MEMES AND CREATIONISM

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Abstract. This paper discusses the question of creationism and evolution theory in the context of memes. Several key questions are raised including the questions of why humans have beliefs at all, and why does belief in evolution excite substantial opposition. The authors address the competition of memes in the meme pool and propose the existence of meme 'receptor sites' responsible for strong maintenance of religious beliefs.
KEYWORDS: memes, creationism, evolution, learning, games, receptor-sites.

I. Background.

The widespread and long-lived opposition to evolution by fundamentalist Christian sects is not the first time the religious sector has opposed the findings of science. Copernican astronomy excited centuries of opposition before finally being accepted. Why did the Catholic Church defend the theories of a long dead Greek? Why do "creation science" followers defend an Anglican bishop's calculations of a world only a few thousand years old? We would like something better than an intuitive, hand-waving answer to these rather serious questions. We would like to be able to make specific predictions and recommendations. Our attempt to answer the "creation science" question above will be in two parts: Why do humans have beliefs at all? And why does the belief in evolution excite so much opposition? In attempting to find answers, we will invoke Darwin in two places. First in asking where human evolution has gone the last few million years. Second to consider the evolution of ideas (which we will also call memes, replicating information patterns, or beliefs) and the forces that shape them. Human and meme evolution is inextricably tangled. This discussion will switch back and forth from the one to the other in seeking an understanding (in evolutionary terms) of why evolutionists run into so much opposition from certain segments of the wider community. Knowledge of the modern concepts of evolution is assumed[1].

Current interpretation of hominid fossils is that the split between the line which led to humans and the one which led to the chimpanzees came about 5 million years ago. A whole suite of changes (male provisioning, bird-like pair bonding, more frequent births, sequestered estrus, and bipedality) evolved together, perhaps in response to the shrinking of the relatively safe forest and the expansion of the dangerous but protein-rich grasslands. These changes long preceded any significant increase in brain size.

Hominid evolution in the last 2.5 million years, that is since our ancestors started chipping rock, has mostly been in the direction of elaborating brains and learning ability. Even prior to "modern" technology humans lived over a wider range of the Earth's surface than any other animal of comparable size. It seems fairly obvious that large brains supporting powerful learning abilities are part of the answer as to why humans (and their ancestors) have been so successful in occupying such a wide variety of habitats. The rest of the answer is in the skills which today, as in the past, we must learn to survive. We learn skills and, once in a while, discover new knowledge as individuals. But most of our learning is from others. A simple example: learning by trial and error that streets are dangerous because of cars is *not* a practical approach for children. A good deal of our learning is across generations, the rest from our contemporaries, or from information stored in some material form (books, etc.).

Most of what we learn is from the "meme pool" (analogous to gene pool) of our culture, and a *selected part* of it gets passed on to the next generation, thus setting up the conditions for the evolution of culture. A meme pool may be imagined as the set of circulating information patterns (ideas, blueprints for making artifacts, customs, and so on) which indirectly structures the artifacts and behavior of a culturally distinct group.

The earliest cultural-information-propagated-across-generations (meme for short) probably dates back to our common ancestor with the chimpanzees. Young chimpanzees learn from their elders how to make tools for extracting termites from termite hills. Surviving hominid artifacts which indicate cultural passage of information date back 2.5 million years. Though it got off to a slow start (chipped rocks look about the same for 2 million years), memes and the human line formed a hyper-cycle (in analogy to the DNA/protein hyper-cycle) where improving knowledge made human line survival ever more likely, and the resulting larger populations discovered and passed on an ever increasing amount of (mostly) useful knowledge. Today humans and a huge, abstract mass of information have become fully dependent on each other.

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In addition to humans evolving the capacity to learn and spread memes, we see Darwinian forces acting on the replicating information patterns themselves. One evolutionary force affecting the frequency of a particular piece of shared information has been the reality of the physical environment. Because they shape behavior, memes that are too far removed from the way the world functions lose influence either by being refuted or by poor survival of their hosts. Memes that cause serious harm to their carriers usually become inactive, though it may take a long time. The Shaker belief persisted in its active form for about 100 years despite incorporating a ban on host reproduction.

