

Three Memetic Theories of Technology

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Introduction

Darwin's theory of evolution is undoubtedly one of the most elegant and powerful conceptual tools in contemporary science. Beyond its original scope within biology and genetics, it has been successfully combined with notions belonging to fields as apparently far-flung as economics (as in Game Theory or experimental economics). Following the interest shown by Darwin himself in the impact of evolutionary ideas on the explanation of human behaviour, attempts have also been made to dissolve the traditional nature/culture divide by extending the scope of Darwinian evolutionary thought to the human sciences – economics, psychology, anthropology, and sociology, among others.

In this paper I would like to introduce three theories of technology based on the evolutionary account of cultural transmission known as **memetics**, probably the least known of Darwinian theories of culture. Indeed, ever since its first formulations more than twenty years ago, the memetic research programme has reached a stage of stagnation, due in part to the lack of a single definition of its basic unit – the meme itself. This paper is thus mainly of an expository nature, given the multiplicity of theoretical trends that characterizes memetics, and the relative lack of literature comparing these approaches. These different trends are, I believe, best exposed and discussed by examining how they apply to the question of technology: for the nature of artifacts (and their conceptual counterpart, mentifacts) is, as we shall see, one of the main bones of contention in the wars of the meme.

The notion of memetic diffusion was launched by evolutionary biologist Richard Dawkins in his 1976 book *The Selfish Gene*, in which he hypothesized that living beings, including humans, are mere "vehicles" or "interactors" for the transmission of the genetic information they bear. Genes, said Dawkins, are "replicators," information units which generate copies of themselves in order to be transmitted from generation to generation; and evolution can be understood as directed by those replicators in order to preserve their continuity.

But in the last chapter of his book, "Memes: the New Replicators," Dawkins took a step further. Dissatisfied with the usual crude Darwinian explanations of human behaviour in genetic terms, he postulated the existence of a unit of cultural transmission, analogous to the gene, which he termed **meme**. Like genes, memes would be replicators, and the mechanism by which they produced copies of themselves would be *imitation*:

Examples of memes are tunes, ideas, catch-phrases, clothes fashions, ways of making pots or arches. Just as genes propagate themselves in the gene pool by leaping from body to body via sperms or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process which, in the broad sense, can be called imitation (Dawkins 1976).

The gene/meme analogy posited by Dawkins is meant to make possible an evolutionary treatment of human society and culture – a "Darwinization" of the study of man which would purportedly bridge the gap between the natural and the social sciences by way of the application of a biological (genetic) model to cultural transmission.

Memetics differs from other evolutionary accounts of human culture in the degree of independence it accords to the sociocultural domain. Unlike sociobiology and evolutionary psychology, whose ultimate aim is to reduce cultural behaviours to biological determinants, memetics accepts the existence of a dual mechanism of inheritance in the human species: biological *and* cultural inheritance. This is a thesis also upheld by the gene/culture coevolution approach in anthropology (also known as cultural selectionism). However, whereas coevolutionists argue that biology is ultimately preponderant, restraining the scope of sociocultural development (what is known as the "leash principle," whereby genetic determinants would hold cultural development in check), for memeticists sociocultural behaviour is causally independent from biological factors, even though they may interact with each other.

Thus, the Darwinization of culture which constitutes the aim of memetics takes a different form from the reductionist claims of sociobiologists and evolutionary psychologists, as well as from the subservience of culture to nature posited by coevolutionists. According to memeticists, the memetic (sociocultural) domain must be explained independently from the genetic (biological) domain. However, this explanation must also be of an evolutionary character – yet not a reductionist

or a biology-dependent one. In order to provide such an explanation, Dawkins has put forward the notion of *Universal Darwinism* – a generalization of Darwinian evolutionary principles that would span not only the genetic domain, but the sociocultural one too.

Universal Darwinism

The strategy of Universal Darwinism consists in abstracting the features peculiar to genes and organisms, which tend to be associated to the concrete material out of which they are built, taking into consideration only the roles played by **genotypes** and **phenotypes**. The genotype is the set of genes which an organism contains. The phenotype is any morphological, physiological or behavioural feature displayed by an organism that is caused by the interaction of its genotype with the environment. This abstract perspective makes it possible to see evolution as consisting in two fundamental processes:

(a) Replication: the process whereby genes become copied from generation to generation, ensuring that successive generations will be alike enough for cumulative selection to take place. The corresponding entity is the *replicator*, which Dawkins identifies with the gene.

