Can Evolution Be Conscious?

Introducing a Collection of Commentaries
Published on This View of Life

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Can Evolution Be Conscious?

If you had a conventional biological education, then you were taught that evolution is not a conscious process. Giraffes that stretch to reach high foliage do not mysteriously cause their offspring to be taller. Instead, their offspring are both taller and shorter and it is differences in their fitness that cause the giraffe population to become taller over time. More generally, you were taught that genetic variation is random with respect to what is selected by the environment, which makes evolution blind rather than conscious.

If you were so foolish as to think otherwise, you would be guilty of errors associated with Jean-Baptiste Lamarck and Herbert Spencer. You would be wrongly invoking orthogenesis. You would be thinking in terms of teleology, when you should be thinking in terms of teleonomy. How very 20th Century.

As we approach the one-fifth mark of the 21st Century, the concept of conscious evolution is becoming respectable again. Before proceeding, let’s demystify the concept of “conscious” by listing some of its synonyms: deliberate, intentional, purposeful, calculated, planned, volitional. All of these words imply...
directionality in the actions of an agent, who works toward a goal rather than behaving randomly with respect to the goal.

To see how an evolutionary process can be directional, consider genetic algorithms in computer science. Some problems, such as how a traveling salesman should minimize the length of his path through different cities, are notoriously difficult to solve because there are so many combinatorial possibilities. One way to proceed is to represent different options (i.e., each path through the cities) as a string of information, like genes on a chromosome, and to select them on the basis of path length. Then variation is created by mutating the strings and recombining them with each other, emulating the process of genetic recombination. Numerous “generations” of this process do a good job of finding the shortest paths. The whole process is consciously (= intentionally) designed to solve a specified problem, but it still counts as an evolutionary process.

Or take conscious human decision-making as a second example. There is a clear objective for evaluating alternative options, which is the target of selection in evolutionary terms. The variation part of the evolutionary process includes both a directed and undirected component. We don’t suggest options at random; typically, we are guided by one set of expectations or another. On the other hand, some options do appear to “come out of nowhere” and these are often the ones that are chosen. That’s what brainstorming is all about. One way to demonstrate the importance of the random component is by giving the same problem to a number of decision-making groups. They usually come up with different solutions, just as different populations of bacteria subjected to the same selection pressures respond by genetic evolution in different ways, based on different mutations that arise by chance. In short, while an evolutionary process has a component that is random with respect to what is selected, it can also have components that are directed, such as the target of selection and variation that is decidedly non-random with respect to the target of selection.

These two examples of conscious evolution are so clear-cut, at least in retrospect, that you might think I am misrepresenting the orthodox view, which treats the concept of conscious evolution as a heresy. In a sense, I am, because the orthodox view confines itself to genetic evolution. Yet, this by itself is highly problematic. Darwin defined evolution in terms of variation, selection, and heredity, which is a resemblance between offspring and parents caused by any mechanism. Once genes were identified as one mechanism of inheritance, they rapidly became treated as the only mechanism, as if the only way that offspring can resemble their parents is by sharing their genes. This is patently false. Only toward the end of the 20th century did evolutionists start going back to basics by defining evolution in terms of heredity, not just genes, and by identifying other mechanisms of heredity, such as epigenetics, forms of social learning found in many species, and forms of symbolic thought that are distinctively human. If evolutionary biologists previously missed forms of evolution that are obviously directed due to their narrow focus on genetic evolution, that is something to be corrected, not perpetuated.

Moreover, even genetic evolution can be more directed than previously thought. For example, an environmental change might trigger an increase in mutation rates in genes especially relevant to adapting to environmental change. This kind of directed genetic evolution is (or should be) uncontroversial because it can easily be shown to evolve from an undirected process of genetic evolution.

To make the concept of conscious evolution fully respectable again, TVOL is pleased to feature this collection of commentaries by leading evolutionary scientists and philosophers. Each will be published individually over the next few weeks and the collected links will appear below. All mechanisms of inheritance will be featured, including genetics, epigenetics, forms of social learning found in many species, and forms of symbolic thought that are distinctively human. In addition, authors were chosen who could speak to the practical implications of regarding evolution as a conscious process, in addition to basic scientific implications. Each author was asked to address the following questions:

- Is conscious evolution a legitimate concept?
- If so, what are some examples?
- How does the concept of conscious evolution change our basic scientific understanding of evolution?
- How can we use the concept of conscious evolution to accomplish positive change in the real world?

Hopefully, this collection will go a long way toward returning the concept of conscious evolution to normalcy.
Cultural Evolution, Insight, and Fundamental Theories of Consciousness

By Liane Gabora

A Panpsychist Response to ‘Is Evolution Conscious’?

To answer the question of whether or not evolution is (or could be) conscious, we must first consider what makes something conscious. Approaches to consciousness can be divided into two camps. Reductionist approaches attempt to explain how consciousness could arise out of non-conscious components. Fundamentalist approaches such as panpsychism bypass the problem of getting consciousness from non-conscious components by positing that consciousness is a universal primitive. Panpsychist approaches are faced with the combination problem: how do you get from the primitive sort of consciousness present in everything to the clearly distinctive form of consciousness possessed by humans? Building on Chalmers’ double aspect theory of information which holds that information has a phenomenal aspect, it was suggested that an entity is conscious to the extent it amplifies information. The origin of life through autocatalytic closure, and the origin of a self-organized understanding of the world and one’s place in it—i.e., a worldview—through conceptual closure, induced phase transitions in the degree to which information, and thus consciousness, is locally amplified. Much as light gets trapped and locally amplified in a diamond or a spherical mirror, organic systems provide a first level of locally amplifying information, and thus consciousness, and human cognition forms a second such layer.

Another challenge for panpsychism is that it strikes most people as counterintuitive; rocks and thermometers don’t seem conscious. However, much as a mirrored surface can block outside light from reaching the interior of a sphere, the localized amplification of information in a living system could effectively shield us from external consciousness; in other words, the apparent paucity of consciousness may be an illusion.

If one accepts this position that consciousness is a universal primitive, then evolutionary processes are conscious, not to the same degree as the (locally amplified) conscious systems they give rise to, but to the same degree as everything else.

Evolution and Locally Amplified Consciousness

From here onward, let us restrict the discussion to the locally amplified sort of consciousness that we ourselves experience. Although the subjects of biological evolution are conscious in this way, the underlying process of biological evolution is not obviously so, unless one considers situations wherein these ‘subjects’ play a role in how the evolutionary process unfolds, as in cases of assortative mating, selective breeding, or genetic engineering.

