with matter and arguments most of which had much better have been retained only among the oral traditions of the author's acquaintances, for by publishing them he lays himself open to the severe criticisms of a non-appreciating scientific public. That Dr. Collyer was among the first to propose and employ anaesthetics, we will not question, but he cannot expect to increase the number of his supporters by the publication of such a work as the above, in which his want of knowledge of the first principles of scientific method and physiological fact is rendered too clear. An instance or two will suffice to indicate the manner in which the subject is treated. Speaking of chloral, he says—"It is administered by the stomach. . . . It seems that the action is immediate on the brain, through the eighth pair of nerves." This is very different from the explanation of the discoverer of that substance, and quite contrary to any explanation of value that has been since proposed. The physiological dogma on which the author bases many of his arguments is that "the lungs at every respiration send vital electricity to the brain, which has been thus assimilated to subserve the purposes of life." In a newspaper account of the relative chances of the Oxford and Cambridge crews for 1871, the author finds sufficient to justify the following valuable generalisation:—"thus endurance *does not belong* to mere size." We think these quotations sufficient.

*The Botanists' Pocket-book*: containing in a tabulated form the chief characteristics of British plants. By W. R. Hayward. (Bell and Daldy, 1872.)

A BOOK of modest pretensions, and not without its value. As a rule there is no class of scientific literature to be more carefully avoided than that which professes to compress the whole of the elements of a science into a small portable volume; nowhere is the master's hand more urgently required than in the compilation of text-books.

Mr. Hayward we do not recollect to have met with before as a botanical writer; this little book, however, evidences great care in its preparation, and the author is careful not to claim for it too high a place. Its object is to "afford information to the tyro, and also to refresh the memory of the more advanced botanist who, by examining on the spot any doubtful plant, may be saved the trouble of carrying home specimens of little value; it is not intended as a book for the study, nor as a rival to the many excellent and complete manuals of our leading botanists; but to be accepted for what it is, viz., 'A Botanist's Pocket-book.'" This purpose it may well serve; occupying not much over 200 pages of thin paper in limp cloth binding, it will be no great burden to the pocket or knapsack, and may frequently be usefully resorted to by a young botanist on the tramp, leaving more careful study till he gets home. A. W. B.

#### LETTERS TO THE EDITOR

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

##### Perception in the Lower Animals

As several persons seem interested in Mr. Wallace's suggestion that animals find their way home by recognising the odour of the places which they have passed whilst shut up, you may perhaps think the following little fact worth giving. Many years ago I was on a mail-coach, and as soon as we came to a public-house, the coachman pulled up for the fraction of a second. He did so when we came to a second public-house, and I then asked him the reason. He pointed to the off-hand wheeler, and said that she had been long completely blind, and she would stop at every place on the road at which she had before stopped. He had found by experience that less time was wasted by pulling up his team than by trying to drive her past the place, for she was contented with a momentary stop. After this I watched her, and it was evident that she knew exactly, before the coachman began to pull up the other horses, every public-house on the road, for she had at some time stopped at all. I think there can be little doubt that this mare recognised all these houses by her sense of smell. With respect to cats, so many cases have been recorded of their returning from a considerable distance to their homes, after having been carried away shut up in baskets, that I can hardly disbelieve them, though these stories are disbelieved by some persons. Now, as far as I have observed, cats do not possess a very acute sense of smell, and they seem to discover their prey by eyesight and by hearing. This leads me to mention another trifling fact: I sent a riding-horse by railway from Kent *via* Yarmouth, to Freshwater Bay, in the Isle of Wight. On the first day that I rode eastward, my horse, when I turned to go home, was very unwilling to return towards his stable, and he several times turned round. This led me to make repeated trials, and every time that I slackened the reins, he turned sharply round and began to trot to the eastward by a little north, which was nearly in the direction of his home in Kent. I had ridden this horse daily for several years, and he had never before behaved in this manner. My impression was that he somehow knew the direction whence he had been brought. I should state that the last stage from Yarmouth to Freshwater is almost due south, and along this road he had been ridden by my groom; but he never once showed any wish to return in this direction. I had purchased this horse several years before from a gentleman in my own neighbourhood, who had possessed him for a considerable time. Nevertheless it is possible, though far from probable, that the horse may have been born in the Isle of Wight. Even if we grant to animals a sense of the points of the compass, of which there is no evidence, how can we account, for instance, for the turtles which formerly congregated in multitudes, only at one season of the year, on the shores of the Isle of Ascension, finding their way to that speck of land in the midst of the great Atlantic Ocean?

CHARLES DARWIN

##### The Sense of Smell in Animals

THE hypothesis put forward by Mr. Wallace in NATURE of the 20th ult., to explain the power possessed by some animals of