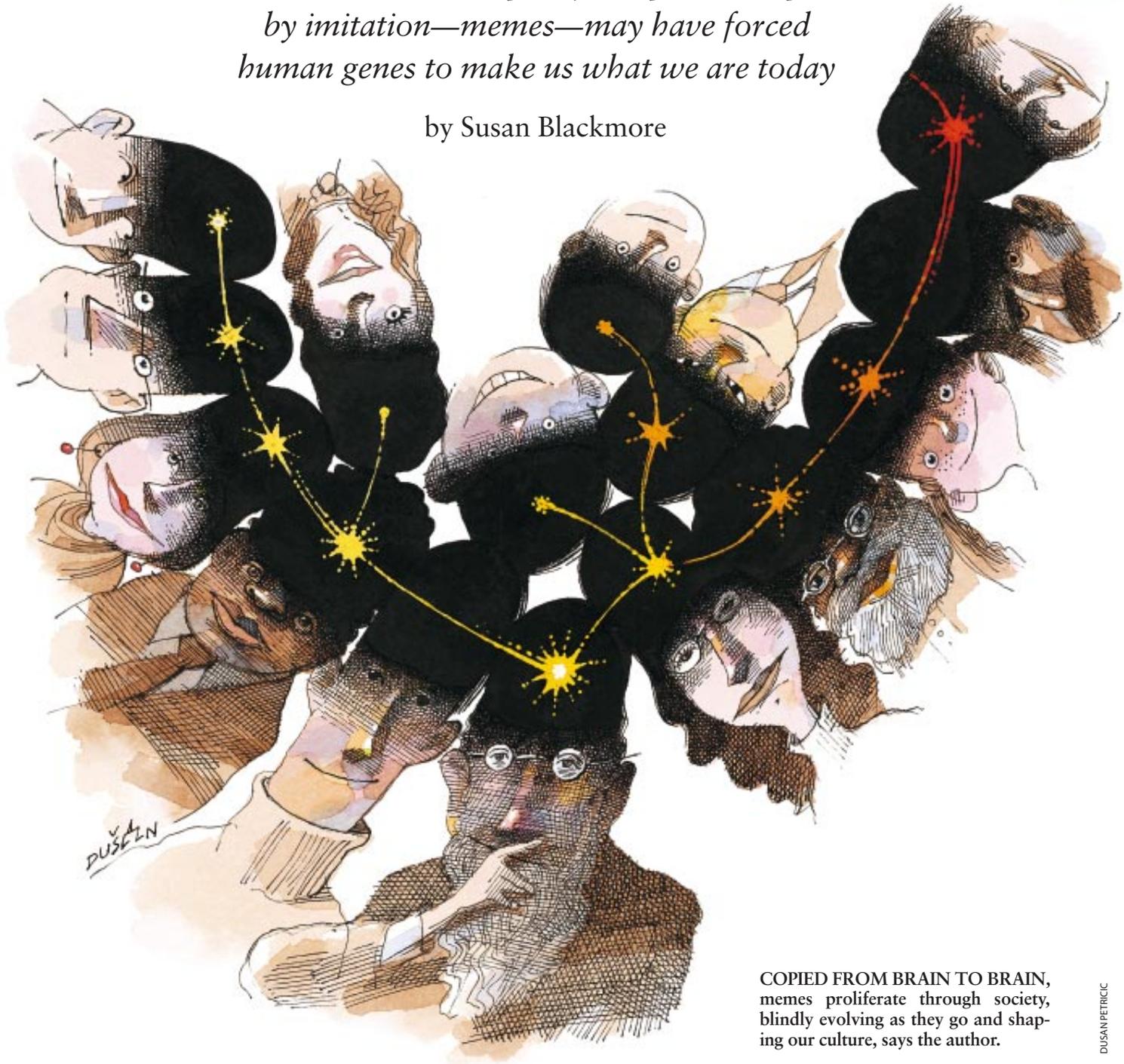


THE POWER OF MEMES

Behaviors and ideas copied from person to person by imitation—memes—may have forced human genes to make us what we are today

by Susan Blackmore



COPIED FROM BRAIN TO BRAIN, memes proliferate through society, blindly evolving as they go and shaping our culture, says the author.

DUSAN PETRIC

Did you know that you spend much of your life copying and transmitting entities called memes? A meme (pronounced “meem”) is “an idea, behavior, style or usage that spreads from person to person within a culture.” Whenever you shake hands, sing “Happy Birthday” or cast your vote in an election, you are giving life to memes.

So far, no debate. But controversy has erupted over the proposal, presented here by psychologist **Susan Blackmore**, that humans’ uncanny ability to imitate, and thus to transmit memes, is what sets us apart from other species. Memes, she argues, have been (and are) a powerful force shaping our cultural—and biological—evolution. To convey the debate, we have included three short counterpoints, written by behavioral ecologist **Lee Alan Dugatkin**, evolutionary anthropologist **Robert Boyd** and population biologist **Peter J. Richerson**, and psychologist **Henry Plotkin**. Enjoy this smorgasbord of competing memes.

Human beings are strange animals. Although evolutionary theory has brilliantly accounted for the features we share with other creatures—from the genetic code that directs the construction of our bodies to the details of how our muscles and neurons work—we still stand out in countless ways. Our brains are exceptionally large, we alone have truly grammatical language, and we alone compose symphonies, drive cars, eat spaghetti with a fork and wonder about the origins of the universe.

