

some twenty years since, the Cinchonas have had showered upon them books and pamphlets innumerable, and where we find such voluminous writings, it would be strange indeed were there not matter of varied quality, and some that could be dispensed with altogether. Mr. Owen's book is very complete in the several branches of Cinchona literature, facts gathered from various authentic sources, such as the works of Dr. King, Dr. Bidie, Mr. McIvor, and the reports of the Indian and Javan Governments, all of which are acknowledged by the author.

The book is divided into six parts, the first part being devoted to the physiology of plants, gathered, as we are told, from Church and Dyer's "How Crops Grow." The second part treats of the alkaloids, the species and varieties, to which a large space is given, and the next part on the choice of land, felling, clearing, weeding, planting, &c. In the fourth part manuring and harvesting are considered; and in parts 5 and 6 the diseases to which Cinchonas are liable, and the estimates of Cinchona planting are digested. In all these matters careful details are given.

The book no doubt will be very useful to Cinchona planters, more particularly the practical part. Its greatest fault, perhaps, is the extent of the book, numbering 203 pages, too voluminous for many planters to wade through; but on the other hand it appeals also to those who, though not actual planters, are interested in the progress of the Cinchona culture.

Kallos, a Treatise on the Scientific Culture of Personal Beauty and the Cure of Ugliness. By a Fellow of the Royal College of Surgeons. (London: Simpkin Marshall and Co., 1883.)

THE author desires his book to be taken seriously. He shows that good looks and manners have a commercial value, since those are more likely to succeed in obtaining the prizes of life who can make favourable first impressions than those who cannot. The first start greatly depends on patronage, and obscure youths who have won wealth and position have almost always been helped by their good looks, good address, and good voice. These are aids of considerable importance to every candidate, whether it be for a place behind a counter or for the suffrages of a constituency. The author considers from a medical point of view how ill-favoured individuals may palliate their defects. He treats ugliness as a disease, classifying its various forms and indicating such remedies as he can. His classes are coarseness, thinness, obesity, vulgarity, wrinkles, defects of circulation, of complexion, and of the hair. Then he takes the features in detail, eyes, nose, mouth, &c. His recipes are not numerous. We learn incidentally that what is sold as lime juice and glycerine for the hair contains no glycerine at all, and that a very popular dressing is castor oil and rum. This would have harmonised with the toilette of the Syrian beauty of old times, whose "garments smelt of myrrh, aloes, and cassia," a very apothecary-like fragrance. The book does not contain practical advice of much novelty, but its interest chiefly lies in directing attention to much that we already know but are too apt to forget; such as that dissipation, gross feeding, and indolent ways create ugliness of various forms. We know there are bad schools where the boys are slouching, ill complexioned, furtive in expression, and generally ugly, and we also know that there are good schools where, owing to healthy habits and keen and varied interests, the boys are bright, vivacious, and attractive. Similar differences due to different habits of life exist in men; they are pre-eminently shown by the good effect of drill on a plough-boy or street loungeur. We may be sure that those who habitually cultivate a healthy mind in a healthy body, and who study how to please, cannot fail to add to the total happiness of the world and to secure for themselves a better chance of succeeding in it than their more negligent rivals.

The Nat Basket. (Printed for the Editress and Publisher, Mrs. Eleanor Mason, at the Albion Press, Rangoon, Burmah.)

WE hope that the subscribers to this extraordinary publication are content to give to it their money and nothing more. It is designed, we are told, to show the natives that there is no contradiction between Scripture and science, but if they believe that what is presented to them in the *Basket* is science they are much to be pitied. Such a medley of misstatements, absurd etymologies, and false astronomy was never before met with out of Bedlam. If this is the stuff that is taught the Burmese by our missionaries, the sooner the latter return home the better.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

Deductive Biology

IN the few remarks which I communicated to this journal (vol. xxvii. p. 554) under the above heading, I protested against the deductive method used in a purely literary manner as a mischievous way of attacking biological problems. Mr. William White objects that if I am right the deductive method must be excluded altogether "as a false and dangerous element of philosophy." I do not myself see that this necessarily follows. The pith of what I said simply amounts to this—the biological sciences not having reached the deductive stage, it is not possible to enlarge our knowledge in them by mere ratiocination. This is I apprehend no more than is laid down by Mr. Mill himself. Writing of the conditions under which the deductive method is applicable, he expressly says that without one indispensable adjunct "all the results it can give have little other value than that of guesswork" ("System of Logic," 4th ed. vol. i. p. 498). The indispensable adjunct is verification, which requires the substitution of the work-table for the desk. When the former has put the stamp of confirmation on the speculations elaborated at the latter we get a scientific result which commands attention. Without this confirmation I am still of opinion that the deductive result is only "a literary performance." It is worth noting that the able writer whose papers and method I took the liberty of criticising so far admitted the validity of what I said, that he promised to have some experiments made which would go a considerable way towards demolishing or sustaining the results at which he had so far arrived only deductively.

