# MAN'S INHERITANCE

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INDIVIDUAL man's inheritance consists of everything which his forebears have passed on to him and which may influence his way of life. There are two main components of this inheritance. There is first and most obviously his genetic endowment which determines his physical structure and much of his behaviour. Secondly, perhaps less obvious but of increasing importance, are the non-genetically determined characteristics which are endowed by his culture but which have their origin in man's genetically determined characteristics.

*Hierarchic interaction*

The phenomenon of man (de Chardin 1959) is more than a summation of the properties of man as a group of individuals and results from the interaction of social man and his culture.

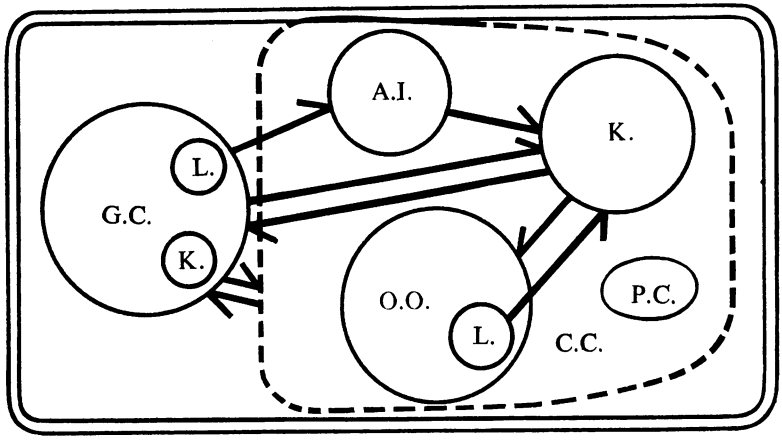
All hierarchic interaction introduces something new into the universe whether it be of the subatomic particles to form atoms and simple molecules, of simple molecules when they form biological material, of simple biological cycles to form the interlocking homeostatic biochemical systems which constitute the basis of the cell, of the interlocking hierarchic arrangements of simple cells to form organs or of similar interlocking hierarchic arrangements of simple reflex circuits to form nervous systems. Hierarchic interaction of this sort is the essence of creativity.

The basic interacting components in the hierarchic structure of the phenomenon of man are expressed diagramatically in figure 6, but the details of this present structure are best considered against their evolutionary development.

*The evolution of the phenomenon of man*

The complete adult animal consists of his physical structure and behaviour codes as laid down by genetic mechanisms. The detail of his total behaviour, and to some extent also his final structure, are completed by feed-back from his environment. The restriction

of the genetic component to a minimum, genetic parsimony, is a general principle of nature (Koestler 1964). The principle is based on the fact that the environment, whether it be inorganic, organisms of other species or organisms of the same species, shows regularities and to the extent that these regularities can be relied on, the gene mechanism concentrates on the transmission of information which cannot be obtained by consistent feed-back from these regularities of nature. The main area in which this feed-back is evident is behaviour rather than structure. However, at the earliest phases of the evolutionary process, most of the behaviour or activity of the organism would have been completely genetically determined.




A.I. = Artificial intelligence

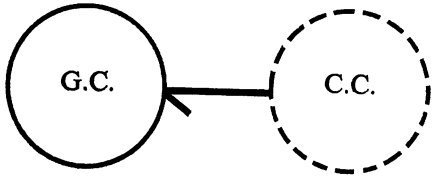
Figure 6.
The phenomenon of man

The relationship between the genetic component (G.C.) of the final form of the organism including its behaviour codes, and the non-genetically determined component or cultural component (C.C.) is shown in figure 2. At this stage the cultural component and the genetic component together are already equivalent to the phenomenon of man and there is no point at which this title can be said to apply suddenly.

*Behaviour patterns*

From the evolutionary point of view behaviour has two main components. There is first, the motivational component or core and secondly its form of expression as a complete behaviour pattern. In social animals, including man, the main motivational components are subsumed under the following main headings (Crombie 1964, 1966), individual or self-preservation drives, social drives, sex drives, aggressive and competitive drives, curiosity, exploratory and

problem solving drives and authority acceptance and social conformancy drives. These last two are subdivisions of the social drives and along with the problem solving drives are exceptionally developed in man. The motivational component or core is almost analogous to Koestler's genetic code (figure 1). The final patterns of behaviour, completed by the addition of the specification for detailed activity to the motivational core, can be classified into four types (figure 1). The dotted line represents the division between the genetically determined structure of the organism, including the genetic component of behaviour, and the environment. In the context of behaviour the environment is the cultural component of the phenomenon of man.




