

Debate 2 Fred in black; Wally1, red; Tommy, Blue; Wally2, orange;

As a biologist (well, a microbiologist). I'd like to say that the modern biology that I know does not in any way consider competition to be the only fundamental operating principal. Examples of symbiosis and cooperation are widely observed. Survival of the fittest often means those that cooperate!

(I fully agree- Tommy)

"Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals directly follows." Darwin

"So the first biological lesson of history is that life is competition." Will and Ariel Durant

Why are most biologists not speaking out for cooperation and altruism? Is it because it is considered a value and therefore beyond science? But if that is so, why isn't competition considered a value too? By giving precedence to competition, Nature Selection is seen as outside conditions that kills the unfit. But by cooperation which originates from the mother/child bond, Natural Selection is seen as an inside emotional commitment that fosters life. Nature is a metaphor that includes us all and the inanimate environment. Selection is objective only in terms of the inanimate environment; but selection is subjective in terms of life.

Wally – my understanding is that in the early years after 'Origin' most people did tend to take natural selection to be primarily combat. The application of this combat idea to society, named Social Darwinism, was used to justify unfettered capitalistic free enterprise and eventually the final solution in Germany. Some German scientists apparently made this incorrect association when Hitler was a youth himself. Somehow he took this idea and ran with it, politically. (I don't know the details)

As an aside, Marx was an admirer of Darwin, but most Marxists after THE Karl Marx also saw Darwin's theories as justifying capitalism and retreated from evolution. One example of this discomfort with Darwinism was the rise of Lamarckism and Lysenkoism (alternate now discredited views of genetics) in Russia after the communist takeover. [That is actually a remarkable story in itself that runs all the way up to Krushev visiting Iowa corn fields in the 1950's.] However, many Darwinists after 1900 came to see cooperation as important as combat. By the time the 'modern synthesis' in genetics was completed in the 1940's (i.e. Darwin + Mendel fully integrated) Ecology was starting to take hold as an idea and cooperation was more fully understood to be important in evolution. By the late 60's, with the environmental movement in full swing and ecologists being elected to the National Academy of Science, the idea of cooperation fully took its place in all evolutionary research and thinking. Many papers on the evolution of cooperation and altruism have been published, including in Science Magazine, perhaps the most prestigious scientific journal in the world.

A lot of natural selection is seen as selection for disease resistance or adaptation to some new environmental stress, not just competition with a neighbor. Abundant examples of cooperation among species are found in nature and recorded by ecologists. Even cooperation among humans related to natural selection has been studied extensively.

Tennyson's 19<sup>th</sup> century view that nature was 'red in tooth in claw' was only a part of what Darwin saw. Darwin fell in love with the grandeur of nature and the amazing adaptation everywhere in life to environmental niches. Darwin did not really like the competition aspect of natural selection although he knew it was there and an important effect. He was much troubled by the competition, actually, and this was part of his religious struggle. His concern was, how could a kind and just God allow so much suffering in the world? He saw how natural selection could.

Cooperation is far more important to life than competition. What makes a species social is not dominance but the willingness to follow. Competition is more important for carnivores than herbivores. For carnivores it is a justification for killing. For herbivores, it arises to protect resources, which certainly does not imply harm, just intimidation. It may look the same behaviorally; but the motivation and end result are far different.

Perhaps by reading Malthus, both Darwin and Wallace were shaped into this competition first mentality. But it was the moral outrage of its interpretation later in the social fields of war, eugenics, and business that motivated scientist to address the issues of cooperation and altruism. But publishing in scientific journals does not meet scientist's social obligation. There is still way to much "red in tooth and claw" thinking in the public. Until scientists clear this away; we cannot expect acceptance of the Theory of Evolution by the public on moral grounds quite independent of any belief about a deity.

As for randomness, this is an area primarily for physics, not biology. Quantum theory is based on this, and Einstein for one could never accept it, he said, "God does not play dice with the universe!". But Quantum theory does explain how atoms and molecules behave very accurately. You can measure randomness with emissions from radioactive compounds, and in many other physical phenomena. Like it or not, it's there... when it is impossible to predict outcomes of events, we call them random, just ask Heisenberg.

