



The Paradoxes of Evolutionary Convergence

Simon Conway Morris

Summary

In contrast to physics and chemistry, evolutionary biologists emphasise the role of chance and the quiriness of outcomes (such as tulips, or humans), not to mention the random resetting of ecological agendas by mass extinctions. As on Earth, so “Out there beyond Earth”. Thus we see a firm expectation of extraterrestrial intelligences, but most likely non-humanoid. Here I offer a set of radical alternatives. I suggest something like a human evolving is an inevitability but, that said, paradoxically we are alone in the galaxy. Far from derailing an evolutionary trajectory, mass extinctions are creative, accelerating what is going to happen in any case. And a final paradox: the cognitive gulf between ourselves and animals is real. Evolution is not quite what it seems.

Christianity and the sciences look pretty immiscible. Perhaps somewhere there is a link between the gravitational constant, a Big Bang and God’s creative acts, but if so it won’t be a key feature in Introductory Cosmology. These apparently tenuous connections become even more strained when it comes to evolutionary biology. What does the feeding of the five thousand (reported in all four Gospels), have to do with natural selection or CRISPR-Cas9? Working in the shadow of Darwin, who experienced a withering of his religious and artistic sensibilities, the majority of evolutionary biologists are gently agnostic, but seldom deplore the activities of their more noisy and militant atheist colleagues. But not all share this view, and amongst its diverse purposes The Faraday Institute seeks to explore how a Christian and fully signed-up supernaturalist (such as myself) can also be an evolutionary biologist (such as myself).

At this early stage a few health warnings may be necessary. Yes, I am seeking some congruence of understanding, a consistency between what the history of life shows (so far as we can ever know it) and the Christian tradition reveals (as far as we can ever comprehend it). Applause, followed by some laughter. So is our author a proponent of “intelligent” design, one of those pesky creationists, cherry-picking examples, and employing numerous sleights of hand and twisted arguments? Certainly not. I wrote “congruence” and more specifically I ask: How is it that our world is so ordered that we can understand it, how did the evolutionary routes provide not only a series of increasingly complex biospheres but late in the day a species that found itself not only embedded in a history, but saw a terrible beauty in the world?

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Evolutionary Convergence

To the materialist the world looks very different. History is a brute fact told by an idiot, while the beauty is a delusion, soon to be a treatable condition. I beg to differ. Here I outline two aspects of evolutionary biology that arguably look beyond the immediate field to the wider metaphysical landscape. One is now widely accepted, the other decidedly controversial. When combined they lead to a paradox. The first concerns evolutionary convergence.¹ In brief, this notes that similar biological structures not only repeatedly evolve, but from different starting points in the Tree of Life. A classic example concerns the camera-eye. We and other vertebrates are so equipped, but effectively the same arrangement is employed by the octopus (and related cephalopods). The common ancestor, crawling in the Cambrian mud, had vision, but at most using a simple eye-spot. Camera-eyes are an excellent optical “design” evolving a number of times (including jellyfish), and even in single-celled organisms.² This is not to say that what the jellyfish and protistan see is the same as you and the octopus, not least because the former has a nervous system but no obvious brain. Even in the case of the vertebrate and octopus there are intriguing differences (such as the position of the retina), but crucially in each case an apparent disadvantage in arrangement is compensated in one way or another. Accordingly,

1 S. Conway Morris (2015), *The Runes of Evolution*: West Conshohocken: Templeton Press.

2 G.S. Gavelis et al. (2015), ‘Eye-like ocelloids are built from endosymbiotically acquired components’, *Nature*, 523, 204-207. One of these components are the mitochondria that form the transparent cornea. Another one-off? Not at all, these organelles have also been recruited in the eyes of some flatworms; see note 49, p. 358 of *Runes*.

the similarities in these eyes are much more than skin-deep. Camera-eyes are probably the most quoted instance of convergence, but such examples could be multiplied almost indefinitely.

Despite this, descriptions of these convergences very often employ adjectives of surprise: “remarkable”, “astonishing”, even “uncanny”. Why such exclamations? After all, apart from anything else, does not convergence echo the power of adaptation, as exemplified in Richard Dawkin’s *Blind Watchmaker*?³ So it does, but perhaps these words of surprise reveal a deeper unease. Far from evolution being random and inherently directionless, perhaps it speaks to a deeply ordered world (as in physics and chemistry), a template whereby no means everything is possible yet at the same time is also endlessly self-fructifying. Even stranger, and irrespective of how familiar this may be, it is a world we can actually understand.

