

Is Cultural Evolution Analogous to Biological Evolution? A Critical Review of Memetics¹

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Résumé : *L'évolution de la culture est-elle analogue à l'évolution biologique ? Une revue critique de la mémétique.* Les défenseurs de la mémétique proposent de bâtir une théorie de la culture à partir d'une analogie avec l'évolution biologique. Cette théorie néo-darwinienne de la culture doit être soigneusement distinguée de la psychologie évolutionniste et de l'anthropologie cognitive, car elle n'est pas réductionniste. Plus largement, elle doit être distinguée de toutes les théories de la culture appuyées sur l'hypothèse selon laquelle l'esprit individuel est actif et non passif lorsqu'il adopte un trait culturel. Elle se rapproche par certains aspects de paradigmes traditionnels des sciences sociales, mais constitue un modèle bien spécifique. En dépit de l'intérêt des arguments qu'elle propose et de certaines recherches qu'elle a suscitées, elle s'appuie sur des propositions et des concepts – en particulier le concept de mème – qui soulèvent des difficultés. La nature des mèmes est incertaine et problématique. À supposer qu'ils existent, leur empire ne peut couvrir qu'une partie des phénomènes culturels. Enfin, la recherche des preuves de leur existence rencontre de sérieux obstacles.

Mots-clé : culture; évolution; psychologie évolutionniste; gène; imitation; mème; sélection naturelle; néo-darwinisme; choix rationnel; réplicateur ; apprentissage social

ABSTRACT : The advocates of memetics seek to construct a theory of culture on the basis of an analogy with biological evolution. Such a neo-Darwinian theory of culture should be carefully distinguished from evolutionary psychology and cognitive anthropology, as it is not reductionist. More generally, it should not be identified with any of the theories of culture that are based on the hypothesis that the individual mind is active rather than passive when it adopts a given cultural trait. Although in some respects memetics is close to traditional social science paradigms, it forms a specific model. Despite its stimulating ideas and the interesting research it has encouraged, memetics is based on propositions and concepts – in particular that of the meme – which raise a number of difficulties. The *nature* of memes is uncertain and problematic. If they exist, their *realm* covers only some cultural phenomena. Finally, the attempt to prove the *existence* of memes encounters serious obstacles.

Keywords: culture; evolution; evolutionary psychology; gene; imitation; meme; natural selection; neo-darwinism; rational choice; replicator ; social learning.

INTRODUCTION

Does cultural evolution obey principles that are analogous to those that govern biological evolution? Can a truly scientific theory of culture be

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constructed on the basis of a comparison with the general mechanisms that have been revealed by evolutionary biology? Since the 1970s, researchers from various disciplines have answered “Yes” to these questions. They propose to define culture as a set of elementary units of information – called “memes” by the evolutionary biologist Richard Dawkins (Dawkins, 1976, Chapter XI) – which spread in human minds according to an evolutionary logic that is similar to that which underlies the evolution of genes² in biological populations³. This model, which is often described as “memetics”⁴, has enjoyed success far beyond specialist circles⁵, although it has not penetrated the social sciences.

The aim of this contribution is to discuss the bases of this theory in the light of successive attempts to clarify the concept of the “meme” since its first appearance in the mid-1970s. What are memes? What are they made of? Where can they be found? Do they exist? Do they explain some or all of the phenomena traditionally grouped under the title “culture”? Is memetics simply a variant of neo-Darwinian reductionism, or does it have specific features that link it to some classical models in the social sciences?

To answer these questions I will first explain and outline the conception of culture that is implied by the genetic analogy that is invoked by memeticists. This investigation of the meaning of the concept of meme shows that for memeticists, cultural phenomena are the result of social learning in which the mind is a *passive* receptacle of cultural traits that are transmitted by others. This model is thus very different from that put forward by other neo-Darwinian theoreticians of culture (evolutionary psychologists and cognitive anthropologists). More generally, memetics must not be confused with conceptions of culture that consider that mental operations play an *active* role in the diffusion of ideas and practices. From this point of view, memetics shows similarities to some classic models of social sciences, such as the ideas of Émile Durkheim or of culturalist theorists. For example, in memetics, cultural facts are considered to be external to individuals. However, memetics has very clear specific characters which make it radically different from these models, to the extent that it can be described as an “infra-cultural” – or “infra-culturalist” – theory. Memes are elementary units which follow a competitive logic that takes place at a *lower* level of complexity than that of culture considered as a whole – a synthetic totality of the ideas and practices that are common to a given social group.

However, this article not only outlines the content of memetics and highlight its specificities. As I will show, such an analysis of the meaning of the concept of the meme also reveals the weaknesses of this theory. The nature of memes remains mysterious, and their very existence is doubtful. Although

² The metaphor of a virus is also used by these theoreticians and those they have inspired.

³ See in particular Cloak (1975); Dawkins (1976); Cavalli-Sforza and Feldman (1981); Hull (1982, 1988); Boyd and Richerson (1985); Durham (1991); Dennett (1995); Runciman (1998); Blackmore (1999); Aunger (ed.) (2000) and Aunger (2002). This group mainly consists of researchers in the hard sciences (genetics, epidemiology, ethology, cybernetics, neuroscience), but there are also philosophers (Daniel Dennett), psychologists (Susan Blackmore), sociologists (Walter G. Runciman) and anthropologists (William H. Durham, Robert Aunger).

⁴ The authors cited here do not all use the term “meme” and, in many respects, their models are very different. However, to make the presentation clearer, I will call the model they share “memetics”.

⁵ Best-sellers such as Howard Bloom’s books (Bloom, 1995) have provided memetics with an important audience amongst the general public.

memetics has produced a number of informative studies and has led to some very stimulating discussions (Cavalli-Sforza and Feldman, 1981; Boyd and Richerson, 1985; Durham, 1991; Runciman, 1998, 2005), it is by no means certain that it will be able to provide theory of culture with solid and original bases.