The problem is that these abilities seem surplus to requirements, going well beyond what we need to survive. As Steven Pinker of the Massachusetts Institute of Technology points out in *How the Mind Works*, “As far as biological cause and effect are concerned, music is useless.” We might say the same of art, chess and pure mathematics.

Classical (Darwinian) evolutionary theory, which focuses on inheritable traits of organisms, cannot directly justify such riches. Expressed in modern terms, this theory holds that genes control the traits of organisms; over the course of many generations, genes that give their bearers a survival advantage and that favor production of many offspring (who will inherit the genes) tend to proliferate at the expense of others. The genes, then, essentially compete against one another, and those that are most proficient at being passed to the next generation gradually prosper.

Few scientists would want to abandon Darwinian theory. But if it does

not clarify why we humans have come to apportion so much of our resources to so many abilities that are superfluous to the central biological task of further propagating our genes, where else can we look?

The answer, I suggest, lies in memes. Memes are stories, songs, habits, skills, inventions and ways of doing things that we copy from person to person by imitation. Human nature *can* be explained by evolutionary theory, but only when we consider evolving memes as well as genes.

It is tempting to consider memes as simply “ideas,” but more properly memes are a form of information. (Genes, too, are information: instructions, written in DNA, for building proteins.) Thus, the meme for, say, the first eight notes of the *Twilight Zone* theme can be recorded not only in the neurons of a person (who will recognize the notes when she hears them) but also in magnetic patterns on a videocassette or in ink markings on a page of sheet music.

The Birth of Memes

The notion that memes exist and evolve has been around for almost 25 years, but only recently has it gained attention as a powerful force in human evolution. Richard Dawkins of the University of Oxford coined the word in 1976, in his best-selling book *The Selfish Gene*. There he described the basic principle of Darwinian evolution in terms of three general processes—when information is copied again and again,

with variations and with selection of some variants over others, you *must* get evolution. That is, over many iterations of this cycle, the population of surviving copies will gradually acquire new properties that tend to make them better suited to succeeding in the ongoing competition to produce progeny. Although the cycle is mindless, it generates design out of chaos.

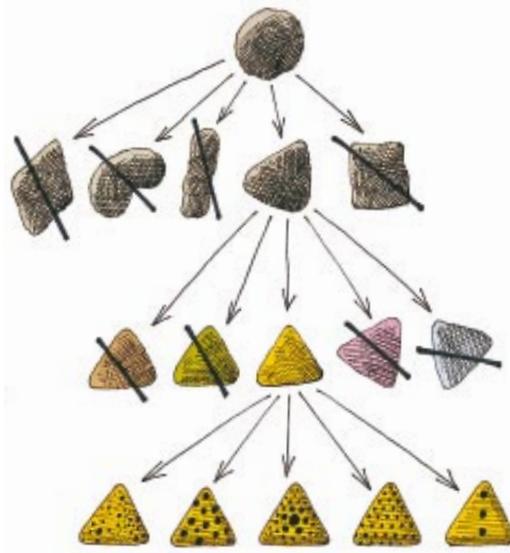
Dawkins called the information that gets copied the “replicator” and pointed out that the most familiar replicator is the gene. But he wanted to emphasize that evolution can be based on any replicator, and so, as an example, he invented the idea of the meme. The copying of memes from one person to another is imperfect, just as the copying of genes from parent to child is sometimes inaccurate. We may embellish a story, forget a word of the song, adapt an old technology or concoct a new theory out of old ideas. Of all these variations, some go on to be copied many times, whereas others die out. Memes are thus true replicators, possessing all three properties—replication, variation, selection—needed to spawn a new Darwinian evolutionary process.

Dawkins says that he had modest intentions for his new term—to prevent his readers from thinking that the gene was the “be-all and end-all of evolution, the fundamental unit of selection”—but in fact his idea is dynamite. If memes are replicators, then they, like genes, compete to get copied *for their own sake*. This conclusion contradicts the assumption, held by most evolutionary psychologists, that the ultimate

function of human culture is to serve the genes by aiding their survival. The founder of sociobiology, E. O. Wilson, famously said that the genes hold culture on a leash. Culture might temporarily develop in some direction that is counter-productive to spreading the genes, but in the long run it is brought back in line by gene-based natural selection, like a straying dog curbed by its owner. In this view, memes would be slaves to the genes that built the brains that copy them, prospering only by helping those genes to proliferate. But if Dawkins is right and memes are replicators, then memes serve their own selfish ends, replicating whenever they can. They sculpt our minds and cultures as they go—whatever their effect on the genes.

The most obvious examples of this phenomenon are “viral” memes. Chain letters (both hard-copy and e-mail) consist of little bits of written information, including a “copy-me” instruction backed up with threats (if you break the chain you will suffer bad luck) or promises (you’ll receive money and you can help your friends). It does not matter that the threats and promises are empty and your effort in copying the letters is wasted. These memes have an internal structure that ensures their own propagation.

