of Balfour's work, and can only enhance the respect which all biologists feel for him.

[NOTE. — Since writing this notice, I have learned of the paper since published by Gaffron upon Peripatus (*Schneider's Zoologische beiträge*, i. 33). The original I have not seen, but only a notice in the *Biologisches centralblatt*, iii. 319. From the latter it appears that Gaffron has independently observed many of the facts discovered by Balfour, and in some respects has added to them. The following is the abstract of his description of the heart. "As in the tracheate arthropods, it lies in a special pericardial sinus, completely embedded in a cellular mass, most developed laterally. Its walls are perforated by fissures, corresponding to the body-segments, and which must be sought in the upper half of the tube. Along the dorsal median line runs a round cord, which is held (probably wrongly) to be a nerve. The pericardial sinus and the body-cavity communicate through numerous oval openings in the septum."]

CHARLES SEDGWICK MINOT.

LETTERS TO THE EDITOR.

Prairie warbler in New Hampshire.

Several seasons ago the prairie warbler (Dendroeca discolor Bd.), was found nesting at Northfield in New Hampshire, in June I believe, though I cannot give the exact date. Two of the nests, however, and an egg, are preserved, and place the identity beyond question.

The locality was a high, bush-grown pasture in the vicinity of a town; and the nests were pitched about head-high from the ground, in the crotch of a thorn-bush. The birds made no demonstrations at the approach to their haunts, but retired noiselessly, seeking to screen themselves from view. One nest contained three eggs, a second four. They are substantially the same, finely and firmly wrought, cup-shaped structures, with a well-turned rim. In the latter instance, the external depth is 2½ inches, the internal 1¼; outer diameter 2½, inner 1½. The nest is composed essentially of bark strippings, Andromeda chiefly, fine grass, and blasted vegetable fibre intermingled, and lined with hairs and the reddish filaments of Polytrichum. The exterior is covered with much cobweb silk and some soft compositaceous substance, which serves to compact the whole and secure it in position.

The egg is pointed at one end, dull white, rather finely and sparsely specked with lilac and marble markings, aggregating in a circle about the crown, measures .68×.50 inches, resembling occasional specimens of the chestnut-sided warbler.

So far as I am aware, there is no previous authentic record of this warbler breeding north of Massachusetts in New England. F. H. HERRICK.

Kalmia.

In your issue for Aug. 17, Dr. Abbott doubts if Kalmia grows sufficiently large to be used for making spoons. The abundant thickets of Kalmia latifolia, beautiful but troublesome, are among the clearest recollections of my youth in southern New Hampshire. This shrub is there familiarly known as 'spoonhunt;' and its stems, near the ground, are not infrequently three or four inches in diameter.

CHAS. H. CHANDLER.

Ripon, Wis., Aug. 23, 1883.

Letters in a surface film.

Can any one suggest an explanation of the phenomenon described below?

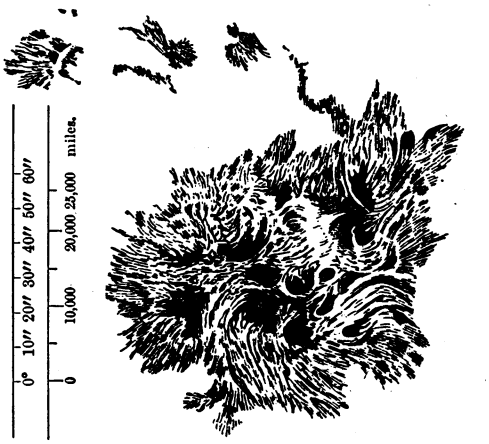
In a box four feet square, and sunk five feet below the surface of the ground, was a water-meter connected with pipes for supplying a factory. Over the face or dial of this meter was a cast-iron cover, on the outside of which the maker's name was inscribed in raised letters. During the spring thaws, the box was half full of surface-water, submerging the top of the meter some eight or ten inches. After a time a greasy film collected on the water, and in this film appeared a counterpart of the raised letters. That it was not a reflection or other optical illusion, was proved by carefully introducing a shovel under these filmy letters, when they were raised and taken outside of the box, being still visible.

In the course of a few hours, fresh letters would appear on the surface. A. P. H.

Boston, Aug. 28, 1883.