However, a case for conscious evolution is more easily made with respect to cultural evolution. The fact that cultural change is cumulative, adaptive, and open-ended suggests that culture evolves, and computational models of cultural evolution have been around for some time. Since cultural evolution is fueled by the creative efforts of human minds which, by anyone’s definition, are conscious, it would seem that consciousness plays a central role in cultural evolution. However, although some view the term ‘conscious’ to be synonymous with deliberate or goal-directed, most people would probably view activities such as mind-wandering or doodling, which would not be characterized as deliberate or goal-directed, to nevertheless be conscious. Creative ideation may be preceded by a period of subconscious incubation followed by a sudden burst of insight, and experiments on the ‘intuitive antecedents of insight’ have shown that, prior to insight, one is actually honing in on an idea even when one is not consciously aware of doing so. Thus, ironically perhaps, the creative processes that fuel culture may be less conscious than other cognitive processes (such as learning and planning).

It is interesting to note that the moment of insight is often portrayed as a light bulb turning on, and words involving light are used to talk about creative insight, e.g., flash of insight, creative spark, and so forth. Creative insight feels like a particularly conscious experience,
and consciousness itself is also discussed using the concept of ‘inner light’.

How can the Notion of Conscious Evolution effect Positive Change in the World?

It has been proposed that what evolves through culture are not discrete artifacts, gestures, and stories, but human worldviews, which as mentioned above are the self-organizing webs of knowledge and experience that guide how we see and be in the world. It has been suggested that worldviews locally amplify information by maintaining their self-organizing dynamics at the proverbial ‘edge of chaos’. Thus, although it is sometimes implied that directed is the opposite of random, the opposite of random is, in fact, deterministic, and it is the edge-of-chaos regime between these two extremes that may be most conducive to consciousness.

We assimilate elements of culture by reframing them in our own terms, and we, in turn, contribute to culture by adapting ideas to our own needs and tastes. When our worldviews are integrated as opposed to fragmented, we can more readily see ideas from different perspectives; thus we are more likely to contribute creatively to culture in ways that are conducive to higher or longer-term goals and to effect positive change. It is interesting that exerting positive change in the world can, like insight, bring a sense of ‘inner light’.

Acknowledgements

This work was supported in part by a grant (62R06523) from the Natural Sciences and Engineering Research Council of Canada.

References

Conscious Evolution is a Category Mistake

By Massimo Pigliucci

I am not usually known for my orthodox thinking about evolution, and yet in this case I have to reject the premise of the current exercise: no, evolution is not a conscious process, and to think so is an example of what philosophers call a category mistake, predicated on a fallacy of equivocation, to boot. How 20th century of me.

Let’s parse this out a bit. First off, consciousness is a complex and inherently fuzzy concept, and Wittgenstein taught us that such concepts are a category mistake, predicated on a fallacy of equivocation, to boot. How 20th century of me.

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does not belong. The classic example is that of a visitor to Oxford University (where Ryle taught). The visitor is shown the campus, the buildings, the faculty, the students, the administrators, and so forth. But at the end of the visit he asks: “okay, but where is the university?” thus betraying a fundamental misunderstanding: “the university” is the thing constituted by the campus, the buildings, the faculty, and so forth. There is nothing above and beyond that.

Similarly with evolution: outside of the well-known instances of human-directed evolution (like artificial selection, computer programming, and the like), we are talking about a natural process characterized by certain properties (non-randomness), made possible by certain processes (natural selection, biased mutation pressure, developmental constraints, niche construction, epigenetic inheritance, etc.), resulting in a teleonomic pattern. To additionally apply the property of consciousness to it — thus making it teleological — is a category mistake because natural processes are not conscious, though some results of a subset of natural processes (namely, us) happen to be.

Of course, what appears to be a category mistake based on current science may turn out not to be in the light of future science. It is conceivable that biologists will discover really solid reasons to think that evolution itself is conscious. Frankly, I can’t even imagine what the pertinent evidence would look like, yet I’m open to the possibility. But we have certainly done nothing remotely like that as of now. Indeed, let us remember that in the past we thought that natural processes were teleological in nature, just think of Aristotle’s classification of causes, and in particular of his final cause. Within the framework of Aristotelian biology, it would make perfect sense, and it is not a category mistake, to think about evolution in terms of consciousness (of course, Aristotle didn’t really think in terms of evolution in the first place, but rather talked of the natural unfolding of things). But the rejection of the Aristotelian approach, which natural theologians during the Middle Ages and until the 19th century turned into the famous argument from design, is precisely one of the greatest accomplishments not just of Darwin, but of modern science. Before we attempt to reverse it, we better get both our logic and our facts very, very straight.

The Origins and Evolutionary Effects of Consciousness

By Eva Jablonka and Simona Ginsburg

Evolution cannot be conscious, just as it cannot be unconscious, silly, clever, or anxious. However, conscious, sentient animals, including reflectively thinking humans, are one of the most amazing products of evolution. So while the question “Can Evolution be Conscious?” has no meaning, it is meaningful to ask how consciousness—the ability to have subjective experiences, such as smelling a rose or feeling fear—has evolved, and how, once in place, it has modified the rates and patterns of evolution. This is a particularly pertinent question when the effects of human reflective consciousness are considered. However, the effects of consciousness on evolutionary processes are more general.

How consciousness evolved and how consciousness has come to affect evolutionary processes are related issues. This is because biological consciousness—the only form of consciousness of which we are aware—is entailed by a particular, fairly sophisticated form of animal cognition, an
Learned behaviors became fundamental to the fight and flight responses of mobile animals who lived in an ever-changing world, and to the construction of the niches that these animals and their offspring inhabited.

The evolutionary entanglement of consciousness and cognition means that animal behavior was driven not only by the direct functional significance of their behavior, but by the mediated values of desires and aversions, which were assigned to ontogenetically-constructed composite perceptions and actions. An animal that could learn in such an open-ended manner could in theory assign value to an unlimited number of perceptions and action patterns, and anticipate positive and negative effects on the basis of neutral cues associated with them. Such associative learning was a game-changing adaptation; animals could adapt ontogenetically rather than only phylogenetically. We have argued that this learning capacity drove the Cambrian explosion. Learned behaviors became fundamental to the fight and flight responses of mobile animals who lived in an ever-changing world, and to the construction of the niches that these animals and their offspring inhabited. For example, if an animal learned to exploit a novel and rich food source and consequently tended to stay and reproduce in areas where this resource was abundant, its offspring would have the same learning-environment and learning opportunities and would seek a similar niche; this would lead to habitat-specific habits, such as new styles of parental care, food handling, and fight-flight behaviors. Any behavioral, physiological or morphological feature that improved the ontogenetic adjustment to a specific learning environment would be selected, and would affect the evolution of interacting species. Rapid learning-guided evolution and learning-guided arms races have led to morphological and physiological diversification.

