

CHAPTER 1:

Introduction

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A number of prominent academics have recently argued that we are entering a period in which evolutionary theory is being applied to every conceivable domain of inquiry. Witness the development of fields such as evolutionary ecology (Krebs and Davies 1997), evolutionary economics (Nelson and Winter 1982), evolutionary psychology (Barkow et al. 1992), evolutionary linguistics (Pinker 1994) and literary theory (Carroll 1995), evolutionary epistemology (Callebaut and Pinxten 1987), evolutionary computational science (Koza 1992), evolutionary medicine (Nesse and Williams 1994) and psychiatry (McGuire and Troisi 1998) -- even evolutionary chemistry (Wilson and Czarnik 1997) and evolutionary physics (Smolin 1997). Such developments certainly suggest that Darwin's legacy continues to grow. The new millennium can therefore be called the Age of Universal Darwinism (Dennett 1995; Czikó 1995).

What unifies these approaches? Dan Dennett (1995) has argued that Darwin's "dangerous idea" is an abstract algorithm, often called the "replicator dynamic." This dynamic consists of repeated iterations of selection from among randomly mutating replicators. Replicators, in turn, are units of information with the ability to reproduce themselves using resources from some material substrate. Couched in these terms, the evolutionary process is obviously quite general. For example, the replicator dynamic, when played out on biological material such as DNA, is called natural selection. But Dennett suggests there are essentially no limits to the phenomena which can be treated using this algorithm, although there will be variation in the degree to which such treatment leads to productive insights.

The primary hold-out from "evolutionarization," it seems, is the social sciences. Twenty-five years have now passed since the biologist Richard Dawkins introduced the notion of a meme, or an idea that becomes commonly shared through social transmission, into the scholastic lexicon. However, the lack of subsequent development of the meme concept has been conspicuous. This stagnation implies that memetics is what the philosopher Imre Lakatos (1970) would call a "non-progressive research program." In particular, there has been no extensive intellectual campaign to produce a general theory of cultural replicators. As will become evident later in this book, little enthusiasm for the meme concept can be found among those professionally charged with understanding culture: that is, cultural and social anthropologists. Those in the fine arts are quite hostile as well. Jaron Lanier (1999), the inventor of the term "virtual reality," has argued that "the notion is so variable as to provide no fixed target. . . Are memes a rhetorical technique, a metaphor, a theory, or some other device? Depending on who you talk to, they can be so wispy as to be almost nothing. . . They make no predictions and cannot be falsified. They are no more than a perspective." Similarly, the famous skeptic Martin Gardner (2000) recently averred that "memetics is no more than a cumbersome terminology for saying what everybody knows and that can be more usefully said in the dull terminology of information transfer. . . A meme is so broadly defined by its proponents as to be a useless concept, creating more confusion than light, and I predict that the concept will soon be forgotten as a curious linguistic quirk of little value." In this view, the analogy to genes is deceptive, and the meme concept is Dawkins' dangerous idea.

At the same time, there are others at the opposite end of the spectrum who herald memes as the saviors of the social sciences. They tout memes as the explanation not only for culture, but for consciousness and the self (e.g., Blackmore 1999). A cottage industry has grown up around the meme idea, with an electronic journal (the *Journal of Memetics - Evolutionary Models of Information Transmission*) and accompanying bulletin board, as well as more standard, printed fare (e.g., Brodie 1996; Lynch 1996; Westoby 1996). Memetics is certainly alive on the World Wide Web and in the popular bookstores, and has considerable currency in some circles, especially among computer literati. This suggests a progressive research program at work.

This image is somewhat illusory, however, as most of the existing work in memetics remains largely abstract. Even those ostensibly sympathetic to the memetic project have noted that there are problems with memes, when considered the focus of an evolutionary process. Dawkins himself has suggested that the meme:gene analogy “can be taken too far if we are not careful” (Dawkins 1987:196). Thus many of the prominent figures in memetics discount the likelihood of memetics ever maturing into an overarching science of culture. They contend that the memetic perspective has yet to enhance our understanding of social-psychological-cultural phenomena compared to more standard formulations such as functionalist or structuralist anthropology. Memetics is surely a very immature science at present, if a science at all.

So what are the specific problems these knowledgeable critics identify? Although a prominent proponent of the memetic perspective, Dennett (1995) has nevertheless mounted perhaps the best-developed attack on the idea that memetics can ever become a science. He primarily elaborates points made earlier by Dawkins himself (see for example Dawkins 1982). Most fundamentally, he argues that “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 1995:353-4; emphasis in original). The syntactic language of genes is in the vocabulary of DNA; that of computer viruses in the computer language that codes it. But if memes exist in the brain, we are unlikely to ever be able to read out the memetic content of some section of cortex. This suggests to Dennett that social scientists will never have the “reductionistic” techniques available that biological and physical scientists have used to such effect in finding just how genes replicate using the material substrate of DNA. And even if we find such a technique, we will still need a translation table to convert into a common system of meaning the various media in which the same meme might be represented (in a mind, in splotches of ink on a page, or the digital bits of a computer hard disk).

