

GAVIN DE BEER AND THE NEO-LAMARCKIANS

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During the early part of this century a number of neo-Lamarckians experimented and taught in various universities. Their names and works were at the time well known and respected. At the present time most undergraduate students and graduate students in biology in the United States seldom, if ever, study and investigate the contributions of these neo-Lamarckians. This lack of open-mindedness to their experiments may be due to the great Darwinian image of Sir Gavin de Beer, noted scientist, evolutionist and embryologist.

In his 1962 work, *Reflections of a Darwinian*, de Beer wrote :

Scarcely a day passes without the appearance of new evidence confirming the truth of the theory of evolution up to the hilt, and it is now universally accepted except by those who are too ignorant or too idle to acquaint themselves with the facts, or too obsessed by irrational considerations to follow scientific evidence wherever it may lead.

The history of natural selection as the agency responsible for the guidance of evolution has been confused by a school of thought which is based on fallacy, and by the interpretation of a great discovery which was for a long time misunderstood.

The fallacy was the Lamarckian supposition that by the effects of use and disuse of organs, the unconscious striving of organisms to meet their needs, and long-continued action by the environment, the organism underwent changes, and that these changes were transmitted to their descendants.¹

As far back as 1930 in *Embryology and Evolution* he recognized the evidence pertaining to the work done on Ammonites by Professor Hyatt but soon turned to Spath to discredit this recognition. He quoted Spath :

It may be necessary to assume an inverted geological order if our views of the biological order of Ammonities are to continue to be governed by discredited "laws" of recapitulation; and when the horizons of all these stocks are definitely known it is hoped to get good additional evidence for a final rejection of the views on ammonite development connected with the names of Hyatt and Wurtemberger.²

Between the latest two editions of *Embryos and Ancestors*, de Beer hardened his stand on the Lamarckian question. In the 1951 edition he declared :

It would be very convenient if it were possible to accept an explanation of the origin of internal factors and of their adaptive nature on the lines of Lamarck's hypothesis of the effects of use and disuse, but in the present state of knowledge it is not possible.³

Later on in the 1958 edition he was obdurate :

It would be very convenient if it were possible to accept an explanation of the origin of change in internal factors and of their adaptive nature on the lines of Lamarck's hypothesis of the effects of use and disuse, but the evidence is dead against it.⁴

Although de Beer presumably had access to the body of research accumulated by the neo-Lamarckians for the past eighty years, he apparently made no effort to surface this knowledge for objective evaluation. As one of the senior scientists in Great Britain, possessing an internationally respected reputation, de Beer has expressed a consistently negative attitude towards Lamarckian theory. His obvious distaste has discouraged a generation of historians of science and experimental biologists from further discussions of the validity of the neo-Lamarckian theory in academic circles.

The dissatisfaction with Darwinism and neo-Darwinism as an explanation for the mechanism of evolution evoked comment from a number of serious scientists in the latter half of the nineteenth century and the early part of the twentieth century. In 1890 John T. Cunningham, Fellow of University College, Oxford, in the preface to his translation of Eimer's *Organic Evolution* observed :

Whether it can be proved that adaptations are due to the inheritance of acquired characters or not, it is at least certain that the Lamarckian view explains the evolution of adaptations as perfectly as Weismann's theory. Nay, more perfectly, for the theory of selection can never get over the difficulty of the origin of entirely new characters.⁵

Neurologist and philosopher of science W. Russell Brain in 1927 in his famous essay *Galatea, or the Future of Darwinism* calls for a re-evaluation of the differences proclaimed by the neo-Darwinists between their theory and that of Lamarck.

I have tried to show in this essay that strict Neo-Darwinism, and the unsatisfactory mechanistic view of the Universe arising from it, rest upon these insecure foundations and that a modified form of Lamarckism can still hold its own as a theory of evolution. It must be emphasized that this Neo-Lamarckism does not dispute the principles of Neo-Darwinism—it merely adds another to them.

