Big Bangs and Whimpers: The Ends and Beginnings of Science

Steven Connor

A lecture given in the lunchtime lecture series Science And Its Fictions, Birkbeck College, 13 December 2006.

I want in this talk to reflect on beginnings, and in particular the kinds of thinking that science has done about beginnings, aided and abetted as always by all the things on which scientists draw – observation, ingenuity, invention, curiosity, obsession, prejudice. I will be exploring the particular kinds of difficulty that the idea of a beginning has represented for scientific thinking: initially because of an uneasiness with what we can call the premature and parochial finitude of unscientific myths of beginning, but, more recently, with an equally productive uneasiness with infinitist thinking. The central conundrum is: how can something come out of nothing? But if nothing comes out of nothing, how can it be that everything has come from something else?

Science took a goodish time to come round to the question of beginnings, and for good reasons. Whatever we might mean by science, it must include some kind of reliance upon the experimental method. Indeed, we might say that nearly all the other features that might be held to be characteristic of science are held in common with other areas of human enquiry – the use of deductive reason, of mathematical analysis, the reliance on evidence and proof. The French word for experiment is *expérience*, an indication of an important principle of the experimental method; indeed, the word experiment could be used in English in the sense of personal experience until the nineteenth century. Experiments have the authority they do because they can be experienced.

Experiments are also repeatable. The principle of the experimental method is that it identifies repeatable procedures; indeed, experimental truth means nothing more than repeatability. An experiment is an attempt to establish a generalisable experience. If I report on a truth established by experiment, I am in fact laying down a wager: I am betting you that, if you conduct the same experiment, under identical conditions, you will get the same results. What is more, if anybody else, ever conducts the same experiment under the specified conditions, the result will always and invariably be the same. If you put a mouse in a chamber from which the air is then evacuated, the mouse will die, not just on the whole, in the majority of cases, but absolutely and invariably all the time. Of course, as John Dewey observed, this means that the truths of science can never in fact be absolute. Scientific truth is only ever truth *so far*. It may be that experiment has repeatedly shown that a coin flipped in the air will either land heads up or tails up. But there is a tiny possibility that, under certain unusual, but still natural and thus experimentally admissible circumstances, a flipped coin might in fact land on its edge.

One of the refractory things about many of the forms of beginning in which science might be interested is that they are not susceptible to experiment. This is for two reasons, which correspond to the two conditions attaching to the nature of experiment that we have just described. First of all, beginnings have already happened, and ultimate beginnings have happened too long ago to be the subject of experiment. In order to conduct an experiment on the beginning of the universe, it would be necessary to able to replicate the conditions then obtaining. But, precisely because the universe must have got under way some considerable time before creatures like us emerged to think about it, it will always already be too late to set up the experiment in the requisite way. One may be able to imagine, deduce and simulate, but the element of experience will never be available. Of course it is possible to simulate certain aspects of such ultimate beginnings (the formation of stars, the production of amino acids, and so on), but the ultimate beginning, the beginning of beginnings, cannot be the subject of experiment, of observational experience.

For the same reason, ultimate beginnings are not repeatable. In order to be able to ensure that one is performing an experiment under the appropriate conditions, that is to say, that one is repeating it exactly as it was previously performed, and not introducing some contamination or bias, one has to be able to specify a set of initial conditions. Where, for example, are you going to toss your coin? Well, it has to be somewhere with sufficient gravity to ensure that, once, tossed, the coin will in fact fall to earth, rather than spinning off into space (for this reason, earth would seem to be a particularly eligible location for the experiment). But the problem with ultimate or absolute beginnings is that the initial conditions cannot be obtained. The very fact that things have already begun mean that it is impossible to begin again in any absolute sense. Indeed, not only can these initial conditions not be replicated, they cannot even be specified.