Convergence is commonplace and in some cases (e.g. C4 photosynthesis, ant myrmecochory)⁴ has arisen scores of times. That is not to say that everything is possible.⁵ One may point to apparently unique solutions, such as the duck-billed platypus. But how unique is unique? Not at least in terms of the sensory systems⁶ where the platypus is gratifyingly convergent. Another observation, if not objection, is that however striking the convergence, they tend to arise within the same group. For example, sabre-toothed cats are matched by the thylacosmilids⁷ and thus are respectively placentals and marsupials. Yet both are mammals and thus share a common ancestor with a dentition that included canines. True enough, but sabre-tooth-like arrangements extend much more widely, not only among the vertebrates⁸ but even to the arthropods.⁹ As with the camera-eyes, the point is not that a sabre-toothed beetle will be wrestling terrified antelopes to the ground, but that such solutions can crop up much more widely than is sometimes supposed.

These and innumerable other examples present a fascinating dossier, sometimes quirky, usually enlightening. The nub of this discussion, however, revolves around deep-seated similarities that reveal the fundamental constraints on biological form and function. Take, for example, myelin. This is the fatty coat that sheathes nerve cells (such as axons) - very

different from the structures known as thylakoids. These have nothing to do with myelin but rather house the photosynthetic machinery of cyanobacteria (aka blue-green algae). What could they possibly have in common?¹⁰ The first clue is evident from both being strikingly multilamellar. More specifically both share molecular pathways (notably the synthesis of ATP, the energy currency of cells) and also play a central role in gas exchange. Nerves fire and algae photosynthesize. In other words, the process of thinking about pond-scum has more in common than meets the eye.

No doubt much convergence is “local” and might be referred to as parallel evolution, but other examples span vast phylogenetic distances. But will the various compilations¹¹ be sufficient to support the thesis of an overall directionality to evolution? However ubiquitous convergence may be, there could still be potentially fatal flaws as to the inevitability of evolutionary outcomes. Consider the evolution of the eukaryotic cell, the essential precursor for the emergence of complex life in the form of plants, fungi and animals. It is commonly supposed that the eukaryotic cell is a one-off, its emergence solely due to a peculiar concatenation of circumstances. So the argument proceeds that if this bottleneck had not, in one way or another, been squeezed through then the world would have remained bacterial. Without eukaryotes, then no multicellularity: Palm-trees, elephants and so on would never have appeared. If, therefore, evolution was punctuated with such bottlenecks, then collectively might they not divert or frustrate evolution into any number of alternatives?

This somewhat gloomy prognosis neglects, however, a less well appreciated feature of evolution: it is lazy. In other words, it repeatedly recruits pre-existing structures that had a different function than that for which they were co-opted. In the case of eukaryotes, proteins essential for a cytoskeleton are already present in prokaryotes. Consider also the lens proteins of eyes, appropriately known as crystallins. They are rampantly convergent, but originally evolved in micro-organisms for completely different purposes. Equally tellingly a significant number of the steps necessary for the emergence of a nervous system took place in single-celled organisms. They did not “know” that down the evolutionary road lay a brain, but

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3 Published in 1987 by W.W. Norton (New York); convergence is addressed in Chapter 4.

4 C4 photosynthesis is a derivative of the more common C3 photosynthesis. Myrmecochory is the selective harvesting of nutritious seeds by ants; note 12, p. 391 of *Runes*.

5 G.J. Vermeij has addressed this topic in two important papers. ‘Historical contingency and the purported uniqueness of evolutionary innovations’, *Proceedings of the National Academy of Sciences*, U.S.A., 103, 1804-1809 (2016) and ‘Forbidden phenotypes and the limits of evolution’, *Interface Focus*, 5, 20150028 (2015).

6 See *Runes*; for tactility (p. 132) and electrosensation (pp. 148-149), not to mention its venom (p. 61).

7 R.K. Engelman, J.J. Flynn, A.R. Wyss and D.A. Croft (2020), ‘*Eomakhaira molossus*, a new saber-toothed sparassodont (Metatheria: Thylacosmilinae) from the early Oligocene (?Tinguirirican) Cachapoal locality, Andean Main Ridge, Chile’, *American Museum Novitates*, 3957, 1-76.

