Cultural Evolution - The Meme Hypothesis

"Most of what is unusual about man can be summed up in one word: 'culture'."[1]

Whilst it is contentious to claim that culture is humans' *only* distinguishing feature, nonetheless it seems clear that culture is one unique and fascinating aspect of our species. In this context, "culture" is not intended to be either a description of a narrow range of purely artistic pursuits, or a synonym for "society". "A *society* refers to an actual group of people and how they order their social relations. A *culture* ... refers to a body of socially transmitted information"[2] - the full spectrum of ideas, beliefs, skills, etc. that are available to us in society. It includes music, scientific theories, methods of transport, carpentry, literature, technology, art, clothing, mathematics, cartography, theatre, dry-stone-walling ... in short, the collective product of human activities and thought.

How did this body of knowledge and methods emerge? How does it now continue to develop? The hypothesis to be considered in this paper, is that culture is subject to some form of evolution. In order to test such a conjecture, though, it must first be decided which *sort* of evolutionary explanation is appropriate. Perhaps the most obvious answer, is that our cultural traits have evolved by just the same processes of natural selection, as have all our other traits. The best available account of their development will, then, be ultimately biological - a specific application of Darwinism. An alternative, is that culture owes more to nurture than to nature: that its evolution is an autonomous process, analogous to that in biology, but independent of it.

I turn first to the view that culture has evolved biologically.

Sociobiology

The name most immediately connected with the theory of evolution, is of course that of Charles Darwin. Since he believed that human behaviour can be attributed to just the same laws of descent as that of other species, it may be that sociobiology is the most appropriate means of studying human society. Sociobiology is "defined as the systematic study of the biological basis of all forms of social behaviour, in all kinds of organisms, including man."[3] Wilson does not claim exclusive control for our genes: he accepts that they interact with our cultural environment, during our development. Nonetheless, in response to the question to what *extent* human social behaviour is genetically determined, he replies that "The

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[1] Dawkins, 1989 p. 189
[2] Barkhow, 1989, p. 118
[3] Wilson, 1978, p. 16

accumulated evidence for a large hereditary component is ... decisive."[4] In fact he goes even further, as can be seen in the following quotation:

> "If the brain evolved by natural selection, even the capacities to select particular esthetic [*sic*] judgements and religious beliefs must have arisen by the same mechanistic process. They are either direct adaptations to past environments in which ancestral human populations evolved or at most constructions thrown up secondarily by deeper, less visible activities that were once adaptive in this stricter, biological sense."[5]

Cultural evolution, then, is forced along the paths permitted by genetic determinism: although some autonomy is allowed, there is a limit "beyond which biological evolution will begin to pull cultural evolution back to itself"[6]; "cultures are not superorganisms that evolve by their own dynamics."[7]

Suggestions about how our biology might influence our culture are not limited to the mainstream sociobiologists: notoriously, Desmond Morris has labelled *homo sapiens* "the naked ape"[8], and accounts for a vast range of present-day human behaviour by reference to ancient biological selection pressures. The chief problem with Morris's theory is that it does not in practice always remain true to his declared intent "largely to ignore the detailed ramifications of technology and verbalisation, and concentrate instead on those aspects of our lives that have obvious counterparts in other species"[9]. Rather, he quite frequently tries to explain specific features of particular cultures as the result of Darwinian selection, and fails to ask why - if such behaviour is the result of the human genotype - it is only found in that particular culture. Moreover, his explanations can appear to be distinctly *ad hoc* (e.g. his explanation[10] of the 'fact' that all people who eat alone in public feel uncomfortable: he claims that humans' carnivorous ancestry means that they are naturally inclined to make eating a social occasion; yet if people are uncomfortable in this situation, may it not simply be because they are alone in what is traditionally a meeting place? Would the same people really feel awkward about eating alone at home?).

Even when considering more mainstream sociobiology, we must be careful in our use of the term "genetically determined". Sociobiology assumes that genes are a more significant factor than the environment in controlling our social behaviour, but this leaves open the question what *level* of social detail our genes control. There is nothing very interesting about the claim that broad, general aspects of social behaviour will, if advantageous, be selected: the whole point of society is to protect its members' genes and encourage their propagation, so behaviour or attitudes that tend to preserve social structures will (amongst social

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[4] Wilson, 1978, p. 19
[5] Wilson, 1978, p. 2
[6] Wilson, 1978, p. 80
[7] Wilson, 1978, p. 78
[8] 1968
[9] 1968, p. 11
[10] BBC1, *The human animal*, 3rd August 1994

organisms) be favoured. On the other hand, this observation does not entail that specific, obscure features of society - its *cultural* facets - are genetically controlled. It is at least conceivable that the immense variation, amongst cultures, shows that many of the specific details are not genetically controlled.

