

Imitation and the definition of a meme

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Abstract

The dictionary definition, and Dawkins's (1976) original conception of the meme, both include the idea that memes are copied from one person to another by imitation. We therefore need to be clear what is meant by imitation. Imitation is distinguished from contagion, individual learning and various kinds of non-imitative social learning such as stimulus enhancement, local enhancement and goal emulation. True imitation is extremely rare in animals other than humans, except for birdsong and dolphin vocalisation, suggesting that they can have few or no memes. I argue that more complex human cognitive processes, such as language, reading, scientific research and so on, all build in some way on the ability to imitate, and therefore all these processes are, or can be, memetic. When we are clear about the nature of imitation, it is obvious what does and does not count as a meme. I suggest that we stick to defining the meme as that which is passed on by imitation.

1. Introduction

There are many ways of defining the meme but there are two that we should perhaps take particularly seriously. First, Dawkins, who coined the term meme, described memes as units of cultural transmission which "propagate themselves in the meme pool by ... a process which, in the broad sense, can be called imitation" (Dawkins, 1976 p 192). Second, the Oxford English Dictionary defines a meme as follows: "**meme** (mi:m), *n.* *Biol.* (shortened from *mimeme* ... that which is imitated, after *GENE n.*) "An element of a culture that may be considered to be passed on by non-genetic means, esp. imitation". Both these definitions include the critical point that memes are cultural information that is copied, and that it is copied by imitation. The OED is arguably the most important dictionary of the English language and is, as far as I know, the first to include the word 'meme'. It would be unfortunate if memeticists began to use definitions of the meme that were incompatible with the dictionary definition, unless there were good reasons for doing so.

Some technical definitions are quite unlike the dictionary one, but are nonetheless perfectly compatible with it. A good example is Wilkins's (1998): "A meme is the least unit of sociocultural information relative to a selection process that has favourable or unfavourable selection bias that exceeds its endogenous tendency to change." This is useful because it emphasises, first, that the size of the relevant unit is not fixed but can vary in different contexts and, second, the importance of fidelity (i.e. the stability or resistance to change of the information). In this way Wilkins's definition of the meme is similar to Williams's (1966) definition of the gene. This definition may be useful for theoretical purposes but is too complicated for more general use, or for popular treatments of memetics. However this is not a problem since Wilkins's definition does not conflict with the OED definition.

Some other definitions clearly are incompatible with the OED. Some, for example, imply that almost everything we know or experience can count as a meme, whether acquired by imitation or not (e.g. Brodie, 1996; Gabora, 1997; Lynch, 1996). Brodie includes operant conditioning, and indeed all conditioning, as memetic. Gabora goes even further and includes ideas, perceptions, emotions, attitudes, and indeed "anything that can be the subject of an instant of experience". According to this broadest definition a garden frog

would have a mass of memes (even though it is totally incapable of imitation or any kind of culture) because it has perceptions and emotions, and is capable of many kinds of learning.

I shall argue that these broader definitions are deeply confusing. They take away the idea of the meme as a replicator (which was the original reason for its invention, and provides its context within evolutionary theory), ignore the idea that memes must be passed on by some kind of copying, and merely add confusion to the already difficult problem of understanding consciousness. I suggest we are better to stick to the original definition of the meme as transmitted by imitation.

1.1 Defining Imitation

What is imitation? In this paper I want to tackle the question from two directions. First I will consider simpler kinds of learning and cognitive processes which may, or may not, be counted as imitation. Second I will consider whether imitation includes all higher-order human cognitive processes, such as speech, reading, teaching and instruction, upon which much of our cultural life depends. I will argue that when we have clarified these issues we will no longer have serious problems in defining the meme.

There is a long history of research on imitation in both animal behaviour and human social psychology (for review see Whiten and Ham, 1992). In the nineteenth century Darwin collected many examples of what he took to be imitation in animals, as did Romanes (1882, 1883) but they did not define what they meant by imitation. Baldwin (1902) gave imitation a central role in his theories of evolution, pointing out that all adaptive processes can be seen as imitative - perhaps foreshadowing the universal Darwinism that today enables comparisons between biological evolution and memetic evolution (e.g. Dawkins, 1976; Plotkin, 1993). The psychologist, Thorndike (1898), was possibly the first to provide a clear definition of imitation as "learning to do an act from seeing it done".

Thorndike's definition (though confined to visual information) captures the essential idea that in imitation a new behaviour is learned by *copying* it from someone else. One hundred years later we can see the importance of this point in distinguishing imitation from simple contagion and from other kinds of learning. These other kinds of learning can be divided roughly into individual learning and non-imitative social learning.

