

ticalars—that which is associated with the normal form of the species.

The "Lamarckian controversy" about which Sir Archdall Reid affects to be ignorant was, and is, as to whether the changes of structures set up in the manner indicated in Lamarck's first law are ever transmitted by generation to progeny. It has been demonstrated that such changes do occur, but no satisfactory evidence of their transmission by generation to progeny has been produced. It is admitted that, so far as we know, such a transmission is possible, and, in the period at which Lamarck wrote, the assumption that such transmission occurs was a reasonable one. But hitherto all attempts to give convincing demonstration of its occurrence have failed, though such attempts have been, and still are, made by able biologists.

Before concluding this letter, may I direct the attention of readers of NATURE to the correspondence on this subject which was started by Sir Edward Fry in 1894 (vol. li., p. 54), to which I contributed a long statement? Sir Edward, owing to his lack of acquaintance with Lamarck's writings, was genuinely misled by the term "acquired characters," then less familiar than it is to-day. E. RAY LANKESTER.

December 8.

IN NATURE of November 25 there appears a long letter from Sir Archdall Reid on the subject of heredity. In this letter he seeks to show that the whole controversy about the inheritability of acquired characters—perhaps the controversy of most vital importance in biology—is a mere "pother" about "words full of sound and fury, signifying nothing." "All the characters of the individual," he assures us, "are innate, acquired, and inheritable in exactly the same sense and degree."

Sir Archdall Reid must have a singularly poor opinion of the intelligence of his co-workers in the field of biology if he thinks that they have wasted, and are still wasting, their time in a meaningless controversy. The list of such "wasters," moreover, must include the honoured name of Darwin himself, who had a very clear idea of what was implied in the term "inheritance of acquired characters," only he termed it the "inheritance of the effects of use and disuse."

The fact is that the whole of Sir Archdall Reid's letter rests on a mere play with words. I recollect reading of a lawyer who, in defending a client on a charge of slander, maintained that "villain" was a perfectly harmless epithet, since logically and etymologically it only signified a servant employed on a farm.

Sir Archdall Reid begins by stating that all characters are acquired in response to external conditions, since there are no characters, but only potentialities, in the formless germ, and these potentialities will not be realised unless conditions are favourable. Did Sir Archdall Reid imagine that this was doubted by any biologist? Is it not, on the contrary, so elementary and self-evident that every biologist, in discussing genetic questions and assuming an irreducible minimum of intelligence in his hearers, takes it for granted?

If, however, Sir Archdall Reid thinks that such an assumption is unjustifiable, let me try to make the issue a little clearer.

The egg of any animal will only develop its innate possibilities as manifested in the features of the adult animal if the surroundings are favourable, but the development results in a definite type. If the surroundings are unfavourable the type may not come to fruition, but there will be an obvious attempt to

attain it; the egg of the shrimp, for instance, never shows any tendency to develop into the same form as the egg of a fish. There is, of course, for every egg a particular combination of circumstances which is especially favourable and may be termed the normal environment, and the normal life of the animal and the function of its organs consist in answering the demands made upon it by this environment.

If, now, the environment be altered to such a moderate extent that the animal is still able to respond to it, then the use of certain of the animal's organs and their growth will be altered. On that point all are agreed; the difference between opposing schools of biologists begins when the question is raised as to what will be the characters of the offspring of the altered individual.

The Neo-Darwinian or Weismannian school maintains that the germs produced by the altered animal will be precisely like the germ which gave rise to that animal. If they develop in the normal environment of the species they will give rise to individuals conforming to the normal specific type; if they develop in the same circumstances as their immediate parent they will show similar divergences from the specific type.

The Lamarckian school, on the other hand, contends that the germs of the altered animal *become themselves slightly altered*, so that if they are allowed to develop in the normal specific environment they may still in their earlier stages of growth show a trace of the altered structure of their parent; and, on the other hand, if they are allowed to develop in the same circumstances as their parent they will manifest the altered structure acquired by the parent *more rapidly and in stronger degree than did the parent*.

I have already had occasion to direct the attention of readers of NATURE to the fact that certain experimenters on the Continent claim to have established the truth of these two essential postulates of Lamarckism. This claim may be ill-founded or well-founded—that is a matter for argument—but no reasonable Neo-Darwinian would fail to admit that if the claim proves to be well-founded the Lamarckian position will be established.

Sir Archdall Reid states that, "apart from variation, like exactly begets like when parent and child develop under like conditions." Leaving aside for the moment the quibble about the word "variation," the Lamarckian contention is that like does not "exactly beget like," but that the influence of conditions on the character of the individuals composing a species is *cumulative from generation to generation*. There is a rapidly accumulating body of evidence in favour of this view; for a piece of evidence to which my attention has recently been directed I am indebted to my friend and colleague, Prof. Dendy. It is as follows: The peach in Europe is a deciduous tree. Transplanted to Réunion it has become an evergreen in the lowlands of that island, but has remained deciduous in the highlands. If a seed be taken from the evergreen tree and grown in the highlands it will still in the first generation give rise to an evergreen tree, although its ancestors were undoubtedly deciduous.

Finally, I should like to say that the sense in which I understand the word "variation," and the sense in which I think it is understood by the majority of my co-workers, is a divergence from the normal appearing among the offspring of a normal individual *when the normal environment remains unchanged*, and in that sense it should be used by Sir Archdall Reid.

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