Can Evolution Be Conscious? Since what conscious animals regard as good or bad is context-dependent and not always optimal, new types of features can evolve. Consider an animal that discovers that a rare, though recurrent fermenting food source gives it a very pleasurable feeling (even though the food makes it slightly less vigilant), and the habit of consuming this somewhat addictive food and even searching for it in the right season spreads throughout the group. The tradition may persist because of its strong memorable and pleasurable effects, and lead to the evolution of detoxifying enzymes, or to the consumption of foods with detoxifying microflora, so that the slightly deleterious effects of the tradition are ameliorated. The evolution of the change in the digestive system or in the consumption of other foods was, in this case, driven by the pleasure the food gave to its consumers, rather than its nutritional value. Or consider a female selecting a mate because he has complex patterns of color on his wings and tail. The ability to perceive and enjoy these features leads to positive selection of males even if such males pay a survival cost for their attractiveness (a Fisherian sexual-selection scenario). It is not surprising that Darwin regarded animals that display complex mate-choice as a sign that they had highly evolved mentality. The evolution of consciousness did, of course, evolve much further: in some animals (birds such as corvids and parrots, mammals such as primates and elephants, and possibly some hymenopterans and cephalopods) imagination began to drive behavior.

The reflective consciousness of humans takes this mediated evolutionary effect of consciousness to a new level. Humans have symbolic systems of representation and communication, and through symbolic language they can communicate about the products of their imagination. Human evolution has led to complex artefacts, to the domestication of plants and animals, to elaborate social systems, to human moral laws, to exclusionary and cruel ideologies, to wars and horrific human and animal suffering, and to looming catastrophic ecological destruction led by short-sighted future interests. However, our reflective consciousness enables us to consider all these. We are a strange species, the evolution of which can be driven by visions of a better future-world and by abstract values like justice, beauty and truth. There is, therefore, some hope.

References
The Evolution of Consciousness Enables Conscious Evolution

By Steven C. Hayes

A key challenge for evolutionary science is to provide an account of the evolution of consciousness. While that is widely recognized, evolutionists have also been socialized from their very first moments in the field to believe that a defining feature of their approach to life is that evolution itself is not, has not been, and cannot be conscious. Taken together, this leads to an anomaly: On the one hand, evolutionists recognize and celebrate the central importance of the evolution of consciousness within the story of life, and on the other hand, most evolutionists deny its importance to the understanding of their own field.

For evolutionary science to play a role in society that takes full advantage of its enormous scientific precision, scope, and depth, this anomaly has to end. The reasons for this unfortunate clash of concepts are multiple, but they are all outdated and artificially limiting. Evolution can be, has been, and is consciousness—not in the cartoon forms imagined by a lay public, but rather as an emergent understanding central to a multi-dimensional, and multi-level extended evolutionary synthesis.

The etymology of the word conscious points to its central quality: these are actions that occur “with knowledge.” Stripped to the bone, consciousness can be thought of simply as the ability to respond to oneself and the environment and the regularities within and between them. When human and nonhuman animals show a dramatic diminishment of such responding, such as during sleep or comas, they are said to be “semi-conscious” or even “unconscious.” In a similar but more incremental way, as life forms evolve increasingly elaborate ways of responding to the external and internal environment and its regularities, in such forms as sensation, perception, and learning, they are said to become more conscious of their reactions and their surroundings. An organism that cannot show habituation due to repeated stimulation is less conscious of its environment than one that can; an animal that can detect and respond to antecedent-action-consequence regularities is more conscious than one that cannot.

It is difficult to imagine a world in which consciousness, so defined, is not a phenotypic result of evolution. That is so because of this bedrock fact upon which evolution itself is constructed: No structural or behavioral phenotype is successful in all contexts and thus context sensitivity will generally be useful. Resource acquisition, resource utilization, reproduction, protection of offspring, niche construction, niche selection, predation, avoidance of predation, avoidance of illness or injury, and so on can only be understood based on the selective features of the particular environments in which particular phenotypic variations occur and are inherited through genetic, epigenetic, behavioral, cultural, and symbolic means. The selective power of environmental fit means that the evolution of greater sensitivity to relevant environmental features internally and externally is virtually assured to be a core product of evolution itself. Consciousness, as I’ve defined it, will thus not only evolve; it is a key characteristic of the fitness of complex evolved systems.

Consider a life form that is better able to detect the presence of a predator due to heritable variations in its visual system. It is entirely correct to say that such a life form has evolved to be more conscious of the presence of a predator. The definition I offered earlier is fully satisfied: visually detecting a predator is based on heritable variations in response to light and its regularities, and the result is increased fitness. Other than churlish arguments over word choice, it is an empirical fact that consciousness evolved.

But was evolution itself conscious in such a case?

That is a tricky question because saying “yes” seems agentic. Variations are blind, or so we are told, and thus while the heritable changes in the visual system created a relative advantage in avoiding predation and as a result became more frequent, it was not purposive. The original change was blind. The visual system did not change in order to detect the predator.

This is only partially true (or I could just as easily have said “that is partially false”) because responding in order to produce particular visual effects is indeed part of the story behind the evolution of the visual system. Let me explain.

In the gene-centric era of evolutionary science, it would be easy to miss key features of the complex multi-dimensional and multi-level system that actually gives rise to a successful visual system. A well-adapted visual system requires more than a genetic capacity—it requires properly arranged developmental processes that foster phenotypic development.
such as peripheral and central nervous system stimulation, growth, and coordination. If a kitten’s eyelids are sewn shut during key developmental periods, it will never develop a normal visual system, even if the duration of the visual deprivation is only a matter of days. Note that behavior itself could result in poorly arranged developmental sequences much like this if behavior linked to vision were not constrained. For example, a kitten could in principle close its eyes too much, or hide its face in its mother’s underbelly for much of the day, or stare at the sun for hours on end—all of which would interfere with the proper development of the visual system. A healthy kitten does not normally do so because visual development is impacted by patterns of sensory reinforcement as part of a multi-dimensional system. For example, animals will work to avoid excessively bright lights or to produce positive changes in visual stimulation by head turning, exploration, or working to remove visual obstacles. Sensory preferences of this kind are of such importance that they enter even into animal rights conversations. In other words, evolution created sensory preference patterns that ensure that operant learning processes can play their small but important role in fostering healthy sensory and perceptual systems as part of a much larger system of distal and proximal sources of control over mechanisms of development.

The claim I am making is that relational learning is the central core of human language and cognition, and evolved as an extension of cooperation.

Operant learning is purposive in a particular sense: changes in environmental contexts produced by actions in the past serve to alter the context for action now. Said in another way, operant learning is the past as the future in the present. This kind of learning affords a new kind of conscious, purposive behavior—responding in the present in order to produce something in the future that has been produced in similar situations in the past. In other words, it is a more elaborated form of consciousness based on an ability to respond to particular contingent regularities between environment and behavior. Operant learning impacts other evolutionary processes such as niche construction and niche selection. Indeed, a good argument can be made that the Cambrian explosion was due to the evolution of operant and classical conditioning, which made it possible for organisms to seek out or to alter characteristic environments, changing the selection pressures that lead to speciation or other phenotypic developments. In that sense, it is fairly obvious that this form of increased consciousness altered the course of evolutionary development.

