Classic Text 36 - Memes

Susan Blackmore is a British Writer, Sceptic, Broadcaster and Professor, Known for her Work on Parapsychology, Memetics and Consciousness

A **meme** is an idea, behaviour, or style that spreads by means of imitation from person to person within a culture and often carries symbolic meaning representing a particular phenomenon or theme. A meme is thus a unit of cultural transmission of ideas, symbols or practices, from one mind to another. The medium of transmission may be spoken, textual, gestural, ritual, via the internet or social media. (Wikipedia: Meme)

The word meme was first coined by Richard Dawkins, in his 1976 (2006) book The Selfish Gene. According to Dawkins:

> We need a name for the new replicator, a noun that conveys the idea of a unit of cultural transmission, or a unit of imitation. 'Mimeme' comes from a suitable Greek root, but I want a monosyllable that sounds a bit like 'gene'. I hope my classicist friends will forgive me if I abbreviate mimeme to meme. If it is any consolation, it could alternatively be thought of as being related to 'memory', or to the French word même. It should be pronounced to rhyme with 'cream'. (1976, p. 192)

In her book *The Meme Machine* (1999) Susan Blackmoore championed Dawkins ideas concerning memes, together with insights from Daniel Dennett, at the time, whom she credits for his 'avuncular advice ' in bringing her book to fruition. Blackmoore was arguably the first to make the subject of memetics both accessible and respectable. The first three chapters are available here[1]; although we strongly recommend reading beyond the extract as well as Dennett (1995) which we have cited elsewhere.

The Meme Machine (1999) defies any single classification – it is at the same time evolutionary biology, an extension of genetics, psychology, social anthropology, philosophy, and more. Blackmore draws on her studies in psychology, physiology, environmental psychology and even parapsychology to convince us that memes are genuine evolutionary replicators alongside, but quite different to genes. According to Dawkins, in his forward to the book, "Any theory deserves to be given its best shot, and that is what Susan Blackmore has given the theory of the meme". (p. xvi)

What makes us different?

Most humans are convinced that we are different form other animals. In fact most historical philosophers, except for a handful, like Aristotle, have flatly denied that we are even animals. (Olson, 2003) Obviously they are wrong, because they knew nothing about contemporary biology, especially since Darwin. But we do differ from other creatures in fundamental ways: We are language users. We can survive in almost any environment from the Arctic to the Antarctic and everywhere in between.

[1] Under South African copyright law, it is permissible to reproduce an extract of a book or a full journal article for educational purposes.

We are unquestionably the apex predator on our planet. We eat anything, including species that could potentially eat us. Indeed we have eaten many species into extinction both plant and animal. We wage war, believe in the afterlife, bury our dead, get embarrassed about sex, destroy ecosystems and, comparatively recently (c. 10 000 years ago), we began farming. And now we do so on an industrial scale. We believe we are the most intelligent species on the planet, but we have been defeated at our most intellectually challenging games, Chess and Go, by computers and now Artificial Intelligences diagnose certain cancers better than oncologists do. But these same intelligences require a disproportional amount of computing recourses just to do something as simple making a pot of tea and serving to four people in cups.

On the other hand, as Aristotle would have pointed out, we are obviously animals. We have eyes, lungs, a liver, intestines, brains and genitals. All of our organs are made out of the same tissues as our animal counterparts, and all of out tissues are made of cells. Some people find this hard to accept. They argue that something special must distinguish us from other creatures, such as a human spirit that transcends the body, or the phenomenon of consciousness that accounts for our inner life or "self" that other animals do not have. As we have seen in previous study units (Classic Texts 06 & 32), these beliefs are multiply wrong.

According to Blackmore, what makes us special is **imitation**. We imitate, we copy speech, gestures, writing, melodies, rhythms, techniques, ideas, trends, fads and fashions. Indeed we, other primates and birds are possessed of **mirror neurons** that fire both when an animal acts and observes the same action performed by another animal. (Rizzolatti & Craighero, 2004; Keysers, 2009 & 2011) Cetaceans probably also have mirror neuros too, because they readily copy each other and can be trained to copy humans. They also recognise themselves in a mirror, a standard test of self-awareness. (Reiss & Marino, 2001)

If some animals are capable of imitation some of the time and via some modalities, humans imitate pervasively and naturally almost from birth. Blackmore asks:

> Have you ever sat and blinked, or waved, or 'goo gooed', or even just smiled, at a baby? What happens? Very often they blink too, or wave, or smile back at you. We do it so easily, even as an infant. We copy each other all the time. Like seeing, it comes so effortlessly that we hardly think about it. We certainly do not think of it as being something very clever. Yet, as we shall see, it is fantastically clever. (p. 3)

Social media are abuzz with stories and videos by pet owners of their animals engaging in imitation. Did you see the one about the cat who learned to flush the toilet and taught a second cat to do the same? In later versions of the story, the cat taught itself to use the toilet and flush afterwards. Blackmore relates a more reliable anecdote as told by Diana Reiss, a psychologist at Rutgers University.

> She trained the dolphins by giving them fish as a reward and also by a 'time out' procedure for punishment. If they did the wrong thing she would walk away from the water's edge and wait for one minute before returning to the pool. One day she threw a fish to one of the dolphins but had accidentally left on some spiky bits of fin. Immediately the dolphin turned, swam away, and waited for a minute at the other side of the pool.

We think of dolphins as *understanding* the action and being possessed of intelligence, consciousness and intentionality like us, but these terms are hard even to define. What we do not dispute is that Dr Reiss' dolphin imitated her in an appropriate way. According to Blackmore, "We are so oblivious to the cleverness of imitation that we do not even notice how rare it is in other animals and how often we do it ourselves". (p. 4)

Imitation and the meme

When we imitate someone else, something is passed on, and can be passed on again…, and so may take on a life of its own. Perhaps this something can be called an idea, an instruction, or a piece of information, but it already has a name – a meme. (Dawkins, 1976) The gist of Dawkins' *The Selfish Gene* was that evolution can be best understood in reductionistic terms as competition between genes.

Early 20th Century biologists spoke of evolution as occurring "for the good of the species" without knowing about the mechanisms by which this is achieved. By the 1960s Williams (1966) recognised that there were serious problems with this view. If all organisms of a species act for the good of a group, then it would be easy for one, or a few who do not, to take advantage of the rest. Presumably, these exploiters would leave more descendants with the uncooperative traits, who do not act for the benefit of the rest, and within a few generations, the group benefit would be lost. On the more recent understanding of cooperation, it may appear that individuals act for the good of the species, but, in fact, this is driven by competition between genes; hence Dawkins' term "selfish gene".

Blackmore belabours the point that this does not mean that there are genes *for* selfishness. Rather, the term 'selfish' means that genes act only in their own 'interest', and that interest is purely their own replication. If we allow ourselves to anthropomorphise for a moment, we could say genes 'want' only to be passed on to the next generation. Of course genes do not have wants or intentions, they are simply bits of chemical instructions that can be copied. So, when we say that genes 'want x' or are 'selfish' we are using a necessary shorthand for "genes that do x are more likely to be passed on to the next generation". Besides bringing about some phenotypic effect, which may be beneficial, harmless or deleterious, the only power that genes have is the power to replicate. And in that sense they are selfish. (p. 4 - 5)

Of course, we do not see naked genes moving about in nature, firstly because genes are simply stretches of DNA or RNA which are too small to see, but secondly because they are stored withing cells. In the most general terms all replicators, are housed within what Dawkins called 'vehicles'. Thus, anything of which copies are made is called a replicator, including 'active replicators' whose nature determines their chance of being copied again. Vehicles, on the other hand, carry and protect replicators within them. Vehicles, in turn, interact with the environment, hence Hull's (1988a) term 'interactor'. The first replicators on Earth were probably very simple self-copying molecules in the primordial soup, probably in environments like small ponds which underwent cycles of drying out and rewetting. This would have had the effect of cyclically concentrating and rediluting these molecules. Now those replicators are DNA and the less stable but faster mutating RNA, but there must have been precursors that have not left a trace. (p. 5)

Although genes are the replicators that drive biological evolution on Earth, Dawkins stated that he believes "all life evolves by the differential survival of replicating entities". (1976, p. 192) This is the

idea of Universal Darwinism, later taken up by Dennett (1995), *i.e.* the application of Darwinian thinking way beyond the confines of biological evolution. (See section below.) According to Dawkins:

