

AUGUST 22, 2010, 5:30 PM

The Third Replicator

By **SUSAN BLACKMORE**

The Stone is a forum for contemporary philosophers on issues both timely and timeless.

Tags:

Evolution, memes, technological evolution, technology

All around us information seems to be multiplying at an ever increasing pace. New books are published, new designs for toasters and i-gadgets appear, new music is composed or synthesized and, perhaps above all, new content is uploaded into cyberspace. This is rather strange. We know that matter and energy **cannot** increase but apparently information can.

It is perhaps rather obvious to attribute this to the evolutionary algorithm or Darwinian process, as I will do, but I wish to emphasize one part of this process — copying. The reason information can increase like this is that, if the necessary raw materials are available, copying creates more information. Of course it is not new information, but if the copies vary (which they will if only by virtue of copying errors), and if not all variants survive to be copied again (which is inevitable given limited resources), then we have the complete three-step process of natural selection (Dennett, 1995). From here novel designs and truly new information emerge. None of this can happen without copying.

I want to make three arguments here.

The first is that humans are unique because they are so good at imitation. When our ancestors began to imitate they let loose a new evolutionary process based not on genes but on a second **replicator**, **memes**. Genes and memes then coevolved, **transforming us** into better and better **meme machines**.

Imitation is not just some new minor ability. It changes everything. It enables a new kind of evolution.

The second is that one kind of copying can piggy-back on another: that is, one replicator (the information that is copied) can build on the products (vehicles or interactors) of another. This multilayered evolution has produced the amazing complexity of design we see all around us.

The third is that now, in the early 21st century, we are seeing the emergence of a third replicator. I call these **temes** (short for technological memes, though I have considered **other names**). They are digital information stored, copied, varied and selected by machines. We humans like to think we are the designers, creators and controllers of this

newly emerging world but really we are stepping stones from one replicator to the next.

As I try to explain this I shall make some assertions and assumptions that some readers may find outrageous, but I am deliberately putting my case in its strongest form so that we can debate the issues people find most interesting or most troublesome.

Some may entirely reject the [notion of replicators](#), and will therefore dismiss the whole enterprise. Others will accept that genes are replicators but reject the idea of memes. For example, Eva Jablonka and Marion J. Lamb (2005) refer to “the dreaded memes” while Peter J. Richerson and Robert Boyd (2005), who have contributed so much to the study of cultural evolution, assert that “cultural variants are not replicators.” They use the phrase “selfish memes” but still firmly reject memetics (Blackmore 2006). Similarly, in a previous “[On The Human](#)” post, [William Benzon](#) explains why he does not like the term “meme,” yet he needs some term to refer to the things that evolve and so he still uses it. As John S. Wilkins points out in [response](#), there are several more classic objections: memes are not discrete (I would say *some* are not discrete), they do not form lineages (*some* do), memetic evolution appears to be Lamarckian (but only *appears* so), memes are not replicated but re-created or reproduced, or are not copied with sufficient fidelity (see discussions in Auger 2000, Sterelny 2006, Wimsatt 2010). I have tackled all these, and more, elsewhere and concluded that the notion is still valid (Blackmore 1999, 2010a).

So I will press on, using the concept of memes as originally defined by Dawkins who invented the term; that is, memes are “that which is imitated” or whatever it is that is copied when people imitate each other. Memes include songs, stories, habits, skills, technologies, scientific theories, bogus medical treatments, financial systems, organizations — everything that makes up human culture. I can now, briefly, tell the story of how I think we arrived where we are today.

First there were genes. Perhaps we should not call genes the first replicator because there may have been precursors worthy of that name and possibly [RNA-like replicators](#) [before](#) the evolution of [DNA](#) (Maynard Smith and Szathmary 1995). However, Dawkins (1976), who coined the term “replicator,” refers to genes this way and I shall do the same.

Both memes and genes are vast competing sets of information, all selfishly getting copied whenever and however they can.

We should note here an important [distinction](#) for living things based on DNA, that the genes are the replicators while the animals and plants themselves are [vehicles](#), [interactors](#), or [phenotypes](#): ephemeral creatures constructed with the aid of genetic information coded in tiny strands of DNA packaged safely inside them. Whether single-celled bacteria, great oak trees, or dogs and cats, in the [gene-centered](#) view of evolution they are all gene machines or Dawkins’s “lumbering robots.” The important point here is that the genetic information is faithfully copied down the generations, while the vehicles or interactors live and die without actually being copied. Put another way, this system

copies the instructions for making a product rather than the product itself, a process that has many advantages (Blackmore 1999, 2001). This interesting distinction becomes important when we move on to higher replicators.