Dennett then argues that in various ways memes fail to count as proper replicators. First, replicators need high fidelity replication. Memes, however, are subject to high rates of mutation, precluding the establishment of long-lived cultural traditions. Second, these mutations may be directed by purposeful human decision-making among competing cultural alternatives, rather than being simply random choices as expected by Darwinian theory. This is one of the interpretations of what Lamarckianism means, with all of its negative connotations (Dennett 1995:355).

Third, when memes get together in the mind, they mix and match, serendipitously, to fit circumstances, or even accidentally. They do not remain independent particles. Dennett (1995:355) cites Stephen J. Gould as saying: “The basic topologies of biological and cultural change are completely different. Biological evolution is a system of constant divergence without subsequent joining of branches. Lineages, once distinct, are separate forever. In human history, transmission across lineages is, perhaps, the major source of cultural change.” So where biological evolution is slow enough for adaptations to accumulate, and for the selective factors to be identified and ecological correlations noted, evolution in memes is too fast and too combinatorial for selective pressures to have a consistent effect (Dennett 1995:356).

Fourth, all this rambunctiousness means that similar memes will often crop up, but not be related -- rather, they will be invented by clever human brains in similar circumstances by convergent evolution. But we have no good way to determine which memes share ancestry since the tracks they leave behind are mired by replication in different media (Dennett 1995:356). In conclusion, “even if memes do originate by a process of ‘descent with modification,’ our chances of cranking out a science that charts that descent are slim” (Dennett 1995:356).

However, all of Dennett’s arguments constitute empirical claims about aspects of meme transmission and replication parameters which may or may not be true. Little attention has actually been paid to establishing the validity of these assertions, seemingly because they are intuitively obvious. But this does not mean they should be immune from testing. Dennett’s claims may only indicate that there are a lot of poorly-functioning memes out there; they don’t invalidate the meme concept, or prove the impossibility of “good memes” (Lake 1999).

The question I suggest the thoughtful reader should keep in mind is therefore: Whither memetics? The task of this volume is to see where a reasonable consensus might fall on this spectrum of opinion regarding the utility of the meme concept. As might be expected, perhaps the most interesting terrain lies squarely in the middle -- in the temperate zone between the extremes of hot and cold. And, as noted above, some of the middle-ground is taken (in more critical moments) by those who are memes' most ardent defenders.

Perhaps most important in the future development of memetics will be to determine its proper direction. What should be the ambition of memetics? If it is to become a successful science, what is its rightful domain -- does it cannibalize the social and psychological sciences en toto (as some argue), or should it seek to digest some smaller corner of those provinces, such as social psychology?

What is a meme?

Determining whether memes can account for a relatively wide range of phenomena vitally depends on defining what memes are. Richard Dawkins (1982:109) suggests a meme is "a unit of cultural inheritance. . . naturally selected by virtue of its 'phenotypic' consequences on its own survival and replication" or "a unit of information residing in a brain." A more formal definition along this line has been put forward by Aaron Lynch (1998):

"MEME: A memory item, or portion of an organism's neurally-stored information, identified using the abstraction system of the observer, whose instantiation depended critically on causation by prior instantiation of the same memory item in one or more other organisms' nervous systems."

The by-now classic examples of memes, according to Dawkins (1976:206), are "tunes, ideas, catch-phrases, clothes fashions, ways of making pots or of building arches." Dawkins (1976:206) also suggested that 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." This orthodoxy has been upheld by arguably the most significant English-language works in recent memetics, Dennett's (1995) *Darwin's Dangerous Idea* and Susan Blackmore's *The Meme Machine* (1999).

However, these canonical statements regarding the nature of memes and their mechanism of replication have been contested by others in the field. For example, Gatherer (1998) takes a behaviorist, rather than mentalist, stance toward memes. He takes his inspiration from Benzon (1996:323):

"I suggest that we regard the whole of physical culture as [memes]: the pots and knives, the looms and cured hides, the utterances and written words, the ploughshares and transistors, the songs and painted images, the tents and stone fortifications, the dances and sculpted figures, all of it. For these are the things which people exchange with one another, through which they interact with one another. They can be counted and classified and variously studied."