THE CENTRAL PRINCIPLE OF MEMETICS: THE EXISTENCE OF CULTURAL REPLICATORS

The models that can be grouped under the title “memetics” are generally articulated around the same fundamental hypothesis, which flows from a very specific conception of evolution and of Darwinism⁶. This hypothesis suggests that evolution can be considered as a general process that exists in other spheres beyond biology. According to the philosopher Daniel Dennett, this process can be described as a “dynamic of replicators” (Dennett, 1995, chapter XII; see also Dawkins, 1976, chapter XI). According to the definition given by memeticists, replicators are units of information that are able to produce exact copies of themselves, using the material resources provided by their environment. Furthermore, these units mutate regularly⁷, leading to the appearance of new variants. To the extent that the resources necessary for replication are limited in a given ecological niche, these mutant variants compete for replication with the variants that preceded them. In this competition, variants that have a higher fitness than others will replicate more, and will end up being statistically dominant in the population. According to memeticists, this differential reproduction of competing replicators will lead to the selection of the fittest variants. Because new variants appear continually, over time the populations of replicators will evolve under the effect of this mechanism of differential adaptation – natural selection – and, equally, under the effect of other evolutionary mechanisms such as speciation, migration, neutral mutation or drift⁸.

Memeticists argue that genes are replicators – the first to have been identified. They claim there are other replicators in human populations, other units of information that are subject to an autonomous evolutionary process. Their argument is as follows. Humans⁹ have brains that can acquire ideas or behaviours¹⁰ from other people; as a result, representations or practices can

⁶ The theoreticians invoked here all base their ideas on the same conception of biological evolution. In this vision, which was developed in the wake of the neo-Darwinian synthesis, the gene occupies a central place. It is considered to be the material substrate of the information that is used to build a given phenotype; it is equally considered as the fundamental target of selection (see, in particular, Williams, 1966; Dawkins, 1976). This conception is not unanimously accepted (see, for example, Fox-Keller, 2002; Morange, 2002). However, because memeticists generally base their ideas on this view, I have concentrated upon it. I will not deal here with the question of whether other conceptions of the gene, of the organism or of evolution can be useful starting points for empirically productive theories of culture.

⁷ The mutation rate must not exceed a certain threshold and will therefore remain relatively low. Variants of a unit that mutates too rapidly have no time to be selected (Williams, 1966; Dawkins, 1976).

⁸ On the role of these different mechanisms in cultural evolution, see in particular Cavalli-Sforza and Feldman, 1981, p. 351; and above all Durham, pp. 20-37 and pp. 183-205.

⁹ Memeticists generally accept that this ability is also found in some animal species (see for example Dawkins, 1976, Chapter XI).

¹⁰ As we will see, the “orthodox” memeticists generally restrict the mechanisms of acquisition to imitation (Dawkins, 1976, Chapter XI; Dennett, 1995, Chapter XII; and above all Blackmore, 1999, pp. 4-8).

pass from individual to individual and spread through society. A piece of information can therefore be transmitted from a transmitter-individual to a receiver-individual through social communication, just as genetic information is transmitted from parents to offspring through reproduction. As with genes, mutations occur regularly in representation and practice: in the Middle Ages a monk modifies a sentence in a book he is copying; someone tells the story of Little Red Riding Hood and slightly alters the end; a woman or a man has a child with a cousin in a society in which this is forbidden; an individual invents a new swearword, a new way to sail a boat, a new way to play a backhand in tennis, a new way to conceive of the Earth's position in the Universe, or a new explanation of the origin of species... These are all new variants that enter into competition for replication with older variants¹¹. In most cases, many of these new variants will not replicate and will disappear. But some variants will experience a rapid success and will have a rate of reproduction that is higher than that of their competitors. From this point of view, we can say that they have a higher fitness, which in this framework simply means that they find it easier to occupy the minds to which they have been communicated. At the end of the process of selection by differential reproduction – cultural selection – the new variants replace the others in the minds of most members of the population.

For memetics, this logic controls what the social sciences refer to as 'culture'. Culture is therefore not an ideational and abstract holistic essence, a synthetic and ubiquitous system of ideas peculiar to a given society and which is more or less accurately and variably expressed in each individual through socialization. Instead, it is the concrete collection of units of information that exist in the heads of different members of a given society or social group, and which have no genetic basis¹². Like genes, these units are supposedly immersed in a process of replication/variation/selection which leads to the continual evolution of their content and of their respective frequency in populations. That is why memeticists argue that culture forms a second level of evolution, which is autonomous with respect to the gene level¹³ (Dawkins, 1976, Chapter XI; Cavalli-Sforza and Feldman, 1981, pp. 3-18; Boyd and Richerson, 1985, pp. 1-18; Durham, 1991, pp. 183-213; Dennett, 1995, Chapter XII;

¹¹ To be precise, these ideas and behaviours are in fact complex associations of memes. For all these thinkers, memes, like genes, are simple elementary units, which group together to form integrated meme complexes, just as genes associate to form the genotypes of complex organisms (Dawkins, 1976, Chapter XI).

¹² Or, for some memeticists, no exclusively genetic basis. On this point, see above.

¹³ Cultural evolution would therefore be explained by mechanisms that are analogous to those that control genetic evolution: in the first place, selection, but also the divergence of cultures that are isolated from each other, drift, neutral mutation and migration. Memeticists generally add a set of evolutionary forces which are specific to cultural evolution: transmission forces. In biological evolution, the transmission of the units of evolution (genes), which takes place through reproduction, leaves the frequencies of the units (genes) unchanged, following Mendel's laws. This is not the case in the transmission of the units of cultural evolution (memes) (Cavalli-Sforza and Feldman, 1981, p. 351; Boyd and Richardson, 1985, pp. 7-11; Durham, 1991, pp. 420-427). The frequencies of two ideas (memes) with equal fitness can evolve differently, simply because one of them has access to a greater number of channels of transmission than the other. This is the case, for example, when an idea is present in the head of a leader in an autocratic society or in that of an influential journalist in a democratic society. From this point of view, in cultural evolution the forces of transmission can have evolutionary effects.

Runciman, 1998 ; Blackmore, 1999, Chapters 2 & 3 ; Aunger, 2002, Chapter 2).

For memetics, the physical and mental human is simply the product of two evolutionary processes – genetic and cultural. On the one hand we are, as Dawkins put it, “survival machines” for our “selfish genes”, on the other our minds are niches which memes ferociously compete to occupy, resulting in the disappearance of the least fit “cultural replicators” (Dawkins, 1976, Chapter XI ; see also Durham, 1991, pp. 183-213)¹⁴.

The various forms of memetics are generally based on these principles. Formulated in such general terms (beyond which popular versions of this theory do not venture), the principles of memetics lack precision and raise a series of questions. These issues have been debated in the scientific community for around thirty years, and can be found at the crossroads of neo-Darwinism, the cognitive sciences, psychology, the philosophy of mind and anthropology. These debates have led the supporters of this theory to try and clarify the uncertainty that surrounds some propositions and concepts, and above all, the concept of the meme.

WHERE CAN MEMES BE FOUND? WHAT ARE THEY MADE OF? DO THEY EXIST?