I'm currently reading Wholeness and the Implicate Order by David Bohm. There are lots of interpretations of quantum mechanics, and Bohm created a causal interpretation. This book is a masterpiece of physics and philosophy. As for the Heisenberg uncertainty principle, since velocity is the change of position, certainty about position forcing uncertainty about the momentum is no indication about the randomness of reality only an uncertainty about our determining it. The question the Dalai Lama posed is, "... whether the randomness is best understood as an objective feature of reality or better

understood as indication some kind of hidden causality.” In the case of the uncertainty principle it would not be an objective feature of reality but an indication of our inability to predict outcomes. I do not believe that randomness is an objective feature of reality. (more below)

As for me, I don't think that physics, The Dali Lama, or the Heisenberg principle speak directly to evolution as it relates to randomness. I am trained as a statistician/geneticist, so randomness in nature is an everyday part of my work and life. In genetics we routinely study the effect of randomness on genetic variability. That is, we do experiments to measure the effects of random genetic drift on breeding populations. We talk about genetic bottlenecks caused by, for example, cataclysmic events when most of a species is wiped out, or when a crop species such as corn is domesticated from a very members of an otherwise widely growing wild species (in corn's case teosinte, a wild corn-like grass in Central America). Cataclysm and domestication leave behind a tremendous amount of genetic variability. This effectively isolates the survivors, which are a small part of the gene pool, to go forward. Random events related to such isolation can have huge impacts on the future of a species. Much of this effect is random right down to the core. It is also rampant in nature. This is what Darwin tumbled to on the Galapagos Islands.

Perhaps we should call it relative randomness in the sense that events that lie beyond the Theory of Genetics can effect genetic recombination, e.g., cosmic radiation, cataclysm, etc. These are studied in other branches of science in terms of causality.

In a way we can see a parallel with evolution and morality. Morality effects evolution like cosmic radiation affects genes. Yet we can see religion as the Theory of Morality. So from the Theory of Evolution perspective, moral inputs would be considered relatively random. But just as genetics would not deny that the validity of astronomy that addresses cosmic rays and meteor collisions; so too, evolution cannot deny religion that addresses morality.

Are mutations random? Well, since they can often be attributed to things like cosmic rays or stray radiation from the earth, how can they be predicted or 'directed'? Other sources of mutation result from mistakes during cell replication. DNA polymerase in a typical bacterial (or human) cell may make a mistake that does not get corrected 1 in a million times. But these mistakes are apparently random. In many organisms, most mutations are neutral, having no effect on fitness or survival. There are some sequences of DNA that you cannot change, however, or the cell dies. For example, ribosomal RNA genes have segments that are absolutely conserved, with the DNA sequence the same in ALL living organisms, from bacteria to plants to man. These are called conserved sequences. Other sequences you can change at will and have little or no effect, called variable regions. It may be comforting to think that there is some direction to this chaos, but there is not evidence for it...

Basically I agree. Some genes have higher mutation frequencies than others, and some are more highly conserved than others, but this effect is not large enough to have a serious impact on one's thinking about evolution, at least not in the kind of discussion we are taking about here. Scientists do study and publish on such things, however. - TC

I thought you were arguing that the direction came from Natural Selection. That it gave order to the genetic chaos. As mentioned earlier, I believe that Natural Selection applies externally and internally. This implies that Natural Selection can operate on a cultural level as well as on the DNA itself. Are conserved sequences an adaptation due to Natural Selection due to the lethal effect?

I absolutely agree that natural selection operates on a cultural level. And yes, highly conserved genes are 'that way' because most mutations, when they occur, are lethal. I do not know if most evolutionists would generally say that natural selection gives order to genetic chaos. Perhaps in a poetic way, many evolutionists might agree. However, they would all agree that natural selection is opportunistic and short sighted. Selection might actually lead to less order in some cases, especially depending on how you define order. Is diversity the opposite of order? No evolutionist would ascribe any conscious will to the selection process, however, whatever they might say poetically about order.

