

## BACK TO DARWIN

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**D**ARWIN and his contemporaries, at the time of publication of the second edition of his *Descent of man* in 1874, were unaware of Mendel's work on the gene mechanism and therefore considered inheritance in general terms. It was not Darwin's fault that his analysis was misunderstood by his successors who became aware of the genetic basis for inheritance of physical characteristics but ignored or were apparently unaware of what Huxley (1942) subsequently called the cultural component of man's evolution and whose characteristics are inherited indirectly by non-genetic means.

In an analysis of the cultural component of what de Chardin (1959) has called the *Phenomenon of man* it has been suggested (Crombie 1964, 1966) that this consists of the structure of knowledge of the environment as embodied in human memory, language, written and other records and the plastic component of behaviour as embodied explicitly in social customs, habits and rituals. Language is the two-way link between individuals and their culture. The final patterns of human behaviour in any society are determined by feed back from the culture which supplies or fills in the plastic component of human behaviour whose rigid component or code is genetically determined (Koestler 1964). The mechanism by which the plastic component is imprinted on the fixed genetic code is provided by authority acceptance in the young (Waddington 1960) and social conformancy or the desire to conform to the attitudes, values and social habits of his peers in the adult (Crombie 1964, 1966). The plasticity necessary for the system to operate resulted from neotony or foetalization (Crombie 1964, 1966).

The plastic component of behaviour appropriate to any culture is not directly subject therefore to natural selection, though indirectly it may be by the elimination of cultures which have unsatisfactory behaviour patterns. It acts primarily as the mechanism of adaptation by which any benefits which might accrue from the structure of

knowledge can be transmitted back to individuals in the form of appropriate behaviour.

Any new behaviour pattern which gives an individual some new advantage in exploiting his environment can rapidly be disseminated through his culture by the mechanisms of imitation, authority acceptance and social conformancy.

Language, however, and the structure of knowledge in general, are evolutionary sub-systems strongly influenced by natural selection (Bain 1874).

The rigid components of behaviour and their genetic codes have also been subject to the pressures of natural selection and are, for the time being, immutable. They can be classed broadly as either favouring the individual or the community with a balance which must obviously favour the community in all animals, including man, which exist in social groups.

The driving forces for the evolution of the structure of knowledge is the genetically determined problem solving abilities of man (Crombie 1964, 1966) acting by the mechanism of conjecture and refutation (Popper 1964) and for the evolution of language, the desire for inter-personal communication between individuals.

The evolutionary origins of this mechanism (Crombie 1966) demonstrate the pressures which secondary evolutionary systems, in this case knowledge of the environment including appropriate behaviour, and language have exerted on the physical evolution of man. The advantages which social life provided compared with solitary existence first favoured and then intensified by genetic selection the mechanisms concerned with inter-personal communication and particularly speech. In the same way the advantages flowing back from an ever-improving knowledge of the environment, including appropriate behaviour, first favoured and then improved by genetic selection, the plasticity of man's behaviour so that any advantage could rapidly be exploited. At the same time it first favoured and then improved by genetic selection, the problem solving abilities and drives of man which power the evolution of knowledge. It has been suggested that the genetic mechanism which natural selection exploited to achieve all this was foetalization or neotony (de Beer 1958, Crombie 1964, 1966). In this sense then the demands initially imposed by knowledge and language as evolutionary systems in their own right first influenced the behaviour of man and subsequently drastically transformed his genetic structure.

It is against this view of the phenomenon of man that Darwin's analysis should be reconsidered. The importance which he attached to the cultural background as part of man's inheritance is indicated

crudely by the allocation of 126 pages of his *Descent of man* to this subject explicitly and implicitly by the continuous references elsewhere.

He clearly stated that social groups could only remain in existence if the social instincts which drove animals to congregate were stronger than the selfish or self-preservation drives and that these instincts must have resulted from natural selection (as we would say now 'genetically determined'). He distinguished between the separate evolution of the social instincts in the individual and the evolution of the structure of knowledge. Within the structure of knowledge he recognized explicitly the evolution of language as a sub-system by natural selection and he was probably aware of Bain's suggestion (1874) that the whole structure of knowledge was evolving by processes of natural selection. Although he recognized that animals were problem solvers he did not explicitly state that this was the driving force for this evolution. He did, however, explicitly recognize the interaction between intellect and the use of language which provided the basis for further evolutionary improvement.