Memes, in this view, are a heterogeneous class of entities, primarily including behaviours and artefacts - the observable things which permit empirical work. But "outside the occurrence of the event, the practice of the behaviour, or the lifetime of the artefact, the meme has no existence. The meme does not 'go anywhere' when it is not manifested. It is not stored in some neural data bank, some internal meme repository" (Gatherer 1998). Gatherer adopts this stance, largely instrumentally (Gatherer 1999), because neuroscience suggests it is highly unlikely there are replicating information structures in brains

(a point seconded by Dennett 1995). In Gatherer's view, the behaviorist position has a number of appealing qualities compared to mentalism, which requires that unobservables (mental states) be taken as the fundamental units of analysis, leading to the empirical doldrums currently experienced by memetics. Since memetics is a cultural, not psychological science, it should aim in his view to describe change in populations by counting up cultural phenomena like artefactual forms. The mentalists instead try to count up how many people have the beliefs or knowledge to produce such artefacts, whether or not they are ever expressed. Behaviorism also frees memetics from defining a meme/host relationship, since artefacts in particular don't appear to have hosts, but to propagate independently of their creators. The study of diffusion in behavioral practices or artefacts -- long underway in the social sciences -- can, according to behaviorists, serve as the proper empirical arm of memetics, which merely coats this standard endeavor in more explicitly evolutionary garb.

Behaviorists suggest that activities like making pots are the memetic equivalents of genotypes, while the mentalists would call such behaviors the phenotypic manifestations of memes-in-brains. This reversal of roles -- thinking of behavior as the "genotype" rather than "phenotype" of culture -- has some intuitive appeal. It is easy to think of spoken phrases as replicators -- repeated, say, in a chain of people playing the game of Whispers. Similarly, the photocopying process can be seen as the replication of information embodied in ink-on-paper. However, this flipping of memotypes and phenotypes makes the behaviorist and mentalist positions potentially antithetical with respect to the essential theoretical distinction between replication and interaction. So even this brief foray into attempts at defining memes suggests there is disarray at a fundamental level in the subject.

What is culture?

The explanatory target of memetics, at least as narrowly conceived, is culture. Unfortunately, there is perhaps an equal amount of controversy about what culture might be as we have seen surrounding the concept of memes. Culture has been variously defined as a social construction, a "text," social behaviors, artefacts or the mental entities (ideas/beliefs/values) in people's heads. Indeed, in the history of anthropology, there has been a good deal of controversy about what categories of things can be included in the definition of this central concept. As noted above, meme researchers tend to be cognitivists, restricting the notion to mental entities. But some memeticists would only include certain kinds of mentemes -- arguing that emotions, for example, do not replicate, or are not infectious (e.g., Blackmore 1999).

A possibility which generally goes unrecognized by memeticists is that culture might be explained without recourse to memes at all. Some would argue that culture is just a new phenotypic strategy used by the most prominent class of replicators, genes (e.g., Flinn and Alexander 1982) rather than the product of a novel, quasi-independent class of replicators (memes) with their own interests (e.g., Brodie 1996; Lynch 1996). One of these theories is wrong: either memes exist or they don't.

Nevertheless, many researchers blithely discuss features of memes, ignoring the fact that their existence has yet to be proven. Most current discussion in memetics attempts to pin down the features of memes when there is as yet not even a standard codification of the concept (Rose 1998; Wilkins 1998). For example, Blackmore (1999) argues we can get some way without bothering about defining memes. The behaviorists, as I noted above, suggest that to make some progress we should ignore difficulties associated with the indefinable mental states associated with memes, and measure observables like behavior. Similarly, work in gene-culture coevolution (Boyd and Richerson 1985; Cavalli-Sforza and Feldman 1981; Durham 1991) is founded on the assumption of a quasi-independent line of cultural inheritance, and hence implies the existence of a cultural replicator. Models from this latter school indicate that natural selection can favor the transmission of acquired information and the persistence of social learning processes (e.g., Boyd and Richerson 1996). However, they do not prove that such abilities underlie human culture, nor that information packets with the characteristics of cultural replicators exist.

Surely, if memes exist, they must leave traces in the world. It seems that a firmer notion of what a meme is must precede any empirical search for them. While it is possible they will be found by accident, fortunes will surely be much brighter if foragers for memes have a clear "search image" in place. In the absence of a well-founded model, recourse has simply been to argue from analogy to the best-known replicator, the gene, with little attention being paid to the necessity of identifying mechanisms for either replication, selection, variation or transmission. Many of the claims made about memes could be false because the analogy to genes has not proven productive. Memetics at present remains linked conceptually but not ontologically to biology.

Linking memes to culture

The vagueness of the meme concept naturally makes it difficult to find an appropriate way to link memes to culture. There are two main approaches to this problem. The first takes memes to be analogous to pathogens. Indeed, the literature of memetics is hugely infected with epidemiological terms -- most readily seen in the titles of meme articles and books: "virus of the mind" (Dawkins 1993; Brodie 1996), or "thought contagion" (Lynch 1996). It is from epidemiology -- traditionally a subject which takes a diffusionist perspective -- that memetics gets its almost obsessional concern with the transmission of information. The main epidemiological question is: What factors influence the distribution or relative rate of spread of "mind viruses" in a population? Qualities of memes themselves are typically viewed as determining their relative success in the replication stakes. But this makes it seem as if memeticists are simply saying that those memes are "fittest" which survive and reproduce -- which leads to a charge of tautology (Wilson 1999).