An interesting sun-spot.

Owing to a misunderstanding, the scale given with the sketch of a sun-spot, in the letter from S. P. Langley and F. W. Very (SCIENCE, ii. 266), was



printed too large. We reproduce the illustration showing the spot, with a corrected scale. — ED.

A CRITIQUE OF DESIGN ARGUMENTS.

A critique of design arguments. A historical review and free examination of the methods of reasoning in natural theology. By L. E. HICKS, Professor of geology in Denison university, Granville, Ohio. New York, *Charles Scribner's Sons*, 1883. 11 + 417 p. 8°.

THAT men can talk about the most serious problems without passion, is certainly shown by our author, whose candor and excellent aims have already been recognized on all hands. For the rest, we must regard the book with mixed feelings. When we undertook to read it, we did not go forth to see a reed shaken by the wind, nor did we find such; we did not venture to look for a prophet, nor did we find one: but we were prepared for just a

little more definiteness of philosophic thought, for just a little more acquaintance with the history of the subject, and, in general, for just a little more strength. But we must not be too exacting. This is the work of a student of a special science. He comes with suggestions that have been a good while in maturing; he expresses himself in clear language, with great and generally successful effort at fairness; and he shows no small ingenuity. His book will do good both to theological and to scientific students if they read it. And it can do no harm to philosophy. Such discussion is, in fact, so timely that one cannot wish that the book had been kept any longer out of print; but one must wish that the author had begun to study the history of thought a good deal earlier. Achilles at the trench will always be a sublime figure; but the lack of armor is not just that feature in the situation of Achilles which it is safest for other people, at other trenches, to imitate.

The argument from design, says the author, is in fact twofold. In one form it is teleological. Certain events or things are judged to be intended for certain purposes. This argument has less signifiance for the men of to-day than it had for former generations. The advance of science throws it somewhat into the shade. But the advance of science itself tends to bring into clearer light the other design argument. This is the argument from the *order of nature*. Order, it maintains, implies intelligence, is itself a mark or sign of mind. The more order we discover, the more intelligence is indicated in the world. This does not necessarily mean that we infer intelligence as the *cause* of order; but it means that we regard order, however it may actually be connected with intelligence, as a *mark* of intelligence. This argument needs a name; and Mr. Hicks proposes to call it the eutaxiological argument, to distinguish it from the teleological.

The teleological argument alone is not satisfactory. To prove that any thing implies intelligence as the cause whereby it was adjusted to an end, you must know what the end or purpose of this thing is. And to do this, you must know that there are ends or purposes for things at all; but to assume that you know this is to beg the question. Teleologically, therefore, intelligence as the cause of things cannot be proven; but only particular adjustments, made by an intelligence already known to be the cause of things, can be teleologically discovered. Teleologically you could at best show, that, if there is intelligence in connection with the world as a whole, then this intelligence works for certain special aims. But teleologically it would be impossible, without aid from some other source, to make certain that any mind at all is associated with the world as a whole. It is impossible 'to prove the *existence* of intelligence by means of the definite *direction* given to intelligence,' because the existence of intelligence 'must be *assumed* in order to ascertain its direction.'

On the other hand, maintains our author, the eutaxiological argument escapes the analogous objection. Teleology has to assume the existence of purpose, in order to use it as a proof of intelligence. But eutaxiology has not to assume the existence of order. Order is the first and last word of natural science; and from first to last science continues to deepen the meaning, and to widen the application, of the word 'order.' The difficulty of the eutaxiologist begins not at this point, but later. Are we sure that order is a sign of intelligence? An orderly arrangement of things is a mark of intelligence in many cases. "Suppose we find smooth stones or shells on the beach, arranged at regular intervals in a straight line, or in three straight lines to form a triangle: we should say that an intelligent being had done this." To be sure, in this case we should suppose that some man had done it; but that would not affect the matter, for, "if we saw such figures upon the moon or upon any of the planets, we should at once conclude that they were inhabited by intelligent beings." Thus in these cases, reasons Mr. Hicks, order is inductively connected by us with intelligence. "We see intelligence producing orderly results; and we project the inference thence derived over those cases of orderly phenomena of which we do not know the cause." But what is done in special cases of order observed in forms or in groupings of objects, ought fairly to be done in regard to the whole of nature; and that especially because every case of orderly connection that we find, and that suggests intelligence, is found not alone, but itself in connection with other cases, so that we could not finally stop with our examination of one case of order before we should know its connections with the whole of the rest of the universe. The more, then, we know of nature, the more orderly and connected does it seem, and the more reason we have to apply our induction to the world as a whole.

