

Wondering about The Next Big Thing

Michael Dowling

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What comes next?

What do we anticipate as The Next Big Thing?

No, not the *little* Big Things.

I'm not wondering about the next major technological development, even something as earth-shattering as Artificial General Intelligence (AGI). I'm not wondering about the next big thing at a cosmological level, in a universe already comprising enormous galactic superclusters and filaments. And I'm not wondering about the next major horror we humans might unleash through our collective stupidity, whether that be nuclear war or some major climate change tipping point.

Rather, I am wondering about something that is both more personal and more stupendous, something that connects to our origin, who we are, and what our future might be.

But, before we can consider The Next Big Thing, I need first to set the scene. We shall begin in a manner consistent with what we shall discover with The Next Big Thing. We shall begin with a consideration of awe and wonder.

Awe and Wonder

"The important thing is not to stop questioning. Curiosity has its own reason for existing. One cannot help but be in awe when one contemplates the mysteries of eternity, of life, of the marvellous structure of reality. It is enough if one tries to comprehend only a little of this mystery every day. Never lose a holy curiosity."
(Albert Einstein)¹

I admit to knowing so little about the workings of our natural world. Yes, I have a degree in science, I've worked in different parts of the scientific field, and I've maintained a lifelong fascination with science and nature, but the complexity of the natural world is such that, when it comes to truly understanding it, I remain a child.

And yet, I take heart from Albert Einstein's quote. Perhaps, when it comes to our relationship with the natural world, being a child isn't such a bad thing. A child, ever curious, ever interested in knowing more, always open to experiencing awe and wonder.

When I was a child, my parents encouraged my natural sense of curiosity. I can remember the anticipation, each month, of them buying for me the latest instalment of *The How and Why Wonder Book* series. The How and Why Wonder Book of...Dinosaurs...Our Earth...Stars...Magnets and Magnetism! It was so exciting! To be honest, I can't recall if I paid much attention distinguishing between the "how" and the "why" aspects. I was simply caught up in the wonder of it all.

Whether we are seeking to understand the everyday puzzles of mundane living or the mysterious wonders of existence, the how and why questions can challenge us. That's why I'd like to seek wisdom from a genius of ancient times.

Aristotle and Causation

Aristotle (384-322 BCE) lived at a time before the advent of specialization, before the mothership of philosophy (*philo-sophia*; the love of wisdom) had given birth to the individual sciences, each with their own increasingly defined sub-specialties. In seeking to understand something, the Greek philosopher brought *all* domains of knowledge to bear on a problem. In his own approach, Aristotle employed something known as *fourfold causality*. This strikes our modern ears as a little odd. When we think of causality, of cause and effect, we think of one thing (the cause) bringing about something else (the effect). How then can causality be fourfold? Perhaps a better way of describing Aristotle's idea is a *fourfold explanatory framework*. An example will make this clear. Consider the object depicted in Figure 1.



Figure 1

Jörg Bittner Unna (https://commons.wikimedia.org/wiki/File:'David'_by_Michelangelo_Fir_JBU004.jpg),
 “David' by Michelangelo Fir JBU004”,
<https://creativecommons.org/licenses/by/3.0/legalcode>

How does one “explain” such an object? According to Aristotle, it is to be explained on four different levels.

The first explanatory level is the *Material Cause*: what stuff is it made from? Geologists will offer one answer, chemists another, but its material cause can, in one way or another, be defined. The second explanatory level is that of the *Formal Cause*: this isn't merely a shapeless lump of marble, but has instead a very particular form. The third explanatory level is that of the *Efficient Cause*: marble statues don't just sprout spontaneously from the ground, like carrots, but instead are shaped by the hand of a master craftsman. The fourth and final explanatory level is the *Final Cause*: what is the purpose and meaning of the object in question? In the absence of getting into the mind of Michelangelo, one might surmise that the

purpose, in his creation of the statue of King David, may have been to inspire others with the beauty of the male form.