The same can be said, Dawkins argues, of the great religions of the world. Of all the myriad small cults with charis-



UNIVERSAL DARWINISM produces evolution in any system of replicators that exhibit variation, selection and heredity. Variation arises by recombination and imperfect copying. Selection occurs when limited resources cannot support all the variants. Heredity ensures that good properties are passed on. This mindless algorithm generates highly sophisticated entities.

matic leaders that have sprung up in human history, only a few had what it took to survive—copy-me instructions backed up with threats and promises. In religions the threats are of death or eternal damnation, and the promises are of everlasting bliss. The costs are a proportion of one’s income, a lifetime devoted to propagating the word, or resources spent on building magnificent mosques and cathedrals that further promote the memes. The genes may even suffer directly at the hands of the

memes—as occurs with a celibate priesthood.

Of course, not every cult (or chain letter) with the appropriate viral structure will actually succeed. Some threats and promises are more effective, or virulent, than others, and all compete for the limited resource of human attention in the face of experience and skepticism (which, in the viral metaphor, act as a kind of immune system).

Arguably, religions are not entirely viral; for example, they provide comfort and a sense of belonging. In any case, we must not make the mistake of thinking that all memes are viruses. The vast majority make up the very stuff of our lives, including languages, political systems, financial institutions, education, science and technology. All these are memes (or conglomerations of memes), because they are copied from person to person and vie for survival in the limited space of human memories and culture.

Thinking memetically gives rise to a new vision of the world, one that, when you “get” it, transforms everything. From the meme’s-eye view, every human is a machine for making more memes—a vehicle for propagation, an opportunity for replication and a resource to compete for. We are neither the slaves of our genes nor rational free agents creating culture, art, science and technology for our own happiness. Instead we are part of a vast evolutionary process in which memes are the evolving replicators and we are the meme machines.

This new vision is stunning and scary: stunning because now one simple theory encompasses all of human culture and creativity as well as biological evolution; scary because it seems to reduce great swathes of our humanity, of our activities and our intellectual lives, to a mindless phenomenon. But is this vision true? Can memetics help us to understand ourselves? Can it lead to testable predictions or do any real scientific work? If it cannot, memetics is worthless.

I believe that the idea of the meme as replicator is what has been missing from our theories of human evolution and that memetics will prove immensely useful for explaining our unique attributes and the rise of our elaborate cultures and societies. We are different from all other animals because we alone, at some time in our far past, became capable of widespread generalized

MEMES AND COMPLEXES OF MEMES

Stories, urban legends, myths
Clothing, hairstyles, body piercing
Cuisine, cigarette smoking
Applauding, cheering
Language, accents, catchphrases
Songs, music, dances

Belief in UFOs, ghosts, Santa Claus
Racist slogans, sexist jokes
Religions
Inventions, theories, science
Judicial systems, democracy
Proust’s story of the madeleine cake

NOT MEMES

Subjective experiences, complex emotions, sensory perceptions
Eating, breathing, having sex
Innate behaviors, even if contagious: yawning, coughing, laughing

Conditioned responses: fear at the sound of a dentist’s drill
Cognitive maps: knowing the way around your neighborhood
Associations with sounds and smells

Note: Many human behaviors are complicated mixtures of innate, learned and imitated—for example, riding a bicycle.

Animals Imitate, Too

by Lee Alan Dugatkin



I applaud Susan Blackmore's attempt to infect people's minds with the meme "imitation is important." But I take issue with her view that memes—the imitated entities—influence the evolution of behavior in humans alone. Animals from fish to primates copy one another in making such decisions as what to eat and with whom to mate. That being the case, I will argue that memes may influence the habits of many animals just as they drive human behavior. A close look at blackbirds can help to illustrate that memes are not necessarily unique to humans or even to other primates, such as chimpanzees and other apes. But first I should clarify the definition of the word *imitation*.

Psychologists seem to revel in debating the meaning of imitation, and dozens of papers divide its meaning into an array of subcategories. In a discussion of memes, however, it seems only fair to use Blackmore's own description. Her book *The Meme Machine* presents two different perspectives. The strictest definition states that imitation involves three complex stages: deciding what to imitate, transforming one point of view to another and producing a matched bodily action. Under such strict criteria, no rock-solid cases of animal imitation may exist. It is extraordinarily difficult to decipher whether animals can transform one viewpoint to another and, if so, whether we know what exactly they are choosing to imitate.

Blackmore also promotes a much more liberal idea of imitation when she describes a story being passed from one friend to another. "You have not precisely imitated your friend's every action and word, but something (the gist of the story) has been copied from her to you and then on to someone else," she writes. Surely hundreds of examples of animal imitation fall within this broad definition, and the way blackbirds learn about predators is no exception.

In 1978 Eberhard Curio of Ruhr University of Bochum in Germany and his colleagues created a small theater in which one blackbird could view a second one squawking and flicking its tail in reaction to a nearby predator. The second bird was responding to a true predator—a little owl—but a series of partitions hid the owl from the first blackbird's view. Thanks to some clever manipulations, the observer was made to think that its companion was reacting to a noisy friarbird, which blackbirds do not normally regard as a threat. The researchers then put the observer blackbird near a friarbird, and it, too, reacted with squawks and tail flicks. Curio and

BLACKBIRDS can be convinced to fear creatures that are not a threat, because they learn to recognize predators by watching what spooks their companions.

his colleagues discovered that the false message "friarbirds are predators" can spread down a chain of at least six other blackbirds.