'In the beginning', we say in English. In the beginning, God created Heaven and Earth. (Genesis, 1.1) In the beginning was the Word, and the Word was God, and the Word was with God (John 1.1). As so often, the torque of thought involved in such a conception is carried by the preposition. What is the difference between being in and at the beginning? To say 'at' the beginning implies a punctual point in time; a date, or a particular moment. To say 'in' the beginning implies that beginning is a condition, that has some kind of extension in time, that might continue. In both cases, though, it implies that there was something there before the beginning. In fact, not only is it always too late for us to replicate or repeat the beginning, the beginning itself will always come late on the scene. This is because our concept of beginning actually always implies beginning from; 'where did I come from?' children traditionally ask. This is to say that there is a contradiction buried in our very notion of beginning, namely that all beginnings are beginnings from something. Nothing in fact comes from nothing. But this is in turn would be to say that there are no real or absolute beginnings, only variations of existing conditions.

In other words, it is a constitutive fact of thinking, or at least of the kind that we seem to be stuck with, that we can only posit a beginning that has already in fact begun, or is a departure from some other state of things that has come before it. Perhaps human beings are perhaps particularly obsessed by the idea of beginnings because our own personal beginnings are not available to us. Even if you could remember coming into being, you could not remember what you were before you were came into being, because, if you could, you would already have come into being. To be means always to have begun being. Human beings are constitutively drawn to beginnings, even as beginnings resist thought.

Why are beginnings important to us? This may have to do with our capacity for memory, or rather its limits. The possession of language, along with other encoding and representational systems, gives human beings the opportunity and therefore perhaps also the inclination to reflect upon themselves, projecting backwards and forwards in time. This allows us to recognise and possess the knowledge that we have not been here always and will not always remain. We know that there is a time out of mind that we cannot remember. Our capacity for memory allows us to recognise that we had a definite beginning, precisely because there is for all of s a limit point before which we can remember nothing. The intolerability to some of the idea that we do not remember when we were not yet has generated theories, like the Platonic, that we have simply forgotten them. The idea of our beginning allows us to synchronise our personal memories with our more abstract representations of the past; my birth is the point at which I entered the world. I include in my retrospection a world that did not yet include me. When I reflect on my own personal beginning, it is as though I were undertaking a surrogate selfparenting, placing myself both after and before my own appearance in time. There are two problems for creatures who are concerned to know and maintain their place in things. One is the possibility that we are no more than a rearrangement of already-existing constituents, and thus have no real individuality or uniqueness at all. The other is that we came out of nothing, as an arbitrary, ungrounded, unanticipated emergence (though the phrase 'came out of ' is testimony to the difficulty of dispensing with the idea of precedence). In the one case, we are swallowed up in the world; in the other we are absolutely alienated from it. In the one case, we had no real beginning; in the other we came from nothing and from nowhere. The work of imagining our beginning involves coordinating these two needs – the need to have come intelligibly from something, and the need to avoid being reduced to what we derive from.

Narrative is the name we give to the activity of creating continuity between these two principles. One of the most important functions of narrative is to establish beginnings, and their relations to present conditions. The child's curiosity about who he is is satisfied by a story about where he came from. But narratives must themselves also have beginnings, and anxiety has erupted at certain times at the arbitrariness involved in the fiat of beginning. 'Begin at the beginning, carry on until you reach the end, then stop', Alice is advised. But things are not always as simple as this. *Tristram Shandy*, which sets out to tell the story of the life of its first-person narrator, gets so tangled in digression and cicumstance that we are some hundred pages into the novel and the narrator has not even succeeded in getting himself born. Samuel Beckett's novel *Molloy*, which is going to be narrated to us by a character who is living in a room, his mother's probably, writing pages which are collected at intervals by a mysterious second character, exhibits even more tightly-wroguht perplexities about beginning at the beginning, since the beginning is never that:

> I am in my mother's room. It's I who live there now. I don't know how I got there. Perhaps in an ambulance, certainly a vehicle of some kind. I was helped. I'd never have got there alone. There's this man who comes every week. Perhaps I got there thanks to him. He says not. He gives me money and takes away the pages. So many pages, so much money… When he comes for the fresh pages he brings back the previous week's. They are marked with signs I don't understand. ..
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> He's a queer one the one who comes to see me. He comes every sunday apparently. The other days he isn't free. He's always thirsty. It was he told me I'd begun all wrong, that I should have

> begun differently. He must be right. I began at the beginning, like an old ballocks, can you imagine that? Here's my beginning. Because they're keeping it apparently. I took a lot of trouble with it. Here it is. It gave me a lot of trouble. It was the beginning, do you understand? Whereas now it's nearly the end. Is what I do now any better? I don't know. That's beside the point. Here's my beginning. It must mean something, or they wouldn't keep it. Here it is.