When it comes to these four elements of Aristotle's explanatory framework, science has been very focussed on investigating the first three levels: the material, formal and efficient causes. Science has been much less focussed, as well as less successful, in exploring the final cause.

Indeed, when it comes to that final cause question, it is often deemed an unscientific question. What is the meaning and purpose of existence? What is the meaning and purpose of my own particular existence? These questions are often relegated to the field of religion or philosophy (but now, of course, with philosophy stripped of its individual scientific disciplines). One wag has suggested that science replaces *important questions* that *cannot* be answered with *unimportant ones* that *can*! Not all scientists have adopted such an approach, but have instead been prepared to ask the deeper, more philosophical questions. This is a point to which we'll return.

Be that as it may, science has been spectacularly successful in answering questions posed by the first three elements of Aristotle's fourfold framework. Its success can be attributed, in no small part, to the power of the *reductionistic* approach. Reductionism, as a technique, recognizes that the natural world is normally far too complex to study in its totality. Reductionism instead focusses on one very small aspect of existence, seeking to understand it, and then to place the understanding thus gained into the bigger picture. This reductionistic strategy has been incredibly powerful when it has been applied to observe phenomena in our world, and in the formulation of scientific theories to explain those phenomena.

However, when it comes to the concept of *theory*, it is possible to get confused about what scientific theories are, and what they are not.

Theories versus Facts

More than once, I have heard the shrill cry, often from someone with strong Conservative Christian beliefs, "Evolution is *just* a theory!" And, on occasion, the equally shrill rejoinder has been, "Evolution *isn't* a theory; it's a *fact*!"

Both statements reflect a hierarchy in which facts are seen as more powerful than theories, and both reflect a fundamental misunderstanding of what is embodied in a well-established scientific theory.

Let us consider the *fact* of gravity, and the *theory* of gravity.

We hold an apple in our hands.

We let go of the apple.

The apple falls to the ground.

This is the *fact* of gravity in action.

When Isaac Newton (1643-1727) pondered the fact of gravity, it wasn't the apocryphal apple hitting him on the head that solved the problem. Apples had been dropping to the ground for millennia without the penny of insight also dropping. It took the singular genius of Newton to connect two phenomena, previously seen as unrelated, as manifestations of the very same

phenomenon of gravity: terrestrial and celestial motion. Prior to Newton, motion in the *terrestrial* sphere – including the falling of apples and the trajectory of cannonballs – were seen as governed by the nature of the object in question. Unlike wind and fire, heavy objects, such as apples and cannonballs, were understood to possess something called *gravitas* (Latin: *heaviness*), which meant that their natural state was one of returning to earth. In contrast, the movement of objects in the *celestial* sphere (e.g. planets, stars) was governed by the power(s) in the divine celestial realm. Newton unified these seemingly diverse phenomena under a single *Law of Universal Gravitation* in which the force between two objects is defined as being directly proportional to the product of their masses and inversely proportional to the square of the distance between them. Newton's theory of gravity was so spectacularly successful at *explaining* phenomena in both the terrestrial and celestial realms, and so spectacularly successful at *predicting* the movement of cannonballs and planets, that one might have been forgiven at the time for thinking that Newton's *theory* of gravity had been upgraded to a *fact*. It would have come as a shock to Newton's contemporaries to learn that, two hundred odd years later, another genius would reveal Newton's theory of gravity to be incomplete.

Albert Einstein (1879-1955) reformulated the theory of gravity in fundamental ways, incorporating space and time into a unified spacetime, a spacetime which could be warped by the presence of massive objects, a warping which in turn influences the movements of objects. Whereas Newton's theory perceived gravity as a force between objects, Einstein's theory of General Relativity reframed gravity as a geometrical curvature of spacetime. In light of Einstein's improved theory, Newton's theory of gravity was revealed to be, in cases of relatively low gravity and low speeds, a brilliant approximation, but which becomes increasingly less precise in cases of more extreme gravity and speeds. As an illustration of the practical significance of the theory, the Global Positioning System (GPS), featuring a constellation of satellites in orbit some 20,000 km above the Earth, is reliant upon Einstein's Special and General Theories of Relativity in providing an accurate GPS location. Key to the system is the relativistic understanding that the atomic clocks on board the satellites run some 38 microseconds per day faster than the earthbound atomic clocks with which they are compared.² Without taking account of these entirely counterintuitive relativistic effects, the GPS systems on our phone would be hopelessly inaccurate within minutes.