Yet the simple fact that something is copied does not make it a full-fledged meme. Blackmore argues that a message has to meet three additional criteria: it must be copied accurately, many copies must be made, and the copies must last a long time. The

Memes may influence the habits of many animals just as they drive human behavior.

message "friarbirds are predators" was accurately transmitted, and copies of the message spread from individual to individual, thus demonstrating some degree of fecundity. It is impossible to assess the longevity of this meme based on laboratory experiments, but in principle there is no reason that the information wouldn't stick around once established in natural populations.

In my work as a behavioral ecologist I have run across dozens of other examples of animal behavior that fit the definition of a meme, and I would not be surprised if the total number were quite large. Memes may be older and more fundamental to biological evolution than Blackmore or anyone else has argued to date. More specifically, the difference between animal and human memes may be quantitative rather than qualitative. Memeticists may well take hold of the idea that animal memes are real and use this to bolster the claim that memes truly are a universally important force in evolution. But if memes do not separate us from animals, as Blackmore suggests, then they alone cannot explain why human culture is uniquely advanced.

LEE ALAN DUGATKIN is an associate professor in the biology department at the University of Louisville. He has studied imitation in animals for 10 years. His new book on this subject, *The Imitation Factor: Evolution Beyond the Gene* (The Free Press), will be published in January.



RISE OF CULTURE could have begun when our early hominid ancestors learned to imitate one another (*left*). Individuals best able to imitate new survival skills such as fire making would prosper, favoring the genes that made them better adapted for general-

ized imitation. Later, as humans became more genetically selected to imitate (*center*), the genes would need to evolve strategies to ensure imitation of the most valuable behaviors. Tactics such as “imitate the best imitators” would result in better copying of new

imitation. This let loose new replicators—memes—which then began to propagate, using us as their copying machinery much as genes use the copying machinery inside cells. From then on, this one species has been designed by two replicators, not one. This is why we

through childbirth complications caused by the size of the head. Why has evolution allowed the brain to grow so hazardously large? Traditional theories look to genetic advantage, in improved hunting or foraging skills or the ability to sustain larger cooperating groups with

a new predator, involves merely the use of an innate behavior in a new situation. Even chimpanzees’ imitation is limited to a small range of behaviors, such as methods of fishing for termites. In contrast, generalized imitation of almost any activity seen—as seems to come naturally to humans—is a much more difficult and correspondingly more valuable trick, letting the imitator reap the benefits of someone else’s learning or ingenuity as often as possible. For example, in experiments conducted in 1995 at the Yerkes Regional Primate Research Center in Georgia, when the same problems were presented to orangutans and human children, only the humans readily used imitation to solve the problems.

It is easy to imagine that our early ancestors imitated useful new skills in making fire, hunting, and carrying and preparing food. As these early memes spread, the ability to acquire them became increasingly important for survival. In short, people who were better at imitation thrived, and the genes that gave them the bigger brains required for it consequently spread in the gene pool. Everyone got better at imitation, intensifying the pressure to enlarge the

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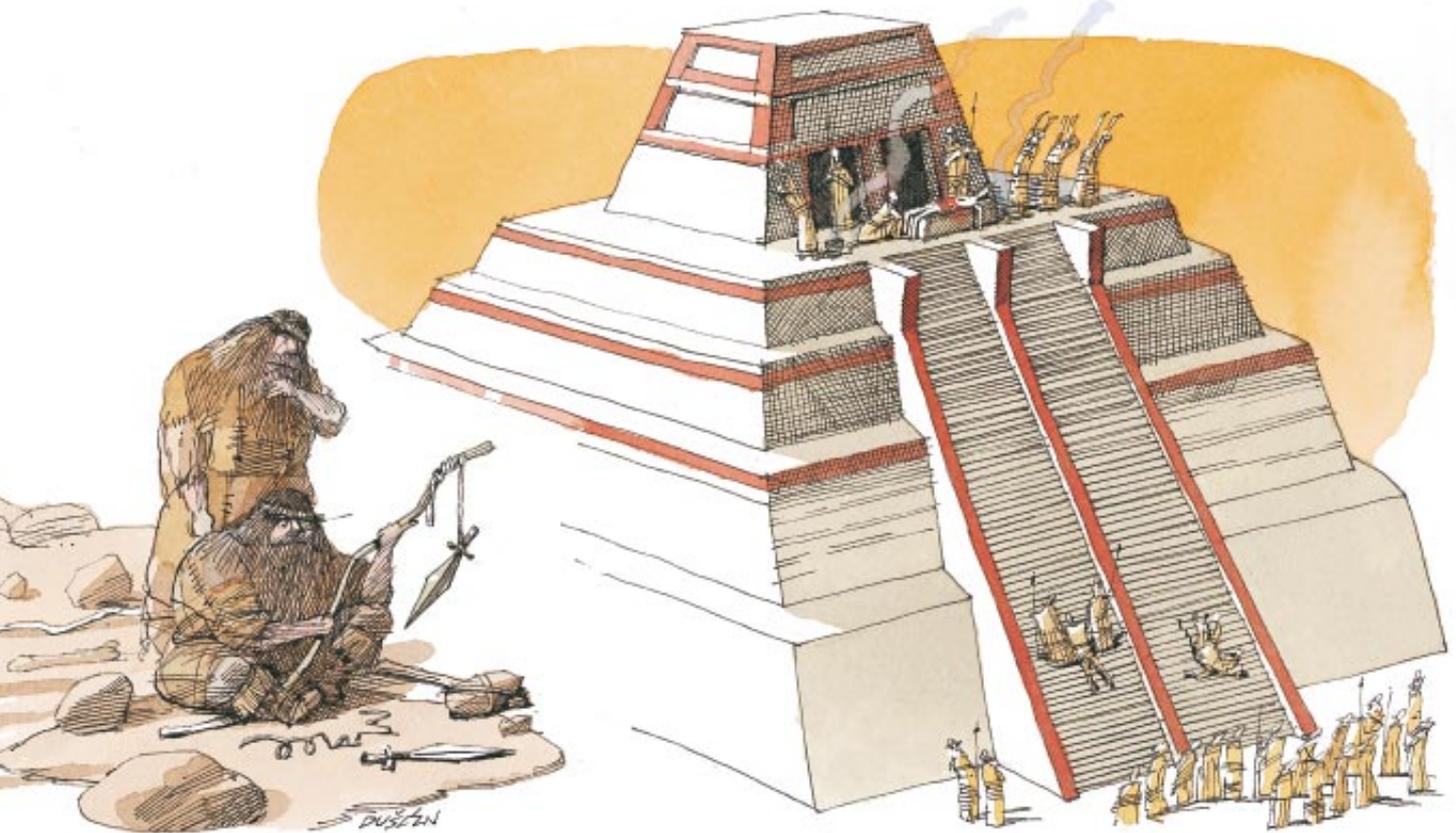
are different from the millions of other species on the planet. This is how we got our big brains, our language and all our other peculiar “surplus” abilities.