> The gene, the DNA molecule, happens to be the replicating entity that prevails on our own planet. There may be others. If there are, provided certain other conditions are met, they will almost inevitably tend to become the basis for an evolutionary process.
>
> But do we have to go to distant worlds to find other kinds of replicator and other, consequent, kinds of evolution? I think that a new kind of replicator has recently emerged on this very planet. It is staring us in the face. It is still in its infancy, still drifting clumsily about in its primeval soup, but already it is achieving evolutionary change at a rate that leaves the old gene panting far behind.
>
> The new soup is the soup of human culture. (*l.c.*)

As examples of memes, Dawkins mentions 'tunes, ideas, catch-phrases, clothes, fashions, ways of making pots or of building arches'. But, he also mentions scientific ideas that catch on and propagate themselves from brain to brain. Religions are also groups of memes, or **meme-complexes** analogous to gene-complexes, with high survival value, including the ability to colonise or infect whole societies with a belief in God or the afterlife. Memes are stored in brains, or with the invention of writing, in text, and with the advent of recent inventions, on smart phones, memory sticks or hard drives, and spread by human imitation or machine replication. (p. 6)

In the pages following Dawkins' quote above he lays the foundations for understanding the evolution of memes. He described their propagation as jumping from brain to brain like parasites infecting a host. He treated them as physically realised living structures, and argued that mutually cooperating memes will gang together in groups just as genes do. Most importantly, Dawkins treated memes as replicators in their own right, rather than merely derivative entities. However, he complained that many of his colleagues seemed unable to accept that memes would spread for their own benefit, independent of any benefit to the genes.

> 'In the last analysis they wish always to go back to 'biological advantage''. Yes, he agreed, we got our brains for biological (genetic) reasons but now we have them a new replicator has been unleashed. 'Once this new evolution begins, it will in no necessary sense be subservient to the old' (Dawkins 1976, p. 193-4). In other words, memetic evolution can now take off without regard to its effects on the genes. (p. 6)

According to Dawkins then, human life is pervaded with memes and their consequences. Everything we have ever learned by imitation from someone else is a meme. Blackmore uses the term 'initiation' in the same broad sense that Dawkins does. If your friend pass on a story to you, and you remember the gist of it before passing it on to a third person, then that counts as imitation. You may not have imitated your friend's every word and gesture, but *something* (the gist of the) story has been passed on. Besides not requiring that everything be copied *verbatim* or with high definition, Blackmore advises that '[i]f in doubt, remember that *something* must have been copied'. (our emphasis, p. 7)

Some philosophers and scientists may consider Blackmore (and Dawkins') definition of a meme hopelessly broad. Wouldn't almost anything count as a meme so long as something is copied? Are

photocopy machines spreaders of memes? What about karaoke machines? No, but they can effectively used by humans instrumentally to proliferate memes. The same "too broad" objection can be made against gestures. Virtually any movement of the body can be used communicate a thought, feeling, or intention, including not moving. Suppose that Mary, who communicates mostly by sign language, is out on a date when her partner leans in for a kiss, she may decide simply not to sign her consent instead of pushing him away.

Furthermore, the "something" that Blackmoore refers to is not something insubstantial like Cartesian thoughts or the "self" that most Westerners believe they have lodged in their heads. No, it is instantiated in the same neural matter that can acquire, store and retrieve information of a given modality. Catchy tunes for example are realised in the same auditory cortex as other acoustic phenomena. Of course, we may use cognitive prosthetics to store information off-line while we are not using it, whether it is on paper, a hard-drive or some other device. However once acquired, such memes can be difficult to consciously ignore, *e.g.* an annoying earworm.

Blackmore observes that memes spread themselves around indiscriminately without regard to whether they are useful, neutral, or harmful to us. A brilliant new scientific theory or an invention may spread because of its usefulness, but an equally brilliant idea may languish in obscurity for decades, simply because it is unappealing rather than false. On the other hand, some memes like chain letters, spam, pyramid schemes and celebrity endorsed quack therapies can be downright harmful. Of course memes don't and can't care – they will propagate and multiply by what ever means are available. (p. 7)

According to Blackmore,

> This is the power behind the idea of memes. To start to think memetically we have to make a giant flip in our minds just as biologists had to do when taking on the idea of the selfish gene. Instead of thinking of our ideas as our own creations, and as working for us, we have to think of them as autonomous selfish memes, working only to get themselves copied. We humans, because of our powers of imitation, have become just the physical 'hosts' needed for the memes to get around. This is how the world looks from a 'meme's eye view'. (p. 7 - 8)

Meme fear

Like Darwinism, the idea of memes is potentially upsetting to the extent that it is misunderstood. At the time of writing, Blackmore reported that authors tended to write inverted commas around the word, "as though to apologise for using it". She even mentions eminent lectures who would signal air quotes above their ears when forced to say it. Gradually however, the word has become more widely known, and was added to the 2nd edition of the Oxford English Dictionary published in March 1989. The meme meme seems to be more successful in cyberspace than in academia, and Blackmore mentions a number of books on human origins, the evolution of language and evolutionary psychology, in which the term is simply not indexed. According to Blackmore, one of the problems with the idea of memes is that is that,

> it strikes at our deepest assumptions about who we are and why we are here. This is always happening in science. Before Copernicus and Galileo, people believed they lived at the centre of the universe in a world created especially for them by God.

> A hundred and forty years ago Darwin's theory of evolution by natural selection provided the first plausible mechanism for evolution without a designer. People's view of their own origin changed from the biblical story of special creation in the image of God, to an animal descended from an apelike ancestor – a vast leap indeed, and one that led to much ridicule and fanatical opposition to Darwin. Still – we have all coped with that leap and come to accept that we are animals created by evolution. However, if memetics is valid, we will have to make another vast leap in accepting a similar evolutionary mechanism for the origin of our minds and our selves. (p. 8)

Two and a half decades after Blackmore's book appeared, most of us have not made that leap. What therefore will determine whether the theory of memes is worth having? In previous study units we have discussed a number of characteristics of successful scientific theories.

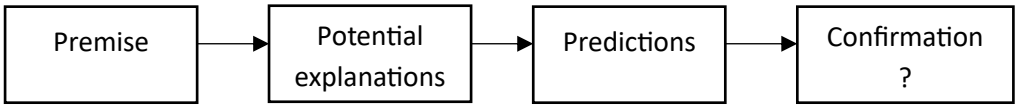
- Firstly, a good theory should do some explanatory work. A theory that explains nothing, or very little, or that itself stands in need of explanation, is of no use. The creation myth that the Universe was born out of a Cosmic Egg is such an example. If true, it would explain the existence of everything, unfortunately how the Cosmic Egg itself came into being remains to be explained.
- A good theory should be able to explain things more economically, or more comprehensively than its rivals. *E.g.* Einstein's two theories of relativity explain the motion of bodies and light and the exitance of space-time in a way that leaves Newtonian mechanics only as a limiting case.
- A good theory should be consistent with the best current evidence available. If insufficient evidence is available, a good theory should predict what sort of additional evidence is required, and to what degree of accuracy. See below.
- A good theory should be testable or verifiable. It should make predictions that can be tested in the laboratory, in the field or in the observatory. If the evidence shows that the theory is not supported, it should be the theory that ought to be modified or scrapped, not the evidence.
- Finally, scientific theories are inherently falsifiable. They have clear criteria by which they can be proved false. Whereas the verificationist approach to a theory says, "Come on, prove me right", the falsificationist approach say, "Come on, prove me wrong". Every time a scientific theory *fails* to be falsified, it gains a little standing. A scientific theory therefore draw its strength by being vulnerable, until it too is ultimately supplanted by a better theory.

Blackmore's stated aim is to show that many aspects of human nature are better explained by a theory of memetics than by any rival theory. The theory begins with only one mechanism as a premise – competition between memes to be hosted by human brains and to be passed on again. This gives rise to potential explanations for such diverse phenomena as the evolution of the disproportionately large human brain, the origins of human language, our tendency to over-talk and over-think, human altruism, and the evolution of the internet. According to Blackmore, human beings look quite different when viewed through the lens of meme theory. (p. 9)

Addressing the question of whether the new way is better, Blackmore states and then sets out her approach:

> It seems obviously so to me, but I expect that many people will disagree. This is where the predictions come in. I shall try to be as clear as I can in deriving predictions and showing how they follow from memetic theory. I may speculate and even, at times, leap wildly beyond the evidence, but as long as the speculations can be tested then they can be helpful. In the end, the success or failure of these predictions will decide whether memes are just a meaningless metaphor or the grand new unifying theory we need to understand human nature. (p. 9)

The following flowchart depicts Blackmore's approach / methodology in the remainder of the text.