On the other hand, sociobiologists may claim that "however it may work in detail, culture will usually enhance genetic fitness"[11] - and this does seem plausible, given the organic origin of the human capacity for culture. Trivial variations would not, if this were true, offer any challenge to the sociobiological hypothesis. So - is it a valid assertion? I think that it needs to be examined more closely, and should like to highlight three different ways in which it is open to misinterpretation.

Certainly, our *general* capacity for culture could not have evolved had it not initially been adaptively advantageous: the early development of the mind and of culture must have provided us with a mechanism to ensure that more of the successful cultural traits were beneficial than were harmful to us (because we still exist). It seems likely, in any case, that an advanced capacity for learning *would* have increased fitness[12]. My first point, though, is that this does not imply that each *particular* cultural trait will increase fitness.

Secondly, the above assertion must also be distinguished from the claim that there will still, today, be a general correlation between cultural habits' popularity, and their helpfulness to us. Today the rate of cultural development is so great that most changes will be *neutral* with respect to our biological survival. There is an enormous disparity between modern culture and that of previous millennia, yet there is no reason to believe that the human brain of one, or even two thousand years ago was dissimilar to ours. This surely implies that the pace of cultural change is much too rapid to be picked up at the level of genes.

My third point also arises from the striking difference between the rates at which the physical and cultural worlds change. Think, for example, of the development of the computer, whose adaptive advantage is immeasurable - yet it would be ridiculous to assert that the human genetic code has changed to accommodate its understanding. This tells us that we must distinguish between the true fact that all human behaviour will fall within the potential range permitted by our genetic code, and the invalid deduction that where there is adaptive behaviour, there is always a genetic basis for it.

Clearly, none of the above undermines the claim that at least some of our cultural heritage is the product of our genes. What it does imply, is that sociobiology's application is more limited than its adherents maintain: it is relevant only to those cultural traits which are genetically determined. Sociobiology is simply a particular branch of the study of genes'

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[11] Boyd and Richerson, 1985, p. 13

[12] "In many circumstances the behavior of experienced conspecifics is closer, on average, to the optimal behavior than the behavior that a naive individual could discover by itself. If imitation is also easier than trial-and-error learning, then it seems plausible that social learning would be favored by selection." - Boyd and Richerson, 1985, p. 288

effects - in this case, their effects on our culture. Thus it is inadequate to account for the *whole* of culture, since it appears that at least some culture is learnt rather than inherited (i.e. *any* branch of genetics is irrelevant to it). We shall therefore need another hypothesis, to account for the emergence and development of this portion of our culture. If we wish to stick with the evolutionary hypothesis, then perhaps it is more appropriate to bring it to bear on behaviour and the mind, than on neural architecture and its genetic code.

Of course, even the successful interpretation of such an hypothesis will leave unanswered the question *where* we should draw the line between genetic and environmental (i.e. cultural) control over behaviour. The closer this line is to the 'innate' extreme, the more significant will be the claims of sociobiology; the closer it is to the 'cultural' extreme, the less plausible they will be. I shall return to this issue at the end.

Cultural evolution

The suggestion that evolution is not restricted to biology, but may also take place in the mental and cultural worlds, is appealing if hardly original. A metaphorical picture is often painted of ideas, theories, etc. 'evolving' through time, but can it ever justifiably be taken literally? That is, does Darwinism illustrate a process that can be applied to the mental and cultural at any level other than the fact that we, the subjects of minds and culture, are the products of biological descent? In order to answer this question, the consequences of the fundamental elements of evolutionary theory have to be worked out for the mental and cultural. The key problem is whether we can meaningfully apply to these areas the basic requirements for evolution: what would replication, variation or selection *be* in relation to mind and culture? Not until this has been explained, can we see whether there is genuine evolution of the mental and cultural.

Several writers, in recent years, have constructed models of how culture is transmitted and developed via social interaction. Amongst these are Cavalli-Sforza and Feldman (1981), Boyd and Richerson (1985), Barkhow (1989), Durham (1990 - he also quotes Lumsden and Wilson as a source). All refer to some sort of autonomous, cultural evolutionary process. Unfortunately there is not room, in this paper, to do justice to every variant of the cultural evolution hypothesis, so I have chosen to concentrate on just one: Richard Dawkins' "meme" theory.