In Newton's brilliant mathematical unification of terrestrial and celestial mechanics, he opened human eyes to the orderly wonder of the cosmos. In Einstein's relativistic elaboration, he vastly expanded the wonder with its awesome implications: curved spacetime, black holes and gravitational waves.

Although General Relativity has been successful in enabling agreement between theory and observation to an extraordinary degree of precision, it too remains incomplete as a theory, since it does not accommodate the realm of the very small: there is currently no accepted theory of quantum gravity. Without doubt, the Theory of General Relativity will one day be augmented or replaced by an even more complete explanatory framework. Despite Einstein's singular genius, even General Relativity is not a fact.

In one sense, facts do trump theory. A scientific theory can be falsified, or at least called into question, by a verified fact that is in contradiction to the theory.

But, in another sense, theory most certainly trumps facts. A tested and well-established scientific theory provides an explanatory framework for *many* facts, and a predictive

framework for *many* facts as yet unconfirmed. Tested and established scientific theories, such as General Relativity, the Standard Model of Particle Physics, and Evolution by Natural Selection, *are not facts*. They are much, much *more* than mere facts.

Moving from Reductionism as Technique to Reductionism as Philosophy

As valuable as reductionism-as-technique has been to the scientific endeavour, there is another domain where it has been less than inspiring: *reductionism-as-philosophy*.

It is possible to tell when one has moved from reductionism as technique to reductionism as philosophy: whenever one hears the phrase, “nothing but.” This is what author C.S. Lewis termed the “Nothing Buttery” approach.

From scientists such as Richard Dawkins, we hear the implication that we are *nothing but our genes*.³

From Francis Crick, co-discoverer of the structure of DNA, and who subsequently moved into the field of consciousness research, we hear that we are *nothing but a pack of neurons*.⁴

And from former UK Prime Minister Margaret Thatcher, employing a different form of wording, we learn that *there is no such thing as society, there are only individuals*.⁵

These are examples of reductionism as philosophy, where a particular entity can be reduced to the smaller units of which it is comprised.

Of course, each sub-specialty of science has its own bias, asserting the importance of its own reductionistic level. Psychologists assert the importance of individual psychology, biologists the importance of biology, chemists the importance of chemistry, and physicists the ultimate importance of their own domain of subatomic physics.

If we follow the inexorable logic of reductionism as philosophy, we have:

Sociology...which can be reduced to
Individual psychology...which can be reduced to
Biology...which can be reduced to
Chemistry...which can be reduced to
Physics...which can be reduced to
 Ultimately...*quarks and electrons*.

And so, depending on our own particular reductionistic bias, we are *nothing but*...

...the biology which defines us (our genes, our neurons)
 ...the chemicals of which our cells are comprised (our molecules)
 ...the fundamental particles of which molecules are composed (our quarks, gluons and electrons).

Closely related to reductionism-as-philosophy is the philosophical and scientific concept of *determinism*. Determinism asserts that all events are predetermined by previous events to which they are causally connected. In other words, things are as they are because they *could not be any other way*. Coupled with reductionism understood in the philosophical sense,

complex objects (e.g. human beings) are as they are entirely by virtue of the combination of the simpler entities which comprise them. Hard determinists will argue that human free will is an illusion, since all events, including human actions, are predetermined. The classic reductionistic-deterministic view is that given by the French scientist and mathematician Pierre-Simon Laplace (1749-1827). In a thought experiment, he posited the existence of an all-knowing intellect (Laplace's Demon) that was capable of knowing the position and velocity of every particle in the universe, permitting it to predict the future course of events and retrodict all past events with perfect accuracy.