The second major strain of thought in memetics sees the meme primarily as a replicator. "Replicator" is a notion coming from the same book in which the word meme was itself coined: Dawkins' *The Selfish Gene*. A replicator is "anything in the universe which interacts with its world, including other replicators, in such a way that copies of itself are made" (Dawkins 1978). In this neologism, Dawkins meant to emphasize that the evolutionary process identified by Darwin could be generalized to other substrates besides DNA -- such as cultural information inherited through social transmission. In a similar fashion, Dawkins generalized the phenotype notion through use of the term "vehicle," described most famously with reference to organisms as the vehicles which genes use to lumber around the environment. David Hull, a prominent philosopher of biology, soon thereafter modified the vehicle notion somewhat, to eliminate its implicit limitation to the case of phenotypic development. He adopted instead the term "interactor." Interactors are "those entities that bias replication because of their relative success in coping with their environments" (Hull 1982:316). This definition emphasizes the interactor's role as an ecological behavior-generator to achieve the differential copying of the replicator-based information it carries around. The replicator/interactor distinction is now standard in philosophical discussions of the evolutionary process, and reappears in many of the chapters that follow.

The theoretical foundation for the replicator analogy is evolutionary biology rather than epidemiology. The questions which come to the fore from this perspective are somewhat different as well: What are the mechanisms of heredity, selection and mutation for memes? What is their origin? Although this arguably gives memetics a stronger theoretical foundation, the problem is that these questions are hard to answer.

So we currently have at least two rival paradigms contending for dominance in memetics -- the "meme-as-germ" and "meme-as-gene" schools. Their formal theories -- epidemiology and population genetics -- are equivalent at an elementary level (Cavalli-Sforza and Feldman 1981:33). So strictly speaking, the diffusionist representation is based on the same three elements as evolutionism: innovation, selection, and reproduction. Nevertheless, the two schools have distinct intellectual histories, disciplinary agendas, and popular perceptions. This is largely due to the fact that epidemiology has not traditionally been concerned with the issues which are important from a theoretical evolutionary point of view, being a rather more pragmatic science with the clinical goal of curing disease. Where diffusionism primarily focuses on the spatial dimension of reproduction -- or the geographical spread of a phenomenon -- evolutionism focuses on the temporal dimension of reproduction -- that is, on the continued existence

and maintenance of a phenomenon. Further, like its biological cousin, memetic epidemiology largely ignores how a “virus” duplicates itself or mutates, regarding innovation as a rare and unique occurrence. Identifying what the selective forces on a pathogen might be is also not a high priority for biological or cultural diffusionists, although they often work with concepts such as barriers to diffusion and differences in susceptibility (in memetic terms, receptivity to new ideas). And whereas evolutionists acknowledge the possibility that the same innovation can occur several times at different places independently, the source of a variant strain is typically not a concern to the epidemiologically-minded.

However, such internecine arguments about the nature of memes and culture belie a more general debate in the social sciences: whether culture can be treated strictly as socially-transmitted information in the first place. While the idea that culture is somehow cognitive, or inside the head, is now generally accepted, it is not universal. And even among those who accept cognitivism in principle, some argue there are aspects of culture which lie outside any individual head -- for example, that emergent social-structural qualities or material artefacts should be included in the definition. Thus, the question arises: Is culture amenable to scientific investigation, and if so, is selectionism the most productive or congenial viewpoint to adopt? While assiduously eschewing the “Social Darwinist” heritage, contemporary strains of evolutionary social theorizing nevertheless speak of “optimality” and “adaptation,” which some see as disturbingly close to a panegyric for the social status quo. As Dennett has suggested, perhaps a cultural replicator dynamics produces more heat than light.

So several aspects of the standard memetic view, as it has thus far developed, may be criticised. First, memes-as-replicators may not discriminate the most important features of cultural traits. Culture may not in fact be composed only of socially transmitted units of information -- in effect, there may be no identifiable or measurable unit of culture. Rather, culture might be considered -- or at least felt to be -- a large, interconnected body of implicit knowledge which only has meaning as a whole.

Second, cultural phenomena may be changed by forces other than interactions among a set of mental replicators. This could be because important components of culture are not in people’s heads. Some argue that at least some cultural phenomena are environmental (for example, in the form of artefacts), or emergent -- a quality of human groups which is constrained, but not strictly determined by, variation in beliefs and values among individuals.

Thus, disputes rage at three levels:

- whether culture is properly seen as composed of independently transmitted information units;
- whether these so-called memes have the necessary qualifications to serve as replicators; and
- whether a Darwinian or selectionist approach such as memetics is the most feasible or desirable form for a science of culture to take.

The objective of this book is to bring together the main contenders on this nested series of questions, both pro and con. Subsequent chapters thus present representative voices from the range of opinion currently available on the topic of memes.