He was aware that the advantages accruing from an ever-improving knowledge of the environment were fed back to individuals via the plastic component of behaviour, but it was his interpretation of this plasticity, which is an adaptive mechanism, that was the cause of the subsequent misappraisal of this, possibly his most important work. He also recognized explicitly that this plasticity was unique to man and although he was aware of what he called 'regression' as an evolutionary mechanism, did not suggest that this was the basis of this plasticity. His views on this subject are logical, presented with his usual clarity and wealth of example, and are worthy of detailed comment. For instance, he states:

"... the social instincts lead an animal to take pleasure in the society of its fellows" ... and again ... "after the power of language had been acquired and the wishes of the community could be expressed, the common opinion how each member ought to act for the public good, would naturally become in a paramount degree the guide to action. But it should be borne in mind that however great weight we may attribute to public opinion, our regard for the approbation and disapprobation of our fellows depends on sympathy which we shall see, forms an essential part of the social instinct and is indeed its foundation stone. Lastly, habit in the individual would ultimately play a very important part in guiding the conduct of each member, for the social instinct together with sympathy is like any other instinct greatly strengthened by habit and so consequently would be obedience to the wishes and judgement of the community".

He also recognized the occasions when characteristics which favour the herd, group or community will be to the disadvantage of the individuals as such. In his balanced assessment of the evolution of social animals he had to accommodate this paradox and also the fact that the behaviour of the group, as expressed by the collective

behaviour of its constituent individuals, could evolve with considerable rapidity and not always as a result of simple natural selection acting on the group as a whole. For example, if natural selection were the only mechanism at work, one community would literally have to eliminate or absorb others as it progressed through various evolutionary changes to cultural systems which had advantage over previous systems. While history abounds in examples of such competitive elimination and absorption it also abounds in examples of simple improvement. It was to account for this that Darwin proposed that inheritance of characteristics acquired by usage could take place. This Lamarckian or Lysenko-like proposition has always been regarded as Darwin's biggest mistake and in so far as it is applied to the inheritance of the physical characteristics of individuals it must remain so. However, it is obvious from his *Descent of man* that he invoked this proposal to explain the evolution of the cultural basis of societies or groups in so far as this affected behaviour rather than the physical characteristics of individuals. If we accept his interpretation of inheritance in the general form in which Darwin used it, then he is merely making a statement about the plasticity of behaviour by which knowledge, evolved by natural selection, is enabled to influence the activities of individuals. It is true that from time to time he also proposed this mechanism to explain inheritance of physical characteristics apparently acquired by usage, but this would seem to have been done only because his observations about the evolution of the characteristics of social groups had made the proposal in that context irrefutable.

It would seem in retrospect that Darwin's misapplication of the mechanism of inheritance via the effects of usage to characteristics which we now recognize, could only be transmitted genetically, was a minor error compared with that of his successors who made the unwarranted assumption that the phenomenon of man consisted only of those characteristics with a physical basis which could be transmitted by the gene mechanism.

The importance of the extra genetic mechanisms in the inheritance of man's culture has only recently been fully appreciated. It seems probable that the reasons which have delayed the exploitation of Darwin's original and early realization of the most important constituent of the phenomenon of man were related to the rediscovery of Mendel's laws on the one hand and Freud's theories on the other. Mendel's laws were overwhelming in their exactness of fit with the facts of inheritance at least in so far as they applied to physical characteristics, and in their explanatory and predictive power. Their effect on thought in this field was similar to that of Newton's laws on physics.

Freud's theories produced an intense interest in the individual as

distinct from the social group to which he belonged even in those who violently disagreed with his particular views. This interest in man as an individual, which had been gaining momentum since the Renaissance, reached its peak in the first half of the twentieth century and only recently has interest widened again to man and his culture.