Another primary force in the evolution of memes is the rest of the meme pool. Simple competition between similar replicating information patterns for a limited number of "slots" in human minds results in the survivors of this process being very good at getting themselves into new hosts, and, once they have, excluding competitors. A few meta-memes apply powerful selective forces to the rest. The scientific method is perhaps the best known "artificial" meme selection force. Phrenology (as a replicating information pattern) is no sillier than palmistry. In spite of a fairly good start, it failed to survive in the scientific meme pool where a testable relation to reality is an asset. A goodly number of memes have no significant relation to reality at all, yet they are quite successful (in the Darwinian sense of existing in many copies). Into this class we would place astrology, Marxist economics, and religions. Our concern in this article is about those *"schemes of memes"* which excite those infected with them to actively oppose the evolution meme. How can we account for the opposition?[2]

II. Theory.

We will start by showing that our minds developed organizational quirks as a by-product of interacting modules in enlarging human brains, and than show how these quirks provide a mental substratum for the spread of a whole class of "reality unrelated" replicating information patterns. Among them we will find the one(s) which excite opposition to Darwin's meme.

Why did our brains enlarge? The advantage must have been larger than the high cost in terms of increased infant care and maternal mortality from getting those oversized heads born. William Calvin in *The Throwing Madonna* proposed one continuous selection mechanism that would come into play for a primate that started throwing rocks and obtained a survival advantage by killing the target instead of just scaring it away. Timing the release of stones or spears to hit small targets must be done much more accurately than the nervous systems of our remote ancestors could achieve. Rebuilding the basic chemistry of nerves, or converting to electronics is out of range for the small steps of evolution, but adding more of the same is an old story. Parallel redundant neural networks reduce timing error by well understood mechanisms. Better accuracy, more protein on the table, and more surviving children for rock-throwing ancestors. However they came to enlarge, the brains we now possess support even self-awareness[3].

Recent work has found the mind to be organized into a vast number of interacting, simpler modules. A substantial amount of data has emerged from the work of neurologist Michael Gazzaniga, artificial intelligence expert Marvin Minsky, and others. (In historical prospective, this work was presaged by Freud & Co.) Simple mental modules or "agents" (Minsky's word) combine into larger agencies to accomplish tasks of great complexity. Starting from a base of hardwired connections from the senses to the brain, Minsky shows how motor activity and feedback from the physical world builds agents that allow a small child to stack blocks. Stacking blocks is not a task to be sneered at. Many a graduate student-year has gone into building machines that fall short of the abilities of a three year old! Memes may be seen to program or direct the formation of more complex agencies such as those for chipping rock or making clay pots or shoes.

Minsky speculates that a substantial number of our agents are censors. It's easy to see how, with an enlarging number of modules in potential conflict for "attention" we need censors to stop us from getting into logical tangles or "inappropriate" behavior. They may work by detecting unfruitful "loops" or painful thought activity in other parts of the brain, and inhibiting the part that is thinking "improper thoughts." One "improper thought" is to think about our mortality. In getting smarter and being able to plan far enough ahead to store food or plant a crop, we have gained powerful agents with "think ahead" ability, and they have been so successful in helping us survive, that we can't "wire out" the ability to think about the future and consequently about our own end. This is, however, an unproductive and (at least potentially) a survival-threatening class of thinking. Such thoughts are likely to activate censor modules that powerfully inhibit further thought about the topic.

So far we have Minsky's censors and "think ahead" agents. Gazzaniga clearly demonstrated the presence of another agent, an "inference engine." This mental module detects or invents plausible "causal" relations, sometimes when there aren't any. New replicating information patterns seem to be invented (or recombined) here. The same hardware seems to be involved in judging meme input from others for plausibility. It makes evolutionary sense that unsatisfied inference engine problems would be anxiety provoking. If there is no "explanation," there is no way to predict (or control) when similar events, especially frightening ones, will happen. Almost any answer, no matter how far fetched, reduces anxiety. There is a great deal of data on the functioning (and misfunctioning) of this module in Gazzaniga's *The Social Brain*, and in the landmark *Human Inference* by Nisbett and Ross. Ritual passed on through memes (praying, rites, etc.) gives the illusion of human control over events, a psychological condition thought to be essential for mental health. (At least the counter condition of hopelessness is known to be detrimental.) Though the plausibility standard of the inference engine is pure *National Inquirer*, the importance of this module should not be underestimated. It was a milestone in our evolution, and lies behind every advance we make. But it was shaped by evolution to jump to the conclusion that the noise in the bushes is a bear. People who screen out its less plausible outputs do so at the conscious level, making use of difficult-to-learn logical and mathematical skills.