So what happened next? Earth might have remained a one-replicator planet but it did not. One of these gene machines, a social and bipedal ape, began to imitate. We do not know why, although shifting climate may have favored stealing skills from others rather than learning them anew (Richerson and Boyd 2005). Whatever the reason, our ancestors began to copy sounds, skills and habits from one to another. They passed on lighting fires, making stone tools, wearing clothes, decorating their bodies and all sorts of skills to do with living together as hunters and gatherers. The critical point here is, of course, that they *copied* these sounds, skills and habits, and this, I suggest, is what makes humans unique. No other species (as far as we know) can do this. Song birds can copy some sounds, some of the other great apes can imitate some actions, and most notably whales and dolphins can imitate, but none is capable of the widespread, generalized imitation that comes so easily to us. Imitation is not just some new minor ability. It changes everything. It enables a new kind of evolution.

This is why I have called humans “Earth’s [Pandoran species](#).” They let loose this second replicator and began the process of memetic evolution in which memes competed to be selected by humans to be copied again. The successful memes then influenced human genes by gene-meme co-evolution (Blackmore 1999, 2001). Note that I see this process as somewhat different from [gene-culture](#) co-evolution, partly because most theorists treat culture as an adaptation (e.g. Richerson and Boyd 2005), and agree with Wilson that genes “keep culture on a leash.” (Lumsden and Wilson 1981 p 13).

Benzon, in [responding to Peter Railton’s post](#) here at The Stone, points out the limits of this metaphor and proposes the “chess board and game” instead. I prefer a simple [host-parasite](#) analogy. Once our ancestors could imitate they created lots of memes that competed to use their brains for their own propagation. This drove these hominids to become better meme machines and to carry the (potentially huge and even dangerous) burden of larger brain size and energy use, eventually becoming [symbiotic](#). Neither memes nor genes are a dog or a dog-owner. Neither is on a leash. They are both vast competing sets of information, all selfishly getting copied whenever and however they can.

To help understand the next step we can think of this process as follows: one replicator (genes) built vehicles (plants and animals) for its own propagation. One of these then discovered a new way of copying and diverted much of its resources to doing this instead, creating a new replicator (memes) which then led to new replicating machinery (big-brained humans). Now we can ask whether the same thing could happen again and — aha — we can see that it can, and is.

A sticking point concerns the equivalent of the meme-phenotype or vehicle. This has plagued memetics ever since its beginning: some arguing that memes must be inside human heads while words, technologies and all the rest are their phenotypes, or “[phemotypes](#)”; others arguing the opposite. I disagree with both (Blackmore 1999, 2001). By definition, whatever is copied is the meme and I suggest that, until very recently, there was no meme-phemotype distinction because memes were so new and so poorly replicated that they had not yet constructed stable vehicles. Now they have.

As “temes” proliferate, using ever more energy and resources, our own role becomes ever less significant.

Think about songs, recipes, ways of building houses or clothes fashions. These can be copied and stored by voice, by gesture, in brains, or on paper with no clear replicator/vehicle distinction. But now consider a car factory or a printing press. Thousands of near-identical copies of cars, books, or newspapers are churned out. Those actual cars or books are not copied again but they compete for our attention and if they prove popular then more copies are made from the same template. This is much more like a replicator-vehicle system. It is “copy the instructions” not “copy the product.”

Of course cars and books are passive lumps of metal, paper and ink. They cannot copy, let alone vary and select information themselves. So could any of our modern meme products take the step our hominid ancestors did long ago and begin a new kind of copying? Yes. They could and they are. Our computers, all linked up through the Internet, are beginning to carry out all three of the critical processes required for a new evolutionary process to take off.

Computers handle vast quantities of information with extraordinarily high-fidelity copying and storage. Most variation and selection is still done by human beings, with their biologically evolved desires for stimulation, amusement, communication, sex and food. But this is changing. Already there are examples of computer programs recombining old texts to create new essays or poems, translating texts to create new versions, and selecting between vast quantities of text, images and data. Above all there are search engines. Each request to Google, Alta Vista or Yahoo! elicits a new set of pages — a new combination of items selected by that search engine according to its own clever algorithms and depending on myriad previous searches and link structures.