There are several reasons for this focus. Firstly, *all* versions of a theory of cultural evolution are, for now at least, merely speculative. Thus it seems to me pointless to devote much time to their relative merits: better to use one model as an illustration, working on any inadequacies as necessary. Secondly, Dawkins himself has made some very strong claims about its theological significance, which it might be interesting to investigate. Thirdly, Dawkins' thesis is appealing because of its close analogy with neo-Darwinism: the mechanism it postulates for cultural evolution is simply a cultural analogue of the gene.

The meme hypothesis

Dawkins says that "Darwinism is too big a theory to be confined to the narrow context of the gene."[13] What is its *essential* feature? It is the differential survival of replicators - *any* replicators. Whatever the type of replicator involved, he conjectures, their variation under conditions of restricted resources would lead to a form of evolution.

In particular, he turns his attention to mental and cultural replicators (memes), for which he postulates a new form of selection, such that "once the genes have provided their survival machines with brains that are capable of rapid imitation, the memes will automatically take over."[14] A meme is any "unit of information residing in a brain"[15] that is capable of replication; like a gene, it should be regarded as distinct from "its phenotypic effects, which are its consequences in the outside world"[16]. Thus it will, like a gene, be successful 'by proxy': via its phenotypic effects (the external consequences of that piece of information). Words, skills, and music are "the outward and visible (audible, etc.) manifestations of the memes within the brain"[17], which are transmitted between individuals via their sense organs, leaving on the recipient's brain a (not necessarily exact) copy that is free to transmit again.

As examples of memes, Dawkins suggests ideas, catch-phrases, tunes (or snatches of tunes), fashions and skills. As with genes, the constituents of success will be long life, fecundity and accuracy of replication. The element of competition necessary for any selection to take place is introduced by the brain's limited attention: in order to dominate, a meme must distract the brain's attention from other memes. Success in this matter will depend upon the structure of the brain, as well as on the stability of the meme and its "penetrance in the cultural environment"[18]. The latter will depend on psychological appeal, and according to Dawkins this means (as for genes) that co-adapted complexes - i.e. evolutionarily stable sets of memes - will occur. Selection will favour those memes capable of exploiting the current cultural environment, which obviously includes other memes also trying to be selected. As sets of memes co-operate, new ones will find it more difficult to penetrate the environment later: the complex provides protection against invasion. Particularly in areas such as theories of science will the compatibility rule apply. For other types of memes different criteria will apply - 'catchiness' for tunes, for example.

Dawkins emphasizes that memes' success will *not* depend on the (dis)advantages they produce for the genotypes that gave rise to the brains they inhabit. Memes, like genes, are selfish: their success depends on the advantages that they confer on *themselves*. In the struggle for brains' attention, they must in some way be 'better' than their rivals, but this need

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[13] 1989, p. 191
[14] 1989, p. 200
[15] Dawkins, 1982, p. 109.
[16] *Ibid*.
[17] 1982, p. 109
[18] 1989, p. 193

have nothing to do with the effects that they have on their possessors' genes' success. "Selection favours memes that exploit their cultural environment to their own advantage."[19] Although the needs of genes and memes may often coincide (a meme will not last long if causes its possessor to die before he can transmit it, for example), they may sometimes be in complete opposition: Dawkins uses the example of a meme for celibacy to illustrate this possibility.

The gene-meme analogy

Notice that, although 'memetic' evolution may for convenience be referred to as 'analogous to' genetic evolution, this should not be taken to imply that the former is theoretically dependent on the latter. Whilst it is true that in the chronological order of theoretical development, memetic evolution has been inspired by the theory of genetic evolution, this is not the order of explanatory dependence. Rather, both are examples of a more abstract, generally applicable theory of the evolution of replicators under conditions of competition.

In fact the use of the term 'analogy', in this context, deserves closer attention. Usually this term implies that at least one side of the comparison is fairly well developed - we talk about electric 'current', for instance, because water flow is familiar to us - and an analogy would not be of any use if this were not the case. Another sort of scientific comparison, however, is exemplified by gravitational and electrostatic forces, where a new student can easily see the similarity between Newton's law of universal gravitation:

"The force between two masses is directly proportional to the product of their masses and inversely proportional to the square of their separation."

and Coulomb's law:

"The force between two point charges is directly proportional to the product of their charges and inversely proportional to the square of their separation."

without being familiar with either field. The relationship between memetics and genetics is best understood as a combination of these alternatives. A meme (if it exists at all) is not, strictly speaking, an analogue of a gene: rather it is a different token of the same type of entity, a replicator. Similarly, mental evolution is (if true) a different example of the same type of process as neo-Darwinism, rather than a simple analogue of it. The two processes have the same description at a sufficiently functional, abstract level. Nonetheless, because we are already familiar with genetics, we can use it to illuminate memetics.

