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The Boyle Lecture 2005: Darwin's Compass: How Evolution Discovers the Song of Creation

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It was G.K. Chesterton who trenchantly reminded us that, if one was going to preach, then it was more sensible to expend one's energies on addressing the converted rather than the unconverted.[1] It was the former, after all, that were – and even more so are – in constant danger of missing the point and sliding away from the Faith into some vague sort of syncretistic, gnostic, gobbledegook. Chesterton, as ever, was right and should you think this is just another of his tiresome paradoxes may I urge you to reread him: his prescience concerning our present situation and, worse, where we are heading, is astounding. Yet, it might seem a little odd in a lecture devoted to the ancient and ongoing debate between science and religion to invoke at its onset the name of Chesterton. Well, no, I don't think so. First, as Stanley Jaki has reminded us, it is over-simplistic to regard Chesterton as anti-science.[2] What Chesterton regarded with the deepest alarm was not science, but its misuse. Indeed, long before the time of Chesterton, others already saw the dangers of unprincipled meddling where hubris and ignorance marched hand in hand. Robert Boyle was one such.

Indeed, we should ask how far we have come from the time of Boyle. So far as the science-religion debate is concerned the linearity of history looks curiously circular. What exactly has changed? In Boyle's time we see science, albeit in nascent form, already beginning to grasp limitless possibilities in knowledge while at the same time the drumbeat of Hobbesian materialism is clearly heard. As Reijer Hooykaas[3] has remarked, the reductionists were abroad then, and amongst the atomists there were leanings towards naturalism, if not atheism. Somewhat mysteriously the barriers between science and religion, if not already in place, were certainly in the process of construction. And today, who hasn't met the scientist who boomingly – and they always boom – declares that those who believe in the Deity are unavoidably crazy. Conversely, the religious reaction was to shy away from the implications of science, and so it remains today. Better to doubt evolution, the age of the Earth, even the world itself, than imperil one's soul. The devout Boyle remained confident that this divide

1 Chesterton, G.K. 'An accident', In *Tremendous Trifles*, London: Methuen (1913), p. 31.
2 Jaki, S.L. *Chesterton, A Seer of Science*, University of Illinois Press (1986).
3 Hooykaas, R. *Robert Boyle: A Study in Science and Christian Belief*, University Press of America (1987).

was false and pernicious. Yet even in his time Boyle's vigorous faith and orthodoxy, rather than simple observance of the customary pieties, was perhaps more unusual than we realise. Of Boyle himself it was written that he was 'said to be a learned and witty man of science *in spite* of his religious convictions'.[4] If that raised eyebrows in the time of Charles II, the same sentiments today are likely to provoke mute astonishment.

It is surely telling that the apparent disagreements between science and religion are so often treated with a bluntness and lack of subtlety that in any normal discourse would be dismissed as juvenile. No sooner are the sounds of debate heard than we will be reminded of Galileo before the Inquisition or of Bishop Wilberforce being mangled by T.H. Huxley. So often the terms of reference are condescending and dismissive, with the supposedly losing side being equated with flat-earthers. If at all possible the additional sins against political correctness are also heaped against the doors of religious discourse. This is bad enough, but the discussion is usually based on a chronic chronological snobbery that supposes that individuals dead for many years, if not centuries, were singularly unfortunate not to have lived in our times among people who not only know but are *right*. It would also be a mistake to overlook the fact that the undoubted continued hostility between science and religion in is no small part exacerbated by the sleight of hand whereby a materialist philosophy is illicitly imported to bolster a particular world-view of science. It remains an astonishing piece of window dressing: meaning is smuggled into a world which by definition lacks meaning. Boyle himself knew the enemy. He was more than prepared, in the words of Hooykaas, to be the one who 'unmasks their pride …exposes their narrow mindedness [and] …shows up their arrogance'.[5]

So how are we to be true heirs of Robert Boyle, legitimate scientists but inspired by faith, willing not only to conduct the debate, but win it? The present-day auguries are hardly auspicious. Too often our arguments, our world-picture, even our data, are cringingly presented, in a combination of nervousness and accommodation. Do I really have to remind you of our opponents' visceral aversion to religious thought and practice? To be labelled the credulous believers in fairy tales, bottomless receptacles for wish-fulfilment, blind to the undoubted evils of the world, are common enough jibes. So too is our opponents' almost limitless degree of patronising. Think of Daniel Dennett's parody of religious thought in the form of his 'Skyhooks'.[6] Is he so naïve as to imagine the orthogonal intersection with our world of other realities is akin to some sort of elevator or a London Underground escalator? Nor should we forget that the attitude of our opponents is not one of benign disdain, but a deep-seated animus. Nor are they reluctant to pronounce on matters, such as reproductive

4 Hooykaas, *op. cit*., [3] p. 59; original emphasis.
5 Hooykaas, *op. cit*., [3] p. 58.
6 Dennett, D.C. *Darwin's Dangerous Idea: Evolution and the Meanings of Life*, Allen Lane, Penguin Press (1995).

technology or genetically modified food, with a conviction and assurance which in other contexts they would despise as symptomatic of the worst of dogmatic interference by the Pope or similar. These things matter and, as Peter Kreeft reminds us, they not only matter, they matter absolutely.