When it comes to determinism, Quantum Mechanics has rather thrown a spanner into the works. While the Wave Function describing a quantum system does evolve in a deterministic fashion, the "collapse of the wavefunction" which occurs during a "measurement," results not in a deterministic, but in a *probabilistic* outcome. And, at the heart of quantum measurement, the Heisenberg Uncertainty Principle asserts that the more precisely one defines the position of a quantum particle, the more uncertain becomes that particle's velocity. Nonetheless, determinism and reductionism remain very popular with many people, some prominent scientists among them.

I have come to realize, however, that it's really not my cup of tea.

From Awe to Ashes to Awe

I did go through my own reductionist phase, a period during which I explored in considerable detail the workings of the human brain. For quite a while, I simply couldn't get enough of the brain. Neuromodulators! Excitatory Post-Synaptic Potentials (EPSPs)! Ionotropic and metabotropic receptors! Serotonergic and dopaminergic circuits! For quite a time, I reveled in the reductionistic quest to understand the human person through understanding the workings of the human brain. Perhaps, if I could understand enough about the brain, I might eventually understand what it is...*to be human?*

I can't quite pin down the day, but at some point in my reductionist journey, my awe turned to ashes. The reductionistic quest, although revealing so much that was fascinating, ultimately failed to satisfy. It left me feeling that something was missing. When it came to the wonder of existence and when it came to the wonder of my own existence, something other than my neurons, my genes, my molecules, and my quarks and electrons was at play here.

My pathway out of ashes and back to awe came through a number of avenues.

One was that of poetry, immersing myself in poems that spoke of our human experience of awe and wonder, in ways that transcended the purely rational. Another was in thoughtful narrative writing about the natural world by people such as Julia Baird and her marvellous book *Phosphorescence*.⁶ Documentaries about the natural world have also been helpful in regaining that sense of wonder. But even more powerful has been my experience of actually being immersed in nature, whether that be walking through my local Sturt Gorge, swimming with whale sharks off Ningaloo Reef or observing the Milky Way from a dark sky reserve.

My final pathway out of ashes and back to awe was an intellectual one. It was through learning about a particular scientific phenomenon, a phenomenon that's best appreciated by

examining living organisms, a phenomenon that will lead us to the concept of The Next Big Thing.

A Most Reluctant Entrant to the Field of Biology

For the longest time, I had no knowledge of and no interest in biology. In fact, in my supreme ignorance, I was rather contemptuous of it.

“*Biology?! All those squishy, living things?! How boring! Chemistry is where it’s at!*”

Yes, for me, chemistry was indeed where it was at.

I studied organic chemistry and later went on to work as an analytical chemist, then spent a couple of decades in the scientific instruments field, involved in sales, service and training of scientists in the use of complex scientific instruments.

For so long, all through high school and university and part of my career in the scientific field, I managed to remain almost entirely ignorant of all things biological, with the exception of biochemistry. I never passed up an opportunity to avoid a biological learning experience! Until, that is, I needed to gain experience in the biological domain for work reasons. With great reluctance, I acquired a biology textbook and started to explore what made these squishy “living things” tick. I began to look at the microstructure of the human cell.

Hmmm...

A plasma membrane...made of lipids...*just molecules*.

The cell’s DNA...a very long and interesting helical structure...but *just a molecule*.

The enzymes that catalyze reactions...proteins...complex structures...but *just molecules*.

But, where’s the “living bit” that makes these cells, well, *alive?!*

I don’t know exactly *when* it dawned on me, and I certainly don’t know *why* it took so long to happen, but eventually the penny dropped.

“Are you telling me, that if I combine a collection of sufficiently *complex-yet-non-living molecules* in a sufficiently interesting way, the end result will be...*living?!*”

Yes, that’s *exactly* what I’m saying.

Niels Bohr, one of the great founders of quantum mechanics, is reported to have once said about the subject, “If quantum mechanics has not profoundly shocked you, then you haven’t understood it.” Precisely the same can be said for the phenomenon of living matter being comprised of non-living molecules. If it does not profoundly shock us that combining certain *non-living* molecules in a particular way can result in something that is *living*, then we really haven’t understood it.