(b) Ecological interaction: the relationship between organisms and their surroundings – including other organisms – which biases replication and ensures that the differences between successive generations are significant enough for mutation to take place. The corresponding entity is the *vehicle* or *interactor*, which Dawkins identifies with the organism housing the genes, and on which the phenotypic effects take place.

Thus, replication would be a function of an organism's genotypic makeup, whereas its ecological interaction would be linked to its phenotypic manifestations. This yields the following set of oppositions:

Genotype	Phenotype
Replication	Ecological interaction
Replicators	Vehicles / Interactors
Genes	Organisms

This highly abstract definition of evolutionary processes has made the extension of (Universal) Darwinian principles from biology to culture considerably easier.

Thus, memeticists currently strive to identify sociocultural equivalents for the concepts given above. The **memotype**, or genotypic meme, has been defined as the cultural analogue of the genotype, whereas the **phemotype**, or phenotypic meme, would be the cultural analogue of the genetic phenotype.

Insofar as it is a part of culture, technology can be approached from a memetic standpoint. Indeed, the nature of artefacts has been the main issue in the debate between three main currents within memetics, which differ in their respective definitions of phemotypes and memotypes. Standard, or cognitive/mentalist memetics, regards artefacts as phemotypes, i.e. as the phenotypic expressions of memetic genotypes, which would consist in mental representations. This is what I have termed the phemotypic theory of technology. The memotypic theory of technology posited by behaviouralist memetics, on the other hand, sees material culture itself as the genotypic blueprint out of which conceptual phemotypes are generated. Finally, Robert Aunger's theory of the neuromeme denies altogether the pertinence to the study of culture of the phenotype / genotype opposition.

The Phemotypic Approach

In his original formulation in *The Selfish Gene*, Dawkins cited “tunes, ideas, catch-phrases, clothes fashions,” and “ways of making pots or arches” as examples of memes. It is important to note that these are all instances of abstract concepts or ideas. Just as the way of making a pot is not the same thing as the pot itself, neither is a catch-phrase the unique, concrete utterance of an individual, but an abstract word sequence which can be repeated in multiple occasions by multiple individuals; nor are clothes fashions sets of concrete clothes, but sets of collective tendencies regarding clothes.

Daniel Dennett explicitly claims that memes *are* ideas,

not Locke's and Hume's “simple ideas” (the idea of red, or the idea of round or hot or cold), but the sort of complex ideas that form themselves into distinct memorable units (Dennett 1996, 344).

Dennett identifies the genotype with the meme *qua* concept, the phenotype with the physical effects of such concept, and the vehicular organism with the phenotypic manifestations which transmit the memetic genotype. In this way, technology would be the phenotypic manifestation of a memetic or conceptual genotype:

Genes are invisible; they are carried by vehicles (organisms) in which they tend to produce characteristic effects (phenotypic effects) by which their fates are, in the long term, determined. Memes are also invisible, and are carried by meme vehicles – pictures, books, sayings (in particular languages, spoken or written, on paper or magnetically encoded, etc.) Tools and buildings and other inventions are also memetic vehicles [...]. A wagon with spoked wheels carries not only grain or freight from place to place; it carries the brilliant idea of a wagon with spoked wheels from mind to mind. A meme's existence depends on a physical embodiment in some medium; if all such physical embodiments are destroyed, that meme is extinguished (Dennett 1996, 347-8).

He then goes on to give such examples of memes as the *ideas* of “the arch, the wheel, wearing clothes, vendetta, the right triangle, the alphabet, the calendar, the *Odyssey*, calculus, chess, perspective drawing, evolution by natural selection, Impressionism, *Greensleeves*, and deconstructionism.”