Charles Drawin, like Lamarck, believed that the inheritance of acquired characteristics played an important part in evolution. His followers have rejected this view. Is it rash to believe that the insight of the master led him nearer the truth than their agnosticism has brought his disciples and that the future of Darwinism is—Darwinism?⁶

In the same year William McDougall, Professor of Psychology at Duke University, spoke even more strongly in support of the Lamarckian thinking: "I have long felt that a long sustained experiment for the testing of Lamarck's hypothesis is a crying need."⁷

In addition to recognizing the merit of a Lamarckian approach on a theoretical basis, scientists were at work, experimentally, with the problem of the inheritance of acquired characteristics. The experimental findings of Fisher and McDougall suggested that there was a need for active and more sophisticated laboratory and field research. In France, Yves Delage, Professor of Comparative Zoology at the University of Paris, in *The Theories of Evolution* described Fisher's experiment:

Fisher's experiments, also on butterflies, are less open to criticism. He concentrated his attention upon the influence of temperature. Pupae of *Arctia caja* were exposed to a very low temperature, 8° centigrade; the butterflies showed certain abnormal modifications in pattern and colouring and even in the shape of wings and legs. Fisher cross-bred them, raising the pupae of the second generation in a normal temperature. Still, many of the hybrids presented some of the characters produced by a low temperature.

In this case distinct characters were transmitted to the offspring, for a modified wing is not merely a symptom of a defective condition. Here we have a bonafide example of hereditary transmission of a character acquired under the influence of the environment.⁸

In a longer sustaining experiment McDougall found the following results:

Twenty-three generations of rats have been trained in the tank to the performance of a specific task. The rats of the successive generations have displayed increasing facility in mastering this task. Whereas rats of the control stocks make on the average about 165 errors (and receive the same number of the shocks) before learning to avoid the shock, rats of the 23rd generation of trained stock make on the average only 25 errors; the latter have acquired a greatly increased facility in mastering the task, the increase being measured by the difference between 165 and 25 shocks required for learning.

The average degree of facility shown by any group of rats is in the main a function of their genetic constitution.

In the light of our present knowledge there would seem to be only two ways in which such change of constitution as is shown by the rats

of the trained stock can be brought about ; first, by steady selection of such variations or mutations as may occur in the direction of such change ; secondly, by transmission of modifications acquired by the rats in the course of training.

It seems very improbable that the former process, selection, can have played any appreciable part in producing the change of constitution here described ; and still more improbable that selection can have been the main or the sole process ; first, because selection (other than strictly random selection) was carefully avoided by me from first to last in the conduct of the experiment.....

It begins to look to me as though Lamarckian transmission were a real process in nature ; and I submit for criticism the proposition that, if continuance of the experiment, combining training with strongly adverse selection, should result in steadily increasing facility, the reality of Lamarckian transmission will have been demonstrated.⁹

CONCLUSION

As early as 1900 William Emerson Ritter of the Department of Zoology of the University of California, and later Director of Scripps Institution of Oceanography, advocated :

In conclusion, I may state in the form of a brief summary what, so far as I am able to make out, partly from evidence of the sort presented in this paper, but more from evidence that it has not been possible to touch at all, is the best that biological science is able to do at present with this difficult but vastly important problem.

1. Among the lower organisms, meaning by this not merely the protozoa and the protophyta, but including as well some of the lower metazoa and metaphyta, acquired characters may be transmitted.¹⁰

Fifty-eight years later H. Gram Cannon, Fellow of the Royal Society, in *The Evolution of Living Things*, stated categorically :

As I have already explained, Darwinism was dropped because it was found impossible to prove experimentally that the variations which he showed to exist were actually inherited. Now this has provided no stumbling-block for the modern geneticists. A new mutation called the Neo-Mendelian has turned up among them and they now state that Darwin's small variations simply must be inherited after all ! In other words, experimental proof of the inheritance of small fluctuating variations is no longer considered necessary ! Darwinism has come into its own again. It is accepted after being scorned but it is viewed through the rose-tinted spectacles of Neo-Mendelism and the votaries of this cult have been known to refer to themselves as Neo-Darwinians ! What would Darwin have said ?

But what about 'Lamarckism'? It has had no such revival. On the contrary it is condemned out and out. What Samuel Butler said in 1879, 'Lamarck has been so systematically laughed at that it amounts to little less than philosophical suicide for anyone to stand up on his behalf.' This applies *a fortiori* today.¹¹

Despite H. Gram Canon's appeal of twenty years ago, the achievements of the neo-Lamarckians are neglected today. During the period between 1880 and 1930 many great scientists in America and Europe spent their academic lifetimes experimenting with and teaching neo-Lamarckism, yet their work is without influence. If future scientists of the calibre of Gavin de Beer assume a more open-minded approach to the neo-Lamarckian question, perhaps we might better understand the many roads taken by Natural Selection.

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