While polemic and rhetoric have their places, our present purpose is not only to honour Boyle, but also to re-examine how science and religion must coexist. (I hope nobody reading this has fallen for Stephen Jay Gould's reckless canard of science and religion defining independent magisteria of influence[7] – any tempted to toy with that superficially appealing idea should be warned that they face logical incoherence.) Additionally, and, far more importantly, we need to re-examine how science reveals unexpected depths to Creation while religion informs us what on earth (literally) we are going to do about it. From this perspective the impoverished world-picture which the western world has been busy painting with a meagre palette of predominantly browns and greys on a scruffy piece of hardboard rescued from the attic might not only be re-illuminated but, in this new blaze of light, the wonder might become deeper – and the risks clearer.

I think it almost goes without saying that, of all the areas of science concerned with this dialogue, that of organic evolution is the most sensitive, in some ways the most vulnerable. This is hardly surprising; the stakes are the highest because where we humans came from, who we are, and what we represent must be questions of central importance. In other areas of science, on the other hand, the temperature of engagement is lower and, even, in quiet corners scenes of cordiality may be witnessed. Such is most obvious in terms of the astounding developments in physics, not only with the evidence for an instantiation of Creation – the Big Bang, if you prefer – but even more powerfully the now famous evidence for cosmological fine-tuning and the implication this has for an Anthropic Universe.[8] So peculiar and so finely balanced do the key physical constants appear to be that it is hardly surprising that many physicists have embraced the concept of not just one universe but a gadzillion of them tucked away behind black holes or hidden in other dimensions, ever present but ever invisible. And out of that gadzillion we are the lucky ones where everything turned out to be just, precisely right.

Theologians are suspicious, and so they should be. Alternative universes, for ever invisible? That sounds like an area for debate by such as Albertus Magnus, Thomas Aquinas and perhaps especially William of Ockham. More topically, is this concept of multiverses so very far removed in our society from the inalienable belief in our society of unlimited 'choice', a matter not only for the deathly pursuit of consumerism, but also more worryingly expressed in the

7 Gould, S.J. *Rock of Ages: Science and Religion in the Fullness of Life*, Cape (2001).
8 Rees, M. *Just Six Numbers: The Deep Forces That Shape the Universe*, Weidenfeld and Nicholson (1999).

enthusiasm for making religion out of a patchwork of beliefs? Yet, to return to the cosmic dimension, even if we accept the possibility of multiverses, George Ellis has reminded us that the concept is highly protean. One possibility is that, if indeed there are multiple universes, then they are all the *same*.

Should we choose to be parochial, and stick to just one, fourteen-billion-year-old universe with its physical constants just so to ensure habitability, then we are not necessarily clear of the woods. Neil Manson[9] has emphasised that if we can accept fine-tuning we still have no notion of why the numbers are what they are, nor how they could all be systematically different yet still be combined to provide a habitable universe. Yet we must also acknowledge Howard van Till's[10] point that it is the interdependence of each value as much as the fine-tuning of any one that is so remarkable. All this smacks of design: physicists are rightly wary and the invisible host of multiverses is ever popular.

Somewhere, and even more mysteriously somehow, out of physics and chemistry life emerged. By natural processes surely, but by routes and in an environment of which we have no secure knowledge. Despite its physical substrate, the processes of evolution, and indeed their bewildering complexity of products, seem to find no echo in any anthropic principle, no sense of particular rules analogous to the gravitational constant or nuclear strong force. The paradox of this view is that it is nevertheless just these evolutionary processes that have led – inexorably, in the view of some – to a species that strangely can find meaning in such physical concepts. Some find it distinctly strange that just one species has stumbled on facts that not only inform us about the cosmos but also in a deep fashion define its comprehensibility. From an evolutionary point of view, paradox or irony notwithstanding, this view in turn verges on the incomprehensible because, if there is a consensus amongst neo-Darwinists, it is that evolution is an open-ended and indeterminate process. It cannot be overemphasised how pervasive is this view. Organisms must be fit for purpose, but 'purpose' in only a relative sense. A widely agreed corollary is that, just as humans are an evolutionary accident, as interesting in their own way as a duck-billed platypus or for that matter watercress, so too is human intelligence. More than one investigator has pointed out that if indeed this is true then the SETI project, that is the Search for Extraterrestrial Intelligence, is at best quixotic and more likely based on a massive delusion. A profound irony: the one species capable of understanding the Anthropic Principle can only share his discovery with – a gerbil.

Intelligent design?

Yet even if we were to espouse this view of evolution as being utterly indeter-

9 Manson, N.A. *Religious Studies* (2000) 36, 163-176.
10 van Till, H. 'Partnership: Science and Christian theology as partners in theorizing', In Carlson, R.F. (ed.) *Science and Christianity: Four Views*. Intervarsity Press, (2000), pp. 188-194.

minate, everything a fluke of history and circumstance, the organisms themselves never cease to amaze us, be it a bacterium living in the boiling water of a volcanic pool, an albatross circumnavigating the Southern Ocean, or a spider spinning its web of silk. As is repeatedly pointed out, to talk about the organism as designed may indeed be a metaphor, but the integration of function, their unbelievable complexity not least at the level of biochemistry, their emergent sophistications be they in terms of navigation, exquisite sensory perception or intelligence, indeed their sheer poise, should leave us stunned. Organisms *are* astonishing, and it is our common failing that this is too often lost sight of in the attempt to depict biology as a subject only to be conducted in an atmosphere of steely rationalism. The latter is no doubt the necessary procedure for investigation so long as it is never forgotten that the things we study are *alive*. In unguarded moments some biologists will gladly admit that the way an organism is put together is remarkable. It is not the point that we understand that biochemical cycle, this enzyme, or a particular hormone, it is the way systems interact and have a dynamic interdependence that is – unless one has lost all sense of wonder – quite awe-inspiring.

