

Daniel C. Dennett

**From Bacteria to
Bach and Back**

The Evolution of Minds

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For over half a century, Daniel Dennett has been engaged in the grand naturalistic project of examining the world in accordance with scientific theory. His latest book, *From Bacteria to Bach and Back: The Evolution of Minds*, is a work of enormous ambition. This time, he is “going for the whole story” about the evolution of intelligence, beginning with unicellular organisms and culminating in the intellectual achievements of humans.

The theoretical hard core of Dennett’s book is Charles Darwin’s theory of evolution by natural selection. The theory states that changes in a population across generations result from heritable variations in the traits of members of that population differentially affecting the reproductive rates of these members of the population. With regards to biological organisms, the variations are partly due to mutations in genes, which are heritable through asexual and sexual reproductive processes. As we shall see, though, selective processes may also apply to variations in structures other than genes that are heritable through other means. For Dennett, the theory of evolution presents what he calls a “strange inversion of reasoning”, whereby the appearance of competence does not indicate the presence of an intelligent designer but instead is explained by the purposeless process of natural selection. Of course, the theory of evolution is nowadays widely accepted, and we widely consider creationism to be false. However, Dennett suggests that there remains some resistance to applying the theory to human intellect. A central aim of his book, then, is to show how the mystery of the human intellect might be dispelled by a more extensive application of the theory of evolution by natural selection.

The book roughly has a historical structure, albeit with some digressions. Beginning with the world before the appearance of life, Dennett conjectures that cyclical patterns at different temporal scales, including seasons, tides, night and day, and the water cycle, may have resulted in cumulative changes in the earth’s conditions. These conditions, in turn, became capable of supporting simple forms that are capable of replicating. Given the pau-

city of empirical evidence available, any hypothesis about how these forms took shape is going to be highly speculative, but Dennett’s discussion is well informed and has *prima facie* plausibility. Dennett then takes us from unicellular organisms, via animals, to the achievements of humans, including language, culture, and technology. Finally, he reflects on the prospects of intelligent machines. Interestingly, Dennett does not think that the comprehensive capacities of machines are on the verge of reaching the levels reached by the comprehensive capacities of humans, because the comprehensive capacities of machines are parasitic on the comprehensive capacities of humans. Hence, for Dennett, the comprehensive capacities of machines currently remain on par with the comprehensive capacities of simpler organisms.

As always, Dennett offers an engaging read. He writes with a familiar style which remains accessible despite also being technical. Although his position is presented as being informed by science, much of what he says in the book is conjectural, rather than empirically established. Accordingly, we should be aware that what he says may reflect his partisan view on a contested topic, rather than scientific consensus. For example, Dennett assumes an adaptationist view of evolution, according to which the only important explanation for the presence of a trait in an organism is that this trait had been selectively advantageous in the ancestors of that organism. While certainly influential, this view is not universally accepted among biologists. Famously, Stephen Jay Gould and Richard Lewontin have argued that the evolution of a trait may also be influenced by historical limitations, morphological constraints, and developmental contingencies. Dennett has little time for these critics in this book. In previous work, he has offered an *a priori* defence of adaptationism, which characterises natural selection as an algorithm involving repeated steps of chance variation, differential survival, and imperfect replication. This is an elegant formulation, but it is a formulation that has been abstracted away from the other variables and constraints in the world that could also affect the evolutionary process. Therefore, what turns out to be the case *a posteriori* may not be what is *a priori* expected by the algorithm.

Occasionally, Dennett seems to prioritise this sort of algorithmic reasoning over the empirical detail. An example is his peculiarly provocative discussion of gender, which he introduces early in the book. Dennett asks the question of why there have been more male geniuses than female geniuses recognised in history. Later in the book, he plausibly states that the answer is likely to lie more in “culture

than in cortex". However, in a footnote, he also claims to find it obvious that the selective pressures posed by asymmetrical parental investments would result in "females that do the evaluating and males that do the strutting". The trouble is that this adaptationist reasoning is undermined by empirical evidence regarding the diverse relations between the sexes in humans and in animals. For example, among our primate relatives, bonobos form egalitarian societies where both sexes are promiscuous, gorillas form patriarchal societies where dominant males are polygynous, gibbons usually form monogamous pairs, but females are also frequently polyandrous, and lemurs form matriarchal societies where females engage in more agonistic displays than males. These examples show that relative gamete size does not necessarily correspond to a given pattern of sexual behaviour. The relations between the sexes turned out to be much more diverse and flexible than the behavioural roles that Dennett derives through adaptationist reasoning. So they are better understood by examining the actual conditions and contexts that contributed to their manifestations than by committing to what might seem to follow from an algorithm.