All this, of course, implies no definite view about the way in which intelligence is connected with the order of the universe. Whether it be that arbitrary collocations of matter are

the immediate sources of the order, or whether the order follows from the fundamental properties of matter, the result is the same. And for a like reason eutaxiology has nothing to say of divine attributes over and above intelligence. Eutaxiology does not even by itself prove the existence of God. It simply proves that intelligence exists in the universe. It leaves to other proofs the discussion of other divine attributes. Eutaxiology having proved intelligence, teleology can then be used to prove that this intelligence is somehow associated with will and power, and works (through evolution or otherwise) for definite aims; and other proofs may be used for other purposes. In conclusion, why may not the various theistic arguments agree to divide labor, and combine the outcome, so that each one shall undertake to prove just that divine attribute to whose defence it is especially fitted? Thus confusion might be avoided, and the cause of natural theology advanced. Mr. Hicks even goes so far as to suggest, in a very generous outburst (p. 389), that possibly that despised creature, the ontological proof, might find some kind of mission in the midst of his desired association of theistic arguments. The ontological proof, having very long been able to say, —

"I lie so composedly now in my bed,
That any beholder might fancy me dead,"—

must regard the kindness of Mr. Hicks with very mixed emotions. He thinks that it might be 'just the thing to supplement' the others. But during its natural life the ontological proof used to think that the others might possibly be of use to supplement itself.

Such, then, is our author's own line of argument. Between the introduction and the final exposition of this argument, he inserts a discussion of the history of design arguments. This is a mere collection of notes, with more or less ingenious reflections that suggested themselves to the mind of the collector here and there in the course of his work. The 'Natural theology of the Greeks and Romans' is treated in some thirty pages, which are devoted to Socrates, Cicero, and Galen. How, one may ask, would it look for one to head a chapter with the title 'The astronomy of modern times,' and then to treat the subject by briefly expounding some statements of Galileo, Lord Brougham, and Dr. Whewell? Thirty pages might well be the limit allowed by the plan of our author; but such a space is not too limited for a really connected historical sketch, with some attention to the perspective in which every man's thought ought to be viewed. The author's account of Spinoza is similarly imperfect, because no effort has been made to see what the man, with his odd, crabbed method, really had in mind. We are told, what we all knew before, that Spinoza's method is unsuccessful; but, for the rest, we learn more in this chapter about Mr. Lewes than about Spinoza. 'Reimarus, Kant, Hume, and Reid' are somewhat embarrassed to find themselves side by side in one chapter; and poor Kant especially is made to speak as he did in 1763, instead of being allowed to present himself as he does in the 'Critique of pure reason,' nearly twenty years later. Although this error is in just this discussion not so serious as the corresponding error would be in expounding other parts of Kant's doctrine, yet the method is unhistorical; and the result is, that, in summing up, Mr. Hicks hopelessly confuses Kant's pre-critical and critical periods. In short, our author shows himself in general no historian of thought. Throughout the whole sketch, there is a lack of a sense of the development of thought. Each man's notions stand beside his neighbor's, as if the philosophers were all speakers in a debating-club. And Mr. Hicks, as intelligent listener, adds his applause and his comments in brackets, and is not afraid to express himself with even boyish freedom of speech. But he is always good-humored, and his criticisms often hit the mark very well. Yet it is to be hoped that nobody will undertake to judge the history of natural theology on the basis of this account.

Now as to the result. What shall we say of eutaxiology? We have no hesitation in declaring the argument, as our author presents it, an altogether defective one. For, as he presents the eutaxiological argument, it is an inductive argument, and solely inductive. If we saw a triangular arrangement of objects on the moon, we should conclude that some intelligence had done this. We should extend the known association of intelligence and order, as we find it about us, to cases of order more remote from our direct observation. We should conclude that order is a sign of intelligence, even where we have no other evidence of the presence of intelligence. So reasons Mr. Hicks. But is this sound? And, first, is the author's suggestion about the supposed geometrical figure seen on some planet a correct one? Should we, if we saw such a figure on some planet, at once conclude that intelligence had caused it, or was in any way associated with it? Surely not everybody would feel the force of such an induction.