In summary: although we should not expect the particular details of biological evolution to carry over into mental evolution, it seems reasonable to exploit our knowledge of neo-

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[19] Dawkins, 1989, p. 199

Darwinism as a guide to what the essential elements of mental evolution might be. This sort of comparison between two phenomena is far from unique in science, where it is quite common to find different tokens of the same type of process realized within different media (c.f. the fact that wave properties such as diffraction, interference, refraction, etc. may all be observed in water waves as well as in electromagnetic and sound waves). As Darden and Cain point out, "comparison of two examples is a good way to locate what is most important", and helps in "pruning away content and leaving essentials"[20].

Support for the meme hypothesis

Having clarified the nature of its relationship to genetics, the question remains why (if at all) we should accept the meme hypothesis.

For Darwin, the starting point of his line of thought about natural selection, was that variations occur within the traits of a species. Variation seems to be a good starting place for a theory of mental evolution, too. There are often marked differences amongst the beliefs and practices of those who would claim to have the same concept, skill or idea, and it is possible to trace the extent of such variation to the point where two people at either extreme of it would deny that they have the same idea at all. Two people who share what might loosely be called the "same" skill, of piano-playing, may more accurately be classified into two separate categories: concert pianists and jazz improvisers, for example. Two people who share what might loosely be called the same life-style and set of beliefs, and both call themselves Christians, may more appropriately be referred to as Greek Orthodox and Methodist. In other words, it seems fairly uncontentious to note that there is variation within those aspects of our mental and cultural life that might be regarded as memes.

How might memetic variations occur? For genes, mutation is perhaps the most obvious factor in the production of variation, but in fact the more frequent means of variation is recombination. Although it would not be appropriate to try to extrapolate from the detailed structural ways in which genetic variation occurs, to the ways in which memetic variation might occur, still it might be useful to discuss the nature of (and limitations on) this aspect of evolution as applied to genes. Such a discussion should illuminate the significant elements of the variation that is necessary for evolution.

One of the most significant features of genetic variation, is that there are limits on the 'innovation' to which it can give rise. There are obvious limitations on possible recombinations, in that alleles have to correspond and the possible recombinations are, though rich, finite with respect to any given gene pool. Popularly, however, genetic mutation is referred to as 'random' and, unless used with care, this term may easily lead to confusion - it certainly does not mean that all genetic changes are equally likely. 'Random' is a context-dependent term, used to indicate that its subject is free from a specific form of causal control.

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[20] 1989, p. 109

If it is used independently of that context, i.e. without specifying from which kind of control a process is free, then the term becomes confusing and perhaps even meaningless. The important sense in which genetic mutation *is* random, is that it entails "no general bias towards bodily improvement"[21] (rather, most mutation is probably fatal). Evolution's tendency towards improvement stems solely from natural selection.

What are the implications for memes, of this brief discussion of genetic mutation?[22] I think it clear that in the cultural realm, too, there are changes that might realistically be characterized as "mutations": unpredictable alterations in existing concepts, practices and ideas. Such changes, too, seem to be random with respect to their own fitness - equally likely to be altered in a way that makes them less successful in their field, as to be improved by the mutation. Think of a mistake or experiment during cooking - are you really any more likely to make a change for the better, than for the worse? Similarly a mistake during a scientific experiment, a wrong note during a music recital, or a miscopied part of a text or poem seems to me to be, if anything, *more* likely to be a "one-off", never repeated, than it does to be a resounding and much-replicated success.

I think that there are also cultural events that might be described as "recombinations" - and that they, too, are subject to restrictions analogous to those in the biological world (i.e. "alleles" have to "match"). Rather than novelties, these are instances in which one existing method, idea, theory, etc. is replaced with another that already exists: the Church congregation is accompanied by a guitar rather than an organ, for instance. In such cases, the replacement concept has to control the same cultural feature as its predecessor: you could replace a dry-stone wall with a hedge but not with a bungalow; and you could replace a bungalow with a terraced house but not with a hedge; you could sing "While shepherds washed their socks by night" in the place of "While shepherds watched their flocks by night", but not in the place of "All seated on the ground".