Dennett explicitly opposes the thesis of neuromemetics (which we shall see in the next section) by which memes would have physical nature, and of a single kind at that. For Dennett, identifying the units of cultural transmission with brain patterns, as Robert Auger does, is a mistake analogous to identifying genes with complex DNA structures. Dennett has famously defined evolution as an algorithmic process. In his view, this algorithmic character of evolution implies that it must be describable in purely informational, substrate-neutral terms. Interestingly, Dennett also specifies that the memetic genotype – the meme proper, the concept or idea – would have a *syntactic* character (that is, it would be a purely formal entity, subject to meaningless mechanical processes), whereas all its phenotypic manifestations would be of a *semantic* nature (that is, they would be characterized by the fact that they are entities endowed with meaning, subject to interpretation):

what is preserved and transmitted in cultural evolution is information – in a media-neutral, language-neutral sense. Thus the meme is primarily a semantic classification, not a syntactic classification that might be directly observable in “brain language” or natural language (Dennett 1996, 353-4).

By “meme,” Dennett seems to refer here to the (semantic) phenotypic manifestations of (syntactic) mental representations. Ultimately, says Dennett,

the syntactic concepts might in theory be reducible to the brain structures which embody them – but defining those brain structures would not prove too useful. Unlike genes, which are endowed by the existence of a single genetic language with “a satisfactorily strong alignment of semantic and syntactic identity,” memes can only be identified by their “meaning,” their phenotypic effects:

It is conceivable, but hardly likely and certainly not necessary, that we will someday discover a striking identity between brain structures storing the same information, allowing us to identify memes syntactically. Even if we encountered such an unlikely blessing, however, we should cling to the more abstract and fundamental concept of memes, since we already know that memetic transmission and storage can proceed indefinitely in non-cerebral forms – in artefacts of every kind – that do not depend on a shared language of description (Dennett 1996, 354).

That is, Dennett assumes that there is in the case of genes a close correspondence, almost to the point of identity, between their internal configuration – their “syntax” – and their external effects – their “meaning.” The fact that both the “syntactic” elements of genetics and their “semantic” effects are observable, and their high degree of coherence make it possible to use a unified vocabulary for both aspects of genetic dynamics. However, this is not the case in memetics, where conceptual memes are not empirical entities, but can only – and questionably – be identified by their effects upon the empirical world.

The correspondence between genetic and memetic terms in standard memetics would therefore be as follows:

	GENETICS	MEMETICS
SYNTAX	Genotype	Memotype; genotypic meme; mentifact; (ultimately) brain structure
SEMANTICS	Phenotype	Phenotype; phenotypic meme; artefact
	Vehicle / Interactor	Memetic vehicle / interactor

Thus, in this branch of memetics, which can be called “idealist” or “mentalist,” technological artefacts are considered to be the semantic phenotypic expression of syntactic mental entities, or “mentifacts.” Mentifacts, on the other hand, would

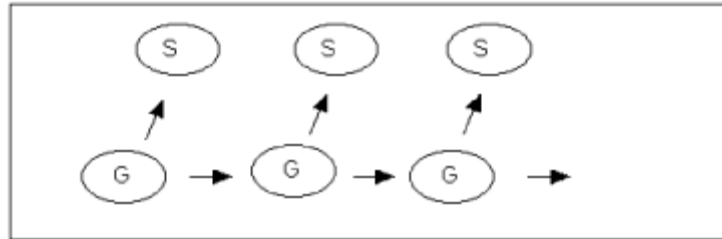
constitute the genotypes giving rise to artefactual phenotypes in their vehicle-mediated interaction with the environment.

However, this standpoint has one serious drawback. There are two main differences between genetic and memetic transmission, which the evolutionary theorists John Maynard Smith and Eörs Szathmáry have put as follows:

Genes are transmitted from parents to children: memes can be transmitted horizontally, or even from offspring to parent. But there is a deeper difference between genes and memes. Genes specify structures or behaviours – that is, phenotypes – during development; in inheritance, the phenotype dies and only the genotype is transmitted. The transmission of memes is quite different. A meme is in effect a phenotype: the analogue of the genotype is the neural structure in the brain that specifies that meme. When I tell you a limerick, it is the phenotype that is transmitted: I do not pass you a piece of my brain. It follows that in the inheritance of memes but not of genes, acquired characters can be inherited. If I tell you a limerick and you think of an improvement, you can incorporate it before you pass it on. In this sense, cultural inheritance is Lamarckian (Maynard Smith & Szathmáry 1999, 140).

