EDITOR'S FOREWORD TO SPECIAL ISSUE

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CULTURAL EVOLUTION AND GENERALIZED DARWINISM: THEORY AND APPLICATIONS

Daniel Dennett

Natura non facit saltum
—Leibniz, Linnaeus, and others

Evolutionary theory has been a magnet for revolutionaries since Darwin's "strange inversion of reasoning" (Beverley 1867) overturned the idea of Intelligent Design in 1859. And hence it has also been home over the decades to redoubtable champions of the day's orthodoxy, intent on squelching whatever upstart iconoclasts were currently mounting the barricades with their manifestos. It has all been thrilling, with ringing denunciations of heresy from the defenders of *echt* (neo-) Darwinism and equally ringing declarations of the impending death of neo-Darwinism, whether by the "hardening of the modern synthesis" (Gould 1983), or by evo-devo or by epigenetics, or whatever other "revolutionary" idea is in the limelight. Those who would prefer to stay out of battle have often taken the reasonable precaution of avoiding anything that smacked of heresy, denying themselves the dangerous luxury of anything that looked remotely "Lamarckian" (e.g., the Baldwin Effect) or "saltationist" or, shall we say, *imperialist*: the greedy application of Darwinian theory beyond its "proper" limits. The widespread reluctance to extend Darwinism to account for features of human culture is, I suspect, in large part due to nothing deeper than the desire not to pick a fight with our many colleagues in the humanities and social sciences who unaccountably find evolutionary thinking to be philistine, reductionist, and somehow disrespectful of the glories of human civilization. Are there better reasons?

William Paley (1802) was right about one thing: mechanisms as intricate as watches do not coalesce by coincidence, and neither do exquisitely designed ribosomes or motor proteins. These are all the products of substantial histories of R&D, research and development, and one way or another all that design work must be accounted for, as a series of gradual or not so gradual transits away from chaos to more ordered structures, preserving gains by some sort of ratchet. Before Darwin all design was seen to trickle down, directly or indirectly, from the Intelligent Designer: God designed the eagle's eye and the hummingbird's wings, and if Leonardo da Vinci or Jane Austen or John Harrison (inventor of the chronometer) were able to produce intelligent designs, it was because they were blessed with *God-given* talents. As Alexander Pope proclaimed in a charming couplet:

> Nature, and Nature's laws lay hid in night:
> God said, Let Newton be! and all was light.

Since Darwin, we have come to appreciate the tremendous power of gradual bubble-up processes of *non*-intelligent design, competence without comprehension (Dennett 2017). Why, then, should researchers who wholeheartedly endorse natural selection as the central mechanism that illuminates the origins of the sub-cellular nanomachinery of biology, as well as the macro-machinery of eyes, wings and circulatory systems built out of those brilliantly designed pieces, shrink from extending these powerful evolutionary ideas to the many excellent products of human culture? It is unlikely that they agree with Freeman Dyson, who has opined:

> Technology is a gift of God. After the gift of life it is perhaps the greatest of God's gifts. It is the mother of civilizations, of arts and of sciences.

If not God's gift, then whose? The traditional answer has been that technology—and culture more generally—is the gift of human geniuses, intelligent designers. Most of them are anonymous, like the unknown inventors of the spear, the plow, the wheel, and the sail, but a few of them are celebrated as heroes, from Archimedes to Thomas Edison and Tim Berners Lee. Did all these geniuses have language, or were some of their innovations produced and propagated by pre-linguistic hominins? Language, the chief enabler of *cumulative* culture, is a "communication technology" (Dor 2014), and so it, too, is not a gift of God but something that had to evolve. It is tempting to suppose that without language, there would be no mechanism, no memory ratchet system (like DNA), for preserving *cultural* innovations long enough to build further innovations on top of them. So it is also tempting to see all the well-functioning elements of culture as the result of conscious, intellectually explicit processes. We should resist these temptations, since they lead to awkward conclusions about early giant steps in Design Space that are as improbable as the "hopeful monsters" of Goldschmidt (1944). Nobody invented language, not even a succession of dedicated would-be language-inventors, and for that matter, even in the modern cases of quite sudden giant steps in technology, no single author or inventor deserves all the credit—not Tim Berners Lee or Al Gore! Edison's oft-quoted line about genius should actually be amended: 99 percent perspiration, 0.01 percent inspiration and 0.99 percent luck.