2. Contagion

The term "contagion" is often associated with memetics. We may say that certain memes are contagious, or more contagious than others. We may treat the spread of memes as comparable with the spread of infectious or contagious diseases and use models derived from epidemiology (Lynch, 1996). The term social contagion is often used to include phenomena that are certainly memetic, such as the spread of fads, hysterical reactions (Showalter, 1997), or even suicide (Marsden, 1997). However, the term is used in confusing ways (Levy & Nail, 1993) and there is one kind of contagion that we must clearly distinguish from imitation.

This is what has variously been called instinctive imitation, imitative suggestion, social facilitation, coaction, and (simply) contagion (Whiten & Ham, 1992). Examples in humans include the spread of yawning, coughing or laughter. All these behaviours are extremely contagious. Indeed it can be difficult not to laugh if everyone around you is already laughing. This kind of contagion probably relies on specific stimulus feature detectors which detect laughing or yawning in someone else and then trigger the same innate behaviour as the response. In other animals there are many examples of contagious vocalisations, such as alarm calls. Most vertebrates yawn and some animals, such as chimpanzees, laugh in response to tickling and play, but contagious laughter appears to be limited to humans (Provine, 1996).

This kind of contagion is not true imitation. We can see why by considering Thorndike's simple definition. Yawning, coughing and laughing are innate behaviours. When we start laughing because everyone else is laughing we have not learned how to do an act. We already knew how to laugh, and the kind of laugh we make is not modelled on the laugh we hear. So this kind of contagion is not imitation and should not be counted as memetic.

3. Individual Learning

In individual learning a person or animal learns something by itself, without anyone else necessarily being involved. There are traditionally two major types of learning in psychology - classical conditioning and operant conditioning.

3.1 Classical conditioning

Classical conditioning is when two stimuli become associated by repeated pairing. In the best known experiments Pavlov paired sounds with the smell of meat and found that dogs then salivated to the sounds even without any meat. Classical conditioning is widespread in the animal kingdom, for example when animals learn to distinguish palatable foods from poisonous foods, or learn other important facts about their environment. It occurs in humans whenever we associate two things together because they have previously been paired, whether those things are sights, sounds, tunes, ideas or pain. Behaviour is changed by the process but nothing is passed on by imitation from one person to another, so the process is not memetic.

You may say that Pavlov, in setting up the experiments in the first place, was passing on something to his dogs. However, the dogs were not imitating him. There is no replication or copying of behaviour from Pavlov to his dogs. Similarly if you have a dog or cat, it probably starts salivating at the sound of the fridge opening or the knife hitting the food dish. Or maybe it gets frightened at the sight of a new flea collar. This is classical conditioning at work. You have certainly trained the animals by the contingencies you set up, but there is no imitation involved.

3.2 Operant conditioning

Operant conditioning is when a behaviour made by an animal is either rewarded or punished and therefore either increases or decreases in frequency. A hundred years ago Thorndike studied this kind of trial and error learning in cats trying to escape from specially designed boxes. In the 1930s Skinner famously provided animals with levers which, when pressed, caused food to be delivered. Rats, pigeons and other animals quickly learn to press the levers and their subsequent behaviour depends on the schedules of reinforcement used.

Skinner (1953) pointed out the similarity between operant conditioning and natural selection - some behaviours are positively selected and others weeded out. In this way learning can be seen as an evolutionary system in which the behaviours are the replicators. Several selection theories of learning and of brain development have since been proposed (e.g. Calvin, 1987; Edelmann, 1989; Plotkin, 1993), and are important for understanding the breadth of application of Darwinian processes. However, as long as the behaviours cannot be passed on to someone else by imitation then they do not count as memes and the selection is not memetic selection.

Much of human learning is Skinnerian and not memetic. Whether consciously or not, parents shape their children's behaviour by the way they reinforce them. The most effective reward for children is attention and rewards work better than punishment. So if parents pay lots of attention to their children when they are behaving well, and act uninterested when they scream or have tantrums, then behaving well is in the best interests of the children and they will do it. The parents' behaviour can be seen as part of the environment in which the children learn, or as part of a complex pattern of social learning (discussed below). Either way if the children are not imitating the parents then the process is not memetic.