Ways of seeing memes

The popularity of Susan Blackmore’s recent book, *The Meme Machine* -- together with Dennett’s earlier advocacy (most notably in his book *Darwin’s Dangerous Idea*) -- has resulted in a substantial revival of interest in memes. Thus, it is appropriate that Blackmore presents in the first chapter a rousing defense of what might be called “radical memetics.” This is the belief that memetic processes can explain a wide

range of phenomena, including the rise of big brains, culture, consciousness and notions of self. Blackmore here recounts and defends herself against some of the major criticisms of her book. These points of contention include seeing the evolution of the big human brain strictly as a response to the pressure of producing better memes, and the restriction of memetics to traits learned through imitation.

Perhaps the most important claim in Blackmore's work is the concept she calls "memetic drive," which she believes is unique to the memetic perspective and distinguishes it from alternative evolutionary theories of culture, such as evolutionary psychology (e.g., Barkow et al. 1992) and gene-culture coevolutionary theory (e.g., Boyd and Richerson 1985). This drive is how the causal power of memes, derived from their ability to influence replication, manifests itself -- primarily over the course of human evolution. This drive underlies most of the other claims Blackmore makes in her book (echoed here), particularly about the role of memes in explaining sociobiological conundrums. These evolutionary paradoxes include the hypertrophy of the human brain, the extravagance of human language (since much simpler communication systems are sufficient to organize other animal societies), and the tendency for humans to engage in altruistic acts, even in large groups of non-kin. She also deals with the provocative issue of whether memes are likely in the course of their further evolution to become replicators that no longer depend on human hosts. This inspiring -- or perhaps frightening -- vision of memetics is targeted from numerous directions by the authors of later chapters.

Next, David Hull presents his personal view of what contemporary philosophy of biology has to say about memes-as-replicators. In the process, Hull makes a number of fundamental observations. For example, he demolishes the familiar misconceptions that cultural evolution is always faster than genetic change. What about the case of HIV, which mutates into a quasispecies within a single host's body within months? In contrast, the theory of evolution still hasn't succeeded in colonizing many hosts in any form.

Hull also believes that memetics cannot rightfully be charged with Lamarckianism -- or the inheritance of acquired characteristics -- because memes are defined as replicators, not interactors. As Hull contends, memes are analogous to genes, not phenotypic characteristics. From the perspective of genes, things like mental states or words are phenotypes, but this is irrelevant. From the memetic perspective, hearing words is acquiring memes, and hence becoming host to a new replicator. Passing along memes is therefore a Darwinian, not Lamarckian process. This highlights the importance of adopting the proper perspective -- the "meme's-eye-view" -- when positing novel evolutionary processes.

Although generally sympathetic to memes, Hull takes issue -- as do others who follow (see the chapters by Laland and Odling-Smee, Plotkin and Conte) -- with Blackmore's restriction of memetics to "information learned through imitation." In her view, this is the only mechanism leading to descent with modification, and hence the only mechanism for social transmission which can properly be seen as evolutionary. Hull argues that this restricts memetics, unlike other evolutionary theories, to a single species: humans. While this leaves memetics of interest to us, it means that memes cannot play a role in explaining more general evolutionary trends like the increase in intelligence within some animal families.

However, Hull's main objective seems to be to use his magisterial voice to argue we should "just get on with it." As someone who has empirically studied the question of how science progresses, memeticists would probably do well to take his advice to heart. Leave definitional issues until later, Hull declares, and concentrate on getting results. These should, in dialectical fashion, make theoretical questions more clear. In the same vein, Hull is careful to promote memetics directly: he cites the younger memeticists who remain largely unacknowledged by the academic mainstream -- due in some cases to lack of institutional affiliation and credentials. As he knows from his own studies of citation practices, this is a powerful way to help the eventual success of an upstart research program.

Our next contributor is the psychologist Henry Plotkin. He is particularly keen to assuage the fear implicitly underlying most social scientists' rejection of memetics (see the chapters by Kuper and Bloch below): that it is yet another brand of biological domination. He cogently argues against memetics as a science that reduces culture to biology. This is because large-brained creatures like humans do not have

enough genes to specify the connections established between their many neurons. As a result, the state of the brain largely reflects information processing due to environmental pressures, including social stimuli, rather than genes. Further, since culture is the emergent result of big-brained creatures interacting with one another, there must be an additional level of complexity to the explanation of such a population-level phenomenon. This takes us far from genetic determinism in Plotkin's view.

Plotkin also identifies two kinds of memes, which he calls "surface-" and "deep-level," depending on the breadth or depth of knowledge-structure they subsume. Deep memes, he argues, are not acquired through a single act of imitation, but rather through the integration of many experiences and perceptions. Plotkin hopes the notion of deep memes will assuage the fears of those who think that memetics is too atomistic to account for the learning of complex knowledge structures. (To the minds of these critics -- represented here by Kuper and Bloch -- not all knowledge acquired through enculturation is like the classic memetic examples of tunes and catch-phrases.) In good evolutionary psychological fashion, Plotkin suggests that deeply structured memes are likely to be the result of naturally-selected modules in the brain. So presumably the commonality of deep memes is due at least in part to the universal psychological mechanisms of construction that Sperber (in a later chapter) talks about. This knowledge must therefore be distinguished from transmitted information *sensu strictu*. At the same time, some higher-level functions of the brain (such as Plotkin's example, the supervisory attentional system) involve multiple domains. Presumably, deep memes result from the activity of such cross-level and cross-domain functions. Whether the distinction between surface and deep memes will hold up under empirical scrutiny, however, remains to be established.