According to the Lamarckian version of evolution, the characteristics acquired in the course of an organism's life can be passed on to that organism's offspring. Or, in other words, the variations in an organism's phenotype can be transmitted to its genotype and thus be inherited by the organism's offspring.

Genetic Lamarckism was refuted at the end of the 19th century by Augustus Weismann with his famous doctrine of the separation between germ and soma (better known as the *Weismannian Barrier*). According to this theory, the separation between those lineages of cells destined to become germinal or reproductive cells and the lineages of cells destined to become somatic or body cells would take place at a very early stage in embryogeny. The implications of this find were crucial, for it meant that whatever events may happen to an individual organism, they will not affect its progeny, as there is no way for them to be transmitted to its germinal cells. (In this way, for instance, if a man loses one leg, such loss is not reflected in his genotype, and his children need not be born lame). Thus, Lamarckian inheritance – the inheritance of acquired traits – was rejected.



The Weismannian Barrier

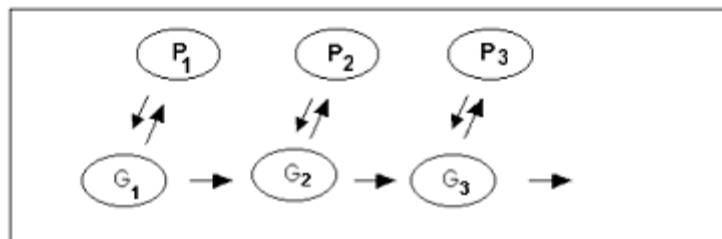
G = germ, or reproductive cells
S = soma, or body cells (organism)

Weismann's distinction between soma and germ corresponds to that between phenotype and genotype. In this way, the Weismannian Barrier can be reformulated, stating that the genotype produces the phenotype, but changes in the phenotype bear no effect upon the genotype.

Given the identification that idealist memetics establishes between the (replicating) genotype and the meme *qua* concept, on the one hand, and between the phenotype and the meme *qua* object, on the other, the characterization of processes of cultural transmission as "Lamarckian" would thus seem to have a certain plausibility. Dawkins himself contemplates such a possibility in his *Extended Phenotype*:

The equivalent of Weismannianism is less rigid for memes than for genes; there may be "Lamarckian" causal arrows going from phenotype to replicator, as well as in the other sense (Dawkins 1992, 112).

That would result in a scheme similar to this:



Memetic Lamarckism

G_x = genotypic meme or memotype

P_x = phenotypic meme or phemotype

One of the most common objections to Lamarckism is that most of the changes effected on organisms by the environment are non-adaptive: they are usually the result of injury, disease, and aging. A genetic system which had a mechanism of "reverse translation," by which information about the adult phenotype might be incorporated to the genetic message passed on to the next generation, would lead to degeneracy, not to adaptation. But, as Maynard Smith points out, if there were some way of selecting for transmission only those phenotypic traits which would prove adaptive, not only would adaptive change endure, but it would also speed up. Indeed, that is precisely what cultural evolution is all about. As Szathmáry has expressed it,

whereas genes are weismannian replicators, with no flow of information back from the phenotype, memes are lamarckian ones, relying on reverse encoding from the phenotype, as if genetics canonically included something akin to reverse translation, or at least to some other means of inheriting acquired traits. The immediate consequence is higher variability and the potential for cultural evolution to be much faster than genetic evolution (Szathmáry 2002, 370).

The Neuromemetic Approach

Recently, Robert Aunger has put forth in his book *The Electric Meme* an extreme version of mentalist memetics which he has termed neuromemetics. Neuromemetics differs from standard memetics in that it defines the meme as

a configuration in a node in a neural net which is able to induce the replication of its state in other nodes (Aunger 2002, 197).

By "node," Aunger seems to mean a neuron or set of neurons that have a given state and cause another neuron or set of neurons to acquire that state. This definition avoids the identification of memes with neurons: the neuromeme would be a *brain state* rather than the *material substrate* supporting it. However, Aunger's view differs from standard memetics in its denial of the substrate-neutrality of memes. Whereas the standard view has it that meme lineages can jump across different material substrates, from brain to computer to book to

another brain, Auger holds that neural nets are the only possible material substrate in which memes can thrive. Thus, even though he avoids the equation of concepts with neurons, Auger holds a resolutely physicalist view of memetics in that he identifies the units of sociocultural transmission with neural patterns – and *only* with neural patterns.