The most striking difficulty concerns the nature and existence of memes. To justify the existence of memes, memeticists have often been initially content to point to the ability of human beings to learn from their fellows, and to the rapid diffusion of some ideas or practices, such as fashions, in human societies. But this does not make clear exactly what a meme is, what it is made of, or even if the cultural domain does indeed contain entities that are strictly analogous to genes. A memeticist who is satisfied with this kind of argument is like a biologist who has claimed to explain biological evolution by merely invoking the phenomenon of reproduction and the resemblance of parents and offspring. To meet this criticism, memetics has to acquire something that resembles genetics – at the very least, it has to be able to pose and to answer the same kind of questions that genetics can pose and answer with regard to biological phenomena (Aunger, 2000b).

To justify the idea that there are cultural replicators that are similar to genes, we have to be able precisely to characterise the learning phenomena that can be considered to be mechanisms for replicating of a piece of information. And we then have to be able to make clear what, in the replication mechanism thus defined, is considered to be the replicating unit of information. *A priori*, there are many potential candidates for this status: memes could be behaviours, representations, or publicly-formulated beliefs. Or they could be only some

¹⁴ It should be noted that for a meme to be fit does not mean that it is “biologically” fit, that it is selected by biological natural selection: it merely means that it replicates itself in the minds of a population more frequently than its competitors. In other words, it means that it is selected by an autonomous process of selection that operates at the level of cultural units. In such a model, cultural evolution is as “natural” as biological natural selection, because it also constitutes the third stage of a process of replication/variation/selection. It therefore has, in principle, just as much explanatory power as biological natural selection. However, for memeticists, cultural selection cannot be reduced to natural selection, and in some cases is opposed to it: an idea that is genetically disadvantageous or neutral can be very fit memetically (Dawkins, 1976, Chapter XI; Durham, 1991, Chapter 7; Blackmore, 1999; Dennett, 2000).

behaviours, representations or publicly-formulated beliefs. If this is the case, what are their specific properties? Are memes semantic or syntactic units? What is the material basis of memetic information? Are memes neural networks? Can we use memetics to build a reductionist theory of culture? Are artefacts (see for example Gatherer, 1998), such as pottery, or photocopied printed pages or e-mails, memes? If they are, that surely implies that memes should not be considered as strictly mental units. Is memetics ready to accept this? All these problems need to be dealt with if a solid and productive theory is to be constructed.

THE CAUSAL POWER OF SOCIAL LEARNING

To answer these questions, we have to clarify the nature of the mechanisms involved in those cases of the acquisition of cultural information that can be considered as involving replication. The solutions vary from author to author. Some supporters of memetics favour a very broad definition, which sometimes appears to go beyond the framework of social transmission. For these thinkers, imitation, contagion (laughter that spreads through a group of people, for example), local enhancement¹⁵, but also Pavlovian conditioning (through the association of two stimuli by repetition), Skinnerian conditioning (through reward and punishment), or what ethology calls “imprinting”, which includes a genetic aspect, could all be mechanisms of memetic transmission of a piece of information (Cavalli-Sforza et Feldman, 1981, p. 7; Brodie, 1996; Gabora, 1997). For some thinkers, like Liane Gabora, a meme or cultural replicator can even be “anything that can be the subject of an instant of experience” (Gabora, 1997, cited in Blackmore, 1999, p. 45). Other theoreticians adopt more restrictive definitions, and argue that the units of cultural evolution are beliefs and behaviours that do not have a direct genetic basis and which are acquired through inter-individual learning. From this point of view, things that are socially learned (in the broadest terms) are memetic (Reader and Laland, 1999; Aunger, 2000b). Memetics is thus limited to a range of mechanisms that includes imitation, as well as some other processes, such as local enhancement¹⁶. Finally, the most radical thinkers (often those who are the least reticent about proclaiming themselves to be “memeticists” – the “orthodox” memeticists) restrict replication to imitation (Dawkins, 1976, p. 206; Dennett, 1995, Chapter XII; and above all Blackmore, 1999, pp. 42-52). In this

¹⁵ The presence of an individual in a given location can attract other individuals. Attracted by the same stimuli, the “follower” individuals adopt the same behaviour as the first – for example, in the case of birds, by opening the milk bottles placed on the doorstep each morning. In these cases, there is no imitation of one individual by another, even if there is a social component to the learning.

¹⁶ Local enhancement is a mechanism of social learning which does not involve the imitation of one individual by another. This mechanism can be described as follows. Let us imagine that, by chance, an animal discovers an unusual resource in a given location, and that appropriating that resource requires a particular technique (for example, tits learning to pierce thin metal milk-bottle tops (see Fischer and Hinde, 1949, Sherry and Galef, 1984, Reader and Laland, 1999). The mere presence of this individual in this location may attract other members of the same species if it is gregarious. Once they arrive at the location, the other animals are subject to the same overall stimuli as the first individual, and they will end up discovering the resource by themselves – through pecking, they perforate the milk-bottle top, and then retain the technique in their memory. Acquisition here is individual – information is not transmitted directly by the observation and imitation of others. But there is a social component to this learning, because it necessarily involves two individuals, and the existence of gregarious behaviour in their species. Local enhancement can therefore be considered as an example of social learning, even though it does not involve imitation.

framework, only those units of information that are acquired by the observation of another person, and which can be transmitted to others by the same mechanisms, could be considered as memes, which would exclude, for example, local enhancement, which is important in some animal species.

Among these definitions, the first (that is, the broadest) appears less pertinent and productive than the others. To bundle together under the heading “memetics” all the mechanisms involved in the cultural acquisition of information – including conditioning and imprinting – would clearly go beyond the framework of the analogy that was the starting point of the model. The idea of a cultural replicator, of an analogy with the transmission of genes, appears to imply the presence of at least two individuals, and the acquisition by one individual of a piece of information which she or he did not initially possess in his or her repertoire of genetic dispositions. It therefore seems reasonable, as a first approximation, to limit the mechanisms of cultural replication to cases of social learning (Aunger, 2000b, p. 220).

MEMETICS: A FIELD THAT IS LIMITED TO PASSIVE CULTURAL TRANSMISSION

This draft definition of memetic transmission has important consequences for the characterisation of memes. It implies that some phenomena should be excluded from the field of memetics, restricting the areas of the social sciences in which memes might be found.