To some degree, all forms of evolved evolvability make a similar point. Bacteria that show more variation when placed in a growth medium that is missing key amino acids are showing a very limited form of “consciousness” that in turn will alter the course or evolutionary development. But operant and classical conditioning are a clear leap forward—one in which the temporal and spatial features of an act in context alter how the environment impacts future actions. If we grant that consciousness evolves and that consciousness impacts evolution, is it necessary to say that organisms evolve consciously? At least when we reach the level of consciousness represented by symbolic learning I think the answer is “yes.”

Human Symbolic Learning

By 12-16 months, a normally developing human infant who has learned that an object (say, a rubber duck) has a name (“duckie”) will orient toward the object when hearing the name, without specific training to do so. Furthermore, if the rubber duck squeaks, the infant will know that “squeak” is the sound “duckie” makes and vice versa even if the name and the sound have never been heard together.

Said in another way, an instance of one-way contingency learning (object -> name) leads to a robustly two-way street of symbolic meaning that is then recombinable into symbolic networks (object \(\leftrightarrow\) name).

Deriving a network of the kind I have just described is called “stimulus equivalence” and although it is readily shown in human infants, after decades of trying, it has not been reliably produced in non-humans. Furthermore, we have known for more than 30 years that children who do not show stimulus equivalence do not develop normal human language.

Stimulus equivalence marks a transition in the evolution of consciousness because it is the first example of a learning process that is relational, not associative. Learned associations and direct acting contingencies are not robustly reversible or combinatorial. For example, in classical conditioning, providing food after a bell will lead to salivation to the bell, but not to a robust raising of ears when food is later presented. Backward conditioning is very weak and does not enter into long backward sequences when chains of events are provided (e.g., later presenting a foul odor before the bell may eventually lead to salivation at the odor, but not food avoidance based on backward associations with the odor).

That lack of reversibility and combinatorial capacity is not true of relations. If I am certainly bigger than you, you are certainly smaller than me. The derived relation is just as robust as the known relation. The evolution of human language and cognition is based on this relational property.

From the beginning of the act of naming itself, some forms of relational learning are not limited to formal relations. In the context of a cooperative social group with some level of social referencing, joint attention, and perspective taking, regularities in naming can be made reliably reversible by paralinguistic or other cues. If this object is a ‘duckie’ from the point of view of a speaker, then it can be entirely safe to assume within a given troop or band that a ‘duckie’ is this object from the point of view of a listener. Relational terms like...
The human infant and toddler quickly learn to apply other reversible relations, increasingly controlled by arbitrary contextual cues. If a human infant hears an unfamiliar name it will search for an unfamiliar object in its environment and, if one is found, it will derive a two-way symbolic relation between the two.10

In other words, two relations of “different than” (the name is different than other names; the object is different than other objects) leads to a two way “same as” relation (unfamiliar name <-> unfamiliar object). As additional relations are added (comparisons, such as more / less; opposition, such as hot/cold; contingency, such as if <-> then; person, such as I/you; etc.), vast cognitive networks can emerge from very limited environmental inputs.

There is expansive experimental literature on this topic under the rubric of Relational Frame Theory that shows the ontogenetic histories needed to reveal these evolutionarily prepared responses.11 The claim I am making is that relational learning is the central core of human language and cognition, and evolved as an extension of cooperation.12

Impact of Human Consciousness on Evolution

Symbolic learning is another step forward in the evolution of consciousness because with this repertoire of relational responding we can respond to the past as the symbolically constructed future in the present. Only a rather small set of cognitive relations are needed to solve problems through symbolic reasoning: names of events and their features, if -> then relations, and comparisons. Stated more simply, human verbal problem solving involves an “if/then/better” relational network that alters present action so as to coordinate with the verbally constructed future. Responding of this kind is not only conscious, it allows symbolically intentional behavior.

The two-way street of human cognition transforms the present based on cognitive networks about the future. The evolving future that is presented symbolically in present moments via human language can alter the impact of the environment. Nelson Mandela can treat a prison guard kindly, for example, because that action brings a just world a little bit closer, even if the guard is a source of deprivation.

Symbolic learning is key to human consciousness, but human consciousness can comprehend and consciously apply multi-level and multi-dimensional evolutionary models to the accomplishment of human purposes.

Evolution begins with processes of blind variation and selective retention, but it does not stay there for the simple reason that evolvability itself evolves.13 The phrase “survival of the most evolvable” is far truer to the whole of evolutionary data than the hoary phrase “survival of the fittest.” Symbolic learning is key to human consciousness, but human consciousness can comprehend and consciously apply multi-level and multi-dimensional evolutionary models to the accomplishment of human purposes.

Behavioral variation and selection within the lifetime of individuals is not merely an expression of genes and cultural practices. Learning is a legitimate evolutionary dimension that impacts on other evolutionary dimensions at other levels and time frames. Symbolic processes led to the principles of evolutionary science itself—variations within the relational networks of particular people were expressed and selected by accomplishment of their scientific purposes individually and culturally. If these principles then lead human beings to change their behavior in order to achieve better outcomes, and if the success of these actions maintain them—as would be the case with any successful application of evolutionary science that was sustained because of its utility—it seems impossible to avoid the conclusion that evolution can be conscious.
Applied evolutionary science is not just the passive beneficiary of scientific understanding—the very field in which an extended evolutionary synthesis will be fostered. We can think of applied evolutionary science as a type of fieldwork in the evolution of human behavior. No amount of laboratory knowledge is enough to be certain that the action of an organism is understood—but if this knowledge is applied in the actual environment in which the behavior occurs and predictable changes occur, the validity and utility of evolutionary science expands.

When we have created a robust field of applied evolutionary science, evolutionary science will be relevant to the world in a way that it is not now. And if applied evolutionary science is possible, it means that evolution itself can indeed be deliberate, intentional, purposeful, calculated, planned, and volitional. These are all merely terms for actions that are regulated by the “if / then / better” symbolic formations of human beings. Evolutionary principles can be applied to and contained by these formulations themselves.

We have evolutionary accounts of consciousness—now we need evolutionists to apply those accounts to their own assumptions, theories, and purposes. Understanding the evolution of consciousness provides the scaffolding for evolutionary science itself to consciously evolve, and to help human individuals and groups do so as well.15

References

11. See Hayes and Sanford, 2014 in footnote viii above.
13. Rather than tie down this paper with dense referencing, I have done so fairly lightly. The following references are particularly useful in exploring the arguments I am making:
Welcome to the Noösphere

By Alice Andrews

Noösphere: “The sphere of human consciousness and mental activity especially in regard to its influence on the biosphere and in relation to evolution.”

1. Information is a fundamental property of the universe; it’s a concrete property of matter and energy that can be quantified and measured.