61

To sum up, our think ahead (and look back) capacities raise painful questions, for which our inference engines either invent "causes" or judge acceptable some meme obtained from others. The effect of these modules has been to open our minds to replicating "explanations" of our origin and fate. Religions and such "new age" philosophies as "cosmic consciousness" memes or beliefs satisfy the inference engines in most of us, providing explanations-- superficial or profound--to account for times before birth or after death. Just as chemical replicators were the consequences of the primal soup, this entire class of memes is the consequence of the way our mental processors were long ago wired up by evolution, and the recent growth (in evolutionary terms) of these processors. Beliefs in this class can be traced back at least as far as the beginnings of oral history, and probably go back much farther, given the finding of flower offerings in 70,000 year old graves. It may be that primitive versions of such beliefs were essential stabilizers, which had to be on hand prior to the last great expansion of the human brain. By now, the difficulties evolution has as a replicating information pattern should be apparent.

In explaining one side of the where-did-we-come-from/where- are-we-going question, the evolution meme is in serious competition for limited mind "space" with long-evolved religious memes. Unlike the memes of physics, it is out there in a Darwinian fray for mind space with a large group of well adapted, fearsome competitors, some of which have induced those infected to incredible physical exertions, from building cathedrals to flaying infidels. There is an even more important strike against evolution in this competition. Most of the religious memes provide for both origin and fate. Unlike them, evolution deals only with origin and says little (certainly nothing comforting!) about our fate, either as individuals or as a species.

With so little going for it, why has the meme of Darwinian evolution had any success at all? First, physical evidence--especially from geology and biology-- and the meta-meme of the scientific method are strongly supportive of evolution as a meme. Second, the (relatively) tolerant, secular world, with its diverse religions, and rapidly increasing scientific knowledge was complex enough when the concepts of evolution were first introduced that space in minds was available that was not wholly committed to competitive memes. Had there been no diversity in the religions at the time of Darwin, the religious meme carriers might have succeeded in suppressing ideas about evolution, or at least censoring those holding such beliefs as they did temporarily with Copernican astronomy.

As it turned out, the memes of evolution have spread well in the subpopulation of receptive humans. They fit in seamlessly with the scientific meme pool. Since Darwin, most religious schemes have evolved to at least ignore natural history, waxing metaphysical and getting vague about the meaning of passages written by (or about) nomads thousands of years ago. But a few of the religious belief patterns have successfully evolved into an expanding niche (especially in the southern part of the US) where organized opposition to evolution memes is a distinguishing, even driving feature. Anti-evolution beliefs involved fit comfortably into a meme pool that is almost an inversion of the scientific one. The developing situation is reminiscent of the struggles driven by memetic competition that sometimes turn into physical conflict between groups of people infected with different religions.

On this rather alarming note, let us resume thinking about mental models and see if a better understanding of the processes within the minds of "creation scientists" and their ilk can come out of it. We are going to assume some "mental space," and speculate a little about the shape and function of it. We are not proposing a literal, physical space into which ideas tumble and take root, like fertilized eggs in a uterus, yet the metaphor is useful. Consider "mind" to be composed of various "modules," or functioning computation sites like parallel processors within a computer. The form and identity of many of these modules are shaped by memes. Thus we could say (from examination) that person has the baseball meme (or memes). That is, enough knowledge so that they could teach a recognizable game to a group of children who had never seen or heard about it.

"Game" memes seem to have relatively little competition with each other. Knowing about baseball probably has little influence on susceptibility to learning marbles, hockey, or hopscotch, though there is competition among these memes for a person's "game time." This is not true of all memes. Memes of the religious class are quite effective in excluding each other. Games do not include a "play only this game" sub-meme; religions ordinarily do. Religious memes may be taking advantage of the mortality censors, i.e., having acquired an "explanation" that accounts for "after death," the censors close off thinking that may change the structures of this area. For those who already have one religion, there is little to be gained by acquiring a different one. In former times, and to some extent today, changing religion often cost you your social group. During our tribal past, questioning the tribe's beliefs or ritual was potentially disruptive, a threat to the group, and, even up to late historical times, put your survival in question.

Anything statistically affecting survival can cause genetic bias to emerge if there is variation in the available genetic material. Edward Wilson and Charles Lumsden in *Genes, Mind and Culture* provide suggestions as to how units of cultural transmission may influence hereditary "biases" toward certain kinds of behavior via a cycle of both physical and cultural reinforcement over several hundred generations. It seems fairly obvious that if your tribe makes its living with chipped rocks, inability to learn how to chip rock will be bred out after a while. Likewise, we may have coevolved with religious memes to accept, and not question, the one of our tribe.

