

BOOKS RECEIVED.

Einführung in die Chemie in leichtfassliche Form. LASSAR-COHN. Hamburg and Leipzig, Leopold Voss. 1899. Pp. xii + 299. M. 4.

Qualitative Analysis for Secondary Schools. CYRUS W. IRISH. New York, Cincinnati and Chicago, American Book Co. 1899. Pp. 99.

Laboratory Exercises, with Outlines for the Study of Chemistry. H. H. NICHOLSON and SAMUEL AVERY. New York, Henry Holt & Co. 1899. Pp. vi + 134. 60 cents.

The Hygiene of Transmissible Diseases. A. C. ABBOTT. Philadelphia, W. B. Saunders. 1899. Pp. 311.

SCIENTIFIC JOURNALS AND ARTICLES.

The American Naturalist for September opens with 'A Contribution to the Life History of *Autodax lugubris* Hallow,' by Wm. E. Ritter and Loye Miller, followed by an account of 'The Worcester Natural History Society,' by Herbert D. Braman. The third of the very useful 'Synopsis of North American Invertebrates,' is by J. S. Kingsley and deals with the Caridea; and N. R. Harrington who this summer sacrificed his life in order to study *Polypterus*, contributes a valuable article on its life habits. The 'Pads on the Palm and Sole of the Human Fœtus' are discussed by R. H. Johnson who considers them homologous with the walking pads of some mammals. Among the topics discussed by the editor is that of 'New Species,' many of which are considered to be founded on very trivial characters.

DISCUSSION AND CORRESPONDENCE.

NATURALISM AND PHILOSOPHY.

"Had men in the discoveries of the natural world, done as they have in the intellectual world, involved all in the obscurity of doubtful and uncertain ways of talking, volumes writ of navigation and voyages, theories and stories of zones and tides, multiplied and disputed, nay, ships built and fleets sent out, would never have been taught us the way beyond the line, and the antipodes would still be as much unknown as when it was declared heresy to hold there were any."

IN a discussion, in the current number of *SCIENCE* of my criticism of Ward's *Naturalism and Agnosticism*, it is intimated that my 'harshness' may, perhaps, be due to irritation by Ward's

castigation of Spencer. I therefore wish to say that I read this with interest and sympathy, and found it by far the most valuable part of the book; but as Ward's method of treating the Synthetic Philosophy is an old story to zoologists, I saw no reason to review it for readers of *SCIENCE*.

As I understand Ward's reasoning on this subject, I fully agree with it, and should myself put it in these words: It is not by generalization and abstraction, but by discovery, that knowledge is advanced; but the first principles of this philosophy are based upon abstraction and generalization and can add nothing to knowledge.

Zoologists have long been aware that they who, in past generations, sought to advance our knowledge of living things by generalizing them, or referring them to genera, hindered the progress of zoology, which began to advance with rapid strides as soon as naturalists perceived that our only source of knowledge of living things is the study of the living things themselves. So far as it concerns the zoologist, Ward's method of handling the works of the author of 'The Principles of Biology' is ancient history—a record of a fight that was fought out fifty years ago.

Passing, then, to another topic, I ask space for a few quotations which seem to have a bearing upon the assertion by my critic that Ward's book is 'wrought out in sympathy with scientific methods.'

Ward says, II., 44.—"Granted that we are only entitled to say that the dice actually do fall, when they are thrown from the box, not that they must fall; granted that we may only say that their after course *is* entirely and absolutely the result of the initial conditions, not that it must be; still this is enough. * * * On the naturalistic assumption * * * matter and energy are indestructible and ingenerable, and the laws of their working rigorous, exact and unalterable."

It is not the naturalist, but the philosopher, who asserts that the dice *will* fall. The naturalist expects them to fall, but expectation, however well founded and reasonable, is not fatalism. Naturalism knows nothing of determinism. It does not assert that the after course of the

dice is inevitably and absolutely the result of the initial conditions. This is the teaching of philosophers. What the naturalist asserts is that the 'initial conditions' are signs which mean that he may expect the dice fall. So far as his scanty and imperfect knowledge of nature extends, all dice thus placed have thus fallen, and he has reasonable confidence—confidence so reasonable in this case that we call it moral certainty—that dice will continue so to do, since the after course of all the dice he has thrown has been neither more nor less than what the initial conditions would have led one to expect.

Ward says that he has tried, in his first lecture, to present "an outline sketch of that polity of many mansions, which we may call the Kingdom of the Sciences, and the mental atmosphere in which its citizens live"; but the mental atmosphere which is here presented is one in which few of these citizens would care to pass their lives, however wholesome the philosophers may find it.

Thus we are told, P. 13—"as to material phenomena, certain mechanical laws are held to be supreme; that a single atom should deviate from its predetermined course were as much a miracle as if Jupiter should break away from its orbit and set the whole system in commotion."

So far as I understand the mental atmosphere of the men of science, and may be permitted to speak for them, they assert that nothing can deviate from natural law, since nature is neither more nor less than that which is.

Scientific law involves no notion of supremacy, since it is nothing more than a statement of observed facts, joined to reasonable confidence—confidence which is more or less reasonable according to knowledge—what we may expect under certain conditions. As Berkeley has expressed it, natural laws are "general rules, which teach us how to act and what to expect."