Most scientific astronomers, observing such a regular figure for the first time, would at once look for some ordinary physical explanation of its presence, even as they now try to explain the shapes of the planets; and, failing to find such an explanation, they would be content to call the triangle a mystery. Only some man whose position as a public lecturer on astronomy demanded that he should have a new sensation ready for each new lecture-season would be apt to insist on the existence of some set of geometrically disposed planetary giants. More sober people would be content with an *ignoramus*. But how much less satisfactory becomes such an induction when applied to the whole of nature! At best would not such an argument be like the inductive reasoning of a man, who, having already learned the modern doctrine of the relation of the colors of flowers to the habits of insects, should for the first time, and without any previous knowledge of marine zoölogy, find a colored shell by the sea-shore, and who should then at once expect to find some race of insects in some analogous relation to the inhabitant of this shell? Or, again, if one extended even to the rainbow, or to the sunset, an explanation derived from the case of colored flowers, and their relations to insects, would not the argument possibly be no more absurd than the induction upon which Mr. Hicks lays so much stress? Men and beavers and other creatures make orderly groupings of things. Hence order implies intelligence, and that wherever we find order. Is this argument any better than the old teleology? Mr. Hicks is deceived, it would seem, by the vast wealth of facts to which his argument appeals. He neglects the difficulty of bringing such various facts within the control of an induction that has for its narrow basis such intelligent activity as we see about us among men and animals. As induction, pure and simple, eutaxiology seems to us simply worthless.

But is the order argument in any form therefore worthless? Certainly not. Mr. Hicks does fine service in bringing before the public, just at this moment, a thought that is by no means new, and that is profoundly suggestive. 'What does the order in the world imply?' This is a great question, not of inductive science, which is concerned solely with discovering the actual order itself, but of general philosophy. And Mr. Hicks is, we doubt not at all, quite right in saying that order implies intelligence. But how, and what intelligence? Such questions he leaves wholly unanswered. The critical philosophy of Kant would, strictly speaking, affirm that order in the world implies only the intelligence of the thinking subject to whom the world appears. The world is orderly, because only as orderly could it become known to an intelligent being. Not the world in itself, but the world for thinking beings, is to be viewed as orderly. This view would make short work of our author's 'induction,' but it would not satisfy him. He would then need to know and build beyond Kant. In short, Mr. Hicks has very ingeniously set his reader down at the beginning of a great philosophic problem. It would argue a lack of intelligence in the reader if he did not seek to bring his thoughts into a better order than that in which Mr. Hicks will have left them; and the author's service lies in making it impossible for an inquiring mind to rest content with what is here offered to him. This, however, at least, he has very well suggested, though he has not proved his suggestion: viz., that the postulate of natural science is the rationality of the world. Whether we find order, or only seek it in nature, we are always *a priori* sure that the world is actually full of connections that admit of expression in rational terms, of explanation to an intelligent mind. And so we assume a fundamental likeness of nature and intelligence that suggests to us very strongly some kind of real unity or identity of nature and intelligence. But whether this suggestion has any ground, whether this identity of nature and mind is to be accepted at all, or is to be accepted in Kant's sense only, or in Berkeley's sense, or in Hegel's sense, or in some other sense, this is a matter for philosophy to discuss. We thank Mr. Hicks for having shown afresh the necessity for such discussion. His eutaxiology is not so original as he thinks; but his offering on the altar of philosophy deserves the reward due to every gift that a special student of natural science finds time to offer in the true spirit of calm investigation.

MAYNARD'S MANUAL OF TAXIDERMY.

Manual of taxidermy; a complete guide in collecting and preserving birds and mammals. By C. J. Maynard. Boston, *S. E. Cassino & Co.*, 1883. 16 + 111 p., illustr. 12°.

A really *complete* guide in collecting and preserving the objects named in the title of this work, which can safely be relied upon for information under all circumstances and in all climates, has long been sorely needed by the host of amateurs, taxidermists, travellers, and even professional naturalists interested in verte-