G.C. = Genetic component
C.C. = Cultural component.

Figure 2.
The evolution of the phenomenon of man

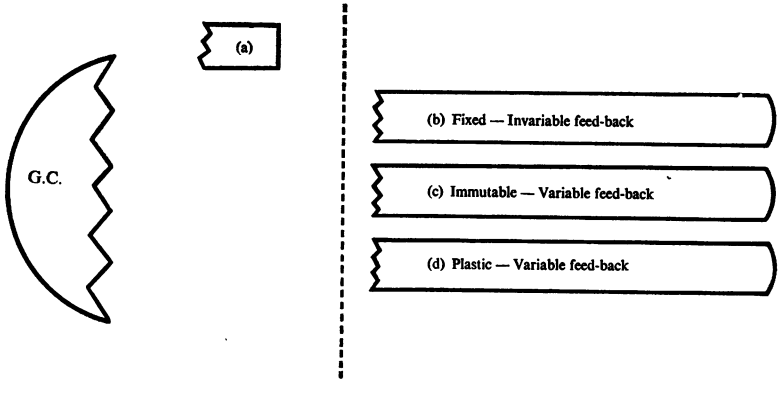



Figure 1.
The structure of human behaviour.
G.C. = Motivational core or genetic component.
Dotted line = Boundary between organism and environment.

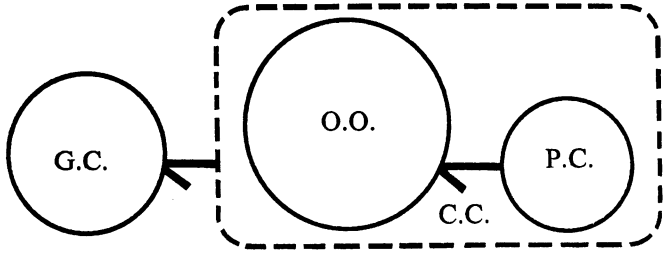
In the first type of behaviour pattern (*a*) the details as well as the motivational core or code are determined entirely by genetic mechanism within the organism. In the second type (*b*) the details are

provided by the environment but are invariable so that the final patterns of behaviour are both invariable and fixed for the life of the organism. In type (*c*) the feed back from the environment may be variable so that a variety of final forms are possible. However, once the pattern is fixed (imprinted) it remains immutable and unchanging for the rest of the life of the organism. In type (*d*) the feed back is variable and the link with the motivational core is temporary only so that the final patterns are plastic and changeable during the life of the organism.

Man is distinguished from all other animals by his possession of behaviour patterns which belong almost entirely to groups (*c*) and (*d*). A certain flexibility can be given to behaviour patterns in class (*c*) by the fact that more than one final pattern may be attached to any motivational core and be available as alternatives of behaviour in appropriate situations.

*The link between the genetic and cultural components*

In social animals, such as man, the most important element in feed back from the environment comes from other members of the species (O.O.) rather than the inorganic or physical component of the environment (P.C., figure 3), and the most important effect of this feed back is on the final behaviour of the developing animal rather than on its physical structure. Examples of this relationship

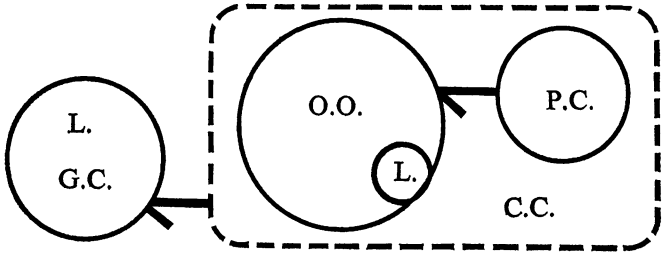



O.O. = Other organisms.
P.C. = Physical component of C.C.

Figure 3.

are seen in the imprinting mechanisms by which graylag goslings can be made to accept permanently any suitably shaped structure as their mother substitute if this is presented visually instead of the true mother goose at the appropriate time (Lorenz 1952). Imprinting merges imperceptibly with the more complex relationship of teaching and learning which provides even greater evolutionary opportunity to a species which can utilize it (figure 4). The one way arrow from the cultural to the genetic component now represents authority accepting mechanisms in the young (Waddington

1960) and, at a later evolutionary stage, the drives in adults to teach the young. At a later evolutionary stage still, curiosity and problem solving drives in the young supplement the authority accepting mechanisms (Crombie 1966).