Universal Darwinism

We have discussed Darwinism in some detail beginning with Classic Text 22. Here Blackmore and Dennett (1995) before her, extend the original theory of natural selection beyond its domain of biological evolution on Earth to a generalized version of the mechanisms of variation, selection and heredity proposed by Darwin, to explain evolution in a much wider variety of other domains, including psychology, linguistics, economics, culture, medicine, computer science, and even physics. (Wikipedia: Universal Darwinism)

Natural philosophy[2] before Darwin recognised the similarity and relations between living forms and fossils and speculated about evolution, but failed to identify the mechanism(s) driving evolution. Charles Darwin (1859) was the first to propose such a mechanism, which can be summarised as an argument in point form:

1. **Variation**: Individuals within a population vary from one another.
2. **Inheritance**: These variations are heritable, *i.e.* they can be passed from parent to offspring.
3. **Struggle for Existence**: There are always more offspring produced than can possibly survive, leading to competition for limited resources.
4. **Survival of the Fittest**: Individuals that are better suited to their environment are more likely to survive and reproduce.
5. **Adaptive Evolution**: These favourable traits become more common in the population over time leading to changes in the species.
6. **Speciation**: Given enough time and accumulated changes, this process can result in a new, distinct species.

[2] **Natural philosophy** or philosophy of nature was the precursor to modern science encompassing physics (nature) chemistry, geology, biology and anthropology, without recourse to theology.

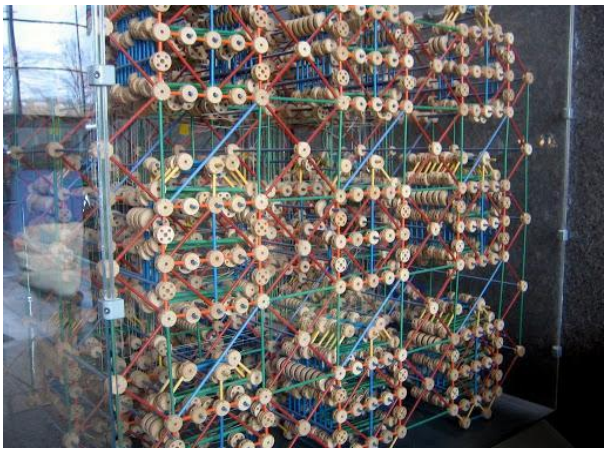
Darwin's *On the Origins of Species* (1859) is a book-length version of the argument as above. Points 1 - 4 are the premises. Point 5 is the conclusion and point 6 is a corollary, although it is so important, it ought not to be called a corollary. In fact, it is the titular subject of Darwin's *Origins of Species*, namely speciation. Taken together, the statements constitute a deductive argument, meaning that, if the premises are true, the conclusion is guaranteed to be true, and if the conclusion is true then the corollary follows. Furthermore, the argument can be generalised. According to Blackmore,

> Put into Richard Dawkins's language, if there is a replicator that makes imperfect copies of itself only some of which survive, then evolution simply *must* occur. This inevitability of evolution is part of what makes Darwin's insight so clever. All you need is the right starting conditions and evolution just has to happen. (p. 11)

The evolutionary algorithm

Daniel Dennett (1995) described the process of evolution as an algorithm, a mindless procedure which, when followed, is guaranteed to produce certain outcomes. Today, we are familiar with algorithms, although Darwin and his contemporaries would not have been. Many of the things we do, from baking brownies to dialling a number are algorithm based. There are a number of steps to follow in a certain sequence to arrive at the desired outcome. There are algorithms, of which most of us are not aware, that determine whether we will be covered by medical aid or insurance or be granted a mortgage bond on our house. Then there are literally millions of algorithms in cyberspace that determine what ads we will see and whom we will be prompted to befriend or follow on social media.

Secondly, Blackmore makes the point that algorithms are **substrate-neutral** – they can run on variety of different materials. For example, the game of tic-tac-toe may be played in the sand, with paper and pencil or on a computer. In fact a perfect tic-tac-to playing computer was built out of TinkerToy in the 1980's. (Dewdney, 1989) By 'perfect' we mean one that will never lose, though it may draw. In Classic Text 11 we introduced the concept of 'multiple realizability' with respect to the mental. The same concept applies to substrate-neutral algorithms which can be realised by multiple physical states or events.[3]



A Perfect Tic-tac-toe Playing TinkerToy Computer Built in the 1980s

In the case of Darwin's original argument, the physical state was living creatures and a biological environment, but as Blackmore points out (following Denett), Darwin's logic would apply equally to

[3] The terms 'biological' *vs.* 'physical' are not antonyms. All biological material is physical because it is composed of mater and energy; however only a tiny fraction of the physical is biological. Similarly, the terms 'mental' *vs.* 'physical are not antonyms either. All mental states are physical states but only tiny fraction of physical states are also mental states.

any system in which there was variation, heredity, and differential survival; hence Universal Darwinism. (p. 11)

Recall from Cassic Text 13 that for vitalists, such as Henri Bergson, the life-principle is essentially dependent on some non-physical "spirit" or *élan vital*; however for Blackmore algorithms are completely mindless, "[i]f a system is set up so that it follows a given procedure then it does not also need a little mind, or extra something, inside to make it work. It just must mindlessly happen". Indeed, Dennett describes Darwin's theory as "a scheme for creating Design out of Chaos without the aid of Mind". (1995, p. 50)

While the evolutionary algorithm necessarily traces the same path given the same stating point, the result is neither predictable nor reproducible, as chaos theory explains. As we saw in Classic Text 27 "complex systems adhere to a specific set of principles, including nonlinearity, self-organizational processes, and movement toward complexity". (Cozolino & Siegel, 2017 p. 694) Chaotic systems are highly sensitive to initial conditions so that even very small changes in the beginning of a process, or indeed changes to the environment as the process unfolds, lead to large and unpredictable changes in the result. Although chaotic processes follow simple and mindless algorithms, their end results are complex, chaotic and unpredictable. (p. 12)

Stuart Kauffman in his second book, *At Home in the Universe*, suggests that if the evolution of life is like an incompressible computer algorithm, then we cannot predict exactly how it will all unfold and can only "stand back and watch the pageant". We can, however, "find deep and beautiful laws governing that unpredictable flow". (Kauffman 1995, p. 23) In his first book , *The Origins of Order*, Kaufman demonstrates, from first principles, that the complexity of biological systems and organisms might result as much from self-organization and far-from-equilibrium dynamics as from Darwinian natural selection. (Kauffman 1993)

As Blackmore points out,

> [w]e can now see that even if evolution is only following a simple algorithm, it is a chaotic system and its outcome can be incredibly complex. Moreover, the results cannot be predicted without running it – and it is only being run once. We can do experiments to test predictions of the theory, but we cannot rerun the evolution of life on earth to see whether it might go a different way next time. There is no next time. Until we find life on other planets there is only this once…
>
> When this algorithm gets going the inevitable result is that design is created out of nowhere – but we cannot predict exactly what sort of design it will be. Evolution emphatically did not have to end up with us. It had to end up with something more than it started with – and that something just happens to be this world with us in it. (p. 12 - 13)

The question as to whether there is progress in evolution is contentious because it depends very much on what one means by "progress". Stephen Jay Gould, (1996a) famously argued against it. He was right in the sense that evolution does not progress *towards* anything – there is no master plan, no end point and no designer. However, there is progress in the sense that we now live in a world of highly complex creatures, when once there was only a primeval soup of molecules. One obvious reason is that once all the simple body plans have been discovered by evolution, only more complex

ones remain yet to be explored, and the process is cumulative. As Blackmore puts it, “Evolution uses its own products to climb upon”. (p. 13)

In his book *Climbing Mount Improbable*, Dawkins (1996) likens the process of evolution to the improbable ascent of a mountain. There is no way of leaping up the cliffs, but it is possible to begin gradually from the foothills and progress incrementally, inch by inch, especially if there are strong selective pressures which may be maintained for many generations. Dennett (1995), on the hand, uses engineering metaphors such as ‘lifting in Design Space’; however professional, calculated intelligent design is the bread and butter of engineering so perhaps such metaphors may have the opposite of their intended effect.