The most startling consequence of the neuromemetic approach is that, while identifying memotypes with neural states, it has no memetic equivalent for phenotypes. In interpreting the signals through which genotypic memes transmit themselves in the environment outside the brain as vehicles or interactors, standard memetics lays itself open to the charge of Lamarckism: and evolution, according to Auger, cannot possibly be Lamarckian, ever. This forces Auger to develop a baroque ontology in which signals would not be phenotypes, but meme-produced “instigators.”

Calling signals instigators instead of interactors or vehicles is crucial because it saves us from the ghost of Jean-Baptiste Lamarck. If signals are not interactors, then cultural evolution does not imply the inheritance of the traits derived from an interactor – Lamarck's folly (Auger 2002, 241-2).

But, obviously, merely *calling* signals one thing or another will not do. In what ways does an “instigator” differ from a plain vehicle, that it may escape the Lamarckian curse? Auger describes instigators as “mass agitators” that would spare memes the task of establishing contact with each other. For Auger, the processes of memetic replication are not really transmission but *conversion* processes in which the neural substrate takes a determinate configuration. Instigators would thus be some sort of replication catalysts, and would have the additional advantage of avoiding the risk of informational degradation inherent to conversion itself.

But if signals are not phenotypic in nature, what are they instead? Auger will not say. As Eörs Szathmáry has pointed out in his review of *The Electric Meme*, Auger “seems to miss the point that a set of signals associated with a meme is in fact its phenotype” (Szathmáry 2002, 370).

The Memotypic Approach

Given that the whole memetic enterprise is based upon the extension of the genetic model to the cultural domain, the cultural Lamarckism which the

phenotypic trend seems to ultimately imply is an embarrassment for certain theorists – Lamarck being, as we have seen, somewhat of a *bête noire* in evolutionary thought.¹ There is, however, yet another current within memetics which is meant to avoid the alleged pitfalls of Lamarckism by providing an alternative to the identification of the genotype with the mental meme. This school of thought has been termed behavioural or externalist memetics, as opposed to standard mentalist memetics, and its main proponents are William Benzon and Derek Gatherer. In his essay *Culture as an Evolutionary Arena*, Benzon suggests

that we consider the totality of physical culture as [cultural] genes [i.e. memes]: pots and knives, looms and tanned skins, utterances and written words, ploughs and transistors, songs and painted images, tents and stone fortifications, dances and sculpted figures, everything. For these are the things that people exchange, through which they interact. They can be counted and classified and studied in various ways (Benzon 1996).

According to this view, memes would constitute a heterogeneous class of entities, comprising both behaviours and artefacts – the observable things that make empirical research possible. In fact, Benzon turns the correspondence established by standard memetics on its head, identifying phenotypes with the mentifacts generated by the genotypic memes embodied in material culture:

What I propose in fact is that we think of these mental objects and processes as analogous to the phenotype in the same way as physical objects and processes are analogous to the genotype [...]. Whereas biologists speak of a gene pool, genes never actually mingle in a physical pool. Genes are DNA chains inside cells. The gene pool of a species exists as a logical fact, not as a physical pool full of genetic slime. It is the phenotypes of species that mingle in the physical pool of the environment. In culture, it is phenotypic traits that are inner whereas genetic memes are out there in the physical pool of the environment. When cultures meet, their memes mingle freely (Benzon 1996).

Genotypic memes, the true memetic units, are thus identified with artifacts because artifacts are more readily available for quantification and empirical study given their physical, discrete existence. Derek Gatherer takes up Benzon's thesis, giving as further support the neurological conjecture that it is highly improbable that there be information-replicating structures in brains.

Gatherer (1998) distinguishes two different definitions of the meme – both given by Richard Dawkins – which he terms the Dawkins A version and the Dawkins B version.

Dawkins A: “... a unit of cultural transmission, or a unit of imitation” (Dawkins 1976, 206). “Examples of memes are tunes, ideas, catch-phrases, clothes fashions, ways of making pots or of building arches” (Dawkins 1976), “... memes for blind faith have their own ruthless ways of propagating themselves” (Dawkins 1976, 213).