L = Language.

Figure 4.

Except perhaps in the earliest phases of this process, part of the final pattern of behaviour is always filled in by feed-back from the environment. Where the feed back is invariable the final patterns of behaviour will be rigid and invariable also. The patterns of behaviour of the individuals who constitute the social group will, however, show the usual biological variations as will, therefore, the behaviour patterns of the various different groups. Natural selection acting on these variations will lead to elimination of inferior patterns with the elimination or cultural absorption of groups or communities which exhibit them in favour of groups of communities with more favourable patterns.

At this stage, therefore, we have now added to the direct effect of natural selection on the individual organism acting via its genetic mechanism, the secondary effects from natural selection acting on the rigid behaviour patterns of the social groups. The evolution of the cultural component, which at this stage consists only of the non-genetically determined component of behaviour, is virtually a subsystem of the main evolutionary process based on the gene mechanism.

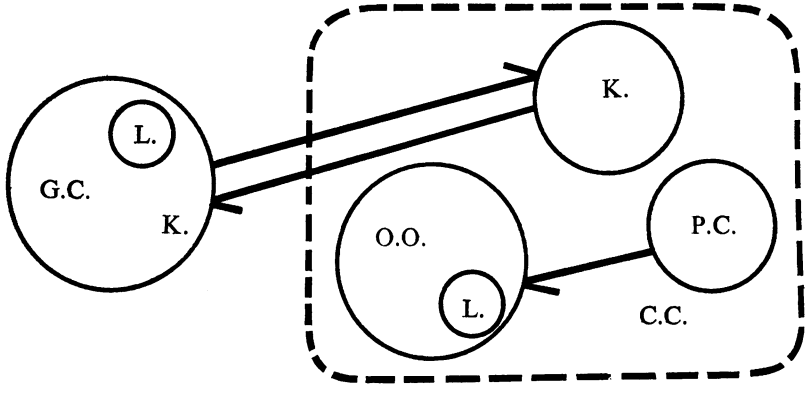
*The structure of the cultural component*

At a later stage still, the advantages of social over solitary living stimulated the production of ever more effective mechanisms for two-way interpersonal communication and culminated in language (L, figure 4). Language immediately introduced a pool of information about the environment. This extra-genetic knowledge (K,

figure 5), was initially only implicit in the structure of the language but increasingly also in the memories of individual man, and in spoken ritual, poems, laws, etc. The size of this pool was obviously limited until the introduction of written and other physically recorded records laid the way for the recent explosive increase in the structure of knowledge.

The structure of language is subject to evolution partly at least by natural selection and is, therefore, a subsystem of the original cultural component. This was known to Darwin (1874) and his contemporaries. He even recognized that the necessary variation on which natural selection could operate was provided by man's love of novelty and variety in general but especially in his use of language.

The structure of knowledge is also evolving under the influence of the curiosity and problem solving drives of man. These act by what Popper (1963) has called the mechanism of 'conjecture and refutation' and is represented by the one-way arrow between the genetic component of individual man and knowledge in figure 5.




K = Knowledge.

Figure 5.

The concept that knowledge evolves by the process of natural selection was also known to Darwin's contemporaries (Bain 1874). Knowledge is therefore a further secondary evolving subsystem of the cultural component. The curiosity and problem solving drives necessary for powering the evolution of knowledge were provided by the process of foetalization (Crombie 1964, 1966) which also lead to a marked plasticity in man's adult behaviour with great reduction in his rigid behaviour (Darwin 1874). Foetalization enabled extension of the authority acceptance mechanisms of child-

hood into adult life as the drive for social conformancy so that man could take advantage of the increased plasticity of his behaviour. Social conformancy subsumes the desire to conform to the attitudes and values of his peers, the desire of social man to imitate his peers, particularly in social habits and ritual, and the desire to present as his personality what he believes his peers expect of him. This increased plasticity enables man to adapt his behaviour patterns as rapidly as possible to changes in his environment and in particular to the changes which result from the increasing consistency and explanatory power of the structure of knowledge. This can only influence the evolution of man by its secondary effect on his patterns of behaviour.

All evolutionary systems require a memory mechanism (Crombie 1964). This is a store of the results of past trials by natural selection so that the organism need not repeat them in the future. The gene mechanism consists mainly of a store of the results of successful trials but many of the less successful characteristics are also in the store and can be retrieved by various manipulations. The structure of language and knowledge constitute their own memory store as does the structure of fixed or rigid behaviour. It is the lack of any memory mechanism which results in the weak evolutionary tendencies of plastic behaviour. This is not surprising for the main evolutionary function of plastic behaviour is adaptability.