Nor should we dismiss this as an unworthy emotion. From this perspective it is easy to appreciate the intellectual attraction of the quasi-scientific/quasi-theological movement known as Intelligent Design (ID). Before you react with consternation and dismay at the prospect of Intelligent Design's having gained another recruit, let me hasten to reassure you – not a bit of it! In my opinion, Intelligent Design is a false and misleading attraction. It is not my purpose here to reiterate the many objections raised against Intelligent Design, especially those made by the scientific colleagues, but opponents, of Michael Behe and Bill Dembski, perhaps the two principal proponents of Intelligent Design. Rather it seems to me that Intelligent Design has a more interesting failing, a theological one. Consider a possible analogy, that of Gnosticism. Where did that claptrap come from? Who knows, but it could have been an attempt to reconcile orphic and mithraic mysteries with a new, and to many in the Ancient World, a very dangerous Christianity. So too in our culture, those who are given over to the worship of the machine and the computer model, those who are admirers of organised efficiency, such would not expect the Creator – that is, the one identified as the engineer of the bacterial flagellar motor or whatever your favourite case study of ID might be – to be encumbered with a customary cliché of bearing a large white beard, but to be the very model of scientific efficiency and so don a very large white coat. ID is surely the deist's option, and one that turns its back not only on the richness and beauty of creation, but also, and as importantly, on its limitless possibilities. It is a theology for control freaks.

To question Intelligent Design might generate a ripple of applause from any neo-Darwinians, until they recall that this is a Boyle Lecture and theology is not a fad, a pastime for eccentrics, but in fact central to our enterprise. And now I want to persuade you that just such an approach may not only be consistent with evolution, but can also resonate with orthodox Christian theology

– the Fall, the Incarnation and the End Times. Let me show you what I mean.

What is life?

My enthusiasm for life surely needs no reiteration. Let us also recall, however, how little of it we really understand. It is pretty clear that organisms are not blobs of malleable protoplasm buffeted by environmental circumstance. First, there is some intriguing evidence that at least in some circumstances organisms are predisposed – I will not use the word, designed – to evolve. That is somewhat less surprising when we consider such evolvability in the context of the complexity of the developmental systems. Amongst the many oddities of life is that fact that first there is no detailed instruction manual – and in this context we can effectively ignore the genetic code – but these systems, if prodded or disrupted, are remarkably adept at self-repair. This is not foolproof, of course, otherwise we would never catch a cold or, for that matter, die. Yet it is remarkable, nonetheless. So too, however neglected it may be because of its sheer familiarity, we too easily forget the remarkable homeostasis of living organisms, that is their internal balance and capacity for adjustment whatever the external environment. In any computer room along with the banks of hard disks, screens and printers there will be the steady hum of air conditioning, extracting the excess heat. It is noisy and inefficient. Compare that with the temperature regulation of your brain. Not only is the integrity and integration of living systems quite astonishing, but attempts to employ machine-like analogies soon run into difficulties.[11] To be sure we refer to motors, switches, transport mechanisms, fluid flow, pumps and electricity, but the reality is that organisms have a subtlety and efficiency far beyond any machine we can build. Again and again we discover that even in apparently straightforward functions there is an exactness to purpose which is eerily precise. The fact remains that we have no idea of what it is about life that, although obviously made of atoms no different from those you find in a stone, combines to form such a dynamic entity, culminating in the entirely surprising ability to become conscious. But consider even the cell. Here jostling together are innumerable chemical compounds involved in extraordinary biochemical cycles, including reactions that may be accelerated a billion times by protein catalysts – the enzymes – and all depending not only on carefully transmitted instructions – again depending on a truly baroque arrangement – but instructions that can be appropriately modified long after transcription from the original genetic code.

We are left in the rather extraordinary position of describing things which at one level we hardly understand. This alone should make us less than confident that our attempts to mimic the products of evolution will be in any way straightforward. Notwithstanding the fact that biological systems are being

11 Barham, J. 'The emergence of biological value', In Demski, W.A. & Ruse, M. (eds.) *Debating Design: from Darwin to DNA*, Cambridge: Cambridge University Press (2004), pp. 210-226.

used increasingly to instruct us, notably in the application of robotics, the manifest failures in the experiments on the origin of life and attempts to re-embed intelligence in an artificial context suggest a failure to grasp what it is that defines life. This is surely sobering, and whilst it is emphatically not my intention to restore vitalism, it remains the case, as James Barham[12] has rightly stressed, that the sum of the parts that defines life will continue to elude us if we insist on constructing definitions that look no further than a physico-chemical basis. Of course, given the remarkable advances in our understanding of biochemistry, molecular biology and evolution as a whole it is all the more strange that we have failed to develop concepts, ideas, even a language, that could capture this dance of life. Or is it so surprising? We forget at our peril that language presupposes deep assumptions about the way the world is. If we decide it is arid, machine-like and meaningless then it will be all the less odd that its richness will slip through our nets.