We learn many things by trial and error, such as the physical skills of walking without falling over or riding a bike, or general ways of interacting with other people and the world. For example, people who are generally rewarded for hard work and persistence will behave differently from people whose efforts are met with arbitrary results. Of course memes may be involved - such as the very idea of riding a bike in the first place - but whenever we repeat actions that led to successful outcomes and suppress actions that led to pain or failure, then we are learning for ourselves by operant conditioning. We are not acquiring new memes.

3.3 Non-memetic learning

There are other kinds of learning that are also not memetic such as the formation of cognitive maps. Many animals develop complex mental maps of their environment without which they could not live at all, whether they are cats, rats, insects or birds. Some have complex territorial systems in which boundaries are carefully guarded, some (like squirrels for example) hide large numbers of food items and are able accurately to find them again, while others use well known paths to explore and find food. The information in the maps is learned by exploration and conditioning. There is no imitation involved. Similarly we develop complex cognitive maps of our own house and garden, the city we live in, and the places we go for our holidays. We can find our way around these places and conjure them up in our imagination. All this is individual learning and not memetic.

In practice we may not always be able to tease out those things we have individually learned by conditioning from those we have learned by imitation, and very often both are involved - but in principle the two are different. We know lots of things that are not memes.

4. Social Learning

Social learning means learning something from other people, (or, more generally, from conspecifics). Very often classical and operant conditioning are the basic processes involved, but something is learned in a way that involves other people or animals.

Social learning includes true imitation, but there are other kinds of social learning as well. According to Heyes (1993) the difference is best explained like this. Imitation means learning something about *the form of behaviour* through observing others, while other kinds of social learning are learning about *the environment* through observing others. I like to think of the difference in terms of copying. In true imitation something about the action is copied from actor to imitator, while in other forms of social learning nothing is copied. This is important because evolutionary processes depend on there being something that is copied or replicated. Note that this fits well with Thorndike's definition of imitation as "learning to do an act from seeing it done". If memes depend on imitation for their transmission then we need to be clear about how to distinguish true imitation, which involves learning by copying a new form of behaviour, from other kinds of social learning which do not.

4.1 Stimulus enhancement, local enhancement, and goal emulation

In 1921, in the south of England, some small garden birds called tits were seen prising open the wax-board tops of milk bottles left on the doorstep. The habit later became widespread across England and some parts of Scotland and Wales, with other species of bird joining in, and foil tops being pecked as well. It seemed that the tits learned from each other because this new behaviour spread gradually from village to village, and across different areas, although it was obviously independently reinvented many times (Fisher & Hinde, 1949). The spread of milk-bottle pecking was a simple cultural phenomenon but purists would argue that it was based not on imitation, but on social learning (Sherry and Galef, 1984). Imagine that one bird learned, by trial and error, that there was cream under the bottle top. Then imagine another bird came by and saw the pecking and the obviously pecked top. Pecking is a natural action for tits and their attention can easily be drawn to something like a pecked top by the actions of other birds. So now the second bird is more likely to land on the bottle and peck too. Reinforcement from the cream now means that this bird is likely to repeat the action. It may then be seen by other birds. So this learning involves

operant conditioning (the effect of the cream), is a kind of social learning (because another bird is involved), but is not true imitation (because the pecking is not actually copied). The fact that the birds used lots of different methods for opening the bottles also suggests they did not learn by direct imitation.

This kind of social learning is sometimes called “stimulus enhancement” - the stimulus, in this case the bottle top, has become more readily noticed by the birds. Another form of social learning that is not imitation is called “local enhancement”. This is when attention is directed towards a specific place. For example, animals learn from each other which objects or places to fear or ignore. Birds and rabbits learn not to fear trains by following others who are not afraid and therefore become used to the frightening noise. Rabbits can therefore establish warrens on railway embankments even though a naive rabbit from somewhere else would run in terror from the sound of a train. Yet another kind of social learning has been called “goal emulation”, when one animal copies the goals or outcomes of another animal’s behaviour but without copying the form of that behaviour itself. An example might be when an ape sees another ape getting food from a container and then uses a different method of its own invention for getting at that food. We can now see that none of these processes is true imitation because no new behaviours are copied from one animal to another (for reviews of social learning and imitation see Heyes and Galef, 1996; Whiten and Ham, 1992; Zentall and Galef, 1988). The behaviour of one animal comes to be similar to that of another animal, but not by copying it.

Other famous examples that look like true cultural learning based on imitation include the troop of Japanese macaques that learned to wash sweet-potatoes, and chimpanzees that learned how to fish for termites by poking sticks into the mounds. However, both of these appear to depend on individual learning and the kinds of social learning described above, not on true imitation (Galef, 1992). So if you want to stick to the definition of memes as transmitted by imitation then you have to say that bottle-top pecking, termite-fishing and potato-washing are probably not memes.