The main concern of Rosaria Conte, in her chapter, is also to emphasize that memetics must be placed on a firm psychological foundation. Although she has this desire in common with Henry Plotkin, her preferred foundations differ from his. Rosaria Conte is among the modelers of cultural evolution. However, her tradition is not gene-culture coevolutionary theory (derived from the population genetics formalism), as in the case of the two pairings of Boyd and Richerson, and Laland and Odling Smee (discussed below). Instead, she is at the forefront of a movement in cognitive science to bridge the traditional concerns of agent-based modeling in computer science with human social psychology. In particular, she is less interested in analytic modelling than in simulation, especially computer-based simulations of complex agents in "artificial societies."

Conte's crucial claim is that memetics is necessarily restricted to intentional agents. The standard view, largely inspired by evolutionary biology, suggests that "cognitively impaired" agents (such as lower animals) can transmit memes. But in Conte's view, memetics must be based on autonomous agents with decision-making abilities, summarized in her notion of a "memetic agent." In Conte's vision, memes can be almost any symbolic token, whether in minds or the environment (see her definition of meme near the close of her chapter). In this, she is quite far from standard evolutionary memetics, which would argue that there are many kinds of representations -- even symbolic ones -- which do not qualify as memes because they have no mechanisms for replicating themselves. But Conte can take a rather general view of memes because for her replication is the responsibility of the memetic agent. As the name suggests, such an agent is the primary mover in her system, not memes themselves. For Conte, memes don't have to be clever; rather, meme receivers or interpreters do. This is a point to which other contributors return.

Two controversial claims derive from Conte's central argument: that neither communication nor imitation is necessary for memetic transmission to occur. First, memes can be transmitted without true communication. For example, one can use deception, where the message is intended to modify the mental states of others (that is, a meme is passed), but in such a way (if the deception is effective) that one's true intention is not communicated. Conte provides the example of leaving a light on in the house to deter burglars while one is away.

Second, memes can also diffuse through a population without overt imitation. For example, thanks to the preference to be like some elite class, individuals can seek to differentiate themselves by maintaining their elite traits -- but only so long as they are rare. In effect, such memetic agents adopt traits unlike those modelled for them by others. Thus, Conte would have us distinguish between kinds of

transmission processes, depending on the psychological abilities of the sender and receiver. For her, a transmission process can be considered memetic when the sender and receiver of messages are able to effectively manipulate each other's minds, producing more stable traditions of information exchange. To determine whether a transmission process is memetic or not, then, we should always ask: Do the sender and receiver have intentional states -- that is, the ability to simulate the intentional states of others? In her view, social cognition matters because these abilities can lead to different social dynamics.

Some in memetic circles would argue that this unnecessarily restricts the kinds of agents which can be counted as memetic. In particular, it limits memes to the few species capable of intentional behavior. So the minimum requirements for memetic transmission are high in terms of the cognitive capacities of the sender and receiver, but low in terms of the symbolic content of the meme itself and with respect to the sophistication of transmission mechanisms. Conte is thus one who would psychologize memetics to a degree not seen elsewhere in this volume.

She also points out that while the memetic literature places considerable emphasis on beliefs, other kinds of mental states can be transmitted through social interaction as well -- and perhaps with greater fidelity. The importance of how a meme is mentally represented lies in the fact that beliefs are not the same things as obligations, for instance, and this has implications for transmission parameters. In fact, Conte focuses almost exclusively on the case of norms. Norms, for her, are particularly interesting forms of memes because they have unique psychological qualities which influence their likelihood and direction of transmission compared to other forms of mentally represented information.

Kevin Laland and John Odling-Smee, in a rich chapter, argue that the developing vision of memetic transmission must be supplemented by an important process they call "niche construction." This is a process in which organisms, through perhaps instinctive behaviors such as building nests or merely excreting detritus, manipulate environmental factors which subsequently introduce important new selection pressures on them, as well as other species which interact with those new features of the environment. If these modifications persist, there can be feedback between the activities of one generation and the selective environments of the next. Laland and Odling-Smee call this transmission of modified environments "ecological inheritance." Models which include ecological inheritance, largely constructed by these same authors, have shown such feedback can produce novel evolutionary dynamics, and so should be considered when organisms construct their niches. Since the idea that this kind of activity has evolutionary importance adds an extra degree of complexity to evolutionary models, is unfamiliar, and remains controversial, Laland and Odling-Smee are at pains to present the case for including this complication in standard evolutionary theorizing.