That satisfactory definitions of life elude us may be one hint that when materialists step forward and declare with a brisk slap of the hands that this is *it*, we should be deeply sceptical. Whether the 'it' be that of Richard Dawkins' reductionist gene-centred world-picture, the 'universal acid' of Daniel Dennett's meaningless Darwinism, or David Sloan Wilson's faith in group selection (not least to explain the role of human religions), we certainly need to acknowledge that each provides insights but as total explanations of what we see around us they are, to put it politely, somewhat incomplete.

World-pictures

Yet, even if levels and mechanisms of evolution are hotly disputed – what do you make of genes, or group selection, for example? – the fact remains that, just as the sky is blue, evolution is true. So what is the problem? That is a rhetorical question, of course, because none of us needs to be reminded that it is the Darwinian world-picture that provides the metaphor of humans being just one tiny twig on the great tree of life – a tree which also, please note, is almost completely dead. Not only are we built of the dust of dead stars, but also we now learn that we stand on a charnel house. To argue from this well-rehearsed perspective that nevertheless we are in some bizarre way also built in God's image would seem to be frankly preposterous. I will suggest that such a reading, effectively built on the assumption that size and position in themselves are important, is woefully simplistic. But there is much more at stake than simple disagreement as to whether or not one species, on one planet, in one solar system and in one galaxy of all the billions, is somehow relevant.

A world-picture that encompasses science and also the deep wisdom of theology may help us to explain how it is we can think, how we discover the

12 Barham, J. *op. cit*., [11]

extraordinary, but so too it may warn us of present dangers and future catastrophes. Not only that, but it can also instruct us as to what may be the limits of desirable knowledge and risks of unbridled curiosity.[13] This world-picture could also show that, far from being a series of mindless accidents, history has directions and, conceivably, end-points. And what of the other world-picture, the one based not just on science but wedded to a scientistic programme? Well, you know it as well as I do. Here all is ultimately meaningless. The metaphorical sparrow in the storm may still enter the warm and well-lit mead-hall, but its return to the violent night outside erases all memories and obligations. Those individuals who espouse this world-picture may, for all I know, be better and more charitable people than the theists. I would not be at all surprised; the latter do not have too good a reputation for tolerance. But the relative moral merits of any of us are in the final analysis only relevant to exponents of the theistic world-picture; to those of scientistic inclination they might be socially useful but in the grand order of things can have no meaning in a soulless world. To repeat Peter Kreef's remark: in the end these are matters whose final resolution is beyond discussion. If correct they matter absolutely, both for us as individuals and for the sort of world we want to inhabit.

So could the study of evolution actually lead us to a far less bleak view than such secular hierophants as Dawkins repeatedly claim? It is, of course, no new suggestion that evolution may be the way God has chosen to arrange matters, and this view in its turn has been resoundingly attacked. What of the sheer waste – all those trilobites, and the pain and evil exposed generation by generation – all those ichneumon flies? Both points have been addressed elsewhere, by others more cogent in argument and skilled in debate. Concerning the latter simply recall that as evil has no reality in a meaningless world we may rightly deplore it because we too have a nervous system, but our pain and that of the ichneumon fly's victims has no permanent significance that might one day be redressed. Why all the fuss? And who, of all people, are we to complain of waste? Our profligacy might also perhaps provide a point of reference when Creation is summed up.

Such views presuppose a world-picture very alien to many scientists and philosophers today. Theirs is ultimately a council of despair; one species, on one tiny planet, in a vast and ancient universe. There are several responses to this view. First, who are we to decide what is or is not appropriate? What metric do we use? One can observe that at least in terms of size, perhaps oddly, we are just in the centre, at the mid-point between the unimaginably small and the cosmically vast.[14] Next, what if we stand on an immensity of time? Leaving aside what time is, would it make any practical difference if the beginning was a million years ago, as against the believed value of 13 billion, let alone even

13 Rendell, L. & Whitehead, H. *Behavioral and Brain Sciences* (2001) 24, 309-373.
14 Virginia Trimble, pers. comm.

100 billion years? Did the innumerable brachiopods (or whatever is your favourite fossil organism) drum their metaphorical fingers and glance at their watches, wishing the Palaeozoic would slip by just a bit more quickly? Maybe the 13 billion years is the time we need, for carbon to form, for life not only to evolve but to find itself in a neck of galactic woods which is stable enough not to frighten the horses with rogue black holes, gamma ray bursts and titanic supernovae.

Suppose that this approach has some merit. Metric-sized animals that are the end-result of many billions of years of prior stellar and biological evolution may be the only way to allow at least one species to begin its encounter with God. But you may well riposte: let us reconsider organic evolution. Isn't it an open-ended process, to be sure showing an inherent evolvability, but to evolve to what? To be able to function, to reproduce, of course, but to produce in the fullness of time a very strange species, capable of great good but also of terrible evil, sensitive to hidden dimensions but also credulous, able to measure the span of the universe but also to allow the Flat Earth Society? As has already been made clear, the viewpoint within orthodox Darwinism is agreed and uncontroversial: humans are an accident of evolution, because *everything* produced by evolution is strictly incidental to the process. Accordingly humans are as fortuitous as a tapeworm, and by implication ultimately no more – or less – interesting. I have already suggested that if we are hardly able to define life, this alone should give us pause for thought.