8 Including fish; see N.R. Casewell et al. (2017), ‘The evolution of fangs, venom, and mimicry systems in Blenny fishes’, *Current Biology*, 27, 1184-1191, and A. Capobianco et al. (2020) ‘Large-bodied sabre-toothed anchovies reveal unanticipated ecological diversity in early Palaeogene teleosts’, *Royal Society Open Science*, 7, 192260.

9 H.E. Escalona and A. Ślipiński (2011), ‘*Australodon*, a remarkable new genus of Australian longhorned beetle (Coleoptera: Cerambycidae: Cerambycinae)’, *Annales Zoologici*, 61, 731-738, and C.E. Bowman (2021), ‘Feeding design in free-living mesostigmatid Cheliceræ (Acari: Anactinotrichidae)’, *Experimental and Applied Acarology*, 84, 1-119, see pp. 81-85.

10 A.M. Morelli, M. Chiantore, S. Ravera, F. Scholkmann, and I. Panfili (2021), ‘Myelin sheath and cyanobacterial thylakoids as concentric multilamellar structures with similar bioenergetics properties’, *Open Biology*, 11, 210177.

11 *Runes*; see also L.S. Berg (1969), *Nomogenesis or Evolution Determined by Law*, Cambridge, MA: MIT Press, and G. McGhee (2011), *Convergent Evolution: Limited Forms most Beautiful*, Cambridge, MA: MIT Press.

with these building blocks in place such a development is at the very least probable. As with crystallins and the precursors of the nervous system, so with much else in evolution. Such examples also indicate that the idea of a causal chain with the accidental loss of any one link serving to derail an evolutionary trajectory are wide of the mark. For example, a key molecule in the transduction of physical stimuli into nervous signals almost invariably is a so-called GPCR (guanine protein-coupled receptor; rhodopsin is one such example). Universal? Not quite; in their olfaction, and for reasons that are not yet clear, insects have recruited a protein with effectively an identical molecular structure (specifically an arrangement of seven transmembrane helices) but of entirely separate origin.¹²

Mass Extinctions

What of that other stumbling block concerning the likelihood of given outcomes in evolution, the regular occurrence through geological time of mass extinctions? If they have a leitmotif, it is their role in the radical redirection of evolution. Thus the insistent mantra is of how only the chance survival of a handful of lucky survivors determines the make-up of the post-catastrophe world. One must acknowledge that in most circumstances the survivors swiftly (geologically speaking) repopulate the devastated planet, but in any counterfactual world it would have been some other bunch of chancers that only just dodged destruction. Mass extinctions are not infrequent and apart from the odd collision with an asteroid seem to be linked to titanic volcanic eruptions. Either way mass extinctions are routinely assumed to define fulcrum points in the course of evolution, radically resetting agendas.

The reality is different. On the day itself mass extinctions are decidedly unpleasant, but paradoxically in the wider scheme of things they are forces for the good, accelerating significantly what is going to happen in any case. Consider the end-Cretaceous extinction, some 66 million years [Ma] ago. A pivotal point in our history as out go the dinosaurs and the mammals inherit a new world. But suppose there was no mass extinction? The asteroid sails harmlessly by, or something similar. The following day the dinosaurs strut their stuff and in the damp undergrowth the shrew-like mammals skulk in impotence. That's the standard scenario, but the evidence shows otherwise. Crucially, long before this mass extinction the mammals are already busy diversifying. Warm-blooded and intelligent, in this counterfactual world, the most likely initial impetus for further diversification would have been a consequence of planetary cooling, culminating in the polar glaciations. In the temperate zones there is little room for reptiles, and so the mammals seize the initiative. The ancestors of the primates had appeared in the Cretaceous, and their increasing dexterity along with increases in brain size make the manufacture of tools very much on the cards. Sooner or later primates (or their evolutionary avatars) would have displaced the dinosaurs, with the last survivors corralled in game parks and zoos (or being served in high-end restaurants). From a

wider perspective any mass extinction is far from destructive but actually creative, each time conveniently delivering the evolutionary goods about 50 Ma ahead of schedule.