Further to the theory of evolution, Dennett suggests that another "strange inversion of reasoning" is presented by Alan Turing's creation of the computer, which shows how a system can perform arithmetic without necessarily having to comprehend what arithmetic is. Hence, an expression that frequently appears in the book is "competence without comprehension". This is the notion that most of the things that organisms do to thrive in the world and cope with one another are not comprehended by them, but are performed unthinkingly. According to Dennett, there are reasons why these behavioural processes developed, which are to do with the pressures of natural selection, but the organisms themselves do not have those reasons. He uses the example of an antelope leaping high in the air during its attempt to escape a predator, a behaviour known as stotting. A suggested evolutionary reason for stotting is that it is an adaptive trait which signals the antelope's fitness to the predator, thus diverting the predator's attention to slower prey that is not able to stot. However, this reason need not be comprehended by the antelope. That is to say, stotting may be advantageous for the antelope's survival, but the antelope may be entirely clueless about why it is advantageous to stot.

Dennett suggests that comprehension complements competence only after the appearance of human reflective thought. However, it could be objected that the account of com-

prehension he assumes is too narrow. In the above animal example, it is possible to accept the evolutionary reason for stotting without denying that the instantiation of this behaviour involves some degree of comprehension. Of course, it would be anthropomorphism to suggest that the antelope comprehends the fitness signalling effect of stotting and methodically uses this comprehension to deter the predator. Nonetheless, it is plausible to say that the antelope at least comprehends the threat that the predator poses and that this comprehension motivates behaviour which averts this threat. And so, the threat that a predator poses can be part of the evolutionary reason for stotting and something which the antelope comprehends.

Although he grants comprehension to human reflective thought, Dennett suggests that much of cultural evolution still proceeds by way of "competence without comprehension". As a putative mechanism, he draws on Richard Dawkins' concept of the meme. A meme is a unit of cultural transmission, such as a word, a song, or a fashion trend, that spread by being copied from person to person. Like genes, memes can undergo variations as they are copied, and so are supposedly affected by similar selective processes to genes. In other words, the variations of memes that are more popular are copied at higher frequencies and become more prevalent in our culture. Think of, for example, the nursery rhymes that have been sung to generations of children, the formal ways of greeting one another that became established in societies, and the traditional festivals that were celebrated for centuries.

In some respect, Dennett's support for the meme is in accordance with the increasing recognition in the philosophy of biology that the gene is not the only important unit of selection. Other factors influence how organisms develop and behave, which are also heritable. Perhaps the most important example of such a pluralistic approach to evolution is developmental systems theory, which emphasises how social patterns, environmental conditions, and epigenetic resources can also exhibit the high levels of copying fidelity and stability that are traditionally associated with genes. Thus, we tend to resemble and behave like our parents not just because we share their genes, but also because many of the material resources, styles of interacting, and social conditions are passed on, copied, and reconstructed across generations. In another respect, however, Dennett's focus in this book is rather different. He focuses on heritable cultural units not because he is interested in exploring the causal roles that they have in how individuals develop, but because he is interested in positing that these cultural

units are promulgated through processes that do not require us to comprehend or endorse them.

The idea that there are heritable units other than genes is correct, but there are problems with positing memes as the units of cultural evolution. Dennett is aware of these problems and dedicates a chapter to addressing some objections. These include the objections that cultural changes do not occur in discrete units, that memes do not have properties analogous to alleles, that memes are not predictive, and that memes are not explanatory. The last objection deserves more attention, as it casts serious doubt on the epistemic value of the memetic approach. To give his approach wide scope, Dennett greatly expands the concept of the meme to encompass anything from a simple phoneme to complex cultural practice. The worry is that this makes the concept too broad to be of explanatory use.

Moreover, it is suggested that cultural evolution proceeds via more popular memes being copied at higher frequencies than less popular memes, but no account is given of what property makes one meme more popular than another meme. Without such an account, we are left with the circular claim that the most popular memes are copied the most frequently, where the most popular memes are just defined as those which are copied the most frequently. Dennett partly concedes this concern about explanatory value. As a conciliatory note, he proposes that a richer understanding of culture also requires knowledge from “psychology, anthropology, economics, political science, history, philosophy, and literary theory”. In light of the above, it is doubtful that the memetic approach adds much more to what can already be explained by traditional social theory.

A further disanalogy between cultural evolution and biological evolution concerns the much greater role of intention in the former than in the latter. Dennett wants to suggest that much cultural evolution, like biological evolution, proceeds via a purposeless process of natural selection, but he is not entirely clear which cultural items he considers to be selected purposelessly. Quite often, intelligent insights also influence how cultural items are produced and promulgated. For example, an author who writes a children’s story may do so to write a bestseller, and so may purposefully think about the visual, literary, and narrative features that are likely to make it appealing. The author may also purposefully increase its popularity through judicious advertising. Of course, we can accept the claim that there are selective processes outside the author’s control which influence how popular the story is compared to other stories,

but this claim does not undermine the suggestion that prior purposefulness also influences the story’s popularity. The relation between intending to write a bestseller and writing a bestseller is not merely coincidental. In this respect, cultural evolution is more like artificial selection or genetic modification than natural selection. The trouble with the memetic approach, then, is that it underplays the role of comprehension in cultural progress. Purposeless processes can affect how cultural features spread, but purposeful insights are often significant influences as well.