Firstly, it excludes representations, dispositions or behaviours that may have a genetic basis. Such behaviours form part of our innate mental equipment, and are therefore not “socially transmitted”. They exist in the minds of individuals not by virtue of the causal force of social learning, but because they are there from the outset. For example, if the human aversion to having sexual relations with close relatives was shown to have a genetic basis, the incest taboo could not be considered to be a meme. Similarly, beliefs that flow from a mental activity that is more or less directly genetically determined should be excluded from the “meme” category.

Second, the definition of memetic transmission as social learning excludes rational behaviours and representations in the sense of rational choice theory (Becker, 1976; Coleman, 1990) or methodological individualism (Boudon, 1994), that is, based on conscious reasoning that can, in principle, be revised, and which make sense inter-subjectively. Two arguments can be put forward to support this.

Firstly, beliefs or behaviours that are adopted for reasons cannot be memes because the motive underlying the behaviour or the belief is not situated in the causal force of social transmission, but in the intrinsic logical force of the underlying reasons or “good reasons” (Boudon, 1994) and of the reasoned activity of the mind which adopts them. If I get vaccinated because I think that may prevent me from getting a disease, both my belief and the practice that accompanies it are based on this reason, and not on the fact that they were socially transmitted to me. In this context, the mind is active, and not passive as in the case of imitation¹⁷. Second, rational beliefs and behaviours cannot be

¹⁷ The mental activity discussed here is different from that evoked by evolutionary psychology or cognitive anthropology (Sperber, 1996). In methodological individualism, mental operations are not considered to be automatic products of “infra-individual” mechanisms (Sperber, 1997) rooted in genes

the object of a selective process, in the sense that biology uses this term. For selection to exist, inherited variations must occur randomly and with no link to any adaptive end. When adaptations are oriented towards an end – in biology, this would be the case if adaptive variations were hereditary, as the Lamarckians thought – selection cannot play a role, because variation already includes a form of adaptation and a selective bias (Dennett, 1995, p. 355)¹⁸.

More generally, this definition excludes all types of information transmission that require active cognitive involvement of the mind of the receiving individual. This has an important consequence: the more we consider that this class of phenomena plays a large part in human existence, the less we will be inclined to accord either pertinence or importance to the memetic approach to the social sciences.

On its own, such a comment does not, of course, constitute a definitive critique of memetics. It has a critical value only if theories that give an important role to the mental activity of individuals in the transmission of cultural information are felt to be particularly pertinent. However, such criticisms are outside the scope of this section, which is intended merely to describe the range of phenomena in which memes might be observed: if memes exist, they will be found in cases of passive social learning.

MEMES ARE NEITHER BEHAVIOURS, NOR BELIEFS, NOR ARTEFACTS

Now that we have defined the realm of memes, it remains to be determined what they are made of. We have a better idea where they can be found, but the question of their existence and their nature remains: are they beliefs held by individuals? Are they private representations? Are they behaviours? Can memes be artefacts?

Let us suppose that memes are individual representations or individual behaviours, such as those that can be seen, for example, when we observe someone catch a fish with a harpoon, make a two-handed backhand at tennis, get married, wipe her or his nose with a handkerchief, explain Darwinism, tell the story of Little Red Riding Hood, or speak about God. These units, to the extent that they are behaviours or overt beliefs, can be considered as aspects of individual phenotypes, in the broadest sense of the term¹⁹. But this definition of the meme raises two problems.

Firstly, such phenotypic attributes vary from one individual to another (Sperber, 1996, 2000; Aunger, 2000b); Darwin's theory does not have exactly

and activated by environmental stimuli. Beliefs and behaviours are controlled by reasons provided by the mind; the mind is therefore the operator of its own reasonings, beliefs and actions, which it can deeply revise if necessary (Boudon, 1994). Despite this divergence in the interpretation of mental activity, methodological individualism, evolutionary psychology and cognitive anthropology share the idea that each mind is not a passive container of the information it receives.

¹⁸ Some authors seem to think that the existence of individual "choice" in the adoption of beliefs and behaviours can be integrated without difficulty into the Darwinian framework (see Cavalli-Sforza and Feldman, 1981, p. 63; Durham, 1991, pp. 198-205). But their definitions of selection and of transmission are modified as a result.

¹⁹ Many memeticists distinguish between observable entities through which genetic information is expressed – phenotypes – and the observable entities through which memes express themselves. There is no *a priori* reason to assume that the latter are phenotypes. Memeticists generally call them "phemotypes" (see, for example, Aunger, 2000, p. 214), but their nature has yet to be precisely determined.

the same content in the minds of the different individuals that know about it; the meaning associated with the word “God” differs in the minds of the members of a given society, just as all tennis players do not play a two-handed backhand in exactly the same way, or all the members of a given family do not pronounce words in exactly the same way, and not everyone tells the story of Little Red Riding Hood in precisely the same fashion. As a result, if we simply observe these phenotypic attributes, limiting ourselves to behaviours and overt beliefs, the transmission of information does not appear to be sufficiently faithful to imply the existence of replicators and, therefore, of cultural evolution through selection. If memes exist, they cannot be overt beliefs or behaviours.

Second, we can empirically observe that, in the realm of culture as in that of biology, the replication of information does not occur through the production of an exact copy of a phenotype. In the living world, it occurs through the intermediary of genotypes, of genes, which are the real vehicles of information, the true functional units of replication²⁰. Similarly, in culture, behaviour, representations or declared beliefs do not directly copy themselves. Whatever their nature, memes have to be transmitted from one mind to another. And to be communicated, they have to be translated from mental language into a signal language that enables another individual to receive them and to re-translate them back into their mental language (Aunger, 2000, p. 214). Therefore, to construct a theory of evolution (biological and memetic) which is congruent with the facts, we have to distinguish between replicators and what the philosopher of biology David Hull calls interactors (Hull, 1988). Interactors – bodies in biology, or behaviours and publicly expressed representations in culture – are individual entities constructed from the information contained in the replicators. The selection of the fittest replicators occurs through competition between interactors. The concrete expression of the genetic or memetic information contained in a replicator, that is, the phenotypic (or phemotypic, in the case of memes) trait of the interactor, is never perfect. For a given replicator, it can vary from one individual to another according to environmental conditions. That is why the interactors that can be observed in a population can present differences as well as being the expression of identical replicators; the phenotypic traits constructed from the same replicator are never identical in different individuals. For example, the same gene complex that codes for eye shape and colour will never give completely identical eyes in two different individuals.