The point here seems to be that there is no natural and self-appointing beginning. Molloy writes in a world in which, because everything has always already begun, anything can turn out to be a beginning.

Science Against Beginnings

So much for some of the perplexities involved in thinking about beginnings in general and ultimate beginnings in particular. The thinking of origins has been driven by a contradictory desire – the desire both to have come into being as an absolutely new and unanticipated entity and the desire never not to have been there, never not to have been in the offing. It is for this reason that, for much of its history, science has not been greatly concerned with enquiry into absolute beginnings. Rather, such enquiry has been the preserve of myths, and particular the particular kind of 'how-it-all-began' myths known as 'cosmogonies'. These are the stories of cosmic eggs cracked open by axe-wielding culture heroes, the earth gathered together from swirls of dust, the coming together of a primal sky-man and earth woman and stories of various forms of primal pap or porridge that is patted, or cooked or swirled into shape. Indeed, it may very well be because myths are so routinely concerned with providing accounts of beginnings that science, concerned to distance itself from the more parochial plausibilities of such mythical thought, itself for a long time eschewed discussion of creation. For myths of the beginnings of things have often seemed to those informed by scientific investigation to be too altogether too small or familiar to account for the facts, involving as they do stories of antagonisms or amours between deities or other mythical personages, rather than the impersonal forces with which science has been concerned.

Where creation myths attempt to make our origins accessible, science therefore set itself to distance ourselves from our origins, rather than to try to narrow the gap between us and those origins. A particular area of vulnerability in Biblical narrative was the question of the age of the earth. Literalist readers of the Bible still proclaim that, counting back through the genealogies provided in the Bible, it is impossible for creation to be much more than 6000 years old. Much of science, especially through the nineteenth century, forced an expansion of the time-scale on which the universe was conceived. The sciences of evolution, initially in geology and subsequently in biology, seemed to require millions and even billions of years to have elapsed for the processes of gradual adaptation and transformation that it postulated to have taken place. The vast expansion of what Shakespeare calls the 'deep dark backward and abysm of time' was accompanied by an equivalent expansion of cosmic distances. The Ptolemaic universe of spheres hung with the pretty fairy lights of the stars, perhaps a couple of hundred miles high, gave way slowly to an even more yawning and sublimely inapprehensible immensity of cosmic space, so immense, in fact, that it could only be represented in terms of the time that it would take to be traversed by light. (As we will see later on, the other feature of scientific enquiry was that it distanced the creation of the world, and the universe, from the creation of man, or life, events that, in many creation myths, including of course, that contained in the Bible, are simultaneous.)

However, if science has tended to push the universe in the direction of the infinite, it has also itself had to combat infinitist notions. A different relation between myth and science is suggested by a story that has propagated pleasingly over the internet in recent years. In its most developed form, it involves a meeting between a sceptical Western enquirer and an Eastern sage. The sage declares that the whole visible universe rests upon the back of a huge elephant. When the enquirer wonders what the elephant might be standing on, the sage replies that it stands on the back of a huge tiger. When the sceptic renews his question, the sage informs him that the tiger is standing on the back of a huge turtle. 'And, before you ask', says the sage, 'from then on, it's turtles all the way down'. The story is told in a different version by Stephen Hawking at the beginning of his *Brief History of Time*. In this version, it is a little old lady who accosts a famous scientist after hearing a lecture on the nature of the universe and insists on telling him her belief that the world is a large flat plate resting the back of a turtle. The story is nicely poised between approval and disapproval for the one arguing for the infinite turtle hypothesis. For ground, the turtle's back, substitute beginning. The story asks, which is more naïve: the one who insists on a ground floor to history, or the one who thinks he can dispense with it? The first version of the story gets its comic sting from the literal-minded refusal of the rationalist to consider anything other than four-square reality. Hawking, by contrast, means the old lady's stubborn refusal to consider evidence to be seen as ridiculous, if winningly so.