Big Brains for Memes

Memetics neatly resolves the mystery of the human brain’s vastness. The human brain is about as big as the genes can make it—three times bigger, relative to body weight, than the brains of our closest relatives, the great apes. It is expensive to build and maintain, and many mothers and babies die

complex social skills. Memetics provides a completely different explanation.

The critical transition for hominids was the dawn of imitation, perhaps two and a half million years ago, before the advent of stone tools and expanding brains. True imitation means copying a novel behavior or skill from another animal. It is difficult to do, requires a lot of brainpower and is correspondingly rare in the animal kingdom. Although many birds copy songs, and whales and dolphins can imitate sounds and actions, most species cannot. Often animal “imitation,” such as learning to respond to



survival skills—but also of extraneous behaviors such as decorating clothing. Good imitators would gain social status, attract mates and have more offspring, further driving the genes to develop bigger brains capable of elaborate imitation. Imitation would become

an intrinsic part of human nature, and ever evolving memes would gradually produce entire cultural systems (*right*), complete with activities such as monument building and human sacrifice that have no payoff for the genes but serve to transmit the associated memes.

brain still further in a kind of cerebral arms race.

Once everyone started imitating, the second replicator was let loose on the world, changing human evolution forever. The memes started to take control. Alongside useful skills, such as building fires, people copied less useful ones like fancy body decoration and downright costly ones such as energetic but futile rain dances. The genes faced a problem: how to ensure that their carriers copied only the useful behaviors. Newly arisen memes can spread through a population by imitation in a single generation, faster than genetic evolution can respond. By the time the genes could evolve a hard-wired predilection for making fires and an aversion to performing rain dances, completely different fads could arise and hold sway. The genes can develop only broad, long-term strategies to try to make their bearers more discriminating about what they imitate.

A useful general heuristic that the genes could bestow might be a predisposition to copy the best imitators—the people most likely to have accurate versions of currently useful memes. (More familiar terms for “the best imitators”

in modern life may be “trendsetters” or “role models.”) In addition to their bag of useful tricks for survival, the best imitators would thereby acquire higher social status, further improving their survival chances and helping to propagate the genes that made them talented imitators—the genes that gave them big brains specialized at accurate generalized imitation.

The genes would continue to respond with improvements in people’s innate preferences about what to imitate, but the genes’ response, requiring generations of people to act on, would always lag far behind the memetic developments. I call the process by which memes control gene selection “memetic drive”: memes compete among themselves and evolve rapidly in some direction, and genes must respond by improving selective imitation—increasing brain size and power along the way. Successful memes thus begin dictating which genes will be most successful. The memes take hold of the leash.

In a final twist, it would pay for people to mate with the most proficient imitators, because by and large, good imitators have the best survival skills.

Through this effect, sexual selection, guided by memes, could have played a role in creating our big brains. By choosing the best imitator for a mate, women help propagate the genes needed to copy religious rituals, colorful clothes, singing, dancing, painting and so on. By this process, the legacy of past memetic evolution becomes embedded in the structures of our brains and we become musical, artistic and religious creatures. Our big brains are selective imitation devices built by and for the memes as much as for the genes.