But the belief "that there is no direction to this chaos", if taken as your worldview would imply as determinism that was inescapable and without purpose. This genetic determinism whose power arises from chaos both kills free will and replaces it with helplessness. It is the worst of all possible worlds. Determinism, which requires causality, and randomness, which requires chaos, are contradictory and therefore any conclusion can be proved. This worldview cannot be disproved; therefore it is not scientific.

It is however two different natural philosophies. But it does go to show how interwoven they are with our so-called pure sciences.

I disagree strongly that evolution is a sort of deterministic straightjacket that leaves us with no free will and no purpose. Regarding determinism, we are exquisitely adapted to compete, or to cooperate. Evolution has provided us the flexibility to do both. Our upbringing and personal experiences mostly 'determine' which character dominates, although I feel that there must be genetic variation for this balance in the human gene pool. Regarding purpose, atheists and agnostics have purpose, love life, love their children, and can be good citizens of the planet. For me, evolution clearly points out that Earth is our home, not heaven. Evolution links humankind with all of nature in a way that Christianity cannot. In that vein, a French priest and evolutionist, Teilhard de Chardin, viewed evolution as a process by which the

universe (our planet?) becomes aware of itself (although not directed- just a natural consequence). He saw religious purpose in that. As an agnostic, I like that notion. I can read purpose into loving our home world and trying to protect it.

I can chose to believe that I have evolved for that purpose, to live in harmony with the planet and take care of it (as well as having purpose in raising kids and all the other things that we do)

It is my belief that evolution has produced an incredible amount of altruism in all of us, and that this IS what we call spirituality. My view is all our great religious leaders from Jesus through Gandhi were products of this evolutionary based altruism. Perhaps they just understood it better because they had more alleles (genes) for altruism than the average person.

Did the genes make Jesus or Gandhi do it? Here we seek a physical mechanistic explanation from the genes. Of course we could have explained it as the experience of a lifetime of spiritual practice, which would be a mental and attitudinal explanation. In a similar way this is what Bill has been questioning me about. Does oxytocin cause the love that causes a mother to care about her children.

About oxytocin, "The study builds upon previous knowledge of the important role oxytocin plays in the reproductive life of mammals. The hormone facilitates nest building and pup retrieval in rats, acceptance of offspring in sheep, and the formation of adult pair-bonds in prairie voles. In humans, oxytocin stimulates milk ejection during lactation, uterine contraction during birth, and is released during sexual orgasm in both men and women." <http://www.oxytocin.org/oxytoc/index.html>

Sounds like the stuff of love. Sign me up. It appears that oxytocin, like many other hormones and neurotransmitters, has different functions in different locations of the brain and the body. Rather than thinking of these as causing emotional reactions, you should think of them as a key that unlocks a complicated mechanism. But this just moves the question back a step, it still looks mechanistic. I think what Bill's challenge to me is to show that it has something more than this physiological mechanism. Once again it is how verses why. Procedure verses function. So here it goes, but in a context that has been tested. You put an electrode into that part of the hypothalamus that controls the bodily mechanism of rage. Stimulate it and the person will have a full-blown rage reaction. Yet after you stop the stimulation and ask the person what went on? That person will be quite perplexed because even though he felt the bodily reaction of rage, he was not angry in his mind. This is called sham-rage. This is also a mental state that was not controlled by a physiological state. The hardware is not the software. The syntax is not the semantics. I believe that we must consider both; however, for sentient beings, i.e. animals, I believe that procedure follows intention.

Regarding genetic determinism, have you seen the movie [Gattaca](#). It shows what society designed by genetic determinism will be like. We can see it happening even now, but instead of blaming God for what is wrong, we're now blaming our genes. So instead of working on my mind with cognitive therapy; I'm waiting for my genetic fix.