As it would be a rather arduous undertaking to follow Mr. White over all the other ground covered by his letter, I will only refer to one point. He asks whether "comparative embryology" is not "founded entirely upon the method of deductive analogy." I am certainly myself under the impression that it would be difficult to pitch upon any area in science in which the knowledge we possess has been more conspicuously gained by persistent investigation or one in which generalisations have more often crumbled under the pressure of fresh results of observation. It is the section-cutter, and not the de-k, which has won the victories in this field. At the present moment two of the most skilled of our younger embryologists (with funds furnished by the Royal Society) are on the point of starting, one for the Cape, to study the embryology of *Peripatus*, the other to make a similar attempt in Australia on the earliest phases of the life-history of *Ornithorhynchus* and *Ceratodus*. They would hardly perhaps engage in so laborious a quest if it would answer equally well to stay at home with a ream of paper, and, say—without any disrespect to the eminent author—a copy of the writings of Mr. Herbert Spencer as "a base of fundamental truth" to start from in the analogical deduction of the embryology of these organisms.

W. T. THISELTON DYER

YOUR correspondent, Mr. William White, has not, it seems to me, a correct appreciation of the words "deductive" and

"induction," as used in reference to the investigation of the causes of phenomena. The mistake which he makes is a very frequent one, and is due to the ambiguity of the words themselves, and to the inaccessibility of a treatise on modern logic.

The "deductive method," as formulated by John Mill, is one method by which the mental process known as induction—"the operation of discovering and proving general propositions"—is accomplished. An "induction" may be a simple inference from an observation; it must be an inference in which the conclusion is *wider or more general* than the premises from which it is drawn. A "deduction" (as the term is commonly used) is a result of ratiocination solely, or, in other words, of a "train of reasoning," by which from a general proposition (not alone, but by combining it with other propositions), we infer a proposition of the *same* degree of generality with itself, or a *less* general proposition. The "deductive method" receives its name from the fact that ratiocination is combined in it with induction.

"In order to discover the cause of any phenomenon by the deductive method, the process must consist of three parts:—(1) Induction; (2) Ratiocination; (3) Verification;" or in common language: (1) A generalisation from observed facts [or a deduction from a previous generalisation]; (2) A deduction from this generalisation [or from an initial deduction]; (3) The testing or verification of the final deduction.

The "hypothetical method" is a special and very usual form of the deductive method in which in place of an induction or primary deduction we have substituted a hypothesis. Under proper safeguards this is the most valuable and fertile method of investigating the causes of complex phenomena. Hypotheses are legitimate or illegitimate. The cause suggested by the hypothesis, if not already known as existing, ought to be capable of being known, and, until the cause suggested is shown to exist, the hypothesis, although verified, constitutes only a plausible conjecture. Further, the hypothesis must be such that no other hypothesis substituted for it would lead to verification.

A hypothesis, as distinguished from a proposition resulting from a complete induction or a correctly formulated deduction, is "a supposition without actual evidence or with evidence avowedly insufficient." The whole value of a hypothesis lies in the final carrying through with it of the deductive method. It must be made the starting-point of deductions, and these must be (one or more) brought to the test of observation or experiment—the final process of verification.

So much by way of preliminary.

The objection which my friend Mr. Thielton Dyer has made to the essay of Mr. Grant Allen upon the forms of leaves does not, it appears to me, consist in a depreciation of the "deductive method" as Mr. William White is led to believe. Nothing can be further from the real state of the case.

What Mr. Dyer objects to is that the method is *not carried out* by Mr. Allen. Mr. Allen gives us hypotheses—suppositions with insufficient evidence—and deductions from the generalisation of evolution, but he is relatively deficient in "verification." He also fails in the condition insisted on by Mill, who holds that the hypothetical method is valueless (or relatively so) unless it be proved that no other hypothesis than that formulated can be similarly verified. He further, in the case of the supposed exhaustion of the carbonic acid in atmospheric air, appears to fail in another respect indicated by Mill, in so far as he does not demonstrate the actual existence of the cause which he assumes in his hypothesis. His proposition on this head is no more than "a plausible conjecture" at the best, and is not a legitimate conclusion arrived at by the deductive method.