The stimulus—response view of behaviour and learning in particular, also coincided with the previous trend and further delayed the fuller view of behaviour which had been clear to Darwin. This was accentuated by the mechanistic outlook during those times and which still pervades much of scientific thinking with a depressing effect on the advancement of the social sciences in general.

### Summary

It is suggested that Darwin's use of the Lamarckian mechanism of inheritance through usage was entirely appropriate in the context of behaviour to which he mainly applied it. The plastic component of behaviour is the adaptive link between man and his culture both of which evolve under the influence of natural selection. Since the primary purpose of plastic behaviour is adaptation it is not itself directly subject to natural selection.

Darwin's misapplication of the mechanism of inheritance via the effects of usage to characteristics which we now recognize could only be transmitted genetically, is a small error compared with that of his successors who made the unwarranted assumption that the phenomenon of man consisted only of those characteristics with a physical basis which could be transmitted by the gene mechanism.

In this sense then the demands initially imposed by knowledge and language as evolutionary systems in their own right first influenced the behaviour of preprominids and subsequently drastically transformed their genetic structure via the mechanism of foetalization. This is the link which restores natural selection in place of Darwin's 'usage' in the chain between behaviour patterns and genetic inheritance.

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## APPENDIX

These extracts, from the *Descent of man*, 2nd edition, first published in 1874 and republished in 1901, by John Murray, London, are in the order in which they occur in the book. They have been kept separate rather than interpolated in the text of the paper. This is mainly because the logical order dictated by present knowledge and which governs the lay-out of the paper, varies considerably from the sequence adopted by Darwin.

- p. 138 "As Max Muller has well remarked:—' A struggle for life is constantly going on amongst the words and grammatical forms in each language. The better, the shorter, the easier forms are constantly gaining the upper hand, and they owe their success to their own inherent virtue '."
- p. 147 " These miserable and indirect consequences of our highest faculties may be compared with the incidental and occasional mistakes of the instincts of the lower animals."
- p. 186 " The wishes and opinions of the members of the same community, expressed at first orally, but later by writing also, either form the sole guides of our conduct, or greatly reinforce the social instincts . . . "
- p. 187 " But it is worthy of remark that a belief constantly inculcated during the early years of life, whilst the brain is impressible, appears to acquire almost the nature of an instinct; and the very essence of an instinct is that it is followed independently of reason."
- p. 188 "As soon as this virtue (humanity to lower animals) is honoured and practised by some few men, it spreads through instruction and example to the young, and eventually becomes incorporated in public opinion."
- p. 190 "Admitting for a moment that virtuous tendencies are inherited, it appears probable, at least in such cases as chastity, temperance, humanity to animals, &c., that they become first impressed on the mental organization through habit, instruction and example, continued during several generations in the same family, and in a quite subordinate degree, or not at all, by the individuals possessing such virtues having succeeded best in the struggle for life."
- p. 191 " . . . as man gradually advanced in intellectual power, and was enabled to trace the more remote consequences of his actions; as he acquired sufficient knowledge to reject baneful customs and superstitions; as he regarded more and more, not only the welfare, but the happiness of his fellow-men; as from habit, following on beneficial experience, instruction and example, his sympathies became more tender and widely diffused."
- p. 192 " Looking to the future there is no cause to fear that the social instincts will grow weaker, and we may expect that virtuous habits will grow stronger, becoming perhaps fixed by inheritance."
- p. 193 " Nevertheless the difference in mind between man and the higher animals, great as it is, certainly is one of degree and not of kind. We have seen that the senses and institutions, the various emotions and faculties, such as love, memory, attention, curiosity, imitation, reason,

&c., of which man boasts, may be found in an incipient, or even sometimes in a well-developed condition, in the lower animals. They are also capable of some inherited improvement, as we see in the domestic dog compared with the wolf or jackal."