To drive home this assertion, consider the following thought experiment.

In the far future, nanotechnology has developed to the point where it is possible to perform a 3D atomic-level scan of any object, mapping the identity and contextual location of every atom. Once scanned, it is possible to 3D-print a replica of the scanned object, using elemental atoms (carbon, oxygen, etc) as feedstocks. Someone can choose to be scanned in their physical and intellectual prime and then, after they die, have themselves reprinted, atom by non-living atom, with the product in the printing chamber being the same walking, talking person that they were in their prime, together with their memories at that time.

This is, of course, a thought experiment. The very idea is preposterous. At the moment. But, what of a thousand years from now, assuming we haven't driven ourselves and many other species to extinction before then?

It is the concept which I wish to highlight here, rather than specifics about the likelihood of acquiring such technology. It is the inescapable and staggering implication of *everything*, *absolutely everything*, including living organisms, having a chemical basis.

Is it any wonder the ancients invented the soul?

If you are still sputtering, I don't blame you. I was too when the penny first dropped.

And, if you are still sputtering, ask yourself if it is any wonder that the ancients invoked the need for a "soul"? The idea that inanimate matter could come alive seems so absurd as to be laughable. Surely something else needs to be *added* to inanimate matter, to imbue it with that extraordinary property we call *life*?

The Hebrew Bible (Genesis 2:7) describes God as shaping the first human (the *Adam*) out of the inanimate earth (the *Adamah*) and then breathing into its nostrils the breath of life. In this mythological account, something must be *added* to inanimate matter to endow it with life. While subsequent Jewish theology posited an *integrated* understanding of the human person (with no belief in a soul separate from the body), later Greek thought brought *dualistic* concepts to bear, in which a human person was seen as possessing *both* a material body *and* an immaterial *soul*: this soul needs to be *added* to the material body in order to bring *life*.

Ancient religious notions of the soul have become for many, myself included, an unnecessary contrivance. We need something more compelling than a soul added to an inanimate body in order to explain the phenomenon of life.

Back to our friend Aristotle, just for a moment.

Aristotle had a very different idea of "soul."

I use inverted commas, because Aristotle most certainly did not believe in a separate soul that was added to an inanimate body in order to give it life. Instead, he described "soul" (Greek: *psyche*) as *a potentiality that is actualized* within an object, whether than object was a plant, animal or human. He posited multiple levels of "soul," exhibiting a hierarchy of capacities: a nutritive soul (plants), a sensitive soul (animals), and finally a rational soul (humans)⁷.

The “soul” of anything, whether plant, animal or human is not something added to an inanimate object, but rather describes an intrinsic *capacity* of that entity, as it is. We can observe this hierarchy of capacity across living things:

Plants have intrinsic capacities not seen in inanimate matter: for example, they can grow and they can die.

Animals have intrinsic capacities that go beyond those of plants: including the capacity for locomotion.

Humans have intrinsic capacities that go beyond those of (at least some) animals: including, amongst other things, conscious awareness.

Aristotle’s ancient understanding of “soul” as capacity, of *potentiality that is actualized*, sits remarkably well with one very modern explanation of the wonder of life: the concept of *emergence*.

Emergence as a Counterpoint to Reductionism-as-Philosophy

Emergence is a phenomenon that is observed across many different contexts. The essence of emergence can be expressed this way:

“Emergence...occurs only when the activities of the parts do not simply seem to give the activity of the whole. For emergence, the whole is indeed more than the sum of the parts.”⁸

In other words, the concept of emergence is a repudiation of reductionism-as-philosophy: the whole *cannot* be reduced to its component parts.