Today we all—even the least "creative" of us—engage in the recursive construction activity of intelligent design so naturally that we can hardly imagine any other way things might come to be designed. Whether writing a letter or painting a picture or inventing a machine, we fix on a (revisable) goal, take stock of the necessary ingredients, and set about trying to make something. When we notice a novelty of some interest or potential utility, we ask what it's called or give it a name, and thereby add a new ingredient to our capacious cultural storehouse. "Hmm, if I were to attach one of these thingamajigs to a couple of those gizmos just so, I'd have a whatchamacallit that might be able to do *X*." Recipes, drafts, blueprints, plans, scale models, analyses, brainstorming sessions, explicit predictions, deliberate trial and error exploration of variations—all the conscious activities of an intelligent human designer seem to depend at least indirectly on language, even when the designer works wordlessly with diagrams and silent manipulations of materials. It is the designer's ability to *explain* what she is doing (and why) that persuades us of her comprehension, and satisfies our curiosity about her intelligence, about her *authorship* of whatever she produces. But are all the design innovations of human culture such brainchildren of intelligent designers, inhabitants of the *cognitive niche* (Pinker 2003; 2010)? Why would that be, and would it even be possible?

When we turn to the capabilities of other species, we see a rich variety of talents,

roughly placed on a gradual scale from innate "instincts" that genetic evolution provides "hard-wired" at birth, through readily learned, or triggered, adaptive responses, through quite mindless trial-and-error conditioning, through stimulus-enhanced (attention-directing) learning with help from parents to a few remarkable instances where parents adopt methods or systems of instruction (in flying, hunting, hiding, . . .), but, of course, no *explicit* instruction (Dor 2014).

How much comprehension should we attribute to the participants in these various instances of learning or design-enhancement? How much do corvids understand when they observe their conspecifics solving a novel problem? How much do lionesses understand when they lead their cubs through what seem to be hunting drills? We should be wary of over-attributing comprehension in these cases of highly appropriate behavior. The stotting gazelles who thereby advertise their vigor to the lions who thereupon elect to chase other, non-stotting gazelles need not appreciate the tactical explanation of this ploy in order to benefit from it, nor do the lions need to understand why they are not attracted to stotting prey (Dennett 2017). How much do birds understand when they build species-typical nests, never having seen one built? Their construction techniques tend to improve over several seasons, so there is some impressive subtlety to the imperatives somehow laid down by their genes. And, whatever the ultimately structural and mechanical details of these algorithms may be, we can be sure that they have been shaped, mindlessly, by the incessant selective forces of natural selection which by blind trial and error gradually uncover the free-floating rationales of good nest engineering for each species.

Setting aside as obsolete any dichotomy between mere automata—"thoughtless brutes" in Descartes's phrase—and beings with a *res cogitans,* a thinking thing or soul, it is not too hard to accept a gradualism to fill the gaps between the world of wild animals and the world of civilization and culture. Why, then, do so many thoughtful researchers on human culture largely ignore the Darwinian processes that one would think could explain this accumulation of talent? Perhaps because they think that once such processes have designed human brains, the activities of those intelligent brains suffice to explain all the further design work that has gone into culture. Mesoudi (this issue) shows that there is a better idea: a transition from blind trial-and-error to intelligent trial-and-error. Cultural evolution has itself evolved, as its accumulated products have enabled ever more directed (and disruptive) innovations (Dennett 2017).