I would further argue that the study of evolution itself already hints that to reduce all to the accidental and incidental may turn out to be a serious misreading of the evidence. In terms of evolution the clear evidence for organismal simplification, not to mention the repeated move to parasitism, does not negate the realities of evolutionary progress and the emergence of irreversibly complex states. More particularly the view that evolution is open-ended, without predictabilities and indeterminate in terms of outcomes is negated by the ubiquity of evolutionary convergence.[15] The central point is that because organisms arrive repeatedly at the same biological solution, the camera eyes of vertebrates and cephalopods perhaps being the most famous example, this provides not only a degree of predictability but also more intriguingly points to a deeper structure to life, a metaphorical landscape across which evolution must necessarily navigate.

Converging on convergence

Concerning evolutionary convergence I could give you innumerable examples, but the central aim of this lecture is to show that the evidence now strongly

15 Conway Morris, S. *Life's Solution: Inevitable Humans in a Lonely Universe*, Cambridge: Cambridge University Press (2003).

suggests humans to be an evolutionary inevitability. On this basis some time-honoured theological questions may be re-addressed. What is it then concerning evolutionary convergence that can inform us about both the definition and the emergence of humanness? This is a large and complex area, and in passing I will only note that there are a number of key features such as complex vocalisations, tool-making and cultural transmission, which are both vital to the general argument and patently evolutionarily convergent. Not only have they evolved independently a number of times, but also, and as importantly, this indicates that these features are real biological properties, defined entities which are necessary prerequisites for the evolution of humans.[16] For reasons of time and also relative importance it is pardonable, I trust, if I choose to focus on the emergence of complex intelligence and mentality. Briefly, it is now clear that an intelligence equivalent to the primates has evolved independently at least twice, that is in the dolphins and the corvids (or crows).[17] In fact the figure is probably substantially higher,[18] but any estimate depends on questions of phylogenetic relationships,[19] and continuing debates about levels of intelligence, for example amongst the cetaceans.[20] Even so, within at least the dolphins[21] and the crows[22] the similarities are indeed very striking. And there is good reason for such surprise. First, this primate-like intelligence has emerged in strikingly different contexts. Sitting in trees and laying eggs is one thing, living in an ocean is another, and both contrast with the evolution of the apes in jungle and savannah. Second, and even more importantly, even though dolphins are also mammals, their brain structure differs markedly from that of the apes, whilst that of the crows is even more distinct. Thus from radically different neural substrates the same type of mind emerges. This is surely startling, for at least two reasons. First, it reinforces our view that mind is not some sort of epiphenomenon, a simple by-product of chemistry and electrical activity in a squishy organ that happens to be located in the skull. If it was, why should it be so similar? Second, as Ed Oakes has pointed out to me, if wings (also convergent) need air to fly, perhaps brains require an equivalent 'mental atmosphere' to operate.

These extraordinary, and in large part only recently appreciated, similarities in mental architectures beg other profound questions. If so similar, what is it then that really defines human uniqueness? In part language of course, but even here the gap is probably narrower than we think. Consider the semantic and syntactical abilities of such animals as the dolphins, not to mention the evidence for animal vocalisations both being acquired in the same manner as

16 Marino, L. *Evolutionary Anthropology* (1996) 5, 81-85.
17 Clayton, N. & Emery, N. *Science* (2004) 306, 1903-1907.
18 Among other examples of intelligence that probably have evolved independently are killer whales, sperm whales, New World monkeys, parrots and, very likely, octopuses.
19 Marino, L. et al. *Anatomical Record* (2004) 281A, 1247-1255.
20 Rendell, L. & Whitehead, H. *op. cit*., [13].
21 Marino, L. *op. cit*., [16]
22 Clayton, N. & Emery, N. *op. cit*., [17]

human speech (including a phase of infant babbling) and having also an inherent structure in terms of the frequency distribution of different 'words' (Zipf's law). Recall also that so far as the hominid fossil record can be relied upon concerning such intangibles as awareness, language and empathy, let alone an almost universal religious instinct, the transition to full humanness was evidently a gradual process (and, remember, a process that is still arguably incomplete). This in turn has two very interesting implications. First, if consciousness was hovering in the wings of the theatre of evolution with its fully fledged emergence only a matter of time, then why should it do so in us as against some other species still grunting in the undergrowth? Was it simply an accident of circumstance, of our being first on the block? Possibly so, but we should remember that belief in a personal God implies choice, both on our part and more importantly on His. Is the history of the Jewish nation a sort of analogy? Chosen, prodded by their true prophets and, despite diversions and disasters, leading the rest of us by a route nobody expected to the Incarnation. But that is a tricky, and possibly a dangerous argument, because of course the story doesn't stop there. Either way, the plea of 'why us?' takes on new and different dimensions, but ones to which our materialist colleagues will, I fear, be blissfully oblivious.