The story doesn't quite end here. Whilst mass extinctions certainly give a leg-up to the groups already on the move, it is important to realize that a great deal of routine evolutionary spade-work is being achieved as the millennia tick by. Thus in the case of the Cretaceous, whilst the dinosaurs take the star role, in many other ways this world is already modern. The flowering plants, for example, are already dominant. Towards the close of the Cretaceous there are fully fledged rain forests, with flitting butterflies and industrious ants. Aerial theropod dinosaurs, the birds, are rapidly diversifying and taking over many of the ecological roles of the pterosaurs, in turn driving them into episodes of gigantism.

Steven Jay Gould famously claimed that were we to re-run the tape of life, say from the Cambrian, then half a billion years later the biosphere would have looked radically different owing to all those twists and turns in history, unexpected disaster and chance opportunities. Yet the ubiquity of convergence, the inherency of the evolution process with its endless co-option, along with the creative potential of mass extinctions ensures that any counter-factual world will for all intents and purposes be much the same. And that includes the evolution of something like a human. Not identical, but very similar.

The Fermi Paradox

We now encounter two conundra.¹³ The first revolves around the so-called Fermi Paradox. The second stares into the cognitive gulf that separates us from even our closest relatives, the chimpanzee and gorilla. Concerning the former, it was Enrico Fermi, followed by many others, who asked "Where are the extraterrestrials?" Even if the likelihood of a distant planet spawning something like a human is relatively small, then such is the sheer abundance of planetary systems, that in principle at any one time a necklace of civilizations should be strung out across the galaxy. Not only that, but in due course some will embark on their interstellar diaspora. In principle, galactic colonisation may be geologically rapid, perhaps taking about 100 Ma. To repeat: "Where are they?" To be sure much of the discussion deals with speculation and intangibles. Consequently there are many competing hypotheses that seek to answer Fermi's enquiry. Collectively, however, they fail to convince.¹⁴ Yes, orthodox explanations abound. That civilization auto-destructed, another lived inconveniently close to a gamma-ray burst, while others opt to remain in a hedonistic bliss with unlimited sex and truly terrible poetry. But *all* of them?

Matters don't stop there. Not only is the estimated total of earth-like planets in the Milky Way alone enormous, but it transpires that our solar system is relatively young, forming about 4.5 Byr ago. Whilst we need not expect other solar systems to be identical to ours, the more general problem is that many other solar systems came into existence billions of years earlier. If one is persuaded by the ubiquity of evolutionary

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¹² See *Runes*; pp. 125-126.

¹³ The following sections on extraterrestrial life and the uniqueness of humans draw on my recent (2022), *From Extraterrestrials to Animal Minds: Six Myths of Evolution*, Conshohocken: Templeton Press.

¹⁴ S. Webb (2015) *If the Universe is teeming with aliens WHERE IS EVERYBODY? Seventy-five solutions to the Fermi Paradox and the problem of extraterrestrial life*, Heidelberg: Springer [2nd edition].

convergence, the likelihood of humanoids evolving and before too long undertaking an interstellar diaspora, then no later than what we call the Cambrian the visitors would have touched down on the edge of the lagoon. “What’s for lunch?” cries a crew-member. Pointing at the water he continues “What about these critters? We’ll need quite a few!! I’ll fetch the Chablis and you get the net”. Grilling proceeds and corks are popped. Absolutely delicious, and there is only one small problem. “Those critters” are our ancestors. With the Earth colonized at the time of the Burgess Shale our history wouldn’t be different, it would be non-existent. Now unless you subscribe to the idea that we live in a virtual universe (not as daft as it sounds), we really did evolve and have never been visited and never will be.¹⁵

Fermi’s question remains unanswered. As I subtitled an earlier book: “Inevitable humans in a lonely universe”.¹⁶ And perhaps the solution to the Fermi Paradox is to ask if the universe is not a brute fact of materiality but something decidedly different? Atoms and so on exist (at least in some sense), but suppose there are other potentialities? One such hint might be the “impossible” antics of UAPs (unidentified aerial phenomena). If this is the property of the lunatic fringe then it includes US Navy pilots.¹⁷ Is this some sort of invitation to the Cosmic Club, echoing Arthur C. Clarke’s *Childhood’s End*? Who knows? At the least it is a reminder that when mystics see the world as a many-storied wonder, they do indeed glimpse other “dimensions”. In the Christian creeds we talk of “Things visible and invisible”, and indeed have confidence that bodies can not only be transfigured but resurrected. We scarcely understand what these “worlds” may be like, but they seem to be a great deal more promising than an indefinite future history of planet-hopping, from one uninhabited globe to another, *ad infinitum*.