To Ward's question, II., 85.—How we "know that the whole sidereal system will not turn out more like the bird than the stone; an organized whole manifesting life and self-direction?" he answers that he does not know anything of the sort. If Jupiter should *break away* from his

orbit, and set the whole system in commotion, the true naturalist would assert, not with regret or disappointment, but with hearty satisfaction, that he knows more about celestial mechanics than he did before, and that he will now, if he has opportunity, study Jupiter's motives and his cerebral pathology, and try to find out what to expect from a planet so erratic. It is not he, but the philosophers, who teach that events which are mechanical are predetermined, although he does assert that he fails to see what good can come from an attempt to find out Jupiter's motives until he does begin to break things and to behave in a way which astronomers had no reason to expect.

Ward tells, II., 48.—that as the naturalists conceive the world as a whole "it seems comparable to nothing so much as an upturned hour glass. The glass could not start itself; this, at least, was an interference from without, but it was an interference before the process, not during it. Science, which is confined to describing the movements of the sand, can give no account of this catastrophe, and no meaning to it. But once the glass is turned the downward dance of the last grain to move is just as inevitable as that of the first; and the several movements being fixed, any collateral consequences of them must be taken as fixed, too."

The naturalist does *not* know that the 'downward dance' of the first grain to move is inevitable. He asserts that he has good reason to expect and no reason to doubt that the sand will run. If it should do anything else, in the absence of an obstruction, he would know more than he does now, and he would try to find out why his expectations have disappointed him.

He asserts, furthermore, that he may find meaning in the turning of the glass, provided he knows what Ward himself calls the 'initial conditions'; that he has good reason to believe that some one turned it because he chose.

He also has good reason to believe that, if he had known these initial conditions, the desire to turn the glass, and the turning of the glass, would be neither less nor more than he might have expected.

The interminable controversy about deter-

minism and free will does not exist for the naturalist—not because he doubts his freedom and responsibility, but because he knows nothing of determinism.

We cannot be surprised that some students of science should confuse their reasonable expectations that the future will, on the whole, be essentially like the past with belief that it must so be, when we remember how often they have been told by philosophers like Ward that the scientific conception of the mechanism of nature is the conception of ‘an unbroken and unbreakable mechanism,’ which ‘absolutely determines’ the order of events, and ‘banishes spirit and spontaneity,’ ‘holding all things fast in fate’; although most men of science are now as emphatic as Berkeley in the declaration that naturalism means nothing of the sort. What they assert that it does mean is that we know nothing of ‘catastrophes.’ As Sir Thomas Browne tells us: “It was the ignorance of man’s nature that begat this very name, and by a careless term miscalled the providence of God; for there is no liberty for causes to operate in a loose or careless way.”

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MEDICAL SCIENCES IN THE UNIVERSITY.

TO THE EDITOR OF SCIENCE.—Permit me to call attention to a somewhat inaccurate statement made by Professor Minot in his very interesting address delivered at the Medical Commencement of Yale University and subsequently published in SCIENCE. Professor Minot says: “If a young man wishes to make a scientific career, if his interest is chemistry, physics, botany or zoology, he is received at one of our universities started upon a well-planned course properly systematized, he gives for two or three years most of his strength to his main subject, but he follows probably two cognate subjects as minor studies, and at the end of his time, if successful in his work, he receives a degree, which attests his proficiency in his special science. Should the same young man elect to study one of the medical sciences, physiology, pathology or bacteriology, no university will give him corresponding recognition. The utmost he can find is opportunity for advanced

work in his special subject, but with no university guidance, no plan of correlated studies, and he can look forward to no degree, nor even to a certificate from the university.”

In this University, from its foundation in 1876, physiology has been given complete university standing. Its courses are coördinate in every way with those in chemistry, physics, botany or zoology, and many students have offered it, after three or more years of continuous study, as a major subject for the degree of Doctor of Philosophy. The same may be said with regard to pathology and bacteriology.

I speak only for the Johns Hopkins University, but there are other universities in this country in which physiology is also accorded every privilege in the philosophical faculty.

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NOTES ON INORGANIC CHEMISTRY.

OWING to the difficulties in the way of using acetylene on a large scale as an illuminant, and in part perhaps also owing to the opposition raised by those interested in other methods of lighting, the new illuminant has not made the rapid progress predicted for it. Some towns on the continent of Europe, however, have adopted it, as the town of Veszprim in Hungary, and in a recent number of the *Chemiker Zeitung*, Professor J. Vértess gives a paper on some of the drawbacks which attend the use of acetylene. In the first place the calcium carbide from which it is generated is in commerce never pure, but contains at least 20 per cent. of impurities. Theoretically, 350 liters acetylene per kilo carbide should be obtained, but as a matter of fact in practice hardly more than 280 or 290 liters can be depended upon. Again, the carbide contains sulfur, phosphorus and nitrogen, so that we have as impurities in the acetylene, hydrogen sulfide, phosphine and ammonia; hence it follows that acetylene must be purified in much the same way as ordinary coal gas. While burning from an ordinary burner, after a time the flame becomes smoky and carbon is deposited on the burners. This seems to be owing to the burner attaining a temperature higher than that of the decomposition of acetylene. Vértess also