Dawkins B: (referring to the original Dawkins A definition, above) “... I was insufficiently clear about the distinction between the meme itself, as replicator, on the one hand, and its 'phenotypic effects' or 'meme products' on the other. A meme should be regarded as a unit of information residing in a brain... It has a definite structure, realized in whatever physical medium the brain uses for storing information... I would want to regard it as physically residing in the brain” (Dawkins 1982, 109). “The phenotypic effects of a meme may be in the form of words, music, visual images, styles of clothes, facial or hand gestures...” (Dawkins 1982, 109).

According to Gatherer, Dawkins's latest reformulation – Dawkins B – lost the elements which constituted the strength of Dawkins A. Dawkins A referred to observable cultural entities – changes in cultural states within groups, with no mention to what might be happening inside the heads of the members of those groups. By contrast, Dawkins B focussed on non-observable, merely inferred events. “Since memetics is a theory of cultural evolution,” states Gatherer, “Dawkins A is preferable as *it allows us to look at culture.*” Given that memetics is meant to be a science of culture, not of psychology, it ought to describe change in populations by quantifying such cultural phenomena as artefactual forms.

Gatherer attributes the stagnation in which memetics has remained for more than two decades to the emphasis placed on the Dawkins B formulation – which is the basis of mentalist memetics. According to Gatherer, a return to the first definition of the meme would prove highly advantageous: besides allowing the identification of observable and definable units, behaviourism would also free memetics from the cumbersome need of defining a meme / host relationship, as artefacts seem not be host-based, but to propagate independently from their creators.

Conclusions

Thus, the perspectives on the genotype / phenotype opposition in memetics can be summed up as follows:

	Cognitivist / mentalist / representational/ internalist memetics	Behavioural / externalist memetics	Neuromemetics
Memotype (memetic genotype)	Mentifacts	Artefacts	Brain configurations
Phemotype (memetic phenotype)	Artefacts	Mentifacts	?

The contrast between the phemotypic, the neuromemetic, and the memotypic theories of technology can be seen as a new form of the mentalist/behavioural opposition lying at the heart of the debate which raged between traditional behaviourist psychology and the new cognitive sciences in the 60s and 70s. The standard view of memetics that regards artefacts as phemotypes or phenotypic expressions of concepts which would be their memotypes or genotypic blueprints is a version of the mentalism which characterizes cognitivism. In fact, the rise of cognitivism as the current prevailing paradigm in psychology and philosophy of mind has brought about a certain consensus in academic circles to consider culture as consisting only in mental entities. The standard version of memetics, with its phemotypic theory of technology, is arguably a result of this consensus. Indeed, it has been precisely one of the foremost cognitivist philosophers, Daniel Dennett, who has given the paradigmatic example of standard memetics's theory of technology. In regarding a spoke-wheeled wagon as a memetic vehicle (i.e. a phenotypic meme, or phemotype) which serves to spread the genotypic meme or memotype (the *idea* of a spoke-wheeled wagon), Dennett remains within the mentalist, representational tradition of cognitivism. Thus, in this internalist version of memetics, technology is seen as the phenotypic manifestation (phemotype) of a conceptual genotype (memotype) lodged in human minds (hence our terming this approach to technology *phemotypic*).

In its most radical, *neuromemetic* form, to the mentalism of standard memetics is added an orthodox Darwinian rejection of Lamarckism, yielding a rather muddled theory which is to all effects unable to account for cultural transmission *outside* the brain. According to the neuromemetic point of view, Dennett's spoke-wheeled wagon is somehow an "instigator" caused by neuromemes that in turn elicits memetic replication in the brains that come into contact with it – presumably, moving people to try to reproduce the wagon. Exactly how this is done remains a mystery, given that Auger refuses to acknowledge the fact that anything produced by the genotype in response to the environment *is* its phenotype. Neuromemetics is thus able to offer an explanation of memetic dynamics as long as they remain memotypes lodged within the brain, but signally fails to provide an account of their phenotypic transmission in the outer world.

By contrast, behavioural or externalist memetics restricts its theorizing to observable entities and events, refusing to take mental representations into account given their non-verifiable character. Or rather, behavioural memetics *does* take mental representations into account, but not as the starting point for its analysis of cultural transmission. Externalist memeticists stress the need for discrete, definable units if a proper analysis is to be undertaken: and obviously mental representations do not meet these requirements – empirical research can only deal with physical things. While externalist memetics admits the existence of mental representations, it relegates them however to a secondary status, regarding them as the phenotypic by-product of material culture – the memotype.