Memes of the religious class infect a majority of the people in most countries of the western world. The combination of widespread vulnerability to these memes and (normally) exclusive rule of one set of memes per mind has led one of us (Henson) to propose a "religious meme receptor site" in human mental space, with the usual properties (selective stickiness and exclusion) of chemical receptor sites. Selective stickiness means that only "religious" beliefs can occupy the site. The "energy currency" to measure stickiness might be the lower level of anxiety from "solving" inference engine problems of the where-did-I-come-from/ where-am-I-going kinds. Exclusion provides a test of what *is* a religious belief, and forces us to include (for example) communism in the class of competitors

for the site. Unless our analogy is misleading, the "site" may be shaped/prepared by other memes (concepts) and experiences that are commonly learned in childhood. Wherever it is in human mental space, the "religious meme receptor site" seems to be ROM like. That is, once occupied, programmed, or constructed, its content does not change, and its influence is not likely to change in intact people (though ablating a small area in the temporal region of the brain completely destabilizes beliefs of this category, according to Gazzaniga). It is not that people never change religious beliefs, but rather that they are just relatively more stable in this aspect than say, political opinions. "Changing" religious beliefs seems to be more of a process of building a new mental structure and cutting the old one off from behavioral connections.

Religious meme receptor sites may be "close" in mental space to the "mortality censors" mentioned above. Religious memes may be protected by the censors, normally preventing us from thinking about (and potentially changing) beliefs near to this area. Since we are discussing receptor sites, let us mention "module activation sites." This would be a recognition activity on the "surface" of the module built by a meme. For example, the baseball agency built by the baseball meme would recognize a physical baseball (or a bat, a mitt ...) through visual or tactile senses and activate the appropriate parts of the module given the context. These sites would recognize the spoken or written word "baseball" and the names or pictures of prominent players. There might even be a site that would recognize roasting peanut smell. (The baseball agency might respond by bringing up the memory of a particular game.) In the case of a person with an influential "creationism" meme programming much of their behavior, the very words "evolution" or "Darwin" may instigate complex behavior patterns, especially when children come home from school and mention that they were studying the "E" word that day.

III. Applications and Conclusions.

Are there practical applications to these theories? That is, can we make predictions with this knowledge? Most of the predictions we have thought of so far are post hoc: we already know that those spreading the evolution meme run into dedicated (and from their viewpoint irrational) opposition. The theory partly accounts for the difficulty we have in trying to explain our case, but we already knew that logical arguments have little effect in changing the beliefs of people who believe in the creation meme. Perhaps one idea to try would be to avoid the trigger words that arouse these mental structures. It is in fact more descriptive to refer to principles of "random variation and non-random selection" than to evolution. Richard Dawkins' "biomorph" computer program is particularly good at demonstrating these phenomena. We would be very interested to hear how a creationist reacted.

Copernican astronomy displaced the Ptolemaic system because it provided a superior world view. For the same reason creationist beliefs will eventually be displaced. This analogy might be of use in public arguments. The comparison alone may be a useful argument if it opens a chink in "mind armor" enclosing creationist memes. The most effective people in spreading creationist memes are intelligent, but have mental agents that put up strong defenses against the commonly used arguments. New arguments may engage other mental mechanisms. It is even possible that novel thoughts about the mental structures holding their beliefs might shake a few of them. A more attractive possibility would be to construct a "scheme of memes" which includes science and evolution memes but is more effective in competing for the religious meme receptor site. There are a number of such movements, Humanism for example, but none are very successful.

In competing for religious meme receptor sites in human minds, we see two ways in which such beliefs fare poorly in comparison to the competition. First, humanist and related beliefs answer where-are-we-going at the personal level with no hope for anything beyond a short life and oblivion. Second, they deny human control over the forces of nature (except through raw engineering efforts). As human control over our environment improves, the second will become less of a drawback. We have personally found a way to hope for better than oblivion through nanotechnology, the developing concepts of cell repair machines, and the concepts of biostasis (cryonics) to take advantage of future medicine, but going into detail would take another article.

Even if we can't propose specific methods to counter the spread of creation memes or deal with those who are infected with these memes, it is useful to know what we are facing. The knowledge may eventually lead to really effective programs, but even if it does not, it may keep us from wasting our time on futile activities, such as conventional arguing with fundamentalists. At least we are personally less upset by the irrational behavior all around us now that we know it has an understandable origin in our evolutionary past.

Footnotes & References.

1. Richard Dawkins' *The Blind Watchmaker*, is a well-written and entertaining book which describes the recent advances in understanding how evolution works.
2. Cooperating groups of memes. Credit this clever turn of phrase to Douglas Hofstadter.
3. Marvin Minsky proposed in *Society of Mind* that what we call "consciousness" arose as the result of the evolutionary reassignment of redundant capacity to new tasks. Thus, the larger brain may have preceded the "smarter" brain. "Newer" thinking skills (which have had less evolutionary honing) may still have more variation than older thinking skills.

63