Heyes' (2018) suggests that *meta-cognition,* our capacity to reflect on our own thinking, is a strongly distinguishing talent, and Distin (this issue) analyzes the explosion of cognitive ability that is engendered by metarepresentation and its offspring, "artefactual languages" that are at least often the result of deliberate intelligent design. (See also Karmiloff-Smith 1979; Sperber 2000; Dor 2014). Is "going meta" a distinctively human talent? And would it mark a giant evolutionary step? Many regularities in animal behavior traditionally seen as instincts, genetically inherited, turn out to be animal "traditions" passed on perceptually, typically from parent to offspring (Avital and Jablonka 2000). This opens up a broad and rich field in which to search for a gradual emergence of what might be called cultural *appreciation*, the adoption of culturally transmitted behaviors *for recognized reasons,* not merely as the result of some transmission bias. Suppose, then, that while animal traditions are in general as mindlessly evolved as instincts, differing only in availing themselves of a second, perceptual-social information highway in addition to the genetic highway (Boyd and Richerson 1985), human culture evolves (in the neutral sense of changing over time,

adding and losing and revising elements) because of the conscious comprehension of human initiators and transmitters of culture. In between these two extremes lie all the varieties of biased transmission and metacognitive evaluation that can be observed in both human and animal cultural transmission. The evidence for at least functionally metacognitive processes in animals (for instance in monkeys that can opt out of low-confidence trials) suggests that even in the case of metacognition there is no bright line separating us from languageless beasts (see Rathkopf and Dennett forthcoming).

Another explanation for the reluctance of theorists to take Darwinian gradualism seriously in their accounts of culture is simply a failure of imagination about the resources available to Darwinian thinking. Baraghith and Feldbacher-Escamilla (this issue) explore the space of possible generalizations of evolutionary theory. Rosenberg (this issue) calls for a *Gestalt switch,* pivoting on a key question of Darwinian theory: *Cui bono?* Who benefits? (Dennett 1995). The successful spread of a new style of ax may well depend on its enhancement of the genetic fitness of forest-dwelling ax-handlers, but other cultural innovations may spread simply because they can, not because they raise the fitness of their hosts. They may even spread in spite of depressing the genetic fitness of their hosts, the way diseases spread. Dawkins' (1976) insight that cultural items—memes—*can have their own fitness,* just like viruses and other parasites that influence behavior, opens up a large and important theoretical space left unexplored by many would-be Darwinian theorists of culture. (For an analysis of fitness concepts see Huttegger, *et al*. this issue.) This idea is finally getting a foothold among theorists, and several of the essays in this issue explore aspects of this important idea seriously, though there are reservations expressed that it might be a mere "heuristic for future research" (Reydon this issue).

Rosenberg points out that the beneficiaries of some cultural innovations are the institutions themselves, and advances Malinowski's distinction between manifest and latent functions to propose that people may be just as oblivious to the utility of their institutions as butterflies are to the utility of their protective coloration. Mesoudi (this issue) arrives at the same observation by a different route, as does Henrich (2015).

Schurz (this issue) sees cultural evolution as "brain-based" in contrast with genetic evolution which is "germ-cell-based," but also notes that memes are "software," and none the worse for that. This largely obviates Aunger's (2002) concern about imagined difficulties with identifying memes across brains. (Some simple examples: PCs and Macs are quite different at the level of computational architecture, but there is no problem identifying Microsoft Word across these different platforms. Queen Elizabeth and I both harbor the *bifocals* meme, and we couldn't if we didn't both have brains, but there is no strong reason to suppose the patterns in our brains responsible for this software sharing are neuroanatomical twins.) Schurz explores the population dynamics of memes by counting "the number of persons that adopt the meme," a good start but only as a drastic oversimplification or toy model. For one thing, we need to distinguish *adoption* from, say, *harboring*. Just about everybody has—harbors—the terrorism meme, but few of us adopt terrorism. A reflection for further consideration: the phenomenon of heterozygote superiority, as famously instantiated in the survival of sickle-cell anemia, raises a host of questions about parallel possibilities among memes. Might a "single copy" of the kidnapping meme protect your child from kidnapping, while a "double dose" would incline your child towards adopting kidnapping as an available choice? Memes aren't stored as paired copies like genes, of course, and measuring the influence of a meme on a

host is not likely to yield good answers in any simple mathematical formula, but differences of opinion about such questions motivate a substantial amount of social activism, encouraging what might be called *cultural hygiene*. Recognizing that memes have their own fitness, independent of their effects on their hosts, may clarify some of these contentious issues.

Those are the points that prompted my responses here, but there are a bounty of other insights in these essays, which suggest that a generalized Darwinism is, if not yet clearly in focus, a realistic goal for future research.

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