Arguably, then, memetic variations occur and can be explained along lines similar to those in genes. Are they passed on to offspring? Clearly, 'offspring' does not here refer to biological but to cultural descendants - and it seems obvious that the variations *are* transmitted, in this sense. If my piano teacher is a concert pianist then he will teach me to read music, with an emphasis on the repetitive practice of pieces that I have first sight-read; if he is a jazz pianist then he will teach me the techniques of improvisation, and how to play by ear. If my Philosophy tutor subscribes to a particular brand of Dualism then my reading may be directed towards Descartes, whereas if he is a Behaviourist then he might suggest Ryle. This does not, of course, guarantee that I will eventually decide to be Cartesian or Behaviourist myself (apart from anything else, I will have many more cognitive than genetic 'parents'), but it *does*

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[21] Dawkins, 1986, p. 307

[22] In the absence of any other immediate candidates for the same rôle, the study of mutation and recombination will provide a useful springboard for the investigation of memetic variation.

guarantee that I will *learn* about those theories. Just as the variations that you inherit from a biological parent may develop differently in you, depending on the nature of your environment and the genes that you inherited from your other parent, so the variations that you acquire from your cultural predecessors (who might be your teachers, people whose books you have read, musicians whose style you have imitated, etc.) may develop differently in the context of your mind and environment. What matters from the point of view of evolution, however, is that those variations *are* replicated in you.

Meme theory, then, depends on the existence of a mechanism for the replication of cultural information. There are two aspects to any form of replication: the information that is copied, and its means of transmission. Genes, for instance, preserve (in DNA) the information needed to control a certain phenotypic effect, from one generation to the next; this information is replicated, of course, via various forms of biological reproduction. Memes, too, must in some way be able to preserve and copy information, between 'generations'. Memes must be *about* (rather than identical with) the things that they affect: a mandolin, for instance, is not also a meme 'for' a mandolin - rather, it is the external effect which that meme controls. Perhaps the best way to describe a meme, is as a concept. As such, it will be preserved in whichever form is most appropriate: memory-based, linguistic, diagrammatic, symbolic, artistic, etc.

In order to replicate, memes need also to be able to pass on the information that they preserve in such forms. I think that there is little controversial about the claim that concepts are continually being transmitted. Methods involved might be intentional (formal pedagogy, or normal conversation), or they might be almost unconscious - as when one person simply imitates another's actions or reads about their ideas. As with the analogous process of gene transmission, the resultant copies will not always be exact, and the idea or skill in question may change in some way *en route*. The essence of any such process, however, is that it imparts the representational content of the relevant idea, theory, skill, etc. It will be apparent that the novel meme has been acquired, when its external consequences are displayed by the recipient: when he applies it in practice, or is able to pass it on by explaining it to someone else. This point also highlights the fact that what has been taught, told or imitated is a generally applicable method or concept, etc., rather than particular solutions or explanations. The particular solutions are rather the *effects* of having acquired the general method.

In culture as in biology, then, variations exist and are passed on to the next 'generation'. The next strand in Darwin's argument came from Malthus's theory of a population which increases much faster than its limited resources. From this, Darwin extracted the idea of the struggle for existence, which is as important a structural feature of evolutionary theory as is variation. Is it true that the mental and cultural 'population' also increases at a swifter rate than its resources?

The answer to this must depend on the definitions of a mental and cultural 'population', and of the nature of its 'resources'. The contenders for membership of the mental and cultural population seem innumerable: ideas, concepts, skills, concertos, fashions, ways of building houses, farming methods, ... These all seem to be aspects of the mental and cultural (traditions, thoughts, etc.) that might potentially be passed on from one possessor of them to another. Meme theory needs some sort of criterion of memetic 'fitness' - something that all these ideas, skills, etc. have in common, in virtue of which their relative success rates can be subject to systematic study - for without this it breaks down into the trivial statement that out of many new ideas, skills, etc., some survive whilst others do not.

The general fitness criterion for genes - the question what will influence their chances of survival and reproduction - is the influence they have on their bearer's ability to find food and sex. So what is the general fitness criterion for the mental or cultural population? It seems clear that the memetic population's 'resource' is the limited attention of human brains, and therefore that a given meme(-complex)'s fitness, or chances of survival and reproduction, will be influenced chiefly by its ability to gain and retain its bearers' attention: gaining someone's attention is a means of replicating itself (c.f. sex), and retaining that attention is a means of prolonging its survival (c.f. food).

Beyond this very general memetic fitness criterion of attention gain and retention, however, the factor that determines memes' fitness levels will vary widely between contexts: whether or not a meme is successful will depend on a variety of fitness criteria, determined by the area of culture to which it pertains. The same is true in biology - to give a crude example, genes that produce giraffe-type necks will not benefit an elephant. The 'particular' question about fitness is therefore how an individual meme, given the demands of its environment, can ensure greater access to its means of reproduction and survival (i.e. gaining and retaining attention). Since memes, like genes, are selected by proxy, this question must be answered in terms of the interaction between the environment and the meme's phenotypic effects. If the effect is a scientific theory then it must enjoy some degree of explanatory success, must not contradict existing theories but must also accord with the available perceptual evidence; if it is a melody or a picture then it must be aesthetically pleasing, and the conditions that this entails may be determined temporally or geographically; if it is a recipe then it must result in good tasting, non-toxic things to eat, and again decisions about the former may differ between cultures.