Second, and I very much fear treading on even more problematic – but in fact related – ground, suppose that there were other species on this planet even closer in sentience to humans than either dolphins or crows? How should we treat them? Should we place them in the larder, in a zoo, on a nature reserve, or hand them an invitation to tea? I suspect strongly that that would be our dilemma if, for whatever reason, the Neanderthals had not disappeared. A similar question is asked by the American writer, Harry Turtledove, in one of his stimulating science fiction novels based on a counter-factual world.[23] In his book *A Different Flesh* we are asked to imagine a North America which is the abode of australopithecines but otherwise uninhabited by hominids, that is, until the arrival of the Europeans. His story stretches over several centuries, but a central theme is how we should treat our very near cousins, creatures he calls the 'sims'. That question stretches from initial contacts to finally medical trials involving the deliberate infection of sims with HIV. Hypothetically with the sims and probably actually with the Neanderthals, these represent species that are so close to us that any Socratic dialogue would beg agonising questions of moral decision. In either case humanness is in the last stages of emergence, a consciousness that is already grasping realities beyond immediate vision. We might be grateful that such a dilemma cannot arise with either the Neanderthals or the sims, until we recall that just such an emergence of mind almost certainly occurs within a few weeks of conception in the human foetus.[24]

23 Turtledove, H. *A Different Flesh*, Baen (1988).
24 I owe this insight to Joe Vining's *The Song Sparrow and the Child: Claims of Science and Humanity*, University of Notre Dame Press (2004), see p. 145.

Far from being the study of a series of curious accidents the study of evolution poses some deep and awkward questions. I suggest, moreover, that it may illuminate in other ways who we are and what our place in the world is. I have already mentioned that evolutionary convergence hints at a prior 'landscape' that predetermines, albeit in an extraordinarily rich way, the outcomes of the process, not least human intelligence and, by implication, the inevitability of contact with a different sort of Mind, an encounter with God. I want to argue that this is more than a powerful metaphor, and in doing so I now move to the heart of this Boyle Lecture. Consider music.

A universal music?

In a fascinating essay Patricia Gray and colleagues[25] remark on the many similarities between our music and that of animals. The gap between them and humans is obvious enough, no bird in a tree astonishes us with Tallis' Forty-part motet, *Spem in alium*, but the basics of harmonics, melody, invention, inversion duetting and even riff sessions are all shared. Like consciousness, the symphony orchestra is also waiting in the wings of the theatre of evolution. Music is, therefore, a splendid example of convergence. As such one can certainly propose scientific explanations, both in terms of the physics of sound and the biology of function such as sexual matters or territoriality. The plausibility of such assumptions, not least in the famous songs of the male humpback whales, let alone their dubious extrapolation to the realms of evolutionary psychology in humans, need not detain us. This is because Gray et al. go on to make a much more interesting argument. Suppose, they suggest, there is a Universal Music, and the reason why all earthly song is so similar is that all are gaining access to an Ideal, a reality both 'out there' but also intimately close, in a 'dimension' discovered by evolution, familiar but also one that defies simple categorisation. Such a view has equal applicability to intelligence, mentality and discovery of the other 'invisibles' that together define our continuing search for Truth.

There is, moreover, an intriguing analogy to the discovery of music that has even more interesting theological implications. I alluded above to the mysterious origins of language. We can, of course, take a biological stance. In the context, say, of predator warnings or the demands of reproduction, the howls, screeches, chattering and whistles may well make good functional sense so that our continuing research will be rewarded with fruitful insights. As with music, however, there are other approaches, other dimensions that touch wider and more remote shores. Here I have in mind J.R.R. Tolkien's fascination with words and the origins of language. His creation, or more strictly sub-creation, of Elvish might owe much to his interests in Welsh and Finnish, but it is also clear that his immense creativity and the invocation of the beautiful, mysteri-

25 Gray, P.M. et al. *Science* (2002) 291, 52-54.

ous and almost painfully real Middle Earth, was founded on a deep appreciation and love for languages. In some strange way the articulation of Elvish and the other languages of Middle Earth was the catalysis for the rest of his mythos. It is also evident that Tolkien, already a master philologist, was fundamentally influenced by another of the Inklings, Owen Barfield and especially by his book, *Poetic Diction*.[26] In essence, and as compellingly explored by Vernon Flieger,[27] Barfield, and thereby Tolkien, believed that from its source language had become fragmented: Flieger's metaphor is 'splintered light'. Originally certain words, in 'primitive' times, carried an immensity of meanings that importantly touched on the unseen, if not the sacred. With the elapse of time these meanings subdivided; to be sure, precision (of a sort) was gained, but also much was lost. Paradoxically, reality was blurred and disenchantment spread.

The implications of this are not difficult to grasp, but they seem to me to be extraordinarily fruitful. The sense that there are other realities, orthogonal to everyday experience, is certainly familiar: who has not entered zones of timelessness, had prescient dreams, compelling hunches or odd synchronicities? It is not my assumption that these realities are either exclusive or incompatible. In fact, there is every reason to think that individually but obliquely they collectively touch on much deeper matters, but in our present state they can be deeply disconcerting. Potentially, however, they open portals to new perspectives and possibilities. Who is not familiar with the metaphor of hearing the harmony of spheres or imagining that somehow we might engage in speech with animals? Literally these are either fanciful or folk tales, but if the New Testament tells us anything, it is that, as Tolkien finally persuaded C.S. Lewis in their celebrated night-time walk in Magdalen College, the point of Christianity and the Incarnation is that this is when myth became true and real. As I will explain at the end of this lecture, in the final analysis how we got here hardly matters, but at this juncture all I need to stress is that the process by which we, and evidently other sentient species, had at least the possibility of understanding a wider reality, a bed-rock of existence, was by the agency of evolution. By this process, life has ramified into a richness and complexity. We are embedded in a true Creation. Unsuspected it turns out that Darwin not only equipped us with a mechanism but also a compass whereby sentience would necessarily emerge so that ultimately the Song of Creation would also be heard. Are science and theology really so far apart?