As a result, if memes exist, they should not be confused with the attributes of interactors, that is, with the overt behaviours or beliefs that can be observed in individuals. For example, an individual’s belief in God, like the backhand played by Roger Federer during a tennis match, or the representation that is associated with this action in his mind when he executes it, are not memes. In the best case, they are merely the phenotypic or phemotypic expressions of a meme. The same argument applies to artefacts. But if memes are not made of behaviours, private or public representations or artefacts, what are they made of? For memeticists, the theory of biological evolution is solidly established

²⁰ At least, this is how memeticists think about the gene and biological evolution. As I pointed out above, there are other ways of thinking about evolution and the relation between gene and organism. But they are not part of the framework used by memeticists.

because it identified its replicators – genes. Can memetics construct equally solid empirical and theoretical bases?

MEMES ARE NOT NEURAL NETWORKS

To resolve this difficulty, it might be tempting to locate memes in the body, to look for physical entities in the organism which could play the same role in memetics as that played by genes in biological evolution. In other words, it can be hypothesised that there are physical vehicles of cultural information, just as there are physical vehicles of biological information. Given that ‘information’ in this context concerns mental phenomena, the material basis of this information (if it exists) must be sought in the brain and its components, that is, in the neurones. According to this hypothesis, the neural network associated with a given piece of information – for example, “play a two-handed backhand” or “the idea of God” – would be expressed through phenotypic or phemotypic expressions (explicit beliefs or behaviours) which differ between individuals, just as a given gene produces organs showing slight morphological or physiological differences in different individuals. Are the units of cultural information neurones, or can they be reduced to neurones? Can we argue that the connections between neurones form a language that can contain information which could be the basis of representations and behaviours?

Supporters of memetics do not generally agree with this position²¹. Many of them see memes as semantic and not syntactic units. In other words, despite the claims of some social scientists, memetics is not a reductionist theory. Daniel Dennett, for example, considers that we will never be able to link the semantic content of memes to a neural network or to a given part of the brain. For Dennett, it is unlikely that anything equivalent to DNA, which is the syntactic support of the language of genes, will be discovered in the realm of memes. He argues that it is improbable that the social sciences will one day be able to employ techniques that are similar to those that allow physics and biology to reduce some of their laws or observations to more elementary laws or observations. And if one day we do have such means, we will have to create a translation table to convert the different forms in which a meme can express itself – private representation, speech, behaviour, the printed page, a computer hard disk, etc – into a set of common meanings (Dennett 1995, pp. 353-355; see also Dawkins, 1976, Chapter XI).

This reluctance to embrace reductionism is not a matter of chance, nor is it due to the more realist memeticists prudently declining to take their theory to its most radical conclusions. In fact, two reasons explain this position. Firstly, unlike genes, neural networks do not pass physically from one individual to another during communication. In this sense, neurones are not replicators. Memes, therefore, are not neurones. But above all, to measure the power of

²¹ Robert Aunger has a different position on this question, adopting a stance that is neither reductionist (like evolutionary psychology) nor similar to orthodox memetics. In his stimulating book (Aunger, 2002), he argues that memes are probably replicators that associate the synapses of several neurones, through electrochemical activity. But, he continues, replication and selection take place only within each brain, and not at the transition from one brain to another. The transmission of memetic information from one brain to another is, he argues, relatively diffuse and does not take place through a copying process. Memes, therefore, remain in brains and do not pass from one brain to another. For orthodox memeticists, Aunger’s view is closer to neuroscience than to the fundamental principles of memetics (Blackmore, 2003, p. 3).

memetics, we need to understand that the intuition upon which it is based is the opposite of a reductionist philosophy. The various variants of memetics are articulated around the idea that minds contain entities that obey their own evolutionary dynamic, which cannot be reduced to that of genes. In such a framework, everything that is considered to be genetic reduces the autonomous dynamic of memes, which flows from the causal power of social learning. In the memetic conception of the world there is a tension between the dynamic of biological replicators and that of cultural replicators, between the biological level of genes and the cultural level of memes. The evolutionary dynamics that control each of these levels are autonomous – a meme can quite easily be disadvantageous from a biological point of view – even if they sometimes interact with each other through coevolution (Lumsden and Wilson, 1981; Durham, 1991).

MEMETICS VERSUS EVOLUTIONARY PSYCHOLOGY

This theoretical tension between the gene and the meme finds its most visible expression in the debates that oppose the representatives of evolutionary psychology and memeticists. Evolutionary psychologists consider that there is a genetic basis to the mental structures that form cultural beliefs and behaviours (Barkow, Cosmides and Tooby (eds) 1992; Pinker, 2002). They argue that many beliefs or behaviours are present in human societies because they are derived from innate mental modules, not because they are diffused by social learning. As Robert Aunger has argued, for evolutionary psychology, “ ‘cultural’ traits are in the brain, with only an environmental spark required for them to be expressed. What remains to be explained from the evolutionary psychological perspective is not social transmission dynamics, but recall dynamics: what kind of responses do different environments cause to arise?” (Aunger, 2000, p. 207). By insisting on the causal power of innate mental modules in the formation of cultural traits, evolutionary psychologists minimise the power of social transmission: if culture is initially present in the brain, it is not transmitted through contact with others.

Evolutionary psychologists – and cognitive anthropologists such as Dan Sperber – emphasise that in most cases, the transmission of cultural information is an *active* process of transformation rather than a passive process of copying (Sperber and Wilson, 1986; Sperber, 2000; Boyer, 2001, pp. 58-62). To support this hypothesis, they first use an argument evoked earlier. Where transmission takes place by spoken or written discourse, the semantic content present in the mind of the emitting individual must be translated into ordinary language. In most cases, this translation leads to the loss of a substantial quantity of information, even when it is simple (Aunger, 2000, p. 216). As a result, in human communication, the receiving individual generally has to compensate for the loss of information by reconstituting the meaning of the emitting individual’s intentions. The receiver does this using his or her own theory of mind and the perspective given by the context in which the message was received. For example, the phrase “What time is it?” can mean that I would like the person who is questioned to tell me the time; but it can also mean that I am trying to communicate my irritation to people who arrive late for a meeting. In each of these concrete situations, the content of the information present in the minds of the emitter and receiver has a meaning that is much more precise than that intrinsically contained in the linguistic message. The same thing applies to behaviours. When I imitate a tennis player whom I

have seen playing a backhand, I use a visual memory which has a very low informational content, given the proprioceptive information I need to employ to make more or less the same gesture. Evolutionary psychologists emphasise the fact that the mind plays an active role in the reception of information, which it often has to reconstruct. If the mind is active, the transmission of information cannot be considered as a passive copying process.

