May 4, 1871

NATURAL

Let the Editor to the Editor

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

Pangenesis

It appears from Mr. Darwin’s letter to you in last week’s Nature, that the views contradicted by my experiments, published in the recent number of the “Proceedings of the Royal Society,” differ from those he entertained. Nevertheless, I think they are what his published account of Pangenesis (Animals, &c. under Domestication, ii. 374. 379) are most fitted to convey to the mind of a reader. The ambiguity is due to an inappropriate use of three separate words, in the only two sentences which imply (for there are none which tell us anything definite about) the habitat of the Pangenetic gemmules; the words are “circulate,” “freely,” and “diffused.” The proper meaning of the word “circulate” is evident enough—it is a re-entering movement. Nothing can justify its use, which does not return, after a while, to a former position. In a circulating library, books return and are re-issued. Coin is said to circulate, because it comes back into the same hands in the interchange of business. A word circulates, when a person hears it repeated over and over again in society. Blood has an undefined claim to be called a circulating fluid, and when that phrase is used, blood is always meant. I understood Mr. Darwin to speak of blood when he used the phrases “circulating freely,” and “the steady circulation of fluids,” especially as the other words “freely” and “diffusion” encouraged the idea. But now it seems that by circulation he meant “dispersion,” which is a totally different conception. Probably he used the word in some allusion to the fact of the dispersion having been carried on by eddying, not necessarily circulating, currents. Next, as to the word “freely.” Mr. Darwin says in his letter that he supposes the gemmules to pass through the solid walls of the tissues and cells; this is incompatible with the phrase “circulate freely.” Freely means “without retardation,” as we might say that a small fish can swim freely through the larger meshes of a net; now, it is impossible to suppose gemmules to pass through solid tissue without any retardation. “Freely” would be strictly applicable to gemmules drifting along with the stream of the blood, and it was in that sense I interpreted it. Lastly, I find fault with the word of the “diffused,” which applies to movement in or with fluids, and is inappropriate to the action I have just described of solid biting its way through solid. If Mr. Darwin had given in his work an additional paragraph or two to a description of the whereabouts of the gemmules which, in my view, is a cardinal point of his theory, my misapprehension of his meaning could hardly have occurred without more hesitancy than I experienced, but I certainly felt and endeavored to express in my memoir some shade of doubt; as in the phrase, p. 604, “that the doctrine of Pangenesis, pure and simple, as I have interpreted it, is incorrect.”

As I now understand Mr. Darwin’s meaning, the first passage (ii. 374), which misled me, and which stands: “. . . minute granules . . . which circulate freely throughout the system,” should be understood as “minute granules . . . which are dispersed thoroughly and are in continual movement throughout the system”; and the second passage (ii. 379), which now stands: “The gemmules in each organism must be thoroughly diffused; nor does this seem improbable,” should now follow: “The gemmules in each organism are dispersed all over it, in thorough intermixture; not does this seem improbable, considering . . .” the steady circulation of the blood, the continuous movement, and the ready diffusion of other fluids,
and the fact that the contents of each pollen grain have to pass through the coats, both of the pollen tube and of the embryonic sack.

(1 extract these later addenda from Mr. Darwin's letter.)

I do not much complain of having been sent on a false quest by ambiguous language, for I know how conscientious Mr. Darwin is in all he writes, how difficult it is to put thoughts into accurate speech, and, again, how words may have conveyed false impressions on the simplest matters in which Mr. Darwin has sketched of the first invention of language. Acknowledgments must of necessity have often occurred. I refer to the passage in which he supposes some unwisely wise ape-like animal to have first thought of some ordinary use of the ground, and to have grown from this to the best of prey so as to indicate to his fellow monkeys the nature of expected danger. For my part, I feel as it were hurrying my first step—so as not to be accosted by a word or a gesture, too little known to me or to my companions, to make my presence belated, but to my ears more like that of a hyena than any other animal, and seeing none of my companions stir a step, I, like a loyal member of the flock, dashed down a path of which I had only seen the hedges, I thought of the young, in the plain, but followed by the their threshold had been a little out of order—a thought was all that was needed. Well, my labour has not been in vain; it is something to have established the fact that there are no hyenas in the plain, and I think I see my way to a good position for a lookout for leopards among the branches of the tree.

In the meantime, Vice Pangenesis.

FRANCIS GALTON

The Hylotubes Ape and Mankind

The reader of Mr. Mivart's communication in Nature for April 20, on the affinities of the Hylotubes genus of ape to the human species, may be interested to learn that the fact was well known to the author of the Ramayana, the earliest Sanskrit epic, probably contemporaneous with the Iliad. In this poem, Rama subdued the demon Rakshasa by the aid of a huge axe, which may be identified with Hylotubes Hylotubes. The human characteristics of these semi-apes, their gentleness, affection, good humour, sagacity, self-importance, impressionability, and prudence to a marked extent, are portrayed with the most vivid strokes, and evidently from careful observation. See Miss Federica Richard-son's charming volume, "The Land of the East," a selection of legends drawn from the Ramayana.

(Macmillan and Co., 1870.)

K. G.

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Tables of Prime Numbers

When a number is given, and it is required, without the aid of tables, to find its factors, there is not, I believe, any other method known except the simple but laborious one of dividing it by every odd number until one is found that measures it, and if the number be prime, this can only be proved by showing that it is not divisible by any odd number less than its square root. Thus to prove that 46000 is prime, it would be necessary to divide by every odd number less than 2659, and even if a table of primes less than 2659 were at hand, about 380 divisions would be required.

On the other hand, there are few tables which are more easily constructed than tables of divisors, and it is the extreme facility of a systematic tabulation compared to the labor of isolated determinations, which has led to the construction of such elaborate tables on the subject as have been produced.

The principal tables are Chenier's, which give the factors of numbers from unity to a million; Burckhardt's, which extend as far as 3 millions, and Dase's, which form a continuation of Burckhardt's, and extend to ten millions.

The mode of formation of these tables was extremely simple. By successive additions, the multiples of 3, 5, 7, 11, 13, 17 ... were formed up to the limit to which the table was intended to extend; this gave all the numbers having these numbers for factors, and the primes were recognized by the fact of their not occurring as multiples of another prime less than themselves.

Practically the work was rendered even simpler by mechanical means; thus, forms were printed containing, say, a thousand squares, and in these were written consecutive thousands of odd numbers in order; one number in each square, room being left for divisors, if any, in the case of multiples of 3, 5, 7, 11, 13, 17 ... formed up to the limit of which the table was intended to extend; this gave the numbers having these numbers for factors, and the primes were recognized by the fact of their not occurring as multiples of another prime less than themselves.

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Units of Force and Energy

The last root for the name of a unit of force is "dynam," that is, therefore, no ground for Mr. Mair's complaint (Nature, v. p. 426), and I now venture to propose that the name dyne be given to that force which, acting on a gramme, produces a velocity of a metre per second. A thousand dyne make one kilodyne, and a million dyne make one megadyne.

Borrowing a hint from Mr. Mair, I should point out that the kilodyne may also be defined as the force which, acting on a kilogramme for a second, generates the velocity of a metre per second, or, as the force which, acting on a gramme for a second, generates a velocity of a kilogramme per second.

The kilo, or pound-force of customary units of force, is about 445 dyne. Very roughly expressed in terrestrial gravitation, the kilo is the gravitating force of half an ounce, the kilogramme of about 1¼ grains, the kilodyne of about ¼ of a pound, and the megadyne of 2 cwt. The approximations are closer in the case of the latter, so that within one part in 4, we have 4 megadyne = the force of terrestrial gravity on a ton.

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