Since the nineteenth century, science's growing vocation towards enlarging the world rather than trimming it to human proportions has meant that it has tended more and more occupy the aesthetic space of the sublime, defined by Longinus and more modern exponents of the idea, such as Burke and Kant, as that area of experience and speculation in which the mind is brought into disconcerting proximity with what exceeds its conceptual powers. For Kant, the sublime is the Unform, that which it is not possible to enclose as a form. But science has also challenged inherited ideas of the eternal, the unchanging and the infinite. For there is something suspiciously sedate about the eternal, and the idea of infinite expanse; it has a self-regarding look about it, that resembles our own self-image. As we are about to see, there is actually something weirder, more amazing, and more essentially inimical to human conceiving than the idea of infinity. That idea is the finiteness of things, what we really ought to be allowed to call 'finity'.

Why does it get dark at night? This question, seemingly so simple to answer, started to worry people in the late sixteenth century, and more particularly one Thomas Digges. Traditional conceptions of the universe suggested that beyond the visible creation was the realm of eternal or divine life; this meant that the universe could be conceived as containing an infinite number of stars. But, if this were the case, reasoned Digges, then there would be no quarter of the sky that would not be crammed with stars. Thus, even at night, the sky should be ablaze. Digges contented himself with the suggestion that these stars were so far away that their light was too faint to reach us. Returning to the riddle thirty years later, Johannes Kepler would have none of this. No matter how far away the stars were, he reasoned, and no matter how depleted by distance their individual lights, the fact that there was an infinite number of them ought to ensure that there would always be more than enough to make up for the faintness of their light. The door was opening, if only a chink, on to the notion that the universe could not, after all, be infinitely large.

In the middle years of the twentieth century a series of extraordinary developments in cosmology began to substantiate this idea. At mid-century, the dominant conception of the universe was that it existed in an eternal steady state. Einstein's general theory of relativity of 1917, that unified space, time and gravity, suggested that a universe that was uniformly filled with matter would either be expanding or shrinking, but could not be static and immutable. But Einstein could not believe this to be the case, and so he introduced something he called the 'cosmological constant', which had the result of stabilising the universe and preserving Einstein's conception of it. If you asked what this constant actually represented,what it was a constant amount of, then the answer would be as tautologous as that which Molière mocked in *Le Malade Imaginaire*, when he had a doctor explain that opium puts you to sleep on account of its 'dormitive faculty'. The constant was a measure of constancy and there in order to keep things –um – constant.

But *eppur si muove*, as another great scientist said, and things were indeed on the move around Einstein. During the late 1920s, Edwin Hubble was engaged in measuring the distances of the furthest visible galaxies. Spectrographic analysis allowed him to measure the composition of the substances that were radiating the light. But when he looked at the spectrographic evidence, he noticed that, relative to the same substances here on earth, the wavelength patterns were shifted across from the blue end of the spectrum to the red, or from shortwave to longwave, like a tune being transposed from B major to C major. Light behaves just like any other undulatory phenomenon in this respect, and a lengthening of wavelength, like the droop in pitch of a sound wave in the well-known Doppler effect, is a clear sign that the source of the vibration is moving away from its point of reception (think of a sound as chopping the air into segments; as the source of the sound recedes, the intervals will be stretched, thus increasing the wavelength and dropping the pitch). Hubble had discovered that, Einstein's cosmological safety-belt to the contrary, the universe was indeed in motion. What is more, the further away a particular object was, the faster it was receding. Indeed, observations made in 1998 seemed to show that this increase is not merely proportional to distance, but that objects are actually accelerating away from us. All of a sudden, a universe of great gulfs fixed was temporalised: those objects which were furthest away were so because they were older. As John Gribbin has put it, in his book *In the Beginning*, 'the reason why the sky is dark at night is not that there is an edge to the Universe in space, but that there is an edge in *time*' (Gribbin 1993, 15).