Evolutionary progress is not necessarily inevitable, steady or increasing. Typically, there are long periods of stasis punctuated by periods of rapid change. Some creatures like crocodilians have not changed much in 120 million years. Sometimes millions of years of accumulated evolution are wiped out precipitously in extinction events. Then there are those free-living forms which “de-evolve” loosing most of their organs and senses to become endoparasites. But natural selection does not have a direction, creatures do not revert to a supposedly primitive form over time, instead they become adapted to their current environment, and those that don’t become extinct. Strictly speaking, evolution is any change in allele frequency over time.

Contemporary humans are undoubtably the cause of the destruction of as much biodiversity as was lost in the last major extinction, but as Blackmore points out, the evolutionary algorithm will start its creative work again on whatever is left. And all of this is down to replicator power…

> … selfish replicators get copied, and they do this willy-nilly so long as they have the machinery and building blocks they need for that copying. They have no foresight, they do not look ahead or have plans or schemes in mind. They just get copied. In the process some do better than others – some obliterate others – and in this way evolutionary design comes about. (p. 13)

If memes are really replicators and can undergo evolutionary processes, then the principles above must apply to them too, and any theory of memetics should be constructed on the same basis. What then are the criteria for being a replicator, and do memes fulfil those criteria? (p. 13 - 14)

Memes as replicators

For something to count as a replicator it must be able to sustain the evolutionary algorithm based on variation, heredity, and differential survival. Memes generate variation every time they are copied. No two stories are exactly retold, and every conversation is unique. As Bartlett (1932) showed nearly a centenary ago, a story is a little embellished or details are forgotten every time it is passed on. When memes are passed on, there is competition for retention of some ideas or behaviours that comprise of the meme – something of the original must be retained for us to call it a copy or learning by example. Some memes grab our attention and are faithfully passed along, while others fail to be copied at all and die out – the memetic equivalent of extinction. According to Blackmore, “The meme therefore fits perfectly into Dawkins’s idea of a replicator and into Dennett’s evolutionary algorithm”. (p. 14)

By way of example, let us consider a version of the story retold by Blackmore that reached our shores in the 1980s. An American lady used to wash her poodle and dry it on low in the oven. When she acquired a new microwave oven she put the poodle in the microwave to dry, which resulted in the poor dog's painful and untimely death. She then sued the manufactures for failing to provide a warning that one should not place pets in the device. She won the case. Although almost certainly false, millions of people from the U.K. to South Africa have heard this story in one form or another. Truth is not a necessary criterion for a successful meme. If it can spread, it will take on a life of its own. (p. 14)

Otherwise called **urban legends** or urban myths, these are a genre of folklore concerning stories about unusual (usually scary) or humorous events that many people believe to be true but largely are not. These legends can be entertaining but often concern mysterious and troubling events, such as disappearances and strange objects or entities. Urban legends may confirm moral standards, reflect prejudices, or be a way to make sense of societal anxieties. (Wikipedia: Urban legend) Although all urban legends are memes, not all memes are urban legends. Some memes may be about dance crazes, knapping stones or styles of food preparation.

Stories like the microwaved poodle are clearly inherited – millions of people cannot have suddenly made them up by chance. They also mutate, and the way changes creep in can be used to demonstrate its ancestry just like a family lineage or pedigree. There are also chance variations because not everyone can have heard the same version, although the basic storyline is recognisable. Finally, there is selection. Millions of people tell millions of stories every day, but most of them are forgotten. Only a tiny minority go on to achieve the status of an urban legend. (p. 14 - 15)

Memes do not come ready-made into our brains. Like genes, they come about through mutation and combination with old ones, in the case of memes within our mind or passed between one person's mind and the next. So with the poodle story. It was concocted out of language that people had already acquired and out of ideas they already knew. What was novel was the way it was put together, not necessarily consciously, in a way that was catchy and memorable. No doubt, the original story must have been through several rounds of variation and selection in the process. The same is true of inventions, songs, works of art and scientific theories. Sometimes truly great composers come up with masterpieces that are solely creative products of their own minds, but even then there are references to their own work and quotations (read: copies) of others.

According to Blackmore, the human mind is a rich source of variation and recombination. We mix up ideas, we turn them over to produce new combinations. Our dreams are even more bizarre, with sometimes creative consequences. Russian chemist Dmitri Mendeleev, for example, reported having a dream in which the chemical elements fell into their place in the periodic table he created. On the other hand, German chemist August Kekulé dreamed of a snake biting its own tail, which inspired his conception of benzene's cyclic, ring structure.

But not all of our thoughts are memes. Our immediate perceptions and emotions are not memes, because they are mostly private and we seldom pass them along. We may cherish a fond memory or fantasise about food or sex without copying the ideas from anyone else. We may even, in principle, think of a completely novel way of doing something without the aid of memes; however because we use memes so much and so often, much of what we think is coloured by them. They are our thinking tools. (p. 15)

Human thought itself may depend on other Darwinian processes. Blackburn cites Ashby (1960) and Young (1965) as attempts to treat learning as a Darwinian process. More recently Calvin (1987; 1996) and Edelman (1989) have argued for the brain as a 'Darwinian Machine'. While these ideas concern processes hypothesised to occur within individual brains, memes are replicators that jump from one brain to another with variable success.

According to Blackmore, the reasons why some memes succeed and others fail fall into roughly two categories. Firstly, there is the disposition of human beings to imitate and select. From the meme's eye point of view, human beings are both replicators and act as the selective environment for memes. Psychology can help to explain how and why this operates. There are properties of our sensory systems that make some memes salient and others not. There are mechanisms of attention and retention, and limitations on both, that allow some memes to commandeer processing power and memory. Similarly, there are aptitudes and constraints on our ability to imitate that determine what we will pass along. (p. 15 -16)

The other sorts of reasons concern the nature of memes themselves, the tricks they exploit, the way they group themselves with other memes, and the processes of memetic evolution that favour some memes over others. According to Blackmore, at the time of writing, this important aspect of memetics had not previously been studied by psychology.

Blackmore summarises and concludes this section as follows:

> Putting together all these reasons we may be able to see why some memes succeed and others fail; why certain stories take off while others are told once and never again. Other examples include recipes, clothes fashions and interior designs; trends in architecture, rules of political correctness, or the habit of recycling glass bottles. All of these are copied from one person to another and spread by imitation. They vary slightly in the copying and some of them are more frequently copied than others. That is how we get useless popular crazes, and good ideas that never seem to get off the ground. I think there can be no doubt that memes count as replicators. This means that memetic evolution is inevitable. It is time we began to understand it. (p. 16)

Memes and genes are not the same

Memes are like genes in that they are both replicators that are inherited and subject to selection, but they are differently realised and do not work in the same way. The science of genetics has come into its own in recent decades to the point where we can identify particular genes, map the entire genomes of several organism including ourselves and fragments of some fossil species, and provide gene therapy for some genetic disorders. Blackmore points out that some of the insight gained may help us understand memes, but may equally be misleading.

Also, genes are not the only biological replicators. Our immune systems are known to work by selection. Henry Plotkin (1993) refers to both brains and immune systems as 'Darwin machines' and applies general evolutionary theory to many other systems including the evolution of science itself. In each case, one can apply the ideas of replicators and vehicles (or replicators, interactors and lineages) to understand how systems evolve. (p. 16)

Blackmore proposes the following way of thinking:

> …evolutionary theory describes how design is created by the competition between replicators. Genes are one example of a replicator and memes another. The general theory of evolution must apply to both of them, but the specific details of how each replicator works may be quite different. (p. 17)

Long before memes were thought of, Donald Campbell (1960, 1965) argued that organic evolution, creative thought and cultural evolution resemble each other because all of them are evolving systems where there is blind variation among the replicated units and selective retention of some at the expense of others. Importantly, he explained that the analogy with cultural accumulations is not from organic evolution, but rather from a general model of evolutionary change of which organic evolution is but one example. Durham (1991) called this principle 'Campbell's Rule'[4].