Harold Morowitz, in *The Emergence of Everything*, describes twenty-eight different levels of emergence, spanning the cosmological evolution of our universe. In each of those twenty-eight examples, the new level of emergence is not explained by, nor is it reducible to the level which preceded it. In other words, with the emergence of a new level of complexity, a new capacity is observed, a capacity not possessed by the lower-level entity out of which it emerged. For example:

- The primordium (very early universe) emerges from the Big Bang.
- A universe of non-uniform density emerges from the primordium.
- Stars emerge out of the non-uniformity.
- The higher elements emerge out of the stellar factories that we call stars.
- Solar systems and planets emerge from gravitational clumping of elemental matter.

As fascinating as these early universe examples of emergence are, I am yet more fascinated by two astonishing instances of emergence: the emergence of *life* and the emergence of *consciousness*.

The Emergence of Life: Abiogenesis

The early Earth, when it formed as part of our solar system, was extremely hot (perhaps 2000 deg C) and, by virtue of that extreme heat, was entirely devoid of life. Fast-forward some 4.5 billion years, and we observe an incredible abundance and diversity of living things, both plant and animal. The direct implication is that, at some point in Earth's 4.5-billion-year history (according to the evidence, perhaps some 3.8 billion years ago), something truly stupendous occurred: *life emerged from non-living matter*.

The emergence of life from non-life is referred to as *abiogenesis*.

To be clear, this is *not* biological evolution, but logically preceded it. Evolution requires life on which to act. Abiogenesis is the process or processes *by which life itself originated*. The Origin of Life field is a very active sphere of scientific endeavour, with researchers seeking to understand the physical and chemical mechanisms responsible for the emergence of the first proto-life, from which all other living organisms evolved.

There is debate around the likelihood of that first proto-life having formed.

Even the simplest bacterial cell is mind-numbingly more complex than the individual molecules which constitute it. The likelihood that one might begin with some molecular raw materials, and then form, by random molecular recombination, a *living organism*, was described by astrophysicist Fred Hoyle as akin to a hurricane ripping through a junkyard and assembling, by chance, a working 747 Jumbo Jet.⁹ The physicist Paul Davies speculates whether there might be an as-yet undiscovered factor or force of nature which favours the formation of life, thereby increasing its probability of occurrence.¹⁰ It remains an open question.

Life is indeed an emergent property, not reducible to the chemicals which constitute it. Chemistry that is staggering in its complexity. Cycles upon cycles. Networks of exquisitely choreographed chemical reactions. Living organisms exhibit a form of chemistry that is seen nowhere outside of the living sphere.

One could say that living systems do not actually contradict the underlying laws of chemistry, but rather they *actualize* capacities which were, in non-living matter, merely *potentialities*.

And yet, as incredible as the emergence of life from non-life is, there is a level of emergence more wondrous still.

Consciousness and the Wonder of Downward Causation

At some point in the history of life, emergence decided to show off yet again, and to actualize a potentiality inherent in certain forms of living matter: *consciousness*. Not only were these organisms alive, but they were also *conscious* of being alive; they were *self-aware*.

I won't claim that humans have a monopoly on consciousness - there is strong evidence of consciousness and self-awareness in other animals - only that, at least on our better days, we humans qualify as being conscious and self-aware. Philosophers and scientists have argued, back and forth, about the nature of consciousness, and even its very existence. Such debates

needn't concern us here. I shall simply accept as a given my everyday lived experience of being a conscious living being.

As I go about my life, I am aware that my self-awareness permits me to consciously choose certain actions, actions that impact upon lower-level processes in my body. I am aware of my amazing conscious capacity for what is termed *Downward Causation*. The phenomenon of Downward (Top-Down) Causation is evidenced across Morowitz's 28 levels of emergence but, to my mind (pun intended), it is most striking when considered at the emergent level of consciousness. An example will illustrate the point.

If you are experiencing depression, you can seek to address this using the *Upward (Bottom-Up) Causation* pathway. You can visit the doctor, who might prescribe for you an SSRI or Selective Serotonin Reuptake Inhibitor. This acts by increasing the concentration of serotonin in certain synapses, increasing the activity of the neural circuit. With some individuals, after a period of some weeks, this altered brain chemistry can produce a subjective change in mood, reducing the feeling of depression. This is Upward Causation.

Upward