More generally, factors such as: compatibility with existing memes; the commitment with which they are held; empirical evidence; any evangelical element of a concept - will also come into play. The main point is that, in order to maintain some sort of grip on day-to-day reality, we have to choose between the skills, theories, etc. on which we might focus our efforts and

keep available in memory. Thus it appears that the mental and cultural population does increase faster than its resources.

From the transmission of variations and the struggle for existence, Darwin derived natural selection: in the struggle for the resources of a limited environment, those organisms with slightly advantageous variations will have a better chance of survival and replication, whereas those whose variations are at all deleterious will find their survival threatened. There is no great difficulty for mental evolution with this stage of Darwin's argument, for it consists merely in deducing the consequences of the previous stages (though, as noted above, those consequences will be played out a far greater pace than is the case in biology). A form of selection must occur in minds and culture, and we should expect to see the preservation of those ideas, skills, etc. with the best fit to their environment, and the extinction of those without.

Finally, in order to move his theory from adaptation by natural selection to a genuine account of the emergence of new species, Darwin invoked two new principles: divergence, and geographical isolation. Present day theories of speciation are not restricted to these two principles, and (so far as I can gather) there is no consensus on which theory is correct. What matters about any such theory, though, is that it attempts to provide an explanation of how variations can become so great that they produce new species. The question thus arises whether such an explanation is available or even appropriate for a theory of mental and cultural evolution. Its answer must depend on what in that theory, if anything, will correspond to the species in biology[23].

Recall that mental and cultural evolution can be expected to share the significant structural features of Darwinism, but not its specific details (since it is not a straightforward analogue of Darwinism, but a process of the same type that Darwinism illustrates). Speciation is, I think, a detail rather than a structural feature: it is a side effect of biological evolution, and is not intrinsic to its operation in the way that variation or selection is. It so happens that, in the natural world, organisms have diversified to the extent that we can now categorize them into separate species, but I do not think that it will be appropriate to seek the equivalent in the mental world. It may be that we can treat, say, different cultures as the 'analogues' of different species, but this issue is, I think, peripheral.[24]

Memes and mental viruses

Having offered a brief defence and development of the meme hypothesis, I should like to emphasise, once again, how much care needs to be taken with the gene-meme analogy.

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[23] A species is "a group of individuals of common ancestry which closely resemble each other structurally and physiologically and, in nature, interbreed, producing fertile offspring" (Steen, 1971, p. 513).

[24] If I am wrong, and speciation is a structural feature of biological evolution, then the emergence of separate categories of meme-complexes will deserve more attention. At this point, however, I see no benefit in pursuing this line of enquiry.

Ironically, the example that I use to illustrate the errors that can arise by taking the analogy too literally, stems from the originator of meme theory.

Dawkins speculates about the extent to which a certain type of cultural replicator might be seen more as the analogue of a virus than of a gene. As an example of this sort of replicator he uses religion, and concludes that it "is best understood as an infectious disease of the mind"[25]. This analysis he uses to add weight to his already well-publicized conviction that truth is incompatible with religion. The aim of the remainder of this section is to discover whether his arguments constitute a valid application of meme theory.

Dawkins starts with a discussion of the nature of physical viruses, and describes them simply as "Duplicate Me" programs written in the language of the DNA code. Their advent was "inevitable" once the cellular machinery for DNA replication had developed, for such an apparatus provides the perfect niche for "subversive, parasitic 'Duplicate Me' programs"[26], which hijack genes' replicative machinery in order to make copies of themselves. Thus Dawkins contrasts viral with genetic methods of survival. Both use the same means of replication, but genes produce it and viruses hijack it: genes' replicative success depends on their producing beneficial effects on their possessors' chances of survival and reproduction, whereas viruses' replicative success depends merely on their ensuring that they are replicated. (C.f. the fact that a robin's successful procreation depends on its *providing* a safe environment for its chicks, in which they are continually fed; a cuckoo's depends merely on ensuring that its chicks *enter* such an environment.) Turning to non-biological parasites, he says that our brains, with their naturally selected openness to memes, also provide an environment that is ripe for exploitation.