This is a radically new kind of copying, varying and selecting, and means that a new evolutionary process is starting up. This copying is quite different from the way cells copy strands of DNA or humans copy memes. The information itself is also different, consisting of highly stable digital information stored and processed by machines rather than living cells. This, I submit, signals the emergence of temes and teme machines, the third replicator.

What should we expect of this dramatic step? It might make

Related [More From The Stone](#)

as much difference as the advent of human imitation did.

Just as human meme machines spread over the planet, using up its resources and altering its ecosystems to suit their own

needs, so the new meme machines will do the same, only faster. Indeed we might see our current ecological troubles not as primarily our fault, but as the inevitable consequence of earth's transition to being a three-replicator planet. We willingly provide ever more [energy](#) to power the Internet, and there is enormous scope for meme machines to grow, evolve and create ever more extraordinary digital worlds, some aided by humans and others independent of them. We are still needed, not least to run the power stations, but as the memes proliferate, using ever more energy and resources, our own role becomes ever less significant, even though we set the whole new evolutionary process in motion in the first place.

Whether you consider this a tragedy for the planet or a marvelous, beautiful story of creation, is up to you.

(Susan Blackmore's essay is the subject of [this week's forum discussion](#) among the humanists and scientists at [On the Human](#), a project of the National Humanities Center.)

Susan Blackmore is a psychologist and writer researching consciousness, memes, and anomalous experiences, and a Visiting Professor at the University of Plymouth. She is the author of several books, including ["The Meme Machine"](#) (1999), ["Conversations on Consciousness"](#) (2005) and [Ten Zen Questions](#) (2009).

References

Aunger, R.A. (Ed) (2000) "Darwinizing Culture: The Status of Memetics as a Science," Oxford University Press

Benzon, W.L. (2010) "[Cultural Evolution](#): A Vehicle for Cooperative Interaction Between the Sciences and the Humanities." Post for On the Human.

Blackmore, S. 1999 "The Meme Machine," Oxford and New York, Oxford University Press

Blackmore, S. 2001 "[Evolution and memes](#): The human brain as a selective imitation device." *Cybernetics and Systems*, **32**, 225-255

Blackmore, S. (2006) "[Memetics by another name?](#)" Review of "Not by Genes Alone" by P.J. Richerson and R. Boyd. *Bioscience*, 56, 74-5

Blackmore, S. (2010a) [Memetics does provide a useful](#) way of understanding cultural evolution. In "[Contemporary Debates in Philosophy of Biology](#)", Ed. Francisco Ayala and Robert Arp, Chichester, Wiley-Blackwell, 255-72.

Blackmore (2010b) "[Dangerous Memes](#); or what the Pandorans let loose." In "Cosmos

Read previous contributions to this series.

• [Go to All Posts](#) »

and Culture: Cultural Evolution in a Cosmic Context,” Ed. Steven Dick and Mark Lupisella, NASA 297-318

Dawkins,R. (1976) “[The Selfish Gene](#),” Oxford, Oxford University Press (new edition with additional material, 1989)

Dennett, D. (1995) “[Darwin’s Dangerous Idea](#),” London, Penguin

Jablonka, E. and Lamb, M.J. (2005) “[Evolution in Four Dimensions: Genetic, Epigenetic, Behavioral and Symbolic Variation in the History of Life](#).” Bradford Books

Lumsden,C.J. and Wilson,E.O. (1981) “[Genes, Mind and Culture](#).” Cambridge, Mass., Harvard University Press.

Maynard-Smith,J. and Szathmáry,E (1995) “[The Major Transitions in Evolution](#).” Oxford, Freeman

Richerson, P.J. and Boyd, R. (2005) “[Not by Genes Alone: How Culture Transformed Human Evolution](#),” Chicago, University of Chicago Press

Sterelny, K. (2006). “[Memes Revisited](#).” British Journal for the Philosophy of Science 57 (1)

Wimsatt, W. (2010) Memetics does not provide a useful way of understanding cultural evolution: A developmental perspective. In “[Contemporary Debates in Philosophy of Biology](#)” Ed. Francisco Ayala and Robert Arp, Chichester, Wiley-Blackwell, 255-72.

Related

Watch Susan Blackmore’s TED Talk on memes and temes.