We need to take cognoscence of Campbell's Rule when we compare memes and genes. Genes are coded instructions for making proteins. They are housed in cells and are passed on during reproduction. Competition between genes drives biological evolution. Memes are instructions for carrying out behaviour. They are housed in brains and certain artefacts, and are passed on by imitation. Competition between memes drives some aspects of the evolution of minds, but then so do genes because minds are one of the functional aspects of brains, which are bodily organs under genetic regulation. Furthermore, both genes and memes exist within their respective environmental contexts, both internal and external. There are no such things as genes or memes in isolation. Finally, Blackmore points out that both genes and memes are replicators, and so must obey the general principles of evolutionary theory, and in that sense they are the same. Beyond that they are very different and are related only by analogy. (p. 17)

Critics of the idea of memes have misunderstood or failed to understand this distinction. Stephen Jay Gould (1996b), who ought to have known better, called the idea of memes a 'meaningless metaphor' and denied the notion that ideas and culture can evolve. According to Blackmore, who was party to the debate, Gould thought that because memes and genes are related by analogy or metaphor we would somehow be doing a disservice to biological evolution by making the comparison. She thinks that Gould missed the point that both memes and genes are replicators, but they need not, indeed do not, work in the same way. (p. 17 - 18)

But analogies are a powerful tool in science and philosophy, and the idea of memes is an excellent example of the use of analogy. According to Blackmore,

> … a powerful mechanism in one domain is seen to operate in a slightly different way in an entirely new domain. What begins as an analogy ends up as a powerful new explanatory principle. In this case, the most powerful idea in all of science – the explanation of biological diversity by the simple process of natural selection – becomes the explanation of mental and cultural diversity, by the simple process of memetic selection. The overarching theory of evolution provides a framework for both.

[4] Campbell viewed cultural evolution, involving blind variation and selective retention, as a process of knowledge acquisition and change, applying the paradigm of natural selection to learning, thought, and science. **Campbell's Law** is a separate but related concept, expressed as an adage, cautioning that using a quantitative measure as a target for social decision-making can corrupt the very process it is intended to monitor. (Wikipedia: Donald T. Campbell; Wikipedia: Campbell's law)

> With Campbell's Rule in mind we can now go on to the task of trying to understand the evolution of memes. We may use the gene as an analogy but must not expect too close a comparison. Instead, we must rely on the fundamental principles of evolutionary theory to guide us in understanding just how memes work. (p. 18)

Copy me!

Say, 'Say me!' or 'Copy me!' or 'Repeat me!' They are the simplest examples of self-replicating sentences. Their point is to get themselves copied, and therefore they qualify as memes, but not very effective ones. Douglas Hofstadter (1985) wrote about 'viral sentences' his monthly column 'Metamagical Themas' for *Scientific American*. Take 'Copy me!' and add '..., and I will grant you three wishes' or '… or I will put a curse on you'. According to Blackmore, no one over five is likely to fall for such simple-minded promises or threats. Unless, as Hofstadter points out, you add the phrase, '… in the afterlife', then most people take them very seriously. Religious texts are replete with promises of rewards for believing and punishments for disbelieving in the afterlife.

Blackmore recounts how, at the age of 5, she was excited to receive a postcard addressed to her that instructed her to append her name and address at the bottom and send the new list to six more people. The card promised receiving many more postcards. That was a fairly innocuous chain letter, but there are much more sinister versions such as pyramid investment schemes, in which people can loose their entire life's savings. These are so pernicious, one would think they would be extinct by now, but they are as popular as ever. (p. 18 - 19)

Then there are internet scams that are delivered to our inboxes daily. There is no point listing them because we are all familiar with them. The point is that they comprise of groups of memes that are replicated together. Dawkins referred to them as 'coadapted meme complexes' which has been abbreviated to **memeplexes** (Speel, 1995).

Genes are also groped. They are parcelled into chromosomes which are packed together inside cells. Dawkins (2006) made the point that the whole genome of a species can be seen as group of mutually cooperating genes. According to Blackmore, the reason is simple:

> … a free-floating piece of DNA could not effectively get itself replicated. After billions of years of biological evolution, most of the DNA on the planet is very well packaged indeed, as genes inside organisms that are their survival machines. Of course, there are occasional 'jumping genes' and 'outlaw genes' and little bits of selfish DNA hitchhiking on the rest, and there are viruses that are minimal groups that exploit the replicating machinery of other larger groups – but groups, by and large, are necessary for genes to get around at all. (p. 19)

Without much thought it is tempting to draw the analogy and suppose that memes should behave the same way. It is also tempting to do the opposite, like Gould, and assert that, because hypothetical memes don't behave the same way, that the analogy is not cogent. According to Blackmore, it is better to go back to the basics of evolutionary theory.

Imagine receiving an e-mail with seven special numbers that are claimed to be lucky… so lucky that, should they be used in the next lottery draw, you could earn millions, but only if you to forward these numbers to seven different friends before the next draw. This e-mail comprises of two components: an instruction to copy and a promise of millions, neither of which are likely to be very effective on

their own. But taken together, and with some other suitable co-memes, they are lightly to be obeyed by at least a segment of the population who will replicate them as a group. The lesson is that the essence of any memeplex is that the memes within it are more likely to be replicated together than any part of it on its own. (p. 19 - 20)

Blackmore was writing at a time when computer viruses were especially troublesome. Computer viruses are essentially self-replicating lines of code. Fortunately today, most personal computers and smart phones come with anti-virus software installed, and servers monitor all incoming and outgoing data for signs of malicious code. Unfortunately, the threat has morphed to include social engineering and phishing, which exploit human trust, and malware and ransomware, which encrypt or steal data. Unauthorised copying and/or remotely disrupting systems remain at the core of such attacks. Even the most sophisticated contemporary scams are constructed around two essential memes: believe me, copy me.

Bots, on the other hand, are computer programs that roam the internet trawling for data, often about internet traffic or marketing information, such as who has clicked what adverts when and where. They are essential to the function of search engines and social media, which direct people to what they are likely to prefer, rather than what is impartial or in our best interests.

Besides literal viruses which probably devolved from free living or parasitic forms by shedding most of their metabolic machinery, and computer viruses which are lines of code intentionally created to exploit vulnerabilities in operating systems, there are what Dawkins (1993) called "viruses of the mind". These are memeplexes such as religions and cults which spread themselves through vast populations using the same copying tricks discussed above. They can have disastrous consequences for those infected, especially children, probably the worst of which are, paradoxically cult suicides[5], the *desire* to be even more infected (faith), and to try even harder to infect others (proselytism). Dawkins, however distinguished useful memeplexes, such as science, from viral ones, in the truly harmful sense of that word (from the Latin, literally 'slimy liquid, poison').

But, as Blackmore points out,

> …if the theory of memetics is right, viruses are not the only memes, and memetics should not become a science of mind viruses. Indeed, the vast majority of memes (like the vast majority of genes) cannot be considered as viral at all – they are the very stuff of our minds. Our memes [are] who we are. (p. 22)

According to Dennett, (1991) our minds, selves and consciousness, are created by the interplay of memes[6], and that it is the competition between memes to get into our brains has made us the kinds of creatures we are. A he puts it: 'The haven all memes depend on reaching is the human mind, but a human mind is itself an artefact created when memes restructure a human brain in order to make it a better habitat for memes'. (Dennett 1991, p. 207)

[5] A virus that kills its host is not necessarily comparable to suicide, so long as it infects more hosts before it does so.

[6] This is the opposite of Parfit's position (Classic Text 32) who was sceptical of the Self and Dennett's 1986 analogy of the Self as "Center of Narrative Gravity" reprinted in Dennett, 1992.

Therefore, according to Blackmore, we require an effective theory of memetics if we are to understand the nature and origins of the human mind. (p. 23)

The evolution of culture

Before we continue, we had better fix a definition of culture because all references consulted so far define culture as something unique to man, whereas we know that populations of other species have identifiable material and behaviour cultures. Therefore we define **culture** as any collective knowledge or technology that is acquired from others and passed on to descents. This leaves us in want of a suitable definition of technology, which unfortunately is almost always defined in terms of the application of science, which prescientific cultures and other species did not or do not have. Therefore we define **technology** as anything and everything used do things better. Because technology is so useful, it is often incorporated into a population's collective knowledge or culture, and passed on to descendants. Again, the use of technology is not unique to man. Consider the twigs used by chimpanzees to "fish" for termites, or stones used by sea otters to dislodge food or crack open shellfish. Arguably, such examples are of tool use not technology, but then the use and creation of tools fits our definition of technology. Consistent with the previous definitions, we can define a **tool** as an object that aids in accomplishing a particular task.