This mental activity explains why messages are rarely precise copies, why the version of a given belief or behaviour is always slightly different from individual to individual, and continually changes during its successive transmissions (Sperber, 1996). Furthermore, even when a message appears to have been faithfully transmitted, even when communication has led to a perfect replication of the mental content of the emitting individual, we cannot conclude that there is an underlying process of replication or copying. As Pascal Boyer has pointed out: “A good transmission requires as much effort as a distortion [...] For example, I can sing *Après de ma blonde* [a folk song] more or less like those who sang the song in the past, because complex mental processes have shaped my memories of the different versions I have heard”. As a result, he adds: “the brain [...] manipulates the information available to it, *above all* when it faithfully transmits that information” (Boyer, 2001, p. 61 – my translation).

For all these reasons, evolutionary psychologists and cognitive anthropologists consider that in many cases the stability and similarity of some representations in human societies – what we call “culture” – cannot be explained by the causal power of transmission from individual to individual, but by the existence of innate information-processing modules that make up the human brain. In a word, there are stable and widespread beliefs and behaviours because most humans have similar natural dispositions to develop these beliefs and behaviours.

Many other interpretations of mental activity, apart from those proposed by evolutionary psychology and cognitive anthropology are, of course, possible. This article is not intended to defend these two models. However, I have chosen to expound the criticisms made of memetics by evolutionary psychology and by cognitive anthropology for three reasons. Firstly, the ideas of memetics have been discussed mainly by researchers from these two strands of thought. Second, these criticisms underline, yet again, the major differences that separate reductionist neo-Darwinian theories of culture from memetics. Finally, and above all, these criticisms raise an empirical argument which retains its validity even if one does not accept the hypotheses about the mind developed by evolutionary psychology and by cognitive anthropology. This argument is as follows: in many cases the transmission of cultural information is clearly not a process of *passive* copying.

ANOTHER ANALOGICAL NEO-DARWINISM, BUT THIS TIME WITHOUT REPLICATORS: THE MODEL OF BOYD AND RICHERSON

To deal with this criticism, some supporters of a non-reductionist neo-Darwinian approach to culture consider that the idea of cultural evolution by social learning is not invalidated by the active role played by the mind in many examples of communication. For Boyd and Richerson, it would be an exaggeration to suggest that the mind passively absorbs the information it receives from other people. But on the other hand, they add, it would be equally wrong to argue, like many evolutionary psychologists, that the content

of human representations and behaviours owes nothing to the causal power of the social transmission of information. They conclude that “the single most important adaptative feature of culture is that it allows the gradual, cumulative assembly of adaptations over many generations – adaptations that no single individual could invent on their own. Cumulative adaptation cannot be based solely on innate, genetically encoded information” (Boyd and Richerson, 2000, p. 148). To illustrate their point, Boyd and Richerson use the example of the maritime compass. This device was elaborated slowly, over a long period marked by seven or eight major innovations, sometimes separated by several centuries. It could be developed only “because novel information can accumulate in human populations, be stored in human brains, and be transmitted through time by teaching and imitation” (Boyd and Richerson, 2000, p. 149). Similarly, they explain, the Papagos people are able to live in the desert between Sonoi (Mexico) and Yuma (Arizona) through their knowledge and their institutions, not because of an innate mental module that is directly adapted to this hostile milieu – many European pioneers tried to live in this desert, and found only death (Boyd and Richerson, 2000, pp. 149-150). They conclude that because cultural facts cannot be reduced to innate mental modules, transmission by social learning plays an important role in the constitution of culture²².

Against the evolutionary psychologists, Boyd and Richerson claim that the constructive activity of the mind during communication does not undermine the idea that cultural evolution is analogous to biological evolution. Although they accept that it substantially relativises the explicatory and heuristic value of the concept of a “cultural replicator” (Boyd and Richerson, 2000, p. 157), they argue that the principle of evolution, as it is currently defined in the neo-Darwinian framework, cannot be reduced to this version of the concept. Adopting an idea of the biologist Ernst Mayr, Boyd and Richerson argue that what is essential in Darwinism is the idea of “population thinking”. This very general principle views evolution as a modification in the frequencies of units of information within a population – in the case of biology, of alleles. This change can occur through other mechanisms apart from the selection of individual replicators. In particular, it can involve selection at the level of the group rather than at the level of the individual. Richerson and Boyd argue that “a propensity to imitate the common type in a population can be coupled with high rates of individual learning to create a model in which there is a little heritable variation at the individual level, but substantial heritability of group differences (Henrich and Boyd, 1998). In such a model the cumulative evolution of adaptative complexity can occur, and occur rapidly, through selective processes that act at the group level (Boyd and Richerson, 1990)” (Boyd and Richerson, 2000, p. 158).

Although these kinds of arguments are stimulating, they do not entirely support memetics. In its orthodox version, memetics is based precisely on the

²² One potential criticism is that even if it is impossible to reduce cultural facts to innate modules, this does not necessarily validate Boyd and Richerson’s hypothesis. As I pointed out earlier, it is equally possible that ideas are transmitted because of the reasons used by social actors to adopt them, as argued, for example, by methodological individualists. The individualist hypothesis and, more generally, those sociological models that include the motives expressed by individuals, are often ignored in the debates around memetics.

idea that there are “cultural replicators” which are analogous to genes – a hypothesis that Boyd and Richerson find extremely doubtful.

MEMETICS AND PSYCHOLOGY

Many of the criticisms of memetics evoked earlier, in particular those formulated by supporters of evolutionary psychology, underline the simplistic character and the weakness of the psychological hypotheses which memeticists use to prove the existence of memes²³. However, some memeticists have put forward a general epistemological argument to reply to this kind of criticism (Dennett, 1995, Chapter XII; Blackmore, 1999, Chapter 4). As we have seen, for memeticists the principle of cultural evolution is the strategic logic of memes, and that to understand this evolution it is pointless to adopt the viewpoint of an individual mind, which is merely the host, a niche that memes compete to occupy. Instead, we are supposed to adopt a “meme’s eye view” (Blackmore, 1999, p. 37), in which the mind, the brain and the laws of individual psychology can be seen as merely the *conditions* that make cultural evolution possible, and not as the *principles* that control it. In this context, psychology should be considered – at least provisionally – as simply a black box. Memeticists consider that the “interpretative strategy” of explaining cultural logic on the basis of an elementary psychological level is flawed and doomed to fail. When Darwin formulated the principles of biological evolution, he did not start with chemistry; indeed, the discovery of those principles preceded the discovery of genes. Similarly, they argue, it is not necessary to have a perfect understanding of the physical mechanisms which underlie thought to be able to construct a more or less accurate and predictive theory of the mind and of culture. Furthermore, by refusing to use concepts that, like the meme, seem to imply that the levels of complexity of the world are irreducible, reductionist epistemology rejects the possibility of understanding phenomena or laws which cannot be revealed by studies that begin from the lowest levels, because the links between levels are many-branched and complex. For memeticists, reductionism may be ontologically correct, but it is epistemologically blind and sterile, while although the “intentional stance” might not be ontologically pure and perfect, it is undoubtedly more parsimonious and more fertile than reductionism. Memeticists concede that it might one day be possible to link the laws of cultural dynamics with those of psychology, but they point out that for this to occur, it will first be necessary to substantially develop our understanding of memes, in order to know what phenomena and what laws need to be reduced to psychology (Dennett, 1995, Chapter XII; Blackmore, 1999).