Having established that the universe had a future, the irresistible next move was to wonder what its past might have been. If one wound back in time (and one wonders how easy this would have been for a generation that had not had the experience of seeing things played backwards in a cinema which had itself had so strong a fascination from its very beginnings with showing various forms of explosions), one eventually ended up with the idea of a single point of unimaginable density, which, at the ultimate beginning of things, had exploded, giving rise to the universe, which was itself nothing more than the form taken by this ongoing explosion.

If the universe really had been formed by what opponents of the theory like Fred Hoyle disparagingly called a 'big bang', then there ought to be some fallout from this early condition, right out at the furthest reaches of space. For a while, this seemed like a tantalising possibility, but one for which evidence was unlikely to be forthcoming. But then, in 1964, something astonishing was discovered. A team of researchers from the Bell Laboratories detected a low and irreducible hiss of static that remained the same wherever their antennae pointed. They had detected what seemed to be background radiation from the Big Bang, or rather from a period about 300,000 years after it. This radiation had gradually cooled as it receded through space – a space which Big Bang theory tells us it was itself actively produced in its expansion, rather than expanding into – and was now at a temperature just three degrees above absolute zero.

But a difficulty emerged. One of the compelling features of this background radiation was that it was so uniform. But, after a while, it became clear to physicists both of a squinting and an equation-scribbling disposition that it might actually be too uniform. But the very lumpiness of the universe suggested that there ought to be some sign of this incipient irregularity in things, some tiny ripples in the background radiation that, much magnified and extrapolated, might result in the distinctive kinds of irregular regularity that constitute the universe. In 1989, a satellite known as the Cosmic Background Explorer, or COBE, began to take measurements of the temperature of the background. It took four years, but eventually, the requisite ripples were indeed detected; in the last two or three years, they have more recently been verified and made more precise by the Wilkinson Microwave Anisotropy Probe.

This theme of originary ripples, implying the necessity of some inaugural disturbance to an otherwise absolutely undifferentiated continuum, recalls intriguingly one of the earliest atomist theories. The Roman poet Lucretius wrote his long poem *On The Nature of Things* around the middle of the 1st century BC. It is based on the atomist theory of matter identified with Epicurus,and originated by Democritus four centuries before, whose philosophy is crisply summarised in the slogan: 'There are only two things in the universe: atoms and the spaces between them. Everything else is opinion.'. Lucretius proposes an originary condition of matter in which atoms rain down vertically (in an infinite universe without bottom). Such a universe would be hyperstable: nothing would ever happen or begin. It is necessary, Lucretius suggests, to posit a tiny swerve, or indeterminacy – which he calls a 'clinamen' – to enable the chain-reaction of irregularities and collisions that will result in a determinate and differentiated universe : 'If it were not for this swerve…no collision would take place and no impact of atom upon atom would be created. Thus nature would never have created anything (Lucretius 1994, 43: 2.222).

Stars, Planets and People

As I have already mentioned, most creation myths tend to join together the story of the creation of the world with that of the creation of life. In fact, they often concertina three forms of beginning – the origin of the universe, the origin of life, and the origin of man. Likethe expanding universe, in which things move further and further apart, science has tended to separate these three narratives, in the process removing man further and further both from the origin and from the centre of things. Nevertheless a strong and intimate relation persists between the attempt to narrate absolute beginnings and the attempt to narrate human beginnings, or the beginnings of the cosmos as such and the beginnings of life.

Human beings have a tendency to identify themselves with life as such. The kind of life that human beings regard themselves as possessing had traditionally been thought to be the gift of God, and to have been accounted for in terms of the original creation, which always, as it were, has life in mind, as its ultimate expression or destination.