The Yawning Chasm

What of the other paradox? In the words of Thomas Suddendorf¹⁸ this is “The Gap”, the yawning chasm that seemingly separates us (and most likely Neanderthals) from groups of otherwise undoubted intelligence, notably the apes and crows. What nobody disputes, of course, is the evolutionary continuity that in its most proximal sense, and

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in an African jungle about 6 Ma ago, led to the divergence of our hominin lineage from the ancestors of the chimpanzees. Initially the anatomical and behavioural differences would have been hardly noticeable, but by at least 4 Ma ago something very obvious was happening in the former group. And so they continued, most obviously with bipedality, dexterity, and encephalization. Nevertheless, from Darwin onwards the default assumption has been that obvious as the differences now are, axiomatically they must still be ones of degree and not kind. Even allowing these differences to be only qualitative, then we need to know when this step-change occurred and as importantly, why only us?

Yet as the evidence accumulates, and despite decades of investigation, this cognitive gulf is if anything more profound than generally supposed. Repeatedly, apparently water-tight investigations into human-like cognition in animals transpire, on further analysis, to be deeply problematic.¹⁹ That humans are in some sense unique is self-evident, but standard accounts of how these differences arose seem to miss the point.²⁰ Just as with the Fermi Paradox, perhaps the resolution is not yet another round of investigations, ever more subtle and wide-ranging (bring on the raccoons!)²¹, but to step back and ask ourselves how we became *Homo narrans*, seeing the world as fundamentally mythopoeic, transformed by music, art and poetry, all whispering of the transcendent.

Heady words, and first some more health warnings. With humans now everywhere, animals have both benefitted (bird-feeders) and suffered (vivisection), but more notably animals brought up in close association with humans are conspicuously smarter than their cousins in the wild. In other words they are enculturated. And this makes a difference. For example, much is made of so-called mirror self-recognition (MSR), with the implication that a positive result is indicative of a self-awareness. Maybe so, but nearly all such positive results are amongst enculturated animals. In the jungle no pool serves as a mirror, nobody reaches for a comb.

Another crucial distinction. Apart from the swear words of an African Gray, even the smartest animals never speak. They vocalize of course, and although bird-song has some intriguing analogies to language, it is not remotely equivalent. Never, for example, does the songster “think” to redeploy the music to a

15 A sweeping claim maybe. But consider the lack of success in detecting tell-tale evidence for both “local” civilizations (e.g. R.A. Carrigan (2009) ‘IRAS-based whole-sky upper limit on Dyson Spheres’ *Astrophysical Journal*, 698, 2075-2086), and on a galactic scale (e.g. M.A. Garrett (2015) ‘Application of the mid-IR radio correlation to the \hat{G} sample and the search for advanced extraterrestrial civilizations’, *Astronomy & Astrophysics*, 581, L5), but I’ll keep an open mind.

16 The title being *Life’s Solution* (2003), Cambridge: Cambridge University Press.

17 K.H. Knuth, R.M. Powell, P.A. Reali (2019) ‘Estimating flight characteristics of anomalous unidentified aerial vehicles’, *Entropy*, 21, e939.

18 (2013) *The Gap: The Science of What Separates us from other Animals*, New York: Basic Books.

19 See, for example, J.E.C. Adriaense, S.E. Koski, L. Huber, C. Lamm (2020) ‘Challenges in the comparative study of empathy and related phenomena in animals’ *Neuroscience & Biobehavioral Reviews*, 112, 62-82 and J. Pladevall, N. Mendes, D. Riba, M.Llorente, F. Amici (2020) ‘No evidence of what-where-when memory in great apes (*Pan troglodytes*, *Pan paniscus*, *Pongo abelii*, and *Gorilla gorilla*)’. *Journal of Comparative Psychology*, 134, 252-261.

20 See, for example, the respective works by S. Baron-Cohen and R. Wrangham. The former (*The Pattern Seekers: A New Theory of Human Invention* (2020), London: Allen Lane) conjures up a generative ability that effectively joins the dots of “if-and-then”, but how this actually came about is far from clear. Wrangham’s approach (*The Goodness Paradox: How Evolution Makes Us Both More and Less Violent* (2019), London: Profile) dwells on self-domestication but it is equally descriptive and again pursues a materialist metaphysics that unsurprisingly provides little underlying traction.