2. The consciousness of something can be quantified by measuring its integrated information.

3. Uncertainty is an attribute of information.

4. “Intelligence is a force that acts so as to maximize future freedom of action.” It ‘wants’ to keep options open.

The above axioms are based on the works of Seth Lloyd, Giulio Tononi, Lotfi A. Zadeh, and Alex Wissner-Gross, respectively.

It’s next to impossible for scientific knowledge to evolve without the expression of ideas: mutations in the pleckstrin homology domain of dynamin 2 cause dominant intermediate Charcot-Marie-Tooth disease; do nasturtium leaves smell like cocaine?; the infinite monkey theorem. Science needs memes — the good, the bad, the ugly, and beautiful — in order to progress. Yes, even the bad and ugly. For even if the arrangement of these morphemes and memes contributes nothing novel that moves us forth, perhaps a mind scanning these pixels will be sparked by an idea or word that does, ultimately, advance us. And an error could cause a reader to propose some other idea that has utility. You get the meme.

This commentary is what Susan Blackmore might call a memeplex — and what I call a memesome. It’s a mine of memes for minds to potentially chew, ingest, transform, replicate, and/or digest. It’s a memetic lottery.

In 2006 or so, I declared (mostly for fun) that I was an evolutionary teleologist and explained my sense of my neologism, evolutionary teleology, thusly:

“I think there are basic chemical and physical (as in particle physics) building blocks within the cosmos. My understanding is that O, N, C, H and other elements can be found throughout the cosmos. I suspect that these building blocks tend toward a direction — to build ever more complex systems when given the ideal ecology. Perhaps consciousness arises (emergently) from this non-random organizing complexity. And I would argue that if you started on another planet with similar building blocks, and if you set it into motion with the same conditions of elements that started here ~4 billion years ago, you’d eventually, perhaps, get consciousness again — similar to the concept of Nietzsche’s ‘eternal return.’ I don’t believe the universe has a purpose in its typical use/sense, though. An evolutionary teleological view would be that no matter where you are in the cosmos, that there is, under the right conditions, a direction toward more complex, organized structures (both physical and non-physical). I think being/existence ‘wants’ to know. There is an organizing principle with a direction.”

This is a hardy meme. A dandelion of a meme, actually. For some, i.e., religious fundamentalists or scientists who distrust anything that has a scent of order and nonrandomness, it may seem like an invasive weed, worthy of eradicating; while others may see its beauty, utility, and naturalness. The strength of this meme, it seems to me, is due to the fact it’s as appealing affectively as it is rationally: it feels right intuitively, but it’s also, ultimately, falsifiable. In fact, a recent scientific experiment hints at this cosmic view, what could also be called conscious evolution. A software program called Entropica was developed using the principles of thermodynamics to maximize its future freedom of action. Without specific goals given to the program, tool use, social cooperation, and walking upright were generated. As the creator of Entropica, Alex Wissner-Gross, says: “In cosmology, for example, there have been a variety of different threads of evidence that our universe appears to be finely tuned for the development of intelligence, and, in particular, for the development of universal states that maximize the diversity of possible futures.” This also aligns well with the grander,
larger view of conscious evolution that Kenneth R. Pelletier wrote about it in 197813 and Barbara Marx Hubbard expounded on twenty years later in her book Conscious Evolution:

“The purpose of this metadiscipline is to learn how to be responsible for the ethical guidance of our evolution. It is a quest to understand our innermost values and how to be responsible for the ethical guidance of our evolution. It is a quest to understand our innermost values and how to cooperate with the processes toward chosen and positive futures.”14

Currently, scientists don’t fully agree on how biological evolution works. One useful way to understand it, before all the messy details, is as an evolutionary epistemologist. W.W. Bartley III, for example, sees evolution as “a knowledge process...in which information regarding the environment is literally incorporated, incarnated, in surviving organisms...”15 I love this — especially in light of one of the axioms of this commentary: that information is a physical, fundamental property of the universe.

Apart from the fascinating and scientifically heretical idea that mutations might not be random, there are two major memes/theories/stories/ideas of evolution battling for epistemic survival: inclusive fitness theory (of which kin selection is one instance)16 and group selection theory. Crudely, inclusive fitness theory says that the unit of selection for evolution is the gene; it measures the reproductive success of individuals and their kin. Group selection theory, however, looks at a different level (the group); it measures indirect, longer-term effects on fitness, such as those achieved when groups of individual organisms cooperate and out-compete groups of non-cooperators. As David Sloan Wilson and E.O. Wilson affirmed: “Selfishness beats altruism within groups, altruistic groups beat selfish groups...and traits with public benefits and private costs do evolve by natural selection.”17

Such debates seem unanswerable and impossible to reconcile, but that’s only because we’re using reductive, bifurcating reasoning. What we need with many of the important philosophical and scientific debates of the day is a quantum leap and lens — a recognition that there may not be one answer, but many answers depending on the context (i.e., the question being asked and the level of analysis). I think this applies, for example, to regular-old consciousness, and it’s why I think Dan Dennett and Galen Strawson are both correct, depending on the context.18,19 We need a multilevel theory for consciousness, God is dead and so is Descartes.

But back to evolution.

Evolutionary biologists David Sloan Wilson and Elliot Sober reconciled the either-or problem with their multilevel selection theory (MLS).20 Essentially, does natural selection work on cells, or genes, or individuals, or groups of individuals, or ideas? The answer is yes! Selection seems to work on different levels of information. As Einstein wrote (about light):

“It seems as though we must use sometimes the one theory and sometimes the other, while at times we may use either. We are faced with a new kind of difficulty. We have two contradictory pictures of reality; separately neither of them fully explains the phenomena of light, but together they do.”21

This is important for many reasons, but the fact that group selection theory is likely as true as other theories (such as inclusive fitness) depending on the question being asked, is reassuring. It reminds us that we are many things: patterns of information (DNA) competing, surviving, reproducing, but also, too, that we are deeply connected to people who don’t share our DNA, to large social groups, and the species, and to all living things. As Charles Eisenstein says:

The emerging science that seeks to explain the desire to serve something transcending the separate self and the pain we feel from the suffering of others, whether it invokes mirror neurons, . . . group evolution, . . . or something further out, doesn’t explain them away, but merely illustrates a general principle of connection, or dare I say it, oneness. The science is beginning to confirm what we have intuitively known all along: we are greater than what we have been told. We are not just a skin-encapsulated ego, a soul encased in flesh. We are each other and we are the world.22

References

To speak of an evolution of consciousness as a natural event is to be committed to the idea that consciousness can be a further expression of something which is not yet consciousness but is a prerequisite for the possibility of consciousness.