I think that it will be helpful for me to clarify (my interpretation of) some of the finer points of his analogy, before looking further into his arguments. If we accept the meme hypothesis, then in what way should we expect 'mental viruses' to differ from memes? To uphold the biological analogy, we should expect mental viruses to succeed by parasitizing the replicative machinery of teaching, imitation and communication, in order to make copies of themselves. There must be a normal process of replication, upon which such viruses are parasitic. We should expect the sorts of ideas, etc. that are viral rather than memetic to be taught and imitated not because of any replicative advantage they hold over other ideas (are better predictors, more aesthetically pleasing, etc.), but merely because they have found some way of ensuring that they are taught and imitated. Putting this another way, the viral nature of a replicator is dependent on its method of replication rather than on its content. With this criterion in mind, I return now to Dawkins' argument.

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[25] 1993b
[26] 1993b

He begins by explaining the properties that make a medium vulnerable to parasitic exploitation: its (almost) accurate replicative powers, and a willingness to obey the instructions that it is replicating. The human brain, he argues, has just these properties. He points out that, in addition, the mind of a child is especially susceptible to parasitic exploitation: it *needs* to be receptive to new ideas, in order to soak up a whole culture and language. In this context, Dawkins first introduces the idea that religion is just such a virus of the mind, able to manipulate the thought processes of its victim - although the victim will be unaware of being so manipulated.

Dawkins contrasts such 'viruses' with 'good' memes. He says that we should be careful not to apply the viral analogy to all ideas and all aspects of culture: some are more like "good genes" than self-serving, "Duplicate Me" viruses. Indeed, "great ideas and great music spread, not because they embody instructions, slavishly carried out, but because they are great. The works of Darwin and Bach are not viruses."[27] Equally, although scientific ideas might seem to spread epidemiologically, in fact they spread "because people evaluate them, recommend them and pass them on"[28].

In such statements, Dawkins comes perilously close to labelling only those things of which *he* approves, as "great" and non-viral. Indeed, I should like to claim that his meme/virus distinction displays a misunderstanding of his own theory. In *The Selfish Gene*, he said that "selection favours memes that exploit their cultural environment to their own advantage"[29]. Yet if this is the case, then how can the difference between good memes and mental viruses rest on the question whether the replicator in question is a 'good' one? We cannot just dismiss as "viral" those ideas whose content we see as harmful or pointless. Even for genes, it is not relevant that (usually) the virus is bad and the gene good for the individual who acquires it: both are replicators, and the distinction between them is a developmental one.

Dawkins' confusion is apparent throughout his discussion of memes and viruses. Contrast, for example, his claim that "the selective forces that scrutinize scientific ideas are not arbitrary or capricious ... they do not favor pointless self-serving behavior"[30], with his characterisation of memes as having "no foresight. They are unconscious, blind, replicators"[31].

He also seems, in his discussion of mental viruses, to have misinterpreted the very essence of the gene-meme comparison. A detail-to-detail analogy is not appropriate between genetics and memetics. In an endnote to the earliest edition of *The Selfish Gene*, Dawkins states that he wants "to claim almost limitless power for slightly inaccurate self-replicating

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[27] 1993b
[28] 1993a, p. 26
[29] p. 199
[30] 1993a, p. 26
[31] 1989, p. 200

entities, once they arise anywhere in the universe". In proposing his meme theory, he was "trying to make the case for replicators in general, and to show that genes were not the only members of that important class"[32]. From quotations such as these it is clear that Dawkins intended the comparisons between genes and memes to be made at a very general, structural level. The meme hypothesis loses much of its credibility as soon as one tries to claim that every feature of genetics can be carried over to the mental. Why on earth should this be possible? The point of the meme hypothesis was that if the essential features of Darwinism can be found in the mental and cultural worlds, then we should expect to see a new type of evolution taking place in those media. The specifics of how the new type of evolution will develop, however, need not parallel those of its predecessor, biological evolution. I think it obvious that viruses, as parasites on the biological evolutionary system, are not essential features of it.

If, on the other hand, Dawkins wishes merely to claim that religious beliefs spread memetically, then this will say *nothing* about the truth value of their subject matter. It will show merely that religious beliefs do not, as scientists and philosophers so often claim, have to be held at the expense of one's intellect. Memetics, like genetics, is merely an hypothesis about the transmission and development of information. Although both theories account for the relation between that information and its external consequences, neither has anything to say about its intrinsic value. Biological fitness is a relative concept: genetic variation *a* may be selected rather than *b*, but this does not tell us whether *a* is 'really' an efficient method of survival and propagation. For the answer to that question, we have to appeal to theories other than neo-Darwinism (engineering, for instance). Similarly, if idea *x* is selected rather than *y*, this tells us nothing about the truth, elegance or any other value of *x*. For that information, we have to appeal to other theories (aesthetics, for instance, or truth criteria). Thus, if religion does spread and evolve memetically, the question of its validity is as open as ever.

