

piers on which the meridian circles of our great observatories are supported ever called alidades?

The sentence under *Law of action and reaction* which I supposed to be an interpolation is, as Mr. Peirce correctly infers, this: "By *action* is here meant, according to Newton, a quantity measured by the force multiplied into the velocity of the point of application." I think he is entirely mistaken in supposing that Newton gives this definition of the word as used in his statement of the law. I can find no such definition in the 'Principia.'

Since my strictures upon some of the definitions on the 'Century Dictionary' appeared in your issue of the 13th inst., I have hastily glanced through the remainder of the letter A, and noticed the following faulty definitions. The word *approximation* is defined as if it were identical with what is known as the method of successive approximations. The definition of *diurnal arc* is meaningless: "the arc described by the heavenly bodies in consequence of the diurnal rotation of the earth." Of course there is no definite arc thus described, but only an endless repetition of one and the same circle. The term is actually applied to that portion of the sun's apparent daily path which is above the horizon. The same term is, I believe, applied to the apparent paths of the stars above the horizon. *Nocturnal arc* is new to me, but I think its definition also incorrect. *Argus*, the constellation, is omitted, though *Aries* and *Aquarius* are included. S. NEWCOMB.

49 (15 August 1889) 136-137

Deductive Logic.

By St. George Stock, M.A. Longmans Green & Co. Pp. 356.

Attributed to Peirce by Fisch in *First Supplement* (internal evidence: reference to O. H. Mitchell and the *Studies in Logic*, which Peirce edited). This review is unassigned in Haskell's *Index to The Nation*, vol. 1.

One of the author's friends who looked over this book in manuscript advised him not to publish it because it was too like all other Logics; another advised him to cut out a considerable amount of new matter. We cannot help being of the opinion that both of these friends were persons of a great deal of wisdom. In spite of the fact that the latter advice was followed, a good part of the new matter which is retained is, as we shall presently show, erroneous, and the old matter is, to say the least, not better set forth than in several other text-books which we could name.

This is not saying that it is not, at many points, fresh and admirably expressed and fully mastered by good sense. It would be impossible for a man who has been studying and teaching logic at Oxford for seventeen years to write a thoroughly bad book on the subject. It is merely saying that the teacher who should decide to adopt this book in his class-room instead of Bain, for instance, would be doing his pupils an injury. The trouble which the student usually has with his book on Logic is that it seems to him too much like a mixture of dry bones and sawdust. The best exposition of the subject is one which forces him, at every step, to see that there is an intimate connection between its formal rules and the trains of

thought which actually go on in his own mind. Mill is still the only book for "the gentleman and the scholar" to read; but, for the young person who must be put quickly through the drill established by the schoolmen, and who must at the same time see that it has a case bearing upon the present perplexities of the scientific man and the practical thinker, hardly anything is so good as Bain. Bain, it is true, is open to plenty of objections of another kind; and there is no subject in which there is more urgent need of a new book which shall embody the recent improvements in the science, and which shall at the same time exhibit a kindly consideration for the weaknesses of immature minds.

Mr. Stock, as far as appears from his book, is wholly unacquainted with Symbolic Logic. That is a subject which throws so much light on logical theory that a brief treatment of it ought to be introduced into every text-book; but even if that is not done, no one who writes a book should be content to be ignorant of it. The conventions which Symbolic Logic finds absolutely essential are a source of very great simplicity and consistency in ordinary Logic. Mr. Stock does not mention Venn among the writers who have helped him, and he can hardly have read his persuasive plea for the thorough-going introduction of De Morgan's idea of a limited universe, and of the convention that particular propositions must imply the existence of terms, and universal must not. With this convention, it is true that we must "accept the awkward corollary" of the collapse of the time-honored jingle about opposition; but worse things than that have been lived through. If it has been shown that black swans are not found in Africa, and that they are not found anywhere else, what follows in real life is that there are no black swans; but what the old-fashioned logician wishes us to believe is that one or other of the two statements must be false. It is evident that the former is the more reasonable conclusion.

Mr. Stock calls the statement "If a is b , c is d " a complex proposition. It should be called a compound proposition, that is, a proposition about propositions, or, better still, a sequence. The term complex proposition is needed for such as have subjects or predicates that are to be broken up in the course of the reasoning, as when we infer from the statement, "Citizen-students are always revolutionists," the other statement, "All students are revolutionists, or else they are not citizens." The three things which logic considers would then be the concept, the judgment and the sequence, the last being defined to be the statement that one proposition follows from another or from several others, either logically (that is, as inference), or materially (that is, as matter of fact).*

Mr. Stock's introduction, on the whole, is good, though a more psychological account of the concept might have been given; and good, also, is his treatment of extension and intension. But he has a curious idea of what constitutes induction. The concluding from "All the metals which we have examined are fusible" to "All metals are fusible," he gives as an example of what induction is *not*, and then he argues that it is a mistake to talk of inductive reasoning as though it were a species distinct from deductive. The above kind of reasoning he stigmatizes as a

*The distinction between the logical and the material sequence is very much the same as that between the verbal and the real proposition.