Since the beginnings of Darwinism various thinkers have drawn analogies between biological evolution and cultural evolution. Blackmore lists several of them:

- The English polymath Herbert Spencer (1820 - 1903), who coined the term "survival of the fittest", studied the evolution of civilizations, which he saw as progressing to an ideal resembling Victoria English society.
- The American anthropologist and social theorist, Lewis H. Morgan (1818 - 1881) proposed an evolutionary theory of society that included three stages: savagery, barbarism and civilisation. The European social theorists Karl Marx and Friedrich Engels, were influenced by Morgan's work on social structure and material culture, and the influence of technology on progress.
- The English historian Arnold Toynbee (1889 - 1975) used evolutionary ideas in identifying over thirty distinct civilisations, some of which descended from others and some of which became extinct.
- Half a centaury after Darwin, the American philosopher and psychologist James Mark Baldwin claimed that natural selection was not merely a biological law but applied to all the life and psychological sciences. (Baldwin, 1909) Blackmore regards this as an early version of Universal Darwinism. Baldwin also coined the term **social heredity** to describe the way individuals learn from society by imitation and instruction (Baldwin, 1896)

Without any commitment to Darwinism, even the ancients recognised that ideas and cultures evolve, *i.e.* changes are gradual and built on what went before; and that ideas spread from one place to another and from person to person. (Sperber, 1990) Similarly, inventions do not spring out of nowhere, they depend on previous inventions. However, according to Blackmore, truly Darwinian explanations require more than just the idea of accumulating changes over time, even though some theories of cultural evolution are just that. Other theories try to specify a mechanism but revert to

biological evolution as the only driving force. Just a few, such as memetics, invoke the idea of a **second replicator**, a unit of inheritance other than DNA or RNA which drives biological evolution. Accordingly, memetic selection drives the evolution of ideas to the advantage of the memes, not the genes, and it is this difference that separates memetics from previous theories of cultural evolution. (p. 24)

Linguistic changes provide a good example of cultural change. According to Darwin (1874):

> We find in distinct languages striking homologies due to community of descent, and analogies due to a similar process of formation. The manner in which certain letters or sounds change when others change is very like correlated growth. We have in both cases the reduplication of parts, the effects of long-continued use, and so forth. The frequent presence of rudiments, both in languages and in species, is still more remarkable… Languages, like organic beings, can be classed in groups under groups; and they can be classed either naturally according to descent, or artificially by other characters. Dominant languages and dialects spread widely, and lead to the gradual extinction of other tongues. A language, like a species, when once extinct, never, as Sir C. Lyell remarks, reappears. (*The Descent of Man* 2nd ed. 1874, Ch. 3)

A nearly a century before The Descent of Man in 1786, the Welsh Judge and scholar Sir William Jones discovered remarkable similarities between Sanskrit, Greek and Latin, and concluded that all three must have descended from a common source, and Darwin must have been aware of this. Despite all three being "dead" languages today in that they are not spoken, they are still studied in many universities and a few schools. According to Wikipedia:

> As of the 2000s, a total of roughly 7,000 natively spoken languages existed worldwide. Most of these are minor languages in danger of extinction; one estimate published in 2004 expected that some 90% of the languages spoken at that time will have become extinct by 2050. Normally the transition from a spoken to an extinct language occurs when a language undergoes language death by being directly replaced by a different one. (Wikipedia: Extinct language)

If languages were species, then most languages are currently undergoing a mass extinction comparable to the Permian-Triassic extinction, a.k.a. "the Great Dying", in which 95% of marine species and about 70% of terrestrial species were wiped out.

The American physiologist and evolutionary biologist Jared Diamond (1997) used linguistic analysis as part of his history of humanity over the past 1 300 years. According to Diamond, languages evolve along with language users, but he does not consider linguistic elements as replicators in a new evolutionary process. Going further, Steven Pinker (1994) explicitly applied evolutionary thinking to the development of languages; however he did not use the idea of selfish replicators to understand linguistic revolutions, or how language evolved in the first place. (p. 25)

Inventions as memes

The reach and spread of inventions is another example of memes at work. Arguably, the most significant of all "inventions" in human history was agriculture. The **Neolithic Revolution**, a.k.a. the First Agricultural Revolution, saw the transition of humans in Afro-Eurasia from a life of hunting and

gathering to one of agriculture and settlement. Archaeological evidence from this time indicates that the domestication of several plants and animals happened in various locations, spreading outward in a great wave, reaching Ireland and Scandinavia by 4 500 years ago. It is not known how many times agricultural food production arose independently, but according to Diamond (1997) it happened at least five times, or possibly more.

Blackmore cites Diamond in considering the question of why some peoples commandeered most of the resources from food production to guns, to germs and steel, while others continued hunting and foraging, and yet others were completely exterminated. The details, while important, are beyond the scope of this chapter. The more vexing question for Blackmore is: 'Why did farming spread at all?' The most obvious, but wrong, answer is so that people who practice agriculture might enjoy a better life or a genetic advantage. On the contrary, early agriculture neither improved people's nutrition or reduced their disease burden. Indeed the British Biologist and science writer, Colin Tudge (1995) describes farming as "the end of Eden". The Neolithic Revolution greatly narrowed the diversity of food available, resulting in a decrease in the quality of foods compared to that which was previously available by hunting and gathering. (Wikipedia: Neolithic Revolution)

Probably summarising Tudge (1995), Blackmore notes:

> Rather than being easier, the life of early farmers was utter misery. Early Egyptian skeletons tell a story of a terrible life. Their toes and backs are deformed by the way people had to grind corn to make bread; they show signs of rickets and of terrible abscesses in their jaws. Probably few lived beyond the age of thirty. Stories in the Old Testament describe the arduous work of farmers and, after all, Adam was thrown out of Eden and told 'In the sweat of thy face shalt thou eat bread'. By contrast, modern hunter-gatherers have been estimated to spend only about fifteen hours a week hunting and have plenty of time for leisure. This is despite the fact that they have been pushed into marginal environments far poorer than those in which our ancient ancestors probably lived. Why would people the world over have given up an easier life in favour of a life of toil and drudgery? (p. 26 - 27)

Tudge argues that agriculture would have been favoured by natural selection because farming produces more food for a given area of land, and therefore would have favoured more offspring, who would have displace neighbouring hunter-gatherers (1995, p. 274). If true, this would have been a distinct genetic advantage; but from the archaeological evidence of early farmers, we know that they were sickly, malnourished and died early – hardly a genetic advantage.

The memetic perspective allows us to entertain a different question, *i.e.* Why were farming practices successful as memes, or collectively as a memeplex? Memes can spread for reasons that have nothing to do with natural selection or genetic advantage. They could have spread because they had an *apparent* advantage, even when they didn't, because they were easily imitated by human brains, because they compete successfully with rival memes, *etc*. From the memetic perspective we ought not to ask how inventions, including the invention of agriculture, benefit human happiness or human genes, but how they benefit themselves. (p. 27)

Turning to modern technology, Blackmore cites George Basalla's (1988) *The Evolution of Technology* in which he develops an evolutionary account of the way in which technological inventions have come about, in the sense that they have arisen from what went before. Playing down the importance

of the inventors, Basalla emphasizes the gradual process of change through imitation and variation. Many popular writers assume that technology progresses towards heroic goals such as the "advancement of humanity" or "the betterment of the human race", but Basalla questions these assumptions.

Basalla sees technology as developing in Darwinian fashion from the present, with very limited, specific goals, and suggests we discard the entire illusion of technological progress. Blackmore, however is quick to point out that the word 'progress' can be used in at least two different senses. One sense implies progress towards some goal or objective. The other sense implies increasing design, complexity or continuous development *without* any inherent goal or endpoint. Basalla, like Gould, eschews both kinds of progress, but Blackmore wants to retain the second. Today's technology is far more complex and sophisticated than that of the Agricultural Revolution, and that, for Blackmore, counts as progress of the second kind, even though there has been no progress towards some predetermined or ultimate goal. We did not go from Acheulean hand-axes to smart phones, but we did have to go from hand-axes to more specialised, designed and elegant micro-blades, points and scrapers of the Late Stone Age before they could be copied and adapted, first in the Coper then in the Bronze and finally Iron Age. (p. 27 - 28)

Drawing on two of the appropriate analogies, Blackmore redescribes what has been going on:

> In Dennett's terminology, there has been ever more exploration of the Design Space of possible artefacts. In Dawkins's terminology, technology has been slowly climbing its own Mount Improbable. This is technological progress, if not progress towards anything in particular. (p. 28)

So, why do we have smart phones, cloud storage or AI-powered personal assistants? We got along just fine without them before, so the answer cannot be 'Because we needed them' or 'Because we wanted them'. According to Blackmore, "it is not enough just to say that technology evolves, without providing a mechanism". She postpones how a memetic approach can help to later chapter, which is an incentive to read beyond this extract.