- p. 194 "The half-art, half-instinct of language still bears the stamp of its gradual evolution."
- p. 195 "Mr Wallace, in an admirable paper before referred to, argues that man, after he had partially acquired those intellectual and moral faculties which distinguish him from the lower animals, would have been but little liable to bodily modifications through natural selection or any other means. For man is enabled through his mental faculties 'to keep with an unchanged body in harmony with the changing universe'."
- p. 198 "It deserves notice that, as soon as the progenitors of man became social (and this probably occurred at a very early period), the principle of imitation, and reason, and experience would have increased, and much modified the intellectual powers in a way of which we see only traces in the lower animals."
- p. 199 "Such social qualities, the paramount importance of which to the lower animals is disputed by no one, were no doubt acquired by the progenitors of man in a similar manner, namely, through natural selection, aided by inherited habit."
- p. 202 "We may therefore conclude that primeval man, at a very remote period, was influenced by the praise and blame of his fellows. It is obvious, that the members of the same tribe would approve of conduct which appeared to them to be for the general good, and would reprobate that which appeared evil. To do good unto others—to do unto others as ye would they should do unto you—is the foundation stone of morality. It is, therefore, hardly possible to exaggerate the importance during rude times of the love of praise and the dread of blame. A man who was not impelled by any deep, instinctive feeling, to sacrifice his life for the good of others, yet was roused to such actions by a sense of glory, would by his example excite the same wish for glory in other men, and would strengthen by exercise the noble feelings of admiration. He might thus do far more good to his tribe than be begetting offspring with a tendency to inherit his own high character."
- p. 210 "Great lawgivers, the founders of beneficent religions, great philosophers and discoverers in science, aid the progress of mankind in a far higher degree by their works than by leaving a numerous progeny."
- pp. 211  
-212 "With civilized nations, as far as an advanced standard of morality, and an increased number of fairly good men are concerned, natural selection apparently effects but little; though the fundamental social instincts were originally thus gained. But I have already said enough while treating of the lower races, on the causes which lead to the advance of morality, namely the approbation of our fellow men—the strengthening of our sympathies by habit—example and imitation—reason—experience, and even self-interest—instruction during youth and religious feelings."
- p. 216 "It is very difficult to say why one civilized nation rises, becomes more powerful, and spreads more widely, than another; or why the same nation progresses more quickly at one time than at another. We can only say that it depends on an increase in the actual number of the men endowed with high intellectual and moral faculties, as well as their

- standard of excellence. Corporeal structure appears to have little influence, except so far as vigour of body leads to vigour of mind.”
- p. 217 “The western nations of Europe, who now so immeasurably surpass their former savage progenitors, and stand at the summit of civilization, owe little or none of their superiority to direct inheritance from the old Greeks, though they owe much to the written works of that wonderful people.”
- p. 220 “The more efficient causes of progress seem to consist of a good education during youth whilst the brain is impressible, and of a high standard of excellence, inculcated by the ablest and best men, embodied in the laws, customs and traditions of the nation, and enforced by public opinion. It should, however, be borne in mind, that the enforcement of public opinion depends on our appreciation of the approbation and disapprobation of others; and this appreciation is founded on our sympathy, which it can hardly be doubted was originally developed through natural selection as one of the most important elements of the social instincts.”
- p. 932 “A great stride in the development of the intellect will have followed, as soon as the half-art and half-instinct of language came into use; for the continued use of language will have reacted on the brain and produced an inherited effect; and this again will have reacted on the improvement of language.”
- p. 935 “It is not improbable that after long practice virtuous tendencies may be inherited.”
- p. 945 “Important as the struggle for existence has been and even still is, yet as far as the highest part of man’s nature is concerned there are other agencies more important. For the moral qualities are advanced, either directly or indirectly, much more through the effects of habit, the reasoning powers, instruction, religion, &c., than through natural selection.”
- p. 100 “But man, perhaps, has somewhat fewer instincts than those possessed by the animals which come next to him in the series.”
- p. 101 “The fewness and the comparative simplicity of the instincts in the higher animals are remarkable in contrast with those of the lower animals.”
- pp. 103-104 “No doubt, as Mr Wallace has argued, much of the intelligent work done by man is due to imitation and not to reason.”
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