Memes vs genes

The final question to which I turn, may be asked whether or not the meme hypothesis is accepted. It is the perennial puzzle of where we should draw the line between "nature" and "nurture": to what extent are we the product of biological evolution, and to what extent are we influenced by our culture? In terms of memetics, this may be rephrased in terms of the relative influences of genes and memes, but I think that this discussion could meaningfully be transposed into one that did not contain the word "meme" at all, for those who are still uncomfortable with it.

I think it obvious that neither factor is wholly responsible for us: genes without environmental input (nourishment, etc.) are useless; culture without genes is non-existent. Nonetheless, the question remains which is the *most* significant factor, and in order to

[32] p. 322

formulate some sort of answer to this, I shall appeal to what Sober[33] calls the "positive main effect", a concept that can be used in answering the following question: given a trait that varies within a population, is biology or the environment the main influence on its variation?

Genes exert a positive main effect on a trait, if an alteration in the population's genotype causes a change in the average phenotype, with respect to that trait. The environment exerts a positive main effect, if a difference in it causes a change in the average phenotype, with respect to the trait in question. The major influence on that trait's variation, within the population, is that which exerts the greater main effect. An example[34] may help to clarify these concepts. Consider the question whether genotype or environment is the major influence on humans' ability to use natural language. Since this trait is universal amongst humans, we need to embed humans within a larger population, in order to see whether genetic differences have any effect. In which circumstances is the language ability developed?

	Exposed to a human language	Not exposed to a human language
Human genes	Yes	No
Chicken genes	No	No

If this table displays accurate results, then it shows that the biological and environmental influences on language acquisition are equal: the right genes are necessary, but so is the right environment. For another example - perhaps a belief in God - the results may be different:

	Exposed to an organised religion	Not exposed to an organised religion
Human genes	Sometimes	Sometimes (less often)
Chicken genes	Never	Never

If *this* table's results are realistic, then it shows that the genetic influences on Theism are greater than the cultural ones - even though there *is* a degree of cultural effect. Without the right genes, the belief will never be acquired, but without the ideal environment it still might be.

Now, it seems to me obvious that genes will exert the major (or, at the very least, an equal) influence over most social traits that are both unique to and universal amongst human beings. In fact, this is almost a truism: if you are not human, then you cannot have uniquely human traits, and if you are human then you are bound to have the universal ones. For these traits, then, sociobiology will be able to offer the best account. Social traits that are universal

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33 1993, ch. 7

34 Based on Sober, 1993, p. 190. Notice that, in both this example and the following one (my own), the accuracy of the (purely speculative) tabled results is not the issue - the point is merely to elucidate the concepts involved.

amongst, but not unique to humans will be best explained by the genetic differences between those species that share the traits in question (e.g. primates), and those that do not.

It is when we consider traits that are unique to, but not universal amongst humans, that the controversy arises. I would argue that cultural evolution can offer a better account of these, than can Darwinism. Traits that vary amongst cultures must, if genes are to be cited as their major influence, correlate with genetic differences between the populations concerned. In the sorts of specific cases to which I have referred, throughout this paper, I think that this is implausible. Is sociobiology really going to claim that every person who uses self-raising flour in pastry, plays Jazz rather than Classical piano, prays through Icons rather than directly, or whatever, shares certain genetic characteristics which are lacking in those who do not?

Of course it is not - to argue against this sort of view, is to challenge a straw man - but Wilson *would* argue that all human institutions "evolve in directions that enhance the welfare of the practitioners"[35]. In other words, there is a sufficiently broad category, from which these specific variations have grown, that *does* have genes as its major influence. In the cases above, these areas might for instance be cookery, music and religious practice. My argument, however, is that such categories are general enough to be universal amongst, as well as unique to humans - and that, as such, it is not surprising that they are explicable by Darwinism. On the other hand, the evolution of *non*-universal traits within these categories is not primarily the result of genetic differences, and is therefore *in*explicable by Darwinism.

It is not even necessary to phrase this conclusion in terms of the controversial meme theory. We simply need to say that if social learning, rather than genetic inheritance, is the major influence in the development of a cultural trait, then it is inappropriate to try to explain that trait as a result of biological evolution; this is true despite the fact that, as sociobiologists emphasise, we are ultimately genetic creatures. The challenge that the meme hypothesis *does* present to those who dismiss it, is to find a better account of the development and complexity of those aspects of human culture which are not subject to biological evolution.

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[35] 1978, p. 175

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