21 M. Pettit, ‘The problem of raccoon intelligence in behaviourist America’, *British Journal for the History of Science*, 43, 391-421 (2010).

new context that would allow a thought to be conveyed. Like all animal noises, they are “flat” and lack any recursive depth. Correspondingly the roars, grunts and even songs are all imperatives and never declarative. Despite this, the received wisdom persists that embedded in these noises is a proto-language. This, however, seems highly unlikely for a number of reasons, not least because speech is deeply cognitive. So it is no accident how current onslaughts on the freedom of speech relentlessly twist and distort meanings for political ends. Recall that the Tower of Babel is not some engineering project, but a hubristic assault on heaven itself. And as the Tower casts its loathsome shadow²² language not so much splits but degenerates into a chaotic and meaningless babble. To animals, of course, this Tower is meaningless and beyond articulation.

When it comes to animal behaviour not being able to speak is a severe handicap. Almost invariably training is required, but seldom is it appreciated that in many cases thousands of trials are required before the animal even begins to get the point. Even then, at regular intervals a duffer is shown to the door, and should Roger the chimpanzee shine at one task it is just as likely that something a bit more complicated leads only to confusion. Excuses of “cognitive failure” are promptly wheeled out, but isn’t it simpler to acknowledge that entire worlds will remain for ever beyond the grasp of any animal? As the investigators reel into the daylight from another frustrating day trying to demonstrate the obvious to their recalcitrant charges, maybe they should look in the mirror and reflect that it is only the oddest species on the planet that has an interest in the minds of their animal cousins.

Why then the gulf? Orthodox explanations might include increases in brain size, chance mutation, population size, etc, but these are all effectively circular arguments. Compelling solutions remain elusive, but in essence animals cannot join the metaphorical dots. Despite all the similarities that link us, their world is devoid of rationality, one where cause and effect are the logical consequences of actions. A classic example of this involves the crows. They are presented with tubes partially filled with water: succulent tit-bits are visible but floating out of reach. Trained to drop stones into the tubes, the water-level steadily rises and the food becomes accessible. The tempting conclusion is that these crows stand on the path leading to Archimedes. To test the true extent of their cognitive grasp the experiments are now made more challenging, perhaps a set of tubes but concealed beneath the floor only two are actually connected. A child will quickly determine which set-up works, but the only way a crow can learn is by a process of laborious trial and error. Never, it appears, does the penny drop, that things happen for a reason.

This failure, in our eyes only of course, is one hint that to animals the world is simply one of perceptions, never of interpretation where hypotheses can be built. Thus there are no categories, and correspondingly analogical thinking is inconceivable. If the world cannot be interrogated, then neither can nearby individuals. Their intentions and emotional states may well be discerned, but not from the perspective of the other. Never can they stand in the shoes of a companion,

no more than they could be actors. To animals abstractions are so circumscribed as to be trivial, so correspondingly whilst they can readily comprehend relative numbers (in the process of numerosity), even simple arithmetic is beyond their grasp. With vast efforts by the trainer they might finally learn that in between two and four comes three, but the addition of $6 + 0$ will provide the ever-reliable answer of 7.

Learn they certainly can and must, but teach never. Cats may demonstrate how to secure a mouse, but never does the mother (a concept also meaningless to animals) offer remedial advice and instruction. To swap metaphorical places with the pupil is an impossibility. The process of learning, therefore, is usually cripplingly slow. Thus a juvenile chimpanzee will eventually learn to employ a stone to crack a nut, but all this relies on emulation and not imitation. So the step-by-step links in the creative process are largely opaque, whereas children quickly discern how action A is essential if B is to operate and thereby allow C. Correspondingly, a number of animals employ tools, although curiously a general link to cognitive capacity is weak. Significantly, however, outside the highly artificial arrangements in the laboratory,

animals never employ one tool to make another. A primate may smash stones for one reason or another but never realize that the sharp-edged flakes might be put to some other purpose. For animals any tool is effectively a prop, to be utilized for a specific function but rarely if ever re-deployed. In the case of humans the case is opposite, not simply with respect to versatility but, as with language, tools are cognitive extensions of our bodies. A chimpanzee might enjoy driving a car, but will have no curiosity as to how it was assembled, let alone why it needs petrol.