They also present a novel theory of the evolution of the cultural capacity during the emergence of the hominid line. Laland and Odling-Smee's approach is founded on a conjunction of transmission vectors, ecological inheritance and the accumulation of constructed features in the hominid niche. Their theory is at odds with Blackmore's take on the same topic (more fully presented in her book *The Meme Machine*), which involves sexual selection for imitative ability. As these contesting theories of the evolution of culture imply, different features of human psychology should be important for cultural transmission. An empirical contest between these competing theories should therefore be possible, at least in principle.

Like others before them, Laland and Odling-Smee provide a powerful argument in favor of opening up memetics to non-imitative social learning, and hence admitting non-human species to the memetic brotherhood. Laland and Odling-Smee thus differ with Blackmore's approach to memetics in several fundamental respects. This is a vivid demonstration of the multiple visions about even basic propositions among proponents within the memetic brotherhood.

The biologists Robert Boyd and Peter Richerson are rather more critical of the meme notion. They argue that memeticists have been far too enamored of one of Darwin's conceptual advances: the identification of natural selection as the mechanism for cumulative adaptation. They would convince us that Darwin's other great contribution -- what Ernst Mayr calls "population thinking" -- is a more appropriate organizing principle for an evolutionary theory of culture. This is because, in their view, cultural evolution need not involve selection among replicators. Culture can instead be considered a pool of information that is

passed to subsequent generations via a variety of hypothetical mechanisms which do not resemble their biological counterpart, natural selection on genes. For example, if one allows selection to take place at multiple levels of organization, continuity of cultural traditions can be produced without information being passed from individual to individual. Instead, the alternatives generated by individual learning which survive can be constrained by mechanisms operating at the group level. The result however, is what we observe: the regularity of cultural traits being preserved over time. Alternatively, individuals may average the values of what they learn from others, but then also internally generate variants of this average through their own cogitations. If these variation-reducing and -augmenting processes balance each other out, there can be a high degree of correlation in what different generations believe. This is again the heritability of cultural traits without the replication of specific bits of information. Since heritability is only concerned with correlations, not mechanisms, these scenarios fall within the domain of evolutionary processes, without being based on replication in the same fashion as genetic inheritance.

This is a strong stance to take, but one which is forcefully argued, impeccably logical, and aptly illustrated with empirical examples. Hull (this volume) counters that “any adequate understanding of selection . . . requires the specification of the mechanisms that are bringing about these correlations” in cultural features between generations. He suggests that no mechanism besides inheritance through descent is currently known to have the necessary qualities to sustain an evolutionary process. Nevertheless, Boyd and Richerson’s hypothetical mechanisms are consistent with their formal modeling in the population-genetics-based gene-culture coevolutionary theoretical tradition. The threat of this logical possibility to memetics is therefore real.

Boyd and Richerson also draw attention to the fact that both genetic and cultural transmission are likely to play a role in the continuity of traditions: unlike most memeticists, they model dual inheritance. So evolutionary psychology -- the genetic transmission of predispositions for interpreting inputs, or for the ability to imitate itself -- is accounted for in their approach to cultural evolution. It is more general than memetics, Boyd and Richerson claim, because it is not specific to the standard memetic assumption of particulate inheritance.

Along the way, Boyd and Richerson also provide a devastating critique of the evolutionary psychological notion that human culture can be almost exclusively innate. Their point is that cultural innovations such as technology simply accumulate information faster than is possible through genetic inheritance. They rehearse the now-standard argument that what separates human culture from proto-culture in other species is the same ability to accumulate innovations across generations. The young of other species only manage to reinvent their parent’s wheels before dying themselves, thus merely reproducing what earlier generations have bequeathed to them. They end with an encomium about the ability of their population-based approach to reconcile the social sciences with its individual-based cousins such as economics and psychology. May their wish come true!

Dan Sperber, in a compelling contribution, sets up a major empirical hurdle for any future discipline of memetics. Sperber’s key point is that one can observe very similar copies of some cultural item, link these copies through a causal chain of events which faithfully reproduced those items, and nevertheless not have an example of memetic inheritance. This is because each copy of the item may have been produced by following “local” instructions, rather than a blueprint received (typically in the form of a message) from the previous producer in the causal chain. The result may be similar beliefs, behaviors or artefacts, but the process is not one of copying. What matters is where the instructions come from: true inheritance requires that the information which makes the items similar be acquired from the original. As Sperber notes, many discussions in memetics do not distinguish between similarity which arises from reproduction and from inheritance. Causation and similarity are not enough. One must also have the relevant information being passed down the causal chain for evolutionary replication.