It can be argued against the memotypic theory of technology that methodological needs in research do not necessarily reflect the nature of the things researched. True, we can observe only material culture, whereas mental representations are largely a matter of subjective introspection, and thus not much use for empirical research. But this does not automatically lead to the conclusion that material culture generates mental representations. Methodological precedence does not entail causal precedence. Therefore, whereas the claim of externalist memetics that only artefacts constitute appropriate units for the study of sociocultural transmission is quite reasonable, its identification of material culture with the genotype and of mental representations with the phenotype is more questionable.

The fundamental motivation for all evolutionary accounts of human behaviour is the denial of any discontinuity between mankind and the rest of species, between culture and nature. Even taking this (I believe) doubtful premise for granted, the application of *biological* models to cultural phenomena, given the range and

complexity of the latter, remains problematic. Furthermore, there is no single evolutionary account of cultural phenomena, but a wide array to choose from. And even if we were to accept the plausibility of a memetic account of culture and technology, and prefer memetics to other evolutionary alternatives, there would be yet a further choice to make – *which* memetics?

As I hope to have shown, the question of which memetic theory is most acceptable would seem to pivot on the dilemma between admitting some sort of sociocultural Lamarckism (the phenotypic option) – which seems unacceptable from a standard evolutionary point of view – and embracing a purely materialist account of sociocultural transmission (the memotypic option). Are we to allow for the possibility that the astonishing rate of technological progress in the human species is due to some sort of phenotypic feedback? Or is cultural evolution best modelled by regarding material culture as the genotypic blueprint for the mental representations it gives rise to?

My own leanings tend towards the first option, the phenotypic version of memetics, according to which mental representations play the role of genotypic blueprints for phenotypic artifacts. As I mentioned before, behavioural memetics – as, indeed, behaviourism as a whole – seems to me to be founded to a large extent on methodological ease and, while not denying the reality of mental representations, does nothing to explain them. Benzon and Gatherer have stressed the desirability of a quantitative approach to the study of society and culture, but the human sciences have already been provided with mathematical tools, such as statistical analysis, that sufficiently cover this ground. The methodological shortcut of overlooking (while not denying) mental representations in order to focus on the behaviour of the observable entities, i.e. of artefacts, thus seems unwarranted, as techniques to deal with diffusion rates and transmission patterns are readily available. What makes memetics interesting, I believe, is precisely its attempt to provide (in its mentalist version) an evolutionary account of the transmission of information from mind to world and back to mind.

Behavioural memetics also seems to be based on a fear of Lamarckism, which, while understandable in genetic research, is more questionable in the cultural domain. Indeed, the transmission of acquired traits is precisely what culture is all about. It can be argued nevertheless that applying a model which originally belongs in a given field to a different one – i.e. the application of the (biological) evolutionary model to the cultural domain – only to eschew the features of that model which prove awkward for the new field – i.e. the Weismannian barrier – is

an unacceptably amateurish and *ad hoc* solution. Certainly, if we consider that biological and cultural phenomena, being essentially the same sort of thing, must be accounted for in the same terms, the Lamarckism of phenotypic memetics renders it useless. However, if we consider that the complexity of the cultural domain calls for an independent account – as, like we said, was originally the case with memetics, unlike cultural selectionism, evolutionary psychology, and sociobiology – then it might be permissible to adopt the genetic evolutionary mode in order to modify it as needed, retaining its main traits and adding whatever peculiarities the cultural field might require. In this view, the Lamarckism of phenotypic memetics would not be a weakness of the model, but rather its main strength.

As we have seen, the question of the nature of artefacts is the main battleground for the various versions of memetics. However, memetics has so far displayed a remarkable lack of empirical research. In this sense, a detailed study of concrete technological developments would be tremendously useful to assess the validity of either version of memetics. It is this empirical direction that memetics must take in the future in order to sustain its general claims concerning the nature of cultural transmission, as well as to attain a unified theory.

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¹ However, the disrepute of Lamarckian notions has been recently questioned even in the genetics itself. Cf. Steele, Lindley & Blanden (1998).