This position with regard to psychology raises an important problem. Memeticists are right to point out that the radical reductionism is methodologically sterile, and it can be argued that the laws that govern the mind are merely the conditions of cultural evolution. But they have yet to prove that memetics can successfully assimilate what we know empirically about these conditions, that the psychological preconditions for the existence of memes are in fact met. As we have seen, the minimal psychological

²³ Once again, it needs to be emphasised that the validity of the criticisms raised here can be recognised by all theoreticians who consider that the mind plays an active part in the transmission of cultural information. These criticisms therefore do not necessarily require that all the hypotheses formulated by evolutionary psychology or cognitive anthropology are accepted.

hypotheses required by memetics are far from verified and they raise a number of very real problems. In particular, the mechanisms that truly copy cultural information – if they exist – must function in a limited realm, given the active role played by the mind in many cases of information communication.

Once again, it is important to underline that there is a profound theoretical reason underlying the reticence shown by memeticists with regard to psychology and the cognitive sciences, and underlying their emphasis on the mechanisms of imitation and the passive transmission of cultural information. This reason can be expressed in a different form to that used earlier. In biological evolution, the replication of genes is not controlled by their fitness. When a gene is replicated, for example during mitosis, it is not copied “because it is the fittest”. Replication is the capacity of genes to multiply (they are replicators), and the properties that give them this capacity are independent of those that determine their fitness. The properties that determine the fitness explain why a given replicator spreads *in greater numbers* than others, why it is *selected*. But they do not determine why it *replicates*. Replication is a mechanism that is defined (and must be defined) independently of any consideration of fitness, and therefore of selection. As a result, for the transposition of this model into the domain of culture to have any meaning, memeticists have to identify a mechanism of replication of cultural information that can be described without evoking the properties that explain why some ideas are more successful than others. In other words, cultural replication must consist of a process that owes nothing to the content of the ideas in question, or to all that determines their degree of adaptation to the ecological niche formed by the human mind and its environment. Memeticists can allow themselves to evoke these properties – the particular properties of ideas and of the human mind – when they speak of the *selection* of memes. But they should not do so when they describe and evoke *replication*. As a result, to isolate the mechanism that, in human communication, can be considered to be a replication of information, they must limit themselves to the mechanisms of the transmission of information that owe nothing to the particular properties of ideas, or the properties of the minds that accommodate them. That is why, when memeticists define cultural replication, which is at the heart of their model, they have to concentrate on passive mechanisms of transmission, in other words on imitation, because it is possible to speak of this mechanism without evoking the content of the ideas that are transmitted, or the active properties of the mind.

A THEORY REDOLENT OF SOME TRADITIONAL MODELS OF THE SOCIAL SCIENCES? MEMETICS AS AN “INFRA-CULTURALIST” THEORY

The complex and ambiguous relation of memetics with psychology and the cognitive sciences is redolent of one of the founding episodes in the history of the social sciences: Durkheim’s criticism of the psychological explanation of social facts, and his opposition to the use of naturalism, as part of his attempt to justify the development of an autonomous sociology (Durkheim, 1895, Chapters I and V). A century before memetics, Durkheim emphasized the impossibility of constructing a social science on the basis of psychology. Like today’s memeticists, he used an analogy with biology to justify this

epistemological assumption²⁴. And, like memeticists, he claimed sociological laws should be established at a level of complexity that was autonomous with regard to the laws that govern the individual mind. This argument led Durkheim, like today's memeticists, to reject the biological reductionism implied by contemporary naturalist psychology²⁵. Finally, it is clear in retrospect that Durkheim, like the memeticists, found it impossible to avoid using hypotheses that were more or less psychological, when, for example, he stated that the social environment determines the beliefs and inclinations of individuals (Durkheim 1894), or when he defined the collective consciousness as an average of individual consciousnesses (Durkheim, 1894), or when he tried to explain how a given state of society could lead to an increase in a particular type of suicide (Durkheim, 1897; see Cuin, 1997).

Nevertheless, there are evident and important limits to the similarities between Durkheim's views and those of memetics: memetics is not a version of Durkheimism, nor of culturalism. Like these classic sociological models, memetics is epistemologically and ontologically opposed to psychological and biological reductionism. But if we want to situate memetics in the ontological and epistemological debates of the social sciences, we must abandon the individual/society dichotomy that is traditionally used to classify sociological and anthropological theories. Because memetics is not based on psychology, it is neither individualist, in the sense of methodological individualism or rational choice theory, nor "infra-individualist" (Sperber, 1997), like evolutionary psychology or cognitivism. But it is also not holistic or culturalist.

For memeticists, the culture of a given society is not a set of ideas that forms a synthetic totality, which only exists in a pure state outside of individual consciousnesses and which is expressed in a more or less exact form in each one of them. They do not consider culture to be an integrated system of norms that members of a society receive during their education in a quasi-indivisible block that is globally identical for everyone. Instead, they view it as a discrete collection of elementary units of information – which can combine with each other to form complex aggregates (memplexes) – which are either present or absent in each of the individual minds of a given society. The frequency of these units can therefore be measured in each society, just like the frequencies of the alleles of a given gene in a population. The number of copies of each meme – that is, the number of minds it occupies – can vary from one society to another, and within the same society over time: the distribution and the evolution of the number of copies of memes depend on their respective fitness and, equally, on other variables such as migration, neutral mutations, cultural segregation, drift or modes of information transmission (Cavalli-Sforza et Feldman, p. 351, Boyd et Richerson, 1985, et Durham, 1991, p. 426).