However, there is an interesting and somewhat troubling alternative to this view, that life was built in to the beginings of things. One of the most tenacious human beliefs is that of spontaneous generation, a belief which flourished from ancient times until well into the nineteenth century. While not exactly a belief that things can have their beginnings in nothing, it does imply that life can be produced from that which is not living. Spontaneous generation is usually a feature of the lower or more despised creatures, especially insects, and especially those which were too small for their processes of sexual reproduction to be easily observed. Aristotle's *History of Animals* remained an authoritative source for these beliefs until well into the seventeenth century. Aristotle thought that different kinds of insects could be germinated from snow, rain, sweat, fire, paper, dust, books and used washing-up water. The cicada is said to be born from the spittle of cuckoos (there is surely a survival of this belief in the fact that the substance in which froghopper aphids have their early lives in a substance is still in England called 'cuckoo-spit'). Hornets were said to be generated from the carcasses of horses and mules and scorpions from the bodies of crocodiles. Despite the widespread familiarity with bees and the practice of beekeeping in the ancient world, bees were thought to be born from the carcasses of bulls. Eels were thought to breed spontaneously from mud. The wind was believed by Pliny and others to have the power to fecundate certain animals, especially mares. Vitruvius advised against building libraries with a southerly or westerly aspect, since winds from those directions bred bookworms. Van Helmont said that 'If a dirty shirt is stuffed into the mouth of a vessel containing wheat, within a few days, say, 21, the ferment produced by the shirt, modified by the smell of the grain, transforms the wheat itself, encased in its husk, into mice. (Harris, *Things Come to Life*, p. 5). Such beliefs can scarcely be said to be unscientific, since they often relied for support on the observation of processes such as putrefaction and fermentation, in which the principle of life did indeed seem to emerge *ab nihilo*. Early Greek cosmologies, which are distinguished from many other Creation myths by the fact that they tend to rely upon the operation of impersonal processes rather than the actions of supernatural beings, often assumed that the earth and the cosmos might have had its beginnings in the same kind of natural processes as were seen in nature, especially those which involved some kind of decomposition.

Although the doctrine of spontaneous generation cannot straightforwardly be said to be unscientific, it represented a challenge to scientific thinking in that it seemed to assume sudden, mysterious suspensions or infractions of the laws seemingly obtaining in nature, laws whose exceptionless dominion seemed to be confirmed more and more by scientific thinking and method. So the progress of science has been identified with the slow demonstration, undertaken against many objections and obstacles, and with very many reverses and delays, that everything living comes from a previous living thing – or, as William Harvey put it, in the frontispiece to his *De generatione animalium* of 1651, 'ex ovo omnia', 'every [animal] comes from an egg'. One of the most important experiments in this history was conducted in 1688 by Francisco Redi, which was designed to test the long-held idea that maggots were bred spontaneously from decaying meat. Redi kept decaying meat in two containers, one sealed, the other open to the air. Only the one open to the air developed maggots, a clear indication that the maggots had come from elsewhere, namely the eggs laid upon the meat by flies. Despiute Redi's apparently definitive demonstration, the belief in spontaneous generation persisted, usually shifted down in the order of creation – so, it was accepted that mice, bees, and worms reproduced sexually, but suggested that microorganisms, such as spores and moulds, might be generated spontaneously. In the 1860s, Louis Pasteur predicted that a container of broth would remain sterile even if exposed to the air, as long as the microbes in the air could be prevented from entering. To effect this, he designed flasks with s-shaped necks that filtered out microbes. He was able to demonstrate that, with this method of filtering, the broth indeed remained sterile. Pasteur's experiment was crucial in establishing the germ-theory of disease, and consolidating the belief that everything comes from something. The effect of this is once again to undermine the idea of the possibility of absolute beginning.

Perhaps because it is in part an argument with our own minds, the argument about how life arose has replayed in many respects the arguments about spontaneous generation. It is not just the more wild-eyed kind of creationist who finds it difficult to accept that the kind of complex, multi-level molecular orderings that we call organic matter might have formed itself, or arisen arbitrarily or out of nothing. The last three decades have seen a flowering of arguments for what has been called the 'anthropic principle', a phrase that seems to have originated with Brandon Carter in 1974. This is the principle that living, conscious creatures like the ones we are (or take ourselves to be) are not just accidental, spontaneous generations, but that the universe may be in some sense predisposed to their production – that the universe is, hugely against the odds, fine-tuned for the production of life. These fine-tunings include the fact that the electromagnetic force is so very much stronger than the force of gravity, preventing the collapse of the universe under its own weight, that the masses of electrons, neutrons and protons are such that they encourage unstable decay and combination, the fact that water, almost uniquely, expands when it freezes, rather than contracting, and, most importantly of all, that conditions of nucleosynthesis in stars are just right for the production of carbon atoms.