Consciousness means many things to many people. For present purposes let’s assume for our sense of consciousness that which is associated with a kind of executive level capacity to steer our own attention and choose our course of action in a way that we feel personally responsible for. We generally do not feel responsible for acts, such as having a seizure, that are not the result of a conscious choice. Whether or not we are free in an absolute, metaphysical sense (a controversial issue) we can’t help but experience ourselves as being free in making choices for which we feel responsible, i.e., conscious choices. But how does nature come to conjure the power of self-consciousness?
I am going to argue for the claim that “nature explores greater levels of detachment” and that “detachment” is just such a property that is both required for, and may evolve in the direction of, the possibility of self-consciousness. I will call this evolutionary movement a dialectics of detachment and will, of course, have to explain what I mean by all of this! Ultimately, I hope to make it apparent that consciousness just is what we call natural detachment at a certain stage, or more precisely what natural detachment comes to call itself.

Curiously, our understanding of what preceded the “Big Bang” provides important insight into the meaning of detachment through its complete negation. Prior to the Big Bang, all existence (whatever that means) was contained in an infinitely dense, infinitesimally small singularity in which there was no space or time and all four basic forces were united into one. The universe was born, space-time emerges, in an explosion of detachment. Without getting too bogged down in the technical details of high-energy physics and cosmology, the take-home lesson is that a logic of detachments-built-upon-detachments is set into motion from . . . the beginning.

**Homo erectus could live in permanent encampments with the controlled use of fire, organize big mammal hunts, produce the Acheulean hand-axe, leave Africa and colonize far reaches of the Euro-Asian landmass, long before the appearance of spoken language, by way of a gesture and emotion mediated form of group consciousness.**

It has been theorized that cosmic detachment begins with the separation of gravity from the unity of fundamental forces, resulting in the formation of elementary particles and anti-particles followed by an inflation into space-time triggered by the detachment of the strong nuclear force. As yet inexplicable asymmetries in the appearance of baryons (matter) versus antibaryons (anti-matter) are a sine qua non for the early persistence of our universe. It is now believed that the possibility of mass is predicated upon the detachment of the particle called the Higgs boson and the associated Higgs field. The detachment of the Higgs boson, and thus of mass, then constitutes the horizon for all subsequent detachments in our universe.

Physicists characterize the “possibility space” of a simple system in terms of its “degrees of freedom”. For example, a simple atom like hydrogen can respond to a perturbation (such as being hit by a photon) by moving in space along three axes (3), rotating (4), or elevating the energy level of its electron (5). It is thus accorded five degrees of freedom. A simple diatomic molecule, like O₂, can also vibrate along its common axis so adds an additional degree of freedom. Detachment is always about the emergence of higher degrees of relative independence. The more degrees of freedom the greater the detachment. As our universe has evolved it has given rise to subunits with greater and greater abilities to buffer themselves against the “ambient winds” (be it bombardment by radiation or predation by voracious carnivores). A particle with rest mass that creates a well in space-time is more detached than a particle (like a photon) with no rest mass. A macromolecule, like a protein-based enzyme, whose folding history affects its future actions is more detached than a simpler molecule whose structure is solely determined by thermodynamic necessity (and thus has no history). A major transition in detachment occurs when a system emerges that actively constitutes its own boundary and actively sustains its ability to do so. We associate this level of detachment with what we recognize as “life’.

All states of detachment, are relative, none are absolute. Levels of detachment exist in nested hierarchies. When a new level of detachment emerges, such as the boundary constituting, self-sustaining system (a simple cell), it also creates a space for downward detachments which may be viewed as parasitic on the higher level of detachment upon which it depends. Viruses emerge as expressions of downward (parasitic) detachment. Parasites and their hosts, lower and higher levels of detachment, dialectically interact resulting in the transformations of each and the appearance of new capacities that either side of the equation alone could not have produced. Compartmentalization and other forms of cellular complexity emerged initially as host defenses against viruses. The mobility of viruses has come to characterize the vast majority of complex genomes and impart the capability of generating de novo variation, not on a random single point-mutation basis, but through segmental duplications and movements that result in species defining gene families.

Philosophical Anthropologists have long since recognized that human ancestors lost their instinctive specializations and viewed as organisms became the highly dependent weaklings of nature. But what was new under the sun was the appearance of a “Hominin Supergroup” whose loss of adaptive instinctual response patterns (First Hominin Detachment) enabled (and required) the emergence of an entirely novel, normatively integrated form of life. Homo erectus could live in permanent encampments with the controlled use of fire, organize big mammal hunts, produce the Acheulean hand-axe, leave Africa and colonize far reaches of the Euro-Asian landmass, long before the appearance of spoken language, by way of a gesture and emotion mediated form of group consciousness. Modern humans are the expression of a downward, ‘Second Hominin Detachment’ that results in the quasi-independent, quasi-parasitic human individual, that dialectically, has appropriated from the consciousness of the group, the resources for identifying, and as with, a consciousness of its Self. Those regimes of consciousness associated with tribal myth, with animism, with religions of the book, with the axial turn, with modernism, with scientism, with political liberalism, with socialism and so on can be reconstructed in terms of dialectical interplays between the legacies of First and Second Hominin Detachments (i.e., as still “Creatures of the Group” who strive for individuated self-identity and understanding).

Increasing levels of detachment constitute a form of directionally. The universe as a whole can be said to owe its existence to processes of detachment and at least in certain precincts of the universe dialectics of increasing detachment have been set into motion. While consciousness may not be an inevitable result of any dialectics of detachment, inasmuch as consciousness is part and parcel of that level of detachment that can reflect back upon itself, it is surely immanent to the logic of increasing detachment.
Can Evolution Be Conscious of Itself?
Yes, It Can!

By Joe Brewer

Imagine this situation: A dog breeder discovers that he can select from docile parents to get puppies that are more easily trained to do what he asks. He has just employed an evolutionary process to alter the reproductive fitness of some dogs that serve his goals. He did this without understanding how evolution works, yet with confidence that some kind of predictable inheritance was likely to be in play.

Now add to the story that a biologist named Charles Darwin has just written a book called On the Origin of Species that explains how “artificial” selection works among animal breeders—which is then extended to the rest of the natural world by removing the person who might do the selecting and letting it happen as an emergent pattern from the environment. The new situation is one where any person who is consciously aware of the mechanisms involved in evolution can now make conscious choices about what gets inherited for future generations. We already have a situation where human beings, which are subject to the workings of evolution themselves, can become aware of their role as shapers of the environment to consciously select which animals get bred and for what desirable outcomes they are doing so. It is not sleight-of-hand to say that this meets the criteria for evolution to be aware of itself.

But such a narrative ploy—clever though it may be—does little more than scratch the surface of what humans can do to intentionally shape our own evolutionary processes. What we are truly capable of, it will be necessary to unpack more of the unique patterns that have come to dominate our ancestral line as a profoundly cultural species.