As a result, memeticists consider that the differences that can be observed between the members of a given society do not occur because those individuals

²⁴ Durkheim used an analogy between the organism and society. "Between psychology and sociology there is the same solution of continuity as between biology and the physico-chemical sciences. As a result, each time that a social phenomenon is directly explained by a psychic phenomenon, we can be sure that the explanation is false" (Durkheim, 1895, p. 197 – my translation). Although the content of the analogy is different, Durkheim and the memeticists make the same polemical and anti-psychological use of the biological metaphor.

²⁵ Durkheim criticises the explanations of social phenomena proposed by contemporary phrenologists, physical anthropologists or criminal anthropologists (such as Cesare Lombroso).

show variation for the degree to which they had integrated their “culture”, seen as an ideational totality that is identical for all, as a system of norms that is peculiar to their social group. Rather, they argue that these differences are due to the fact that a meme – like an allele – is not necessarily present in each member of society. For example, in a given society, the meme – or rather the memeplex – “There is a God” is present in a certain number of minds, while the others are occupied by the meme “There is no God” or by the meme “I do not know if there is a God or not”.

For the memeticists, this conception of culture presents at least three advantages over the traditional culturalist conception. Firstly, it is dynamic – the number of copies of memes can evolve substantially over time: this kind of model therefore makes it possible, in principle, to account for all types of cultural change, from the slowest and most local to the most rapid and widespread. Second, this model is quantifiable – it is, in principle, possible to measure the process of cultural change. Finally, the memeticists argue that it makes it possible to account for the individual differences in beliefs and practices that exist within a given society without it being necessary to introduce additional theoretical concepts, such as the concepts of “sub-culture” or “degree of socialisation” (see Durham, 1991, Introduction).

The anti-individualism of memetics therefore does not lead to cultural holism. Neither does it lead to the “infra-individualism” of cognitive anthropology or evolutionary psychology, because memetics is not reductionist. In reality, it consists of a very specific theory that can be qualified, even if the term is not perfect, as “infra-cultural” or “infra-culturalist”. To explain what I mean by this term, we can draw an analogy with how some neo-Darwinian biologists have proposed to think about life. When these neo-Darwinian biologists – in particular Williams (Williams, 1966), then Dawkins (Dawkins, 1976) – claimed that the nature and diversity of species are controlled by the natural selection of genes, they shifted the logic of life to a level below that of the organism, which became a mere “survival machine” for the elementary units – genes – which in turn took on a primordial role. Similarly, memetics shifts the logic of cultural beliefs and practices to a level below that of culture defined as an organically linked system of ideas²⁶ – but at the same time also above the level of the individual – into elementary ideational units that obey an autonomous strategic and selective logic: memes. To summarise, memeticists share with culturalist theorists the idea that a given social group’s culture is exterior to the individuals that make up that group. But unlike culturalist theorists, memeticists consider that culture is not a *holistic* unit that can be considered as a kind of first explanatory principle. They argue that culture is the result of a competition between *elementary units* that are part of an *inferior* level of complexity – hence the term I have used here to describe this theory: *infra-cultural* or *infra-culturalist*.

Such a perspective can be empirically fertile, if it is used as a simple *methodological* position. By adopting a meme’s eye view – that is, the point of view of ideas, of the strategies that they develop to replace each other – some phenomena may come to light which are not normally clearly visible in the light of classical holistic, individualist or naturalist social science theories (see

²⁶ That is, as it is seen in its traditional meaning by culturalist theorists, as an ideational holistic totality which is shared by the members of a social group.

Cavalli-Sforza and Feldman, 1981; Boyd and Richerson, 1985 and 2000; Durham, 1991; Runciman, 2004, 2005). Finally, seen from this angle, memetics shares some characteristics with some of the positions developed by the sociologists Bruno Latour or Michel Callon with regard to artefacts, technical networks or ideas, which they describe in intentional or strategic terms (Callon, 1986)²⁷. Nevertheless, this perspective can equally be adopted without employing the conceptual framework drawn from the analogy with the gene and biological evolution. At this level, the analogy appears cumbersome rather than heuristic.

It is unfortunate that the social sciences often completely reject ideas relating to culture that are developed in the framework of neo-Darwinism, sometimes without even examining them. But, equally, memeticists appear to be unaware that some of their key arguments have been widely debated in both anthropological and sociological circles for more than a century²⁸. This is particularly the case for the concept of imitation, which was first discussed in relation to the work of Gabriel Tarde, then in economics; for the diffusion of ideas, which was discussed and criticised by anthropologists (Bloch, 2000); for the question of the epistemological autonomy of sociology and anthropology with regard to psychology; or for the analogy between the genealogy of ideas and culture – hypotheses raised by memetics (Durham, 1991) – and the genealogy of individuals and species, the limits of which were clearly shown by the evolutionary sociologist Herbert Spencer (Spencer, 1876-1896, vol. II)²⁹.

CONCLUSION

In its current state, memetics is faced with three principal difficulties.

Firstly, it has to clarify its links with psychology and the cognitive sciences. On this central issue, the positions of the memeticists often appear ambiguous and raise some thorny problems.

Second, the ecological niche within which memes might exist turns out to be relatively limited. More precisely, it does not include all the phenomena which the human sciences study, nor even those that anthropologists traditionally call culture. If memes exist, their evolutionary logic has no influence on those beliefs and behaviours that are not passively transmitted from one individual to another – by passive imitation, the most radical memeticists would argue.

Finally, memetics has to resolve the thorny problem of the nature and the existence of memes. Memes are neither neural networks, nor behaviours, nor discourses, nor beliefs formulated by individuals, nor private representations, nor artefacts. At best, discourses, behaviours, overt beliefs, representations and artefacts are merely phenotypic expressions of memes, which vary from one individual to another. And the nature of these phenotypes remains to be determined – in other words, we have yet to discover which of these entities are the real interactors of cultural replication. To put it simply, memetics needs the equivalent of genetics. To prove that memes exist and to show what they

²⁷ I would like to thank Laurence Kaufmann for suggesting this link.

²⁸ This does not appear to be the case for the sociologist W. G. Runciman, who tries to make a heuristic link between the ideas developed in the classical social sciences and the analogy with genetic evolution (Runciman, 1998, 2004, 2005).

²⁹ These criticisms can be found, in an even more pronounced form, in the work of Tarde (1891, pp. 27-36) and Pareto (1917).

are made of, to convince the sceptics, researchers will have to plunge into the flow of human communication, identify and even “capture” a meme, analyse it and reveal its properties. For the moment, those memes remain extremely elusive.

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