"vague instinct," but he forgets that before the days of Aristotle the strictest syllogistic reasoning was vague instinct in everybody's mind, that it is so now in the minds of all but a very few, and that it is so even in their minds in all but a very few hours of their existence. Another "curiosity of literature" Mr. Stock furnishes when he argues, under fallacies, that it is wrong to ask your opponent to grant the point under dispute, because it is violating "the first of the general rules of syllogism, inasmuch as a conclusion is derived from a single premise, to wit, itself."

But the most original part of the book is the treatment of immediate inference as applied to compound propositions, and this, unfortunately, is almost wholly erroneous. In the first place, the treatment is totally inadequate on account of the fact that it applies only to singular propositions. The denial of "No kings are tyrants" is "Some kings are tyrants," not "All kings are tyrants." "If all men are gentle, all women are brave" is the same thing as "If any women are not brave, some men are not gentle," but it is far from being the same thing as "If no women are brave, no men are gentle." But even for singular propositions, in which "The sun shines" and "The sun does not shine," for instance, contradict each other, Mr. Stock is still chock-full of error. His mistakes are due to two causes—to his ignorance of the fact that particular propositions necessarily imply the existence, real or logical, of their terms, and to his ignorance of the fact, admirably set forth by the late Prof. O. H. Mitchell, in the 'Studies in Logic,' that propositions in two dimensions are necessarily six and not four in number. The reason for this latter fact is, that "All rivers are sometimes dry" may mean either that there are times when every river is dry, or that every river is dry at one time, or another; and that reasoning cannot proceed with safety until it is known which of these two things is meant. We shall not take time to set forth the effects of these two fundamental errors. It is sufficient to point out that no one but a hardened logician would suppose the statement, "Either operators must be careful, or telegrams will sometimes not be correct," to be the same thing as "Either telegrams are correct, or operators are sometimes not careful"; nor would he suppose that in order to deny the statement, "Either men fight, or tyrants reign," we say "Either men fight, or tyrants do sometimes not reign." It gives one a distinct feeling of dizziness, if not of nausea, to be told that these two statements are the denials of each other. To refute him who says, "Either corruption ceased, or the country went to the dogs," it would be necessary to establish *both* that corruption did not cease *and* that the country did not go to the dogs. It happens that statements in *either or* and in *if* are abbreviated forms for *universal* sequences, and that it is impossible to express with those words the particular sequences which are necessary for denying them. All this is as plain as daylight to any one who has been trained in Symbolic Logic, as well as to any one who has not studied Logic at all.

If this author showed greater strength than he does in plain questions of Logic, more interest would attach to the fact, which appears from an advertisement in the end of the book, that he attributes "importance to spiritualism, and gives a degree of credit to its phenomena." There is an admirable collection of examples.

50 (27 February 1890) 184

The Science of Metrology; or Natural Weights and Measures. A Challenge to the Metric System.

By the Hon. E. Noel, Captain Rifle Brigade. London: Edward Stanford. 1889.

CSP, identification: MS 1365. See also: Burks, *Bibliography*. This piece is unassigned in Haskell's *Index to The Nation*, vol. 1.

The metric system is now supposed to be taught in the arithmetic course in every school. If it were well taught—say, if a quarter of an hour twice a week for half a school year were intelligently devoted to it—the pupils would for ever after be more familiar with millimetres, centimetres, metres, and kilometres, with grammes and kilogrammes, with ares and hectares, and with litres, than they are ever likely to be with the English units. Who, except an occasional grocer, can guess at a pound within two ounces; or how many, besides engineers and carpenters, can distinguish seven-eighths of an inch from an inch at sight? Yet these are things easily taught. But schools will gradually get better conducted, and foreign intercourse seems destined before very long to receive an almost sudden augmentation; so that the metric system will pretty certainly become more and more familiar, and there may be expected to be some practical movement towards its use in trade. It is quite within the bounds of possibility that, even in a country with as little governmental initiative as ours, fashion may lead to the partial superseding of the old weights and measures, just as the avoirdupois pound superseded the Troy and merchants' pounds, as ells and nails have given place to yards and inches, as lasts and stones, firlots, kilderkins, long tons, great hundreds, and innumerable other units have disappeared within this century. If the litre, the half-kilo, and the metre were only not all severally greater than the quart, the pound, and the yard, there might be shops to-day where the keepers would affect to be unacquainted with English weights and measures.

There is little real difficulty in changing units of weight and bulk, were there any positive motive for it, for the things they weigh and measure are mostly used up within a twelvemonth. But with linear and square measure it is otherwise. The whole country having been measured and parcelled in quarter sections, acres, and house-lots, it would be most inconvenient to change the numerical measures of the pieces. Then we have to consider the immense treasures of machinery with which the country is filled, every piece of which is liable to break or wear out, and must be replaced by another of the same gauge almost to a thousandth of an inch. Every measure in all this apparatus, every diameter of a roll or wheel, every bearing, every screw-thread, is some multiple or aliquot part of an English inch, and this must hold that inch with us, at least until the Socialists, in the course of another century or two, shall, perhaps, have given us a strong-handed government.

We can thus make a reasonable prognosis of our metrological destinies. The metric system must make considerable advances, but it cannot entirely supplant