This chasm between ourselves and animals is, I think, exemplified by a telling observation. After separation, animals such as chimpanzees and dolphins will greet each other effusively. But they never say farewell.²³ That we can be actors but animals only imitators has uneasy metaphysical implications, uncomfortable that is for those of a materialist bent. As Roger Scruton²⁴ explains with his characteristic crispness, it is a delusion to think that animals possess any rights. This, as adumbrated above, is because animals have no rationality and thus can have no concept of a right, either for itself or others. Correspondingly to an animal any sense of duty is a closed book. Rights and duties are moral imperatives (as also is justice), and as Scruton continues are mostly certainly possessed by the owner, but not his dog. Christians will recall that God gave us gifts of freedom and thereby a suzerainty over animals. Such an ethos fits very ill with most modern-day thinking, but if in doubt, try to obtain an answer from an animal. Not of course that our dominion over animals entitles us to ill-treat them in any way, in fact very much the reverse.

Like Caesar, animals are mortal, but do they themselves have the foggiest notion that they too are doomed? Moreover, to grasp that this is The End and that one can die of something invisible such as a stroke are not for the cognitively faint-hearted. Even so, amongst the great apes, mothers may carry a dead offspring for days, if not longer, whilst in chimpanzees death of a companion may lead to outbursts of emotion that can

22 As in C.S. Lewis' *That Hideous Strength*, London: Bodley Head (1945).

23 W.C. McGrew, L. Baehren (2016) “Parting is such sweet sorrow”, but only for humans? *Human Ethology Bulletin*, 31, 5-14.

24 R. Scruton (2022) Eat animals! It's for their own good. In *Against the tide* (ed., M. Dooley), London: Bloomsbury.

also alternate with intervals of “stunned silence”. The inevitable tendency, if not temptation, is to elide such behaviours with our all too human realization of the sheer awfulness of death. Yet in reality there is precious little evidence that any animal either anticipates an imminent demise of a companion, let alone grasps the utter finality of death.²⁵ Monkeys appreciate that a motionless colleague is not at all in a right state, whilst for apes realization that matters are seriously awry is all too evident from their emotional reactions. But for even the latter to intuit that metaphorically the now-dead chimpanzee has “Crossed the Bar” is an impossible abstraction, let alone a sense that there might be some sort of after-life. For us this passage remains embellished with vital rituals, even if these days the majority of mourners have themselves no expectation of survival. Nevertheless the gulf that separates us from all other animals is encompassed by our self-awareness of an unavoidable fate. Paradoxically, however, Christianity insists this abyss of death is neither final nor eternal but is to be redeemed by the Incarnate One. Nor need it be a matter of wishful thinking that not only humans will be restored, but by promise the rest of Creation.

Artificial Intelligence and *Homo narrans*

Before concluding, let us remind ourselves of another pervasive myth, one that insists how in due course (and perhaps very shortly) just as we superseded animals so we must grant our suzerainty to one or other form of artificial intelligence. Surely as our dull little brains are outclassed in chess or Go, as petabytes of data are ceaselessly analysed, and robots stride into the care-homes, humans will at best be “enhanced” or as likely made irrevocably redundant. Either way it is a hellish prospect, but I am far from despondent. Ironically, just as no animal can intuit cause and effect, so too our causal reasoning is utterly unlike the symbolic logic that powers artificial intelligences.²⁶ They do one thing very well, very boringly and forever without an ounce of imagination. Whatever is saved it certainly won't be the machines.

Linnaeus called us *Homo sapiens*, but as already noted a better binomial would be *Homo narrans* (not to mention *Homo religiosus*). Not only do we tell stories, but we worship. Much more strangely we find ourselves in a narrative not of our

making, but to which we feel deeply connected. This resonates with our sense of an unlimited imagination. Now we reconcile the abstract strangeness of mathematics with its remarkable traction in the real world, how music and poetry tell us insistently of invisible worlds in those “thin” spaces where the numinous hovers, of how even in novels created characters take on a life of their own. In Tolkien's sense we have become sub-creators of the Creator. Invited to enter new worlds, for many of us, as it was for C.S. Lewis, the myth of a god becomes incarnate as a God who spoke, ate and walked among us. Evolution has its paradoxes but they fade as we encounter something both wholly real and entirely mysterious.²⁷

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