I will summarize the arguments made by Joe Henrich and Kevin Laland in their recent books, titled The Secret of Our Success and Darwin’s Unfinished Symphony respectively, to make this argument. Henrich explains how humans are able to achieve their spectacular success as a species because of the ways that we build upon what we learned before. Refining and extending our technologies is one way to go from slightly misshaped stones with sharper edges to eventually building rocket ships that place one of our own on the moon. This is called cumulative culture and there is little evidence that any other species is able to create it. We humans have been shaping our own evolutionary process by building on what came before to achieve desired goals for quite literally millions of years.

One example of this is the invention of techniques for making and maintaining fires. Along with this incredible technology came the cooking practices for tough meat that is both difficult to digest and can carry pathogens that make us sick. By harnessing an external system for digestion, we gained the ability to reduce the length of our intestines (needed to break down tough materials and neutralize bacteria that might cause harm). This opened up the possibility for more energy to go into growing larger brains, a positive feedback of cascading changes that enhanced our ancestral abilities for creating cultural systems.

Laland’s argument is specifically about social learning. Humans, it seems, are rare among animals for our ability and desire to teach things to each other. This gives us the two ingredients necessary for cumulative culture to occur—high fidelity of copying and extensive mentoring to learn complex skills. As our ancestors gained the ability to select which skills are learned, we began to consciously shape how cumulative culture plays out from one generation to the next.

The important thing for our species is that we profoundly shape our social environments with tools and practices that alter what our children can learn. Thus, we become inheritance systems for culture that build upon and work in parallel with the inheritance systems associated with our genes. This is called gene-culture coevolution and humans do it like no other species on Earth. As more among us become aware of gene-culture coevolution, we can begin to consciously choose what kinds of social systems we’d like to create that future generations will inherit. For example, we might choose to build energy infrastructure around a portfolio of renewables that free us from fossil fuels and the disruptions to planetary climate associated with burning them. Or we might choose to employ the many findings from prevention science to raise our children in nurturing environments that increase their abilities to regulate emotions and cooperate with others. In this manner, we would increase the likelihood that future societies are
managed as democracies instead of some form of authoritarian control by dominant force.

Evolutionary biologist David Sloan Wilson has said that we must become “wise managers of our own evolutionary process” and this requires that we first become aware that it is possible to do so. My colleagues and I birthed the Cultural Evolution Society to help researchers around the world to find one another—increasing their ability to cooperate—and more recently we launched the Center for Applied Cultural Evolution to help practitioners learn what evolutionary approaches have to offer them as they grapple with incredibly complex challenges in their communities.

What I hope to have conveyed in this brief essay is that (1) evolution can be conscious of itself; (2) humans, in particular, can be conscious of the ways that evolution shapes who we are; and (3) with awareness and skill, it is even possible for us to shape the inheritance systems for future generations through careful analysis, planning, and implementation. With many global threats confronting our now-planetary-in-scale species, it is urgently incumbent upon us to do so.

One Culture, Two Cultures?
How Many Cultures, How Long?

By Kurt Johnson

When asked “Can Evolution be Conscious?” reactions can occur aptly reflecting the “informal definition” (as stated in most dictionaries) of schizoid, that is, “having inconsistent or seemingly contradictory elements.” I’ll use the term further below.

This results because the question immediately arises, is one referring to “simply” the basic mechanics of biological evolution or also what becomes involved when an intelligent species, of conscious agency and choice, is included “atop” that evolutionary process?

There is a historic landscape of siloed thinking on this question across evolutionary biology and a more recent field -- consciousness studies. Underlying assumptions and points of entry on the conversation differ greatly. These span the range from reductionist mechanics (and all that discipline has contributed to our knowledge of evolutionary process) to the implications of the role of a top tier species like Homo sapiens as a “natural selector-in-chief”. Global thinking across

References

Can Evolution Be Conscious?

First of all, we have to acknowledge a broad landscape encompassing humankind’s historically subjective and objective ways of knowing — whether reflecting the more conventional view of C. P. Snow’s “Two Cultures” (and a later suggested “Third Culture”), or the views of current “integral philosophies” recognizing various interactive domains or universes of discourse ranging from the more subjective (like arts and “spirituality”) to more objective (conventional science) in the endeavors of humankind. Moreover, in common parlance, depending on what “circles” one is in, some domains may be considered “in” (valid to discuss) and others “out” (considered invalid to discuss).

There are, at one extreme of this landscape (and far from the conventional) views that center everything, material and otherwise, on consciousness itself. These must be mentioned and may be a wave of the future. This view, developed (among others) by Drs. Deepak Chopra, Stuart Hameroff, Rudolf Tanzi, Peter Russell, Frederico Faggin and colleagues through the annual “Science and Nonduality Conference” is well summarized in the popular literature by Chopra.

Within more conventional boundaries, a sizable mainstream literature exists on the complex feedback mechanisms by which the conscious activities of human agency affect the core mechanical elements of biological evolution itself. Every time humans, in what Teilhard de Chardin referred to as the realm of consciousness (“noosphere”), do something affecting elements of the geosphere or biosphere humankind is part of influencing myriad aspects of the course of evolution. Today we are even aware that geosphere and biosphere are not clearly distinct,

given the inherent interrelations of life-related gases and liquids in the process of Plate Tectonics. An academic discipline, modern “Discursive Theory” (21 million entries at Google) examines how human narratives and resulting actions create undeniable effects. Examples widely range from the obvious effect on human history of certain books (Adolf Hitler’s Mein Kampf or Thomas Paine’s Common Sense as only two examples) to consequences, intended and unintended, of the “greening” of various industries in the latter 20th Century when a more “green narrative” was required by “political correctness” and had unintended consequences on both corporate cultures and environment arenas like pollution, resource extraction, deforestation and biodiversity. The latter example embraces myriad aspects influencing fundamental elements of biological evolution in geosphere and biosphere.

Controversially, these interactions could be construed as reflecting Dr. Rupert Sheldrake’s contentious theories of “morphic fields”—the view that there are collective subjective effects on reality that influence the actual direction of development and events. Indeed, conflating the more conventional examples above with those of Sheldrake reflects the sometimes “schizoid” nature of the current global discussion (in some circles, Discursive Theory as an “in” [valid to discuss]; Morphic Fields as an “out” [not valid to discuss]).

An ambitious and extensive document by the Canadian Research Institute currently influential in the United Nations community reports in detail on the varieties of interaction between complex elements of human culture, feedback loops regarding human behavior, and resulting effects on the global environment both now and projected into the future. Interactions are highly nuanced, including innumerable interconnections of cultural narratives, religious beliefs, roles of science and technology in societies, changes and shifts in prevailing paradigms and worldviews (even social media), and the actual effects on multitudes of elements in the global environment itself and the relationship to biodiversity, environmental sustainability and so on. Across all these arenas, both the media (and fate) of humankind as well as the process of evolution are inextricably intertwined.