5 True Imitation

The comparison with other forms of social learning raises the question whether true imitation occurs at all in non-human animals.

5.1 Vocal imitation in birds and dolphins

There is no doubt that there are examples of vocal imitation in birds and cetaceans. Song birds have been treated as a special case since research on imitation first began a hundred years ago (Bonner, 1980; Delius, 1989; Thorndike, 1898; Whiten and Ham, 1992). This is partly because imitation in birds is generally confined to sounds, and to rather specific kinds of sound at that (with the possible exception of parrots who may be able to imitate simple gestures). Many songbirds have long traditions. The young learn what to sing by imitating their parents or neighbours. In chaffinches, for example, the nestling may hear its father sing long before it is capable of singing itself. A few months later it begins to make a wide variety of sounds, gradually narrowing down to the song it heard as a chick. Experiments show that there is a critical period for learning and that the bird has to hear its own song and match it to the remembered song it is imitating. Hand-raised birds can learn songs from tape recorders and adopted birds sing songs more like their adopted, not biological, parents. Some species learn many songs from neighbours and a few, like parrots and mynahs, can imitate human speech.

Dolphins can also copy vocalisations, and young dolphins produce a wide variety of sounds which they later cut down. Captive bottlenose dolphins have been shown to easily imitate artificial signals relating to specific objects and use these new signals in spontaneous play (McCowan & Reiss, 1997). So we can count dolphin whistles and bird songs as memes, and indeed the cultural evolution of chaffinch song has been studied in terms of the mutation, flow and drift of song memes (Lynch, Plunkett, Baker and Jenkins, 1989). These

very specific kinds of imitation are therefore unlike the examples of social learning we were considering before.

5.2 Imitation in humans and other animals

As for other species, the picture is unclear. There have been claims of imitation (other than vocalisation) in parrots, budgerigars, pigeons and rats, though all the claims have also been disputed (see Heyes & Galef, 1996). Dolphins can apparently mimic familiar behaviours but have not so far been shown to copy novel behaviours (Bauer & Johnson, 1994). Chimpanzees and gorillas that have been brought up in human families occasionally imitate in ways that their wild counterparts do not (Tomasello, Kruger & Ratner, 1993). However, when apes and human children are given the same problems, only the children readily use imitation to solve them (Call and Tomasello, 1995).

Humans, therefore, seem to differ considerably from all other species. They are “the consummate imitative generalist” (Meltzoff, 1988, p 59). Human infants are able to imitate a wide range of vocal sounds, body postures, actions on objects, and even completely arbitrary actions like bending down to touch your head on a plastic panel. By 14 months of age they can even delay imitation for a week or more (Meltzoff, 1988), and they seem to know when they are being imitated by adults (Meltzoff, 1996). Unlike any other animals we readily imitate almost everything and anything.

If we define memes as transmitted by imitation then we must conclude that only humans are capable of extensive memetic transmission. Some other theorists have included all forms of social learning in their definitions of cultural evolution (e.g. Boyd and Richerson, 1985; Delius, 1989; Plotkin, 1996) and their mathematical models may usefully apply to all. However, I suggest that it will be better for memetics to stick to the original definition of memes.

5.3 Only imitation sustains a true evolutionary process.

One might argue that both social learning and imitation allow information about behaviour to be transmitted and that the difference is only one of fidelity, longevity or fecundity. Indeed Heyes (1994) does just this, arguing that the difference lies primarily in longevity. However, I suggest that the other forms of social learning do not support a replication system with true heredity.

Although new behaviours can be passed on by other kinds of social learning, the process is cumbersome. For example, one animal must invent a new behaviour during individual learning and then somehow lead a second animal into such a situation that it is likely to learn the same new behaviour - or perhaps the first can behave in such a way as to change the contingencies of learning for the second animal so that it learns the same (or a similar) new behaviour. Most importantly, in these cases, the behaviour must be created anew each time by the learner. The social situation, and the behaviour of the other animal plays a role, but the details of the first behaviour are not transmitted and therefore cannot be built upon and refined by further selective copying. In this sense, then, there is no true heredity. This means there is no new replicator, no true evolution, and therefore the process should not be considered as memetic.