I do not think that there is any ground for discountenancing either a "purely deductive" or a "purely inductive" method in the treatment of biological topics, so long as the method is soundly and thoroughly carried out and its logical results truly and clearly stated. Still less is there any shadow of reason for not fully accepting the "deductive method" (so named) as the method of biological research. What we have to deprecate in some modern speculative essays is the tendency to put forward suppositions as though they were propositions which have been demonstrated, and to employ the printing press in launching hypotheses which are neither legitimate inductions nor deductions, and should be kept unpublished until their originator has thoroughly examined them by the accepted "deductive method."

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The Peak of Teneriffe *not* very Active again

WITH reference to my notice in NATURE, vol. xxvii. p. 315, stating, on the authority of a native lady in Santa Cruz, that the Peak of Teneriffe was active again, even to the extent of exuding a red-hot lava stream from near its summit, I am informed now from a higher scientific authority, viz. a Cambridge man, and high Wrangler there in his day, but since then resident in Teneriffe, near Puerto Oratava, for fifty years, that that view was exaggerated. I hasten, therefore, to present to your readers exactly what this venerable and experienced man has to say, without altering a word, so far as the extract goes:—

"The facts of the case," says he, "are simply these. On a clear day of south weather, about the latter end of December or the beginning of January last, I happened to be looking at the Peak (as I often do) and observed several distinct and very copious gushes of steam issuing from the summit. In similar weather I had often seen a similar phenomenon, but never to anything like the same extent. I watched these steam gushes several times that day, and very remarkable they were. On going down to Port the following day, I found they had been seen by several people there, who declared that the peak was pouring forth volumes of smoke and flames. The so-called smoke was simply the steam gushes I have mentioned, and what were mistaken for flames I am convinced were nothing but the same steam gushes illumined by the rays of the setting sun. All agreed that after dark nothing was to be seen there, which certainly would not have been the case had there been fire or flames. As for the lava stream, *that* was a pure fiction of an excited brain. I have looked carefully at the Peak through my telescope, and see nothing but the old, black lava streams that I have known for the last fifty years, and I have spoken with one of the guides who has been lately with a party to the summit, and he declares he saw no trace of any eruption, or of anything different from what he has always seen there."

Then follow some other topics to the end of the letter proper; but to that there is appended the following P.S., which may be interesting to intending travellers this summer:—

"Last night (May 27), about an hour and a quarter after midnight, we had a smart shock of an earthquake which woke me out of a sound sleep and rather frightened us all. However, no damage was done, but here people say that eruptions of the volcano are always preceded by earthquakes; so who knows but that our eccentric friend's vision of the three bonfires and the lava stream may come to be verified after all. If the Peak has any intention of erupting again, I should be personally obliged to it if it would do so while I am still in the body. It would be a grand sight from our Sitio."

To any of the previously mentioned intending visitors to the island I would beg to recommend that they carry Dr. Marcet's recent neat little book on "Southern and Swiss Health Resorts." His descriptions of Teneriffe, and especially of Guajara on the great crater, and Alta Vista on the high peak, are graphic, and true though terse. Indeed the only point of difference I have with him is his reason for there not being forthwith erected a grand hotel on the elevated Canadas, high above the summer cloud level, in the driest air, strongest sunshine, and most curative conditions for the moist kinds of consumptive disease, which the whole of this planet would have to offer. The reason he gives is, that there is nothing to interest the invalids, or ordinary lady and gentleman travellers up there.

Yet there have long been mineralogy, geology, a peculiar, though scanty, botany, meteorology of a most commanding type, and astronomy under special advantages, inviting all the readers of NATURE to go there and participate in the mental feast; while now the probabilities each morning of witnessing from a distance a little real eruption, will add an exciting topic to the breakfast conversation and the noonday ramble.

C. PIAZZI SMYTH,

Astronomer-Royal for Scotland

15, Royal Terrace, Edinburgh, June 19

"Devil on Two Sticks"

WHY a game at once so graceful and attractive should have received such a christening I do not know, and I am equally at a loss to imagine how an outdoor sport like this, requiring skill and promoting a healthful exercise of the muscles, should have passed out of sight and become almost forgotten. Like Clerk Maxwell, I have played the game many a time some twenty years since, and hasten without further preliminary to describe it.