As David Sloan Wilson said at recent conferences “Steering Toward the Omega Point.” [my paraphrase] “When it comes to evolution’s relation to humankind and its cultures, someone has to be at the wheel. If not, we may find, in hindsight, that evolution took us somewhere we didn’t want to go.”

Where to from here? There seems little doubt that this discussion worldwide is moving toward more integration and fewer silos. If we look at the “mosaic” of the discussion mentioned above, we can hope the gaps between the component conversations are naturally narrowing with time. However, this is a global conversation with all the foibles that come with that. Only time will tell.
By Stanley N. Salthe

Can Evolution be Understood as a Conscious Process?

My approach is explored by considering Aristotelian Causal Categories, focusing on Final Cause. I then consider the possibility of understanding this question from an ‘internalist’ perspective.

Organism ontogeny could be non-controversially viewed as finalistic. That is, it can be viewed as being globally entrained by full realization, as well as being pushed forward by local efficient causes. The fact that it can surmount many experimental impediments argues for this. Then, the concept of convergent evolution should also be considered an important application of finality in evolutionary biology.

Even basic physics entertains finality – in the Second Law of thermodynamics. Thermodynamic equilibrium is attained via multiple pathways. This final inevitability is implicit in Big Bang cosmology. Also, the logical inevitability of finality is demonstrated by the fact that dynamical systems theories involve structural attractors. In evolutionary biology, the currently predominant Dobzhanskan approach views selection as a continuing gene pool adjustment in the context of ever-changing environmental conditions. Clearly, a ‘moving target’ is still logically an attractor – and is logically a final cause.

In order to examine the possibility that biological evolution may be viewed as a conscious process, one must define ‘consciousness’ appropriately. Upon Googling ‘consciousness’, we find one major definitional attractor: the condition of being aware. While awareness is a reasonable fitting some theoretical scheme, it appears to be random. Both things are ‘true’. Internalism makes a choice; if apparent externally and not internally a system see itself as if from outside.

We now face the dichotomy between chance and choice. My perspective on this involves the ‘internalist’ discourse. Internally a system makes a choice; if apparent externally and not fitting some theoretical scheme, it appears to be random. Both things are ‘true’. Internalism attempts to understand a system from within, the inquirer being a part, and therefore unable to see itself as if from outside.

Internalism is modest in scope, being focused locally, as things are happening, and would be reported in the present progressive tense. Examples in serious discourse moving in the internalist direction have been Maturana and Varela’s ‘autopoiesis’, dialectics, phenomenology, operationalism in physics, second-order cybernetics, the ‘emic’ approach in anthropology, aspects of quantum mechanics.

While externally we might describe, say, a dinner -- the setting, menu, and so on -- internally the representation of the dinner could be reports on
a sequence of tastes. Note the incommensurable kinds of knowledge here – externally we test things, internally we ‘prove’ them (in the Buddhist sense) to ourselves. The reason for taking the internalist stance is that generativity cannot be approached externally. In that context nothing new is produced except by error, giving us, e.g., the mutation model in current evolution discourse. Internally chance is choice. Important internally would be the concept of vagueness. Fuzziness is a step in this direction but is still externalist. Any system during its development changes by becoming more definitely embodied.

As a system hardens into senescence, it becomes unable to marshall the requisite variety needed to survive perturbations and gets recycled. Then, might evolution be understood in an internalist mode? Might that be how we would locate its consciousness? Again, what difference would this make to our understanding of biological evolution? Perhaps it could lead more of us to love its products more than we do? Might it allow us to anticipate some of its current trajectories in organisms that we relate to? And could that ultimately inform social or political policies?

References
This thought experiment is, of course, beginning to get as silly as the brilliant Monty Python’s Cheese Shop skit — only not funny, so I should stop. In lay terms, we would simply and finally say that humans made new life come into being. (Let’s try for now not to make matters worse by saying that humans consciously made new life come into being.)

That said, one may argue the thought experiment is pointless. Not because creating life from scratch is a fundamental impossibility — that’s a tough case to make — but because we’ll never be smart enough to do it or, rather more cynically, we’re already stupid enough to destroy ourselves before we do it. Granted.

Imagine then the first system able to self-sustain and self-reproduce to have ever existed. Beyond reasonable doubt one such system, however simple, did exist. It turns out that here — apart from the half-suppressed adverb “consciously” — the answer to all explanations suggested in the thought experiment will be the same: No. That first system spontaneously came into being. In other words, it somehow emerged. In this respect, I have argued that a necessary condition for individuation — specifically, for the multicellular individuation unique to eukaryotes — is a regime underpinned by “self-organizing” systems whose dynamics are statistically independent from each other (at least within certain critical regions in space). When two statistically independent “self-organizing” systems found in chromatin becomes coupled across the extracellular space such that the constraints — understood as the thermodynamic boundary conditions that allow energy to be released as work — required by each system are generated by the other, the multicellular individual emerges. And it does so as an intrinsic (with respect to the whole cell population), higher-order constraint on lower-order cellular dynamics.

Yes, at least one agent did emerge spontaneously in the history of the Universe, and another (conscious) agent could figure out how to elicit the spontaneous emergence of a new agent — with no standard (or not that standard) evolutionary mechanisms involved whatsoever in either case. The common denominator here is not consciousness, but the spontaneous emergence of systems that are agents, systems with teleological properties: the “end-directed” properties that unequivocally characterize life. This common denominator is, I suggest, the substantial update evolutionary theory currently lacks. Note, however, that to say even an individual cell is an agent or, in other words, an autonomous, causally efficacious system in the world, is a huge claim. The dynamics of the individual cell, for it to be an agent, must be to some extent indecomposable in a fundamental sense — otherwise said dynamics are only the effect of what molecules, inanimate and purposeless, do. Interestingly, “individual” comes from individus, which is the Latin for the Ancient Greek átomos, or indivisible.

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When two statistically independent “self-organizing” systems found in chromatin become coupled across the extracellular space such that the constraints — understood as the thermodynamic boundary conditions that allow energy to be released as work — required by each system are generated by the other, the multicellular individual emerges. And it does so as an intrinsic (with respect to the whole cell population), higher-order constraint on lower-order cellular dynamics. There is also compelling evidence for aging at the multicellular-individual level explained as a direct byproduct of this emergent higher-order constraint. The consensus evolutionary account is that aging is the result of hundreds of millions of years of relaxed selection on late-life maintenance traits.

Acknowledgments

I wish to thank David Sloan Wilson, Maximus Thaler, and Mel Andrews for inviting me to contribute to this commentary.

References

This View of Life is the online magazine of the non-profit think tank The Evolution Institute, which applies evolutionary science to pressing social issues, deploying a multi-disciplinary team of experts in biology, the social sciences, and Big Data. Projects of study include the Norway Initiative on global quality of life, the Urban Initiative on sustainable community and educational development, and Sheshat, a large, multidisciplinary database of past societies, used to test theories about political and economic development.

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