Scientific ideas, as we have seen, also evolve. Karl Poper, recall, suggested that the accumulation of scientific knowledge proceeds by the falsification of hypotheses, not by supplying evidence of proof *for* theories. A successful theory will be assailed by many attempts at falsification but will survive. Ultimately though, even the strongest theories from the history of science have been supplanted by better ones that explain more and subsume what has gone before. It is unlikely however, that we will ever arrive at a **theory of everything** by which all of science will end because everything is already explained. More modestly, a theory of everything aims to unify all the physical forces and particles as well as general relativity and quantum mechanics under a single theory; however we are nowhere near there yet.

Popper (1972) used Darwinian thinking in proposing his three **stages of cosmic evolution**. Accordingly, World 1 is the world of things or physical objects, such as rocks, trees and human bodies. World 2 is the worlds of subjective experiences, feelings, emotions and consciousness. World 3 is the world of ideas, language, stories, works of art, mathematics, sciences and technology. According to Popper, World 3 is largely autonomous, even though it is created by us – its contents have an effect on other worlds via an unexplained process of downward causation. (See Classic Text

34). According to Blackmore, a scientific theory, for example, may exist as World 1 objects, including the scientist, journal papers and the experimental apparatus. But these are not just things. The ideas *themselves* influence the objects. The problems, hypotheses, ideas, intellectual struggles, solutions work their way through World 2 into World 1. Scientific ideas really do change the world. According to Popper and Eccles (1977, p. 40), 'once theories exist, they being to have a life of their own'. Popper's worlds, of course do not literally exist – they are a metaphor. Moreover, he (and Eccles) had to introduce the idea of interactionism, a dualistic theory of mind which we have already disposed of in Classic Text 06. They also rely on downwards causation, which is problematic at the very least. See Classic Text 34.

Blackmore offers a better explanation in memetic terms:

> … all that happens – whether in science or art – is selective imitation. The emotions, the intellectual struggles, the subjective experiences – these are all parts of the complex system that leads to some behaviours being imitated and others not. And it is because imitation lets loose a second replicator that ideas begin to 'have a life of their own'. In this way, memetics provides a mechanism for the evolution of scientific ideas that Popper's three worlds cannot. (p. 29)

Blackmore also points out that although Popper did not use the idea of a replicator, his views did directly give rise to the then nascent field of evolutionary epistemology, which does. This had its beginnings in a critique of Popper by Campbell who applied Darwinian thinking to the evolution of knowledge. (Hull 1988a, b; Plotkin 1982) David Hull studied the way that scientific ideas develop over time in lineages, similar to the way species do. Hull treats scientific ideas as replicators and scientists as interactors ('vehicles' in Dawkins' terminology). Plotkin meanwhile, regarded science not only as 'the product of a "Darwinian machine"' but 'a special form of culture that is transformed in time by evolutionary processes'. (Plotkin 1993, pp. 69, 223) According to Campbell's (1975) understanding of evolutionary epistemology, biological adaptations are one form of knowledge, and science is another; both are produced by the processes of blind variation and selective retention; and hence based on Universal Darwinism without a requirement for a genetic advantage. (p. 29)

Whose advantage?

Some theories of cultural change do use evolutionary ideas, but they are not the same as memetics. According to Blackmore, there are two fundamental differences: Firstly, most do not distinguish between general evolutionary theory and biological evolution specifically. This means that they are unclear about the relationship between culture and biology, which makes it easy to fall afoul of fallacies involving genetics and cultural evolution. Secondly, they do not introduce a second replicator, such as the meme. This implies that the do not view cultural evolution from a selfish second replicator's-eye view.

Blackmore stresses this second issue because the whole point of taking a second replicator, such as a meme's, perspective, is to treat it as something in its own right, operating solely for the benefit of its own selfish replication. If one is arguing for an evolutionary theory, and there is no second replicator, then everything must reduce to a biological, *i.e.* genetic, advantage. If however, there are two or more replicators, then there will be circumstances in which there is a conflict of interest, in which, for example, the interests of genes pull in one direction and those of memes pull in the opposite

direction. Such examples are important for memetics because they would not be predicted by a purely genetic theory. If they occur, then we need to invoke some kind of second replicator, such as memes. (p. 30)

Blackmore quotes Dennett, followed by Dawkins, who advance similar arguments:

> The first rule of memes, as it is for genes, is that replication is not necessarily for the good of anything; replicators flourish that are good at… replicating! … The important point is that there is no *necessary* connection between a meme's replicative power, its "fitness" from its point of view, and its contributions to *our* fitness (by whatever standard we judge that)'. (Dennett, 1991, p 203 original italics)

> As soon as the primeval soup provided conditions in which molecules could make copies of themselves, the replicators themselves took over. For more than three thousand million years, DNA has been the only replicator worth talking about in the world. But it does not necessarily hold these monopoly rights for all time. Whenever conditions arise in which a new kind of replicator *can* make copies of itself, the new replicators *will* tend to take over, and start a new kind of evolution of their own. Once this new evolution begins, it will in no necessary sense be subservient to the old. (Dawkins, 1976, p. 193-4 original italics)

The fact that memes could have developed a life of their own mean that they could not have come into existence independently of brains capable of imitation. Furthermore, the nature of those brains must have influenced and constrained which memes took hold and which did not.

Dawkins argued that most biologists, at the time, were so committed to the idea of genetic evolution that they tended to forget that it is only one of many possible kinds evolution. In his own words, 'In the last analysis they wish always to go back to "biological advantage"'. (Dawkins, 1976 p. 193) In other words, according to Blackmore, they might accept the idea of memes, or some other unit of cultural evolution, but still believe that memes must ultimately act for the benefit of the genes. But this is missing the point of a second replicator – the do not act for the good of the species, or the individual, or the good of the genes, or indeed of anything but themselves. (p. 31)

Blackmore briefly reviews a paper by the American anthropologist F.T. Cloak, who in 1975, wrote about cultural instructions. Besides being published just a few years before Dawkins proposed the idea of memes, there are many similarities in how both authors thought about cultural transmission. We have decided not to summarise Cloak's work here because it has largely fallen by the wayside and taken up by Dawkins (1982), which we cited in Classic Text 10. Blackmore returns to consider the differences at a later point. (p. 31 - 32)

Sociobiology and culture on a leash

According to Blackmore, at the time that Dawkins was writing *The Selfish Gene*, the new science of sociobiology was being founded. Oxford Languages defines **sociobiology** as "the scientific study of the biological (especially ecological and evolutionary) aspects of social behaviour in [other] animals and humans". Historically as now, humans tend to place themselves on a self-created pedestal at the pinnacle of creation. Therefore, when the new science of sociobiology threatened to displace them from their privileged position, there was pushback from, *inter alia*, sociologists, anthropologists and others who argued that human behaviour was almost entirely free from the genetic constraints and

could not be understood by what they saw as "genetic determinism". Memetics makes another leap in that direction, and has, as predicted, been similarly denounced. Sill, as Cloak expressed it '… if we *are* the slaves of some of "our" cultural traits, isn't it time we knew it?' (*op. cit.* p. 178) (p. 32 - 33)

At the time of writing, Blackmore noted that much of the antagonism towards sociobiology has died down, perhaps because of the much stronger evidence for the evolutionary basis of human behaviour, and perhaps because we have a better understanding of the way genes and the environment interact. Continuing, she writes:

> The old image of genes as providing a blueprint or wiring diagram for building a body is clearly wrong. A better analogy is with a recipe, though it is still not a close one. Genes are instructions for building proteins, and the results of their protein synthesis are influenced at every stage by the available raw materials and the nature of the environment. Nothing is purely genetically *determined* and nothing purely environmentally *determined*. We human beings, like all other creatures, are a complex product of both – and this is true of the way we behave as well as the shape of our legs. (p. 33)

In spite of the antagonism towards it, sociobiology made great progress under its founding father Edward O. Wilson, who popularised the field in his 1975 book *Sociobiology: The New Synthesis*. According to Blackmore however, Wilson complained that sociobiology had little to say about the individual human mind or the diversity of cultures. In 1981, Wilson collaborated with the physicist Charles Lumsden to develop a theory of gene-culture coevolution. They proposed the concept of a '**culturgen'** as 'the basic unit of inheritance in cultural evolution'. (Lumsden & Wilson, 1981, p. x) They hoped that their theory would unify the understanding of genes, mind and culture, and developed mathematical applications that would reveal how different culturgens would affect genetic fitness. However, they always returned to genes as the final arbiters. If maladaptive culturgens are sometimes selected, they argued, it is because their detriment is not always immediately manifest; there would therefore be a lag between selection and the time taken for the system to adapt. Ultimately, the genes are final determinants. As they put it, 'the genes hold culture on a leash'.