This brings us to the part of the book with which Dennett’s critics would perhaps disagree most, namely his discussion of consciousness. In the penultimate chapter, Dennett suggests that conscious experience is a useful illusion, much like the image projected by a computer screen. This is a claim which Keith Frankish has recently termed illusionism. Philosophers critical of Dennett’s view argue that illusionism is false and, indeed, incoherent. To claim that something is illusory is to say that it seems to be real when it is not, but such seeming is itself a conscious experience, and so this claim must presuppose that conscious experience is real. Accordingly, it is nonsensical to claim that conscious experience itself is an illusion because an illusion presupposes the reality of conscious experience. This recalls René Descartes’ famous argument that I cannot doubt the existence of myself as a first-person conscious subject, because the fact that I exist necessarily follows from the fact that I doubt. Likewise, when presented with an appearance, I can doubt whether there is something in the world to which the content of the appearance corresponds, but the presence of the appearance itself is a given and the fact there there appears to be something rather than nothing necessitates the existence of consciousness. Dennett wants to claim that my first-person point of view of my own mind may not be so different from my second-person observations of others’ minds, inasmuch as I neither see the complicated neural processes in my brain nor in others’ brains, but the very fact that there is such a first-person point of view entails the reality of subjective experience. Knowledge of consciousness, then, marks the point at which scepticism becomes false because the existence of consciousness is a necessary condition of possibility for any appearance, illusory or otherwise.

For many of Dennett’s critics, this marks the limit of his reductionism. Dennett wants to try to turn his back on phenomenality because the particular physicalist story he tells fails to account for its reality. We might suspect that the issue is partly conceptual and that he is

neglecting to use the meaning of consciousness as it is usually understood in the philosophical community. Nonetheless, there is no need for Dennett to try to turn his back on something so indubitable for the sake of reductionism, even by his standard. In his previous work, Dennett has warned against what he calls “greedy” reductionism, which is the zeal to explain all things reductively in terms of microphysical processes, despite the resulting analyses failing to capture important features of these things. He instead endorses what he calls “good” reductionism, which recognises the contributions of different scientific disciplines and seeks to reduce things only to the extents warranted by the empirical data. Acknowledging that a phenomenon cannot be adequately explained at a microphysical level, then, does not amount to mysticism or mysterianism. To take an example from a prominent opponent of Dennett, the contemporary dualism proposed by the philosopher David Chalmers is wholly nontheistic and consistent with a naturalistic view of the world. That is to say, we can accept everything that science reveals to us about evolution, behaviour, and culture while also accepting that this form of dualism is true. The point of this example is to show that a proponent of “good” reductionism can still take seriously what Dennett says about natural history while conceding that phenomenality may require a different sort of account. And so, Dennett’s disinclination to admit the reality of whatever eludes his reductive net raises doubt about whether he has heeded his own warning against “greedy” reductionism.

In the final chapter, Dennett considers the question of what is the value of comprehension, if much of what we treasure has been achieved with mere competence. Socrates is famously reported by Plato to have proclaimed that “the unexamined life is not worth living” and many philosophers may be inclined to agree, explicitly or implicitly, that there is some intrinsic value to comprehension. We think it is good that we understand ourselves and how we relate to the world. Dennett himself states that he finds comprehension to be “one of life’s greatest thrills”, but his defence of comprehension is largely instrumental. He reflects on how we rely unthinkingly on technological artefacts for everyday tasks, such as satellite navigation systems to reach our destinations and intelligent virtual assistants to control home devices. For all of this to be possible, a huge social infrastructure is needed. Dennett’s concern is about what happens if this infrastructure breaks down and we are unable to comprehend how to repair it due to our increasing tendencies to rely on the machines unthinkingly. Sombrey, he warns us

that civilisation is an ongoing endeavour and that “we abandon our attempt to understand it at our peril”.

There is another pertinent example that is not explicitly mentioned by Dennett, but which reinforces his defence of the instrumental value of comprehension. This is the example of anthropogenic climate change. Throughout the history of civilisation, we have competently manipulated environmental resources in various ways that have increased our survival prospects and have contributed to the rapid proliferation of our species across the planet. Among other things, these include the intensive farming of livestock, the combustion of fossil fuel, and the inexpensive manufacture of non-biodegradable plastic. Following the sort of adaptationist reasoning endorsed by Dennett in this book, it could be suggested that these practices have persisted due to selective pressures, insofar as the societies that took them up had higher rates of production that could support larger populations. However, comprehension is showing that competence can only go so far. It is now scientifically established that anthropogenic climate change is happening because we have been so competent at manipulating environmental resources in these ways. We know that such practices, which may initially have been advantageous for the proliferation of our species, are now severely harming the welfare and survival prospects of future generations. And so, to continue down the path of mere competence would be calamitous. Only by comprehending the implications of our practices can we become able and inspired to curb our entrenched proclivities and manage our destinies differently.

While we may not agree with all that is claimed in this book, *From Bacteria to Bach and Back: The Evolution of Minds* is a valuable contribution to the literature. Dennett is excellent at communicating complex topics and his conjectures are always captivating. Readers would do well to note that many of these conjectures reflect his prior theoretical assumptions rather than established scientific facts. Nonetheless, the points he raises will certainly motivate philosophers to advance these discussions further with fresh arguments and novel theories.

Hane Htut Maung