The final addition to the cultural component of man's evolution is artificial intelligence (A.I, figure 6). This is a product of man's problem solving drives in conjunction with knowledge. So far, artificial intelligence has only influenced knowledge and therefore the behaviour of man indirectly. Artificial intelligence in so far as it is a part of the subsystem of knowledge, also evolves by processes of natural selection and has now reached the stage where the problem solving drives, at the moment the prerogative of man and on which the whole subsystem depends, may be short circuited and replaced, at least in part, by building similar mechanisms into artificial intelligence.

The interaction of these components, however complex they may seem, constitutes only the skeleton of the phenomenon of man and his inheritance. The flesh of his feelings of awe and wonder, his sense of aesthetic appreciation and his emotions evade simple analysis. However, if this concept of the cultural component of man's evolution is used in place of 'inheritance by usage' which Darwin (1874) invoked to explain man's behaviour, then there is still no better analysis of the evolutionary background to these and other aspects than that given by Darwin in his *Descent of man* nearly 100 years ago.

Whatever the ultimate constitution and complexity of the cultural

component may be it can only find expression in nature through any influence it may have on man's behaviour. Man's genetic endowment is the gateway to the phenomenon of man just as the first self-replicating molecule or system of molecules was the gateway to the whole of organic life as we know it on this planet.

In this respect, as Darwin (1874) and Wallace (1864) realized, man's future lies not in his further genetic evolution but in the fullest exploitation of his present genetic endowment.

The other conclusion which can be drawn from this analysis is that the cultural component has a life of its own and represents an evolving system which individual man himself has ceased to be. The essential components of any evolutionary system are (Campbell 1965, Popper 1963 and Crombie 1964):

(1) A mechanism for introducing variation (conjectural mechanism);
(2) A consistent selection process (refutation);
(3) A mechanism for preserving and reproducing the selected variations (a memory device with feed-back);
(4) Motivational devices.

In this sense, therefore, (figure 6) the cultural component uses man's genetically determined intellectual powers, and his problem solving and competitive drives as the motivational and conjectural mechanism to power the evolution of the structure of knowledge. It uses man's powers of logical refutation and artificial intelligence as the selection process. It uses its own physical structure in the form of written and visual records, books, machines, computers, and so on, as the memory device and reproduces the selected variations via the feed back mechanism of the plastic behaviour patterns of man. In this sense then the cultural component *imposed* foetalization on man in order to provide the motivational, conjectural, refutation and feed-back mechanisms. At the same time the cultural component has had to accommodate from its point of view, the secondary problems which arose from the freeing of man's sexual and aggressive drives from their previous control by rigid behaviour patterns. It has to accommodate also, the enormous increase in man's capacity for aesthetic expression and emotional fulfilment. We should not too lightly accept the view that man is master of his fate.

## Summary

Man's inheritance consists of his genetic and cultural endowments which together constitute the phenomenon of man. The genetic component, although the basis for the whole of the phenomenon of man, has for all intents and purposes finished its evolution by natural selection.

The cultural component, representing initially fixed or rigid

behaviour now also includes the plastic component of man's behaviour, language, systematized knowledge of the environment and artificial intelligence. These last three are subsystems of the original cultural component and are evolving partly at least by natural selection at a relatively enormous pace compared with that of the previous genetic phase. The components of the cultural phase can only influence individual man through their effect on his behaviour.

The effect of natural selection on biological material is to evolve systems which have increasing control over and independance from their environment (Huxley 1942). In this sense natural selection is using the genetic structure of man as a base for a superstructure in which natural selection now acts only on the components other than man himself. The cultural component therefore has very much an existence of its own. It owes no more to man than the first self-replicating molecular system did to its non-biological environment. That this may not be entirely to man's personal advantage is suggested by the fact that much of his emotional ills may have their origin in the demands which the cultural component makes on him (Crombie 1966).

If the concept presented here is correct, man still has the ultimate control over his total non-genetic inheritance if he understands it and cares to manipulate it rationally but is now only one component in a rapidly evolving complex system.

It would seem rational, therefore, to consider not only the genetic inheritance of man from his past on the one hand but also his inheritance from his culture. We should also consider the inheritance of the cultural component from man as a separate but interrelated issue.

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