As for materialism, living organisms are made up of stuff... primarily protein, lipid, and nucleic acids. Is there some 'spiritual factor' involved? The biologist would say don't know... but molecular biologists can today manufacture viruses in a test tube, and 'transfect' living cells to produce more virus indistinguishable from the so called 'natural' ones. Do they have spiritual forces? I can easily imagine that one day in the near future molecular biologists could construct simple bacteria from components that will replicate and grow just like the 'natural' ones. What happens to the 'spiritual factor' when we can do that? Granted that is a far cry from a multicell organism with a brain, but the principle is the same, just the degree of complexity is different.

Personally, I think that humans have been selected through evolution to be spiritual and altruistic. These traits survived because they helped humans survive. Tommy

Once again materialism is a natural philosophy that is assumed by many working scientists. However science theorists tend to shun it ever since Maxwell's field equations. Einstein considered mass/energy as a curvature of space-time. The ascendant conceptions are energy, fields, and waves. David Bohm has an interesting concept about consciousness. The process of thinking is an energy process and the thought is mass created by energy process of thinking. Because we are saturated with materialism, it is hard to conceive the full potential of mind. But within the worldview of materialism it is underpowered.

Buddha thought that mind was spirit and my Hopi teacher thought it was too. Perhaps if you replace the "Spiritual factor" with "mind" you would have fewer objections.

I don't have any strong feelings here- Just to say that educated minds may be able to direct humanity's genetic changes in the future. I worry about who will be in charge to do the directing- a Hitler or a Gandhi - Tommy

Can order and complexity evolve from simple random events? The answer seems to be yes! Shake a box of rocks and the larger ones always end up on top. Try it some time. Lipid structures can self assemble into bilayers and micelles. Laundry detergent is based on this principle. I use 'genetic algorithms' for research that are based on random 'crossovers' and 'mutations' in parameter vectors to find solutions to problems for which there

is no analytical solution. These algorithms work exceedingly well (a bit computationally intensive, but they work well). They are commonly used for complex modeling of things like turbulent flow of air around an airplane wing.

I can only refer to what I said before about randomness. TC

Analysis does have its practical limitations. I take it that your algorithm is a set of selection criteria to evaluate any input, random or otherwise. As mentioned before statistics is a practical solution for unforeseen events and in wave interactions. But with a nerve cell when a certain threshold is met the neuron fires. I'm not so much worried about the events being hard to predict but about the causality of the response. The algorithm does seem like a good model life's response to environmental conditions.

Reason has limitations when it comes to generating hypothesis. I think that the realization of pattern is a process of intuition. Whereas reason is indispensable for justification; intuition is indispensable for creating theories.

I agree with the last 4 lines. All good scientists use intuition every day. Answering a question following the scientific method can be taught. Discerning which question to ask is completely intuitive and separates the truly great scientists from the other. I have observed some 10 year olds that have more intuition about scientific inquiry than many PhDs. You can cultivate creativity and intuition, you can't teach it. Tommy

"Imagination is more important than knowledge." Einstein In fact what we suppose to be the certainty, the unquestioning acceptance of knowledge can prevent creativity. "The important thing is to not stop questioning." Einstein That was my motivation for questioning the theory of evolution. Challenge your assumptions, experiment with your ideas.

I do think that analogous thinking is a way of discovering and creating relationships of patterns. For example with Newton, apple is to ground, as moon is to orbit. This is the creative power of metaphor.

Bill asked me to define intuition, because I think that it is more important in the creation of scientific theory than reason. The next week Bill asked me again, and he came up with a good description of how it works. Basically it arises from the whole of experience. That study primes you for discovery by adding to the whole experience. It appears that reason and intuition operate from the left and right hemispheres of the brain respectively. We would not want to ignore intuition and condemn ourselves to a life as a half-wit. Reason and language, left side also, are sequential whereas intuition is more spatial. Bill even characterized it as arising from the whole of experience. Like there is a part missing, and intuition fills it in. And in the filling we have an ah-ha experience of insight. Reason is new to the evolutionary story but

intuition drives curiosity and that goes back much further. As far as creativity and intuition, Einstein said, "I very rarely think in words at all. A thought comes, and I may try to express it in words afterwards." This often happens to me. I have an intuition than I figure it out with reason and words, which may take a long time. And sometimes the intuition is poop, sometimes diamonds.