Stuart Kauffman has argued, in his tellingly-entitled *At Home In The Universe*, that the universe has built into it forms of or tendencies toward readymade order, which may make the evolution of life something very different from the chance flinging together of something out of pretty much nothing that hard-line Darwinism would suggest it is.

> [I]f the forms selection chooses among were generated by laws of complexity, then selection has always had a handmaiden. It is not, after all, the sole source of order, and organisms are not just tinkered-together contraptions, but expressions of deeper natural laws. If all this were true, what a revision of the Darwinian worldview will lie before us!. Not we the accidental, but we the expected. (Kauffman 1995, 8)

Physicist Paul Davies goes even firther to suggest that a life principle may be built into the universe. '[H]as the cosmic porridge been lovingly cooked up by a cosmic chef who knows what Goldilocks likes? …The more you look at the way in which our Universe is set up, the more it seems to have been set up in a very odd way, to encourage nucleosynthesis and the formation of stars, planets, and people' (Gribbin 1993, 183, 185)

The philosopher Daniel Dennett has stood out against such theories, arguing that they represent what he calls the 'Mind first' principle (Dennett 1996, 26-8). I think he is right to point to the fallacious logic of arguments that suggest that because the universe presents a series of conditions that are, against all the odds, just right for life such as ours to emerge, then not only are we a necessity, the universe might be said to be for us. The fact that these conditions are so exquisitely and precisely necessary for us does not mean that we ourselves are necessary outcomes of those conditions, or that they must have had us in some sense primordially in mind. This idea may be an effect of the tendency to overestimate beginnings, or what can be inferred from them, the tendency to believe that to establish what something is originally is to have discovered what it is essentially.

Interestingly, the argument from design, which implies that nothing can come from nothing, though it has been used to attack scientific theories, itself speaks to a deep proclivity within scientific thinking itself, to be suspicious of absolute beginnings, of spontaneous generation, whether of cicadas or cosmoses. However, accepting the Big Bang hypothesis, along with the principle that the very possibilities for evolution of life must themselves have bootstrapped themselves into existence, rather than having been supplied readymade (whether by comets, aliens, or other sources) does mean accepting something like a principle of spontaneous generation – that some things do indeed come out of nothing. Something (life) appears to have come from nothing (inorganic matter). We find it hard to imagine how such a thing could have happened, so different and so eminent does the thing we call life seem. Perhaps in essence we are really here confronting a much more local and personal difficulty, namely that we ourselves, as individual living consciousnesses, both feel ourselves to be the whole world, and yet know that we have not been here forever. We too seem to have come to life – but from what? Perhaps the worry that attaches to this recognition that our individual lives had a beginning is not the fact that we might indeed relapse into non-being, but that we might not actually be as thoroughly and indubitably alive or self-masteringly conscious as we take ourselves to be.

But this is a version of a theory that, for a long time, represented the principal rival to spontaneous generation, the theory of *emboîtement*, or 'encapsulated preformation'. The theory proposes that every living thing is the unfolding, like a paper flower in water, of a seed contained in the body of its parent, which has similarly unfolded from a seed contained in the body of its parent, and so on (or back). At the origin of all things would be an Abrahamic superseed, not unlike the singularity which produced the Big Bang. If we find it hard to understand how such a belief could seriously have been entertained, we should bear it in mind as we try to make sense of the amazing, terrifying prospect of a finite universe with a determinate beginning.

References

Dennett, Daniel C. (1996). *Darwin's Dangerous Idea: Evolution and the Meanings of Life*. London: Penguin.

Gribbin, John (1993). *In the Beginning: The Birth of the Living Universe*. London: Viking.

Kauffman, Stuart (1995). *At Home in the Universe : The Search for Laws of Self-organization and Complexity*. London: Viking.

Lucretius (1994). *On the Nature of the Universe*. Trans. R.E. Latham. Revised John Godwin. London: Penguin.