The 'leash' metaphor is a catchy way of expressing what Dawkins meant about his colleagues wanting 'always to go back to "biological advantage"'. It also suggests an image of genes as the masters and the culturgens as the dogs. The leash can sometimes be longer – sometimes extremely long – but there is still a dog at the other end. Memetics, however upends this image – genes may become the dogs and memes the masters – or two dogs, one at each end, scampering about to the advantage of their own selfish replication. (p. 33)

In the same year, Stanford geneticists, Luigi Cavalli-Sforza and Marcus Feldman (1981), developed a more detailed model of cultural transmission based on **cultural traits** as the units. Cultural traits are learned by imprinting, conditioning, observation, imitation or direct teaching. Memes by contrast can only be transmitted by imitation. The authors also differentiate cultural selection from Darwinian or natural selection, and employ the concept of **cultural fitness**, *i.e.* fitness for the survival of a cultural trait – a concept that is handy when discussing memetics. They also distinguished between **vertical transmission** *e.g.* from mother to child and **horizontal transmission** *e.g.* from child to child or from adult to unrelated adult. According too Blackmore, 'We shall see later how important this is for understanding life in an age of predominantly horizontal transmission'. (p. 34)

Cavalli-Sforza and Feldman categorised different mechanisms of cultural transmission and proposed mathematical models of particular cases, including maladaptive instances. One such example is the prion[7] disease Kuru, historically spread by the ritual practice of cannibalism among the Foré people of Papua New Guinea, who consumed the brains of deceased relatives. Pork was the favoured meat of the Foré, which the men hoarded for themselves, leaving the woman and the children to practice cannibalism. (Durham, 1991) This lead to an epidemic of the disease killing thousands of Foré people, mostly women and children. The practice has since been outlawed and no further deaths from Kuru have been reported after 2010. Cavalli-Sforza and Feldman demonstrated mathematically that a maladaptive trait such as this could exterminate 50% of its hosts and still spread throughout a population.

Nevertheless, Cavalli-Sforza and Feldman (1981) still see 'cultural activity as an extension of Darwinian fitness' (p. 362), and this is what differentiates their theory from memetics. According to Dennett (1997), the authors fail to ask the question *Cui bono*? (To whose benefit?) Or, if they do, they presumably assume that the answer must be 'the genes', without considering the possibility that 'it is the cultural items themselves that benefit from the adaptations they exhibit'. (op. cit. p. 7) If Cavalli-Sforza and Feldman believe that cultural adaptation is ultimately for the benefit *of the genes*, and maladaptive cultural traits are ultimately deleterious *for the genes*, even if only in the long run, then they too believe in "culture-on-a-leash". (p. 34)

According to Blackmore, the only anthropologists who seem to have let go of the leash are Robert Boyd and Peter Richerson from the University of California at Los Angeles.

> Like sociobiologists they accept that culture arises from 'natural origins' but claim that models that take cultural evolution into account – like their 'Dual Inheritance Model' – can do better than sociobiology. They refer to Campbell's rule and are convinced, as I am, that cultural variants must be subject to their own form of natural selection. They analyse in great detail the structural differences between cultural transmission and conclude '… the behavior that enables an individual to maximize his chance to enculturate cultural offspring may not be the behavior that will maximize the transmission of genes to the next generation'. (Boyd & Richerson, 1985 p. 11)

Theirs is a version of coevolution in which genes can keep culture on a leash but also *vice versa* or that the two may evolve competitively or mutually. (Richerson & Boyd, 1989) Blackmore regards their treatment of their cultural units as separate (secondary) replicators, and that many of their ideas will prove useful in understanding the selection of memes. (p. 35)

Anthropologist William Durham uses the term 'meme' to denote or his unit of cultural evolution; therefore, one might assume that he takes a memetic view, but on closer inspection, for him, the meme is not actually a selfish replicator. Durham claims that organic and cultural selection are complementary and operate via the same mechanism, namely inclusive fitness. He criticises Boyd and Richerson for taking 'the abstract genetic analogy a bit too far' and that they are 'strongly anti-

[7] A **prion** is a an abnormally folded protein that causes normal versions of the same protein to assume the misfolded form, causing a chain reaction of cellular damage. The fatal and incurable neurodegenerative diseases, Creutzfeldt-Jakob Disease (CJD) in humans, and Bovine Spongiform Encephalopathy a.k.a. "mad cow disease" in cattle, are familiar examples diseases caused by prions.

Darwinian'. Moreover, he does not agree with them that human evolution is *fundamentally different* from that of other organisms. (Durham 1991, p. 183)

For some this is a matter of splitting hairs, but for Blackmore, this goes to the heart of the issue:

> For me, as for Dawkins and Dennett, memetic evolution means that people are different. Their ability to imitate creates a second replicator that acts in its own interests and can produce behaviour that is memetically adaptive but biologically maladaptive. This is not just a temporary aberration to be ultimately reined in by the powerful genes, but is permanent, because memes are powerful in just the same way that genes are; they have replicator power. Cloak, and Boyd and Richerson, seem to agree but the others do not accept the independent replicator power of their units of cultural transmission. In that important sense they are much closer to traditional sociobiology – their motto might be 'the genes will always win'. The leash may sometimes get very long but the dog can never get away. (p. 35)

This brings Blackmore to the subject evolutionary psychology which she regards as the successor of sociobiology. **Evolutionary psychology**, in so far as it concerns humans, is premised on the idea that the human mind evolved to solve problems that confronted them in the **environment of evolutionary adaptedness (EEA)** *i.e.* the ancestral environment to which a species is adapted (specifically, a group of selection pressures occurring during an adaptation's period of evolution responsible for producing the adaptation). For humans, the problems to be solved, most recently, were those of the hunter-gatherer way of life in the Pleistocene age. (Tooby & Cosmides, 1992; Pinker, 1997) (p. 35 - 36)

Although Blackburn regards evolutionary psychology as a curial underpinning of memetics, she does not think it goes far enough. In order to understand why certain memes are positively selected, and others are not, we need to understand how natural selection has configured our brains to the advantage of our genes. We are addicted to sweet, fatty and salty food. Websites that feature nudity grab our attention, but we mostly ignore those that display feats of engineering. We pick sweet-smelling bright coloured flowers, but wretch at the smell of rotting vegetables and putrefying meat. Why this is so is essential to the understanding of memetics, but to fully understand human behaviour we need to consider both genetic and *memetic* selection. Most evolutionary psychologists have either rejected or ignored the need for a second replicator; however Blackmore's task in writing this book was in showing why it is so. (p. 36)

It is fitting that Blackmore should have the last word of this extract:

> I have explored various approaches to cultural evolution to see whether any use the same ideas as memetics but under another name. The answer, with the limited exceptions I have discussed, is no. It seems that there is no ready-made science of memetics waiting to be taken over. If we need a science of memetics, as I convinced we do, then we shall have to build one up from scratch.
>
> The main tools available are the basic principles of evolutionary theory, the founding ideas of Dawkins, Dennett and other early memeticists, and the relevant ideas from a cultural anthropology discussed above. Of course, we can also draw on more than a century of research in psychology and several decades of cognitive science and neuroscience.

> Using these tools, I shall try to lay the foundations for a science of memetics. I can then use this to provide new answers to old questions from the apparently trivial, such as 'Why is my head so full of thoughts?' to the weighty questions of why human beings have such big brains. The first step in this endeavour is to start looking at the world from a meme's eye view. (p. 36)

Task

Consider reading the rest of Blackmore's slim volume. It is a remarkable combination of Life Sciences, Psychology and Philosophy, the kind of work that comes around perhaps once a decade. Although *The Meme Machine* was not the first or last word on memetics, it stands as a "flashbulb moment" in the history of ideas that Blackmore captured so well. If you do not have a copy of her book try to order one or borrow one from your local library. Literally tens of millions of books and journal articles can now be freely downloaded from the internet. See under the Books tab.

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