Sperber’s argument puts some flesh on the bones of Boyd and Richerson’s contention that evolution can logically proceed without replication. Sperber suggests this is not just idle speculation, but often the case. Based largely on his own work in human (linguistic) communication (see Sperber and Wilson 1995), Sperber asserts that the kind of high-fidelity copying memeticists assume is characteristic of cultural transmission will only ever be a small proportion of cultural learning. It is but the limiting case of a much

more complex process involving multiple steps of inferencing -- first, to establish the sender's intention, and second, based on that, to decode what the message means. Since words and other linguistic units are memeticists' favorite example of memes (considered as culturally transmitted particles), Sperber's critique is significant. As he concludes, "memeticists have to give empirical evidence to support the claim that, in the micro-processes of cultural transmission, elements of culture inherit all or nearly all their relevant properties from other elements of culture that they replicate." His position is also closely allied to the idea in evolutionary psychology that most of culture represents innate responses evoked by particular circumstances, rather than information transmitted phenotypically between individuals (Tooby and Cosmides 1992).

While the other chapters concentrate on making the notion of meme clearer and sharper, Adam Kuper, in the penultimate contribution, suggests that the target memetics is seeking to explain -- culture -- is itself fuzzy. He even goes so far as to suggest that culture doesn't even exist in any meaningful sense. This makes the memetic project rather like a blunt arrow shooting into the dark. At the very least, it renders the memetic project less likely to succeed. Culture has come to be considered such a conflation of disparate entities, such an all-enveloping *Weltanschauung* -- the very fabric of everyday life -- that it becomes difficult to tease it apart in the ways memetic analysis would require.

Kuper also draws some lessons from history. He points out that culture used to be associated with the aristocratic notion of "civilized taste," but now commonly connotes "shared beliefs." Culture began as the thing which distinguishes us from animals (a distinction which has becoming increasingly blurred in particular as we have learned more about other primates). Now it has become the Boasian notion of what distinguishes one human group from another, each culture being equally good and valuable. So culture-qua-civilization becomes culture as an accumulating inheritance of ideas, practices and institutions. In effect, the concept of culture has been democratized, to reflect current political sensibilities. The memetic perspective of course depends on its explanatory target, culture, having this newer, diffusionist feel, because the memetic idea is that ideas spread epidemiologically like viruses. This analogy to viruses brings culture closer to biology. But this proximity of a neighboring discipline to the anthropological home turf is just what makes Kuper nervous, as readers will see. It draws up specters from earlier times in the history of the social sciences which do not sit well in memory.

Finally, Maurice Bloch, a social anthropologist like Adam Kuper, is favorably disposed toward the basic idea of transmitted culture (as he makes clear in his chapter title). Nevertheless, he complains bitterly about the ignorance displayed by memeticists of the rich academic literature on the topic of cultural change. This ignorance is galling to those who study culture professionally -- to wit, socio-cultural anthropologists like Bloch. As he is at pains to point out, this history is largely news to those approaching culture from other disciplines -- and most memeticists are either from "hard science" or psychology backgrounds. But their ignorance, particularly of cultural anthropology, is not excusable because they are explicitly attempting to explain the central concept in that discipline: culture.

This ignorance also leads memeticists to fall into traps already recognized and currently avoided by theoretic traditions in the social sciences without a biological pedigree. Like Kuper, Bloch takes an historical look at anthropological theory to make his argument. In particular, he likens memeticists to the diffusionists who briefly held sway at the beginning of this century, and reviews criticisms against diffusionism. Like Sperber and Kuper, he argues that considering cultural traits to be separable and independent bits of information flitting through populations in a care-free fashion is not an accurate description of ethnographic reality. As Bloch (this volume) puts it, "The problem which anthropologists immediately recognise with memes lies . . . [with] the notion that culture is ultimately made of distinguishable units which have 'a life of their own'. Only then would it make sense to argue that the development of culture is to be explained in terms of the reproductive success of these units 'from the memes point of view'." Bloch also emphasizes the importance of Sperber's primary critique of the meme notion, suggesting that even if cultural traits take on particulate form during transmission, they nevertheless undergo substantial reformulation as they are integrated by individuals into their knowledge-bases. Communication involves not just transmission, but the recreation, or reconstruction, of information by recipients.

The essential claim by Kuper and Bloch, then, is that culture is not divisible into units because it is a complex, heterogeneous thing. Others “inside” the evolutionist fold agree with them in this respect -- in particular, Boyd and Richerson, and perhaps Sperber. So, a central problem for memetics is obviously to begin to isolate and identify these “bits” of culture. Perhaps only through such an identification will the utility of this approach be broadly accepted in social scientific circles.

Conclusion

This brief review should make it clear that a variety of stances can be legitimately taken with respect to the notion of memes -- or at least the current implementation of the notion. In fact, there remains considerable disagreement about the value of memes, as will become evident to even the idle reader. From whence does this disgruntlement spring? From intrinsic defects in the notion (thus knee-capping any future development of the field from its incipient state), in incidental features of its present manifestation, or from intellectual agendas having little to do with memetics itself? The reader must judge.

At minimum, the following dialogue establishes areas of common ground, as well as highlighting the points of remaining contention. It is designed to represent the state of debate on the utility of memes as the foundation for the study of culture, and hopefully sets the terms for future discussion about the possibility of a Darwinian science of culture.

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