Evolution beyond the horizon

My work on evolutionary convergence, with its claims that the roads of evolution are constrained, that not all is possible (in fact the reverse is the case:

26 Barfield, O. *Poetic Diction: A Study in Meaning*, Faber & Faber (1952).
27 Flieger, V. *Splintered Light: Logos and Language in Tolkien's World*, Kent State University Press (2002).

nearly all is impossible), and that the outcomes of evolution are thereby effectively inevitable, frequently provokes the question along the lines of 'Fine, so what's next?' That is a fair question, and one which not only generates interesting responses but again touches directly on theological issues. Some predictions are pessimistic and well-rehearsed. We simply destroy ourselves, be it by global warming, viral pandemic, bio-terrorism, nuclear warfare: exit is inevitable, whether by a bang or, more probably, by a whimper. Other prognostications I find even more chilling. Maybe we are too clever for our own good, but not clever enough to realise that in serving as a hand-maiden to machine-intelligence we are sealing our fate and embarking on the construction of a terrible world, joyless and cripplingly uninteresting, arid in all but computation. To many, and as with so much else we see around us, there is in this gloomy view a grinding sense of inevitability. In our heart of hearts it is not what we want, 'but then you can't stop progress, can you? Shame really. Another cup of tea?'

Perhaps, however, what is construed as 'progress' is better viewed as the wrong road that if not swiftly abandoned will lead to a destination that we understand but one over which one day we shall have no control. Such thinking, of choices, decisions and acknowledgement of fault (repentance, if you prefer), is of course very germane to theological thinking. Indeed, theology may end up making some absolute and very surprising claims. Let us reconsider the rhetorical question, 'Fine, so what's next?' In contrast to the musings of science, the view of orthodox Christianity is, I think, fairly straightforward, even if its implications are not. If Adam is metaphorically the first man, then Jesus as Christ is the last. In one sense there is no more future. Evolution did have an end-point, it was us, and now with the Incarnation it is time to move on. To the non-theist this perspective will no doubt seem not warped, but simply mad. Robert Boyle emphatically would not have been so minded, and it is now time to see not so much whether science and religion have any relation but rather to suggest that they are intimately linked in a way that actually promises great goodness but from our present stance seems to be much more problematic.

A Faustian compact?

It would be otiose to suppose that science, along with medicine and technology, has not delivered extraordinary benefits and gifts. Nor is it disputed that there are side effects and unforeseen consequences that can undo at least some of the good done. As a group scientists, even under existing pressures, generally maintain a high degree of integrity and are genuinely interested in what is true as against what is popular or expedient. Yet the darker side is never very far away. Discoveries and inventions, even those apparently innocuous, in the wrong hands may lead either to distortion of societies or to ways of delivering death yet more widely and efficiently. So too the dangers of monopoly power and the manipulation of the marketplace may benefit the few and impoverish

the many. The risks are most obvious in biotechnology, but in fact no area of science is free of risk. To many the benefits of science appear to be gained at the increasing expense of a Faustian compact.

Theologians have not been silent on these issues, but I suspect that we are not going to make much headway when the aim of today's culture is blatantly scientistic and deeply manipulative. Here the ultimate aim is of controlling the world in a way ostensibly for the best but in fact wedded to a naturalistic programme, that is to see no arbiter outside human agency, or worse, whim. To such ears talk of the Fall, the realities of radical evil, even the danger of damnation will seem quaint, risible and medieval; nothing that is to do with the real world. Robert Boyle, in his time, was not so sure. He was deeply concerned that some areas, notably of magic and astrology, might lead into very dangerous territory where malevolence would be made manifest. The point is not whether magic and astrology are in any sense true, but acting as if they might be. So too today we are unwilling to concede either the possibility of what Roger Shattuck calls 'Forbidden Knowledge'[28] or that we might be assisted by those intelligences who do not have our long-term interests at heart.

Christian theology offers insights that at the moment are deeply unfashionable, not least as to what we ought to do when we choose to eat at the tree of knowledge. It is not necessarily a viewpoint that is in any way comforting, but neither are we meant to despair. Creation, so far as we know, is infinite in its richness and promise, and while there are many avenues to discover this truth, there is no reason to think that science is not one of them and in certain situations is actually the only inkling we will have. Indeed, science reminds us that Creation is far more wonderful, far more extraordinary, far more diverse, far richer than we could have ever anticipated. Nor is there any sense that we are anywhere close to a complete explanation of all we see. Rather, each discovery yields new and unexpected insights. What is also obvious is that at least materially this knowledge can be extraordinarily powerful. How we choose to use what we learn remains our central dilemma. If we ignore the theological dimension then we are heading for deep trouble. As long as we view the world as an accidental happenstance, to be treated as a utilitarian object, we not only lose sight of Creation, but also of ourselves and our place in it. That is a debate that is still with us, and one that was as familiar to Robert Boyle as to us.