Origin of Language

Language could have been another exquisite creation of this same process of meme-gene coevolution. Questions about the origins and function of language have been so contentious that in 1866 the Linguistic Society of Paris banned any more speculation on the issue. Even today scientists have reached no general consensus, but the most popular theories appeal to genetic advantage. For example, evolutionary psychologist Robin Dunbar of the University of Liverpool argues that language is a

Mememes are best thought about not by analogy with genes but as new replicators, with their own ways of surviving and getting copied.

substitute for grooming in keeping large social groups together. Evolutionary anthropologist and neuroscientist Terrence Deacon of Boston University proposes that language made symbolic communication possible, which in turn allowed improved hunting skills, tighter social bonds and group defense.

In contrast, the theory of memetic drive explains language by its conferring survival advantages on memes. To understand how this works, we must ask which kinds of memes would have survived best and proliferated in the emerging meme pool of our early ancestors. The general answer for any replicator is

those with high fecundity, fidelity and longevity: ones that make many accurate and long-lived copies of themselves.

Sounds are more fecund than gestures, particularly sounds analogous to “hey!” or “look out!” Everyone within earshot can hear a shout, whether they happen to be looking at the speaker or not. Fidelity of spoken memes is higher for those built from discrete units of sound (phonemes) and divided into words—a kind of digitization that reduces errors in copying. As different actions and vocalizations competed in the prehistoric meme pool, such spoken words would prosper and displace less well adapted memes of

communication. Then, stringing words together in different orders, and adding prefixes and inflections, would provide fertile niches for new, more sophisticated vocal memes. In sum, the highest-quality replicable sounds would crowd out the poorer ones.

Now consider the effect of this on the genes. Once again the best imitators (the most articulate individuals) would acquire higher status, the best mates and the most offspring. In consequence, genes for the ability to imitate the winning sounds would increase in the gene pool. I suggest that by this process the successful sounds—the foundations of spoken language—gradually drove the genes into creating a brain that was not merely big but especially adept at copying those particular articulations. The result was the remarkable human capacity for language. It was designed by memetic competition and meme-gene coevolution.

The process of memetic driving is an

COUNTERPOINT

Meme Theory Oversimplifies How Culture Changes

by Robert Boyd and Peter J. Richerson

Genes are replicators. They pass faithfully from parent to child and control the machinery of life. This faithful transmission is what enables natural selection to operate: genes that cause their bearers to survive better or reproduce faster than bearers of other genes will spread through the population. Other processes, such as mutation, play crucial roles in evolution, but most adaptation can be explained by asking which genes will replicate at the highest rate. This simple rule has astonishing power, allowing biologists to understand phenomena as diverse as the shape of the human pelvis and the timing of sex changes in hermaphroditic fish.

Susan Blackmore argues that beliefs and ideas, which she calls memes, are also replicators. They are copied faithfully from one mind to another and control the behavior of the people who acquire them. That being the case, Blackmore suggests, the evolution of ideas is also shaped by natural selection, and cultural change can be understood by asking which memes replicate most quickly.

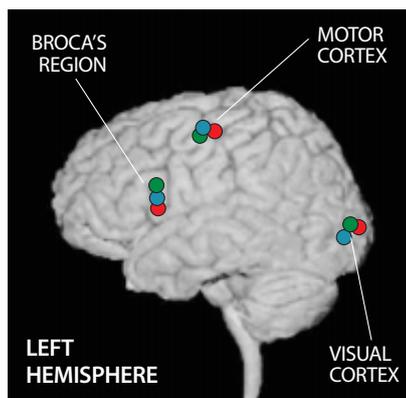
We think Blackmore is at least half right. Ideas from biology are certainly useful for studying cultural evolution. Culture does consist of ideas stored in a population of human brains, and mecha-



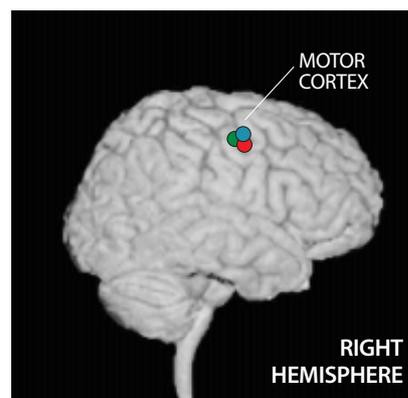
IDEAS are often systematically transformed as they pass from one person to another or from one generation to the next.

nisms analogous to natural selection can affect which ideas spread and which ones disappear. But Blackmore is probably wrong in thinking that cultural evolution can be explained in terms of natural selection alone. Instead scientists need to combine research from psychology, anthropology and linguistics to clarify the multiple processes that actually shape human culture.

Unlike genes, ideas usually are not passed intact from one person to another. Information in one person's brain generates a behavior, and then someone else tries to infer the information required to do the same thing. Breakdowns in the accurate transmission of ideas can occur because differences in the genes, culture or personal background of two individuals can cause one person to make a wrong assumption about what motivated the other's behavior. As a result, memes are often systematically transformed



SCANS OF BRAIN ACTIVITY could test whether the human brain has evolved to imitate and spread memes. Here researchers mapped neural activity associated with a specific hand motion. The same areas lit up whether the subjects acted of their own volition (*red*), merely observed someone else (*blue*) or imitated the other person (*green*). Imitation produced the strongest activity. The results suggest that Broca's region in humans controls a "mirror neuron system" specially evolved to imitate actions. Monkeys, however, have a similar system.



example of replicators (memes) evolving concurrently with their copying machinery (brains). The appearance of memes is not the first time such concurrent evolution has occurred: something similar must have taken place in the earliest stages of life on earth, when the first replicating molecules developed in the primeval soup and evolved into DNA and all its associated cellular replication

machinery. As with the evolution of that sophisticated gene-copying apparatus, we might expect better meme-copying machinery to have appeared—and it has. Written language provided a vast leap forward in longevity and fidelity; the printing press enhanced fecundity. From the telegraph to the cell phone, from "snail" mail to e-mail, from phonographs to DVDs and from computers to

the Internet, copying machinery has been improving, spreading a growing multitude of memes farther and faster. Today's information explosion is just what we should expect of memetic evolution.