By contrast, the skill of generalised imitation means that humans can invent new behaviours of almost unlimited kinds and pass them on to each other by a kind of copying. If we define memes as transmitted by imitation then whatever is passed on by this copying process is a meme. Memes fulfil the role of replicator because they exhibit all three of the necessary conditions; that is, heredity (the form and details of the behaviour are copied), variation (they are copied with errors, embellishments or other variations), and selection (only some behaviours are successfully copied). This is a true evolutionary process.

6. Human Cultural Learning

We learn about our culture in many ways, including reading and writing, watching television, being deliberately taught by parents and school teachers, and by listening to the conversations of others. In any consideration of memetics, from its origins in Dawkins's work, right through to the present, we count as memes all of the cultural behaviours passed on in these various ways, including everything from fashions and habits, to political ideologies and scientific theories. We would be daft to redefine the meme in such a way that any of these was excluded, but this naturally raises the question of whether all these forms of learning can really be counted as imitation.

There have been many attempts to classify the kinds of learning that underlie human cultural transmission. For example Tomasello *et al* (1993) describe three forms of cultural learning; imitative learning, instructed learning, and collaborative learning. They argue that all these involve some kind of inter-subjectivity or perspective taking, with increasingly complex kinds of social-cognitive concepts and processes involved. However, some prefer not to speculate at all about the intentionality or hidden cognitive processes involved in cultural learning (Zentall, 1996) while others take up the substantial questions of just what kinds of perspective-taking, intentionality, mind-reading, or other complex cognitive processes are involved in just which kinds of learning and teaching (see the extensive commentaries following Tomasello *et al*, 1993). There is clearly no consensus here yet, and it will not help us with defining the meme to launch into these tricky issues, even though in the future of memetics these issues may be very important.

Heyes (1994) takes an entirely different route and argues that human cultural learning is different from animals' because it involves instruction and not imitation. However, this distinction will not work, partly because animals do on occasion use instruction without imitation (as in the examples of manipulating contingencies described above) and partly because human instruction often entails imitation (as in learning to write or cook). Heyes further argues that the creation of language and artefacts decouples cultural accumulation from the process of imitation, but this means denying an important role to imitation in either language or the creation of books, art, buildings and ideologies.

We may take a simpler position - that all these kinds of learning and teaching require *at least* the ability to imitate. Language learning is a good example. Although there are many arguments about just how much of language depends on having an innate grammar module (Pinker, 1994), there is no doubt that human language learning involves the imitation of sounds. Chinese children do not spontaneously start using French words, and German children do not suddenly burst into Hindi. The sounds of words are acquired by imitating others. Reading and writing are also learned, at least to some extent, by imitation, as when the shape of a letter is meticulously copied.

When we read a story and then tell it to someone else is this imitation? I would say that it is. The skills involved may be far more complex than the kinds of imitation I have described above, but they have a basis in imitation and are of the same general form. Something about the story is internalised in the listener and then reproduced when she or he tells the story again. The same can be said of passing on religious or scientific ideas - the reader or hearer of the ideas must internalise them in some way and then reproduce them for another reader or listener.

I have no doubt that in the future memetics will become involved in discovering just what the cognitive processes are that are involved in teaching, learning, instruction, and any other kinds of cultural transmission, but for the moment I suggest that we may consider all of them as in some way being forms of imitation, or based on the ability to imitate. I assume that this is what Dawkins meant by "... a process which, in the broad sense, can be called imitation". He meant to include reading, writing, conversation, and academic study as "in the broad sense ... imitation" and I think we should have no hesitation in continuing to do so.

7. Conclusion

My argument has been that the definition of the meme depends on, and *should* depend on, the concept of imitation. Therefore, only those things that can be passed on by imitation should count as memes.

This means we can immediately exclude many things that a few authors have confusingly included as memes, such as perceptions, emotional states, cognitive maps, experiences in general, or “anything that can be the subject of an instant of experience”. Furthermore we can build on the long history of research in animal behaviour to distinguish imitation from contagion, and from individual and social learning, and so to eliminate from memetics the catching of yawns or all the many things we each learn for ourselves, by ourselves.

This, I suggest, leaves us with a simple definition of the meme that not only makes it easy to decide what is and is not a meme, but also shows why it is that humans alone have produced complex culture. Humans are fundamentally unique not because they are especially clever, not just because they have big brains or language, but because they are capable of extensive and generalised imitation. I think we will discover that it is imitation that gave rise to our cleverness, big brains and language - and it is imitation that makes culture possible, for only imitation gives rise to a new replicator that can propagate from brain to brain, or from brain to artefact and back to brain. For all these reasons I suggest that we stick with the dictionary, and define the meme as that which is passed on by imitation.

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