An evolutionary eschatology?

So is this the end of the matter? There is one final aspect of Creation that in my view we would do very well not to overlook. Science certainly informs us about the integrity and complexity of the world around us, and thereby are we the better equipped to appreciate its beauty. Yet whatever else it might be, just

28 Shattuck, R. *Forbidden Knowledge: from Prometheus to Pornography*, Harcourt, Brace (1997).

as with our lives, so the visible world, and so far as we can ascertain the entire Universe, cannot be permanent, at least in any recognisable form. The standard view is that, given the expansion of the universe and the new evidence that on a cosmic scale this process is accelerating, in the long term our future is not too bright. Fairly early on the Earth itself will become uninhabitable as the Sun enters old age and swells up. Present estimates indicate that within a billion years the oceans will have boiled away, and if those estimates are wrong the death of our planet would not be much postponed beyond that. Other local excitement will be the projected collision between our galaxy and the nearby Andromeda galaxy. Again it is in the distant future, but in the cosmic scale of things may get a few lines on page 176594972187 of the *Universal Herald*. After all there is nothing too unusual with this, given that examples of colliding galaxies are known. But as I said these are all views from the parish pump. This is because as expansion of the universe continues galaxy after galaxy will slip away over the horizon of visibility. Whereas today billions of galaxies are visible, in the distant future all will be receding from us so fast, so far away, that none of their light will ever reach us. Beyond our galaxy there will be nothing to see. So too the stars will dim, and later still even the stars will cease to exist. After that, who knows, but the laws of physics suggest an eternity of a near-emptiness populated by solitary particles that slowly decay to even more elementary particles. There is speculation as to whether some sort of intelligence would – somehow – garner enough energy to survive in this diffuse, cold, near-vacuum. The point is that even if we, in some distant future, were able to spread to other worlds, conceivably other galaxies, we would merely win an extension of existence, a postponement of the inevitable.

There is, however, another view. It will not, I warn you, be popular. Yet consider; let us assume that the universe is genuinely *ex nihilo*, made out of nothing by the good grace of God. That is certainly part of the Christian orthodoxy, and so far as I can see neither the size nor the age of the Universe makes any difference to this assumption. It also appears to be consistent with the evidence from the Big Bang. We should, however, be wary about such concord, this apparently happy marriage between cosmology and revealed religion. Not that concordance is out of the question, far from it. One should just be wary because scientific evidence is always provisional. Apparently irrefutable data or hypotheses have a curious habit of turning out to be gloriously, wonderfully wrong. From our present stance it is difficult to see what data could more satisfactorily explain many cosmological observations than the Big Bang, but we should be cautious of two things. First, to assume that the Big Bang is the same as God's Creation, and second to fool ourselves that Creation *ex nihilo* is actually in any useful way open to comprehension. What surely matters, however, is that what can be brought out of nothing might be either returned to nothing or otherwise utterly transformed.

This too, I think, accords with Orthodoxy. The world around is very real, a point again G.K. Chesterton felt so strongly that at times thinking of an alternative literally promised madness. Now, no doubt to our scientistic colleagues

all this *will* seem madness. 'What? The world not defined by its flaming ramparts, but consumed by them? Dear me, not only medieval, but in decidedly poor taste.' Well, like death itself, if one side is correct we will at least know, even if what we are greeted with is 'not only medieval, but in decidedly poor taste'. Well, I don't see any likely response in the mind-set of the moderns; almost any sort of eschatology will seem risible. Christian orthodoxy certainly suggests otherwise, and in this context, it is particularly difficult to remind ourselves how totally unlikely the Incarnation appeared, first to the Jews and very soon the ancient world. Yet, it has an inexorable logic, and so I believe does an eschatology. My hunch is that it too will be quite unlike what we expect. Nor do I think the looming disasters, notably global warming, are the actual avenue. Global warming does, however, provide a very useful mind-set of attitudes. 'Well, maybe it will happen, one day, but not in my lifetime…' But the writing is on the wall, and in the sky and within the oceans. Could the same be true of End Times?

Let me, however, conclude with one small observation. I have, uncertainly and with little skill, tried to show that Robert Boyle's concerns and beliefs remain as valid and pertinent today as they did in his time. A common complaint against such people as Boyle, or indeed any of our antecedents, is that they simply knew less, so no wonder they were the more credulous. This, however, is to fall simply into the scientistic trap, and neglects the likelihood that if some areas of worthwhile human endeavour have flourished, others have unnecessarily withered, to our common detriment. Moreover, this view turns its back on eternal verities that were as true in Boyle's, or Pontius Pilate's, times as they are in ours. That such verities are presently widely dismissed as social constructs, power games, or whatever will simply erode the good and impoverish the many but at least allow the intellectuals to dream the more easily in their many beds. Nor am I sure, despite the best efforts of such people as C.S. Lewis, Peter Kreeft and many other brilliant apologists, how these ventures would be successfully recaptured. Science when it treats creation as a true Creation, and thereby faces up to its responsibilities, may well be important. I expect Boyle would have agreed. It seems ultimately, however, that it is the knowledge and experience of the Incarnation, the wisdom and warnings given by Jesus in the Gospels, and not least the Resurrection that in the final analysis are all that matters. Again I expect that Robert Boyle would have agreed.

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