This memetic theory depends on a number of conjectures that can be tested, especially the assumption that imitation requires a lot of brainpower, even though it comes so easily to us. Brain-

during transmission—a process quite unlike natural selection, which depends on one meme spreading more quickly than competing alternatives. Transformation, on the other hand, could cause people in one generation to acquire a different meme than the one held by every person in the previous generation.

David Wilkins of the Max Planck Institute for Psycholinguistics in Nijmegen in the Netherlands discovered a simple example of

Cultural evolution cannot be explained in terms of natural selection alone.

meme transformation when he found that Americans of different generations varied in their understanding of the word ending *-gate*. People over the age of 40 assumed that *-gate* implied a government scandal in Washington, usually involving a cover-up. These baby boomers experienced Richard Nixon's presidency as adults and interpreted constructions such as *Travelgate* as scandals analogous to Watergate. Younger Americans had heard *-gate* used to refer to a variety of scandals in Washington. But knowing much less about Watergate, they couldn't detect this common thread and instead analyzed *-gate* as a suffix that can be added to any word to indicate a scandal. Notice that this transformation could have occurred without competition among alternative memes. Every meme in every baby boomer brain could specify that *-gate* means a government scandal like Watergate; nonetheless, every younger person could infer *-gate* to mean any scandal.

As Blackmore notes, genes can also be transformed by spontaneous changes called mutations. But genetic mutations are rare, occurring about once every million replications, and as a result

their effect usually can be ignored when thinking about adaptations. If mutations occurred more often—say, every 10 replications—they would have a significant effect on which genes were most common. We think this situation is exactly what occurs with ideas, which can transform rapidly as they spread from one person to the next. If we are right, cultural change will be understood only if the effects of transformation and natural selection are combined.

A number of other nonselective processes may affect the evolution of ideas. For example, a person can learn an idea from someone else and then modify the idea in an effort to improve it. Still other nonselective processes can arise when people synthesize their own beliefs after being exposed to a number of people who behave differently. We think that successful interpretations of cultural change require meticulous attention to the many processes that guide particular instances of cultural evolution. Social scientists have already made some progress on this project. William Labov of the University of Pennsylvania has described psychological and social processes that cause gradual changes in dialect from generation to generation, for instance, and Albert Bandura of Stanford University has studied how imitation shapes the acquisition of ideas.

Over the past century biologists have developed many concepts and mathematical tools that can help clarify what happens when a variety of processes interact to shape the evolution of populations. By combining these ideas with empirical studies, scientists may then be able to understand how culture evolves.

ROBERT BOYD and PETER J. RICHERSON have collaborated for 25 years in studying the evolution of human culture and how cultural and genetic evolution interact. Their work couples mathematical models with empirical work drawn from laboratory and field research. Boyd is an evolutionary anthropologist at the University of California, Los Angeles; Richerson is a population biologist at the University of California, Davis.

People Do More Than Imitate

by Henry Plotkin

I see two main problems with memetics of the Susan Blackmore variety. First is her suggestion that culture is nothing but a collection of memes. She includes everything from a simple action such as using a stone tool to complex institutions such as banks. The second problem is her idea that all memes, and thus all aspects of culture, are spread by imitation. From my perspective as a psychologist, neither assertion is correct.

Early in the 20th century American psychologist Edward Thorndike defined imitation as learning to do an act from seeing it done; this meaning prevails in psychological research today. If the word *imitation* is used in this way, then Blackmore's assertions are trivial, because imitating actions transmits almost nothing of cultural importance. Tying shoelaces and throwing a ball are not in themselves significant in human affairs.

If the word *imitation* is used instead as Blackmore prefers—to mean any and every manner of communication between people, from passing on the gist of a story to remembering the instructions read in a manual a week ago—then the term becomes so vague as to be meaningless. And even this broad definition of imitation cannot account for the existence and evolution of culture, which is much more than the rote repetition of physical actions. Human culture is about the sharing of knowledge, beliefs and values.

At the core of any culture are shared understandings about how the world works, sometimes referred to as schemas. The rules that operate in restaurants form a classic schema: in such places someone prepares your food, brings it to your table and

Human culture is about the sharing of knowledge, beliefs and ideas. Imitation, properly defined, does not come into it.

cleans up after you in exchange for money. Children acquire the many schemas that characterize their own culture through a mix of informal guidance from adults and peers and by the complex psychological mechanisms that enable a person to make sense of abstract ideas. Imitation, properly defined, does not come into it.

Shared beliefs and values, also called social constructions, come to us in a similarly complex and ill-understood fashion. In contrast to schemas, which describe tangible entities such as restaurants, social constructions exist only because people agree that they do. Money is a social construction. So, too, is justice. Some of them have physical embodiments, such as paper or coins, but they all go beyond the physical and into mental agreements about what things mean. Without consensus that bills and coins have specific values, money is worthless. Many beliefs and values also regulate social interactions. In much of Western culture, for instance, justice is based on concepts of fairness and ownership. Other cultures define justice through such ideas as



SHARED KNOWLEDGE, such as the rules that operate in restaurants, cannot be imitated.

service or revenge. In all cases, justice goes beyond courts of law, judges or prisons.

Scientists have remarkably few detailed studies of how children come to understand and uphold such complex abstractions. Language is obviously involved. Also significant is our ability to realize that other people have intentions and desires, a capacity that psychologists call “theory of the mind.” Responsiveness to social force—another psychological trait unique to our species—is an additional potent motive for adhering to shared beliefs and values. Again, imitation does not come into it. We do not and cannot imitate justice. Rather we come to understand it slowly through conversations, formal teaching, reading books, watching films, and the like.

Blackmore argues that this slow accumulation of understanding depends on imitation, but it isn't that simple. Recent neurobiological studies indicate that imitation requires specific messages to be computed in specialized areas of the brain. That means that when as a child I came to understand what a restaurant is, or what justice is, I did so by following a sequence of psychological steps entirely different from those by which I learned to tie my shoelaces.

Schemas and social constructions arise out of the operation of memory and abstraction. They have nothing to do with “learning to do an act from seeing it done.” The acceptance and spread of ideas through society—especially an ideology such as justice—are slow, unpredictable and difficult to measure, and certainly do not fit within the restrictive theory of memes. Culture, as a collective of human brains and minds, is the most complex phenomenon on earth. We will never understand it if we approach it in a simpleminded way.

HENRY PLOTKIN is a psychobiologist at University College London, where he has worked since 1972. The author of two books on evolution and cognition, he is currently writing a third, on the evolution of culture.

scan studies might compare people carrying out actions with others copying them. Contrary to common sense, this theory postulates that imitation is the harder part—and also that the evolutionarily newer parts of the brain should be especially implicated in carrying it out. In addition, within any group of related animal species, those with the most ability at imitation should have the largest brains. The scarcity of imitation in animals limits the amount of data available, but species of birds, whales and dolphins could be analyzed and compared with this prediction.

Experimental Tests

If language developed in humans as a result of meme-gene coevolution, linguists should find signs that grammar is optimized for transmitting memes with high fecundity, fidelity and longevity, rather than for conveying information on specific topics such as hunting or for forming social contracts. Social psychology experiments should show that people preferentially copy more articulate people and find them more sexually attractive than less eloquent people.

Other predictions can be tested by mathematical modeling and computer simulations, which many researchers have used to model evolutionary processes. The addition of a second, faster replicator to a system should introduce a dramatic change, analogous to the appearance of memes and the human brain's expansion. The second replicator should also be able to control, and even stop, the evolution of the first. Such models might then be used to understand in greater detail the coevolution of memes and genes. In addition, the idea that language could spontaneously emerge in a population of imitating creatures could be tested with



EMOTIONS ROUSED BY IDEOLOGICAL SYMBOLS suggest the importance that memes hold for us and the power they have over our behavior.

simulations of noisy imitating robots.

Memetics is a new science, struggling to find its place and with many critics. Some of these critics have simply failed to grasp the idea of a replicator. We need to remember that memes, like genes, are merely bits of information that either succeed in getting copied or do not. In this sense, but no other, memes can be said to be “selfish” and to have replicator power. Memes are not magical entities or free-floating Platonic ideals but information lodged in specific human memories, actions and artifacts. Nor are all mental contents memes, because not all of them were copied from someone else. If all your memes were removed, you would still have many perceptions, emotions, imaginings and learned skills that are yours alone, that you did not acquire from anyone else and that you can never share with another.

A common objection is that memes

are very different from genes. And so they are. They suffer (or benefit) from much greater mutation rates, and they are not locked into a system as rigidly prescribed as DNA replication and protein synthesis. Memes are best thought about not by analogy with genes but as new replicators, with their own ways of surviving and getting copied. Memes can be copied all over the place, from speech to paper to book to computer, and to another person.

Yet many more potential criticisms remain, and much work is still to be done. In the end, memetics deserves to succeed only if it provides better explanations than rival theories and offers valid and testable predictions. Unlike religions, the great meme-complex of science includes methods for throwing out ideas that are vacuous, nonsensical or plain wrong. It is against these criteria that memetics, quite rightly, will be judged. SA

The Author

SUSAN BLACKMORE was infected by the meme meme in 1995 by Daniel Dennett's book *Darwin's Dangerous Idea* and by an essay on memes and consciousness by one of her Ph.D. students. The concept took root: by promising to transform the understanding of the human mind, it caused Blackmore to devote many of her meme-generating resources to further study and propagation of the idea. Her status as a source of scientific memes is embodied in her position as reader in psychology at the University of the West of England, Bristol. The Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP) has awarded her the Distinguished Skeptic Award for her studies of near-death experiences and her suggestion that tales of alien abduction are generated by people trying (with the wrong set of memes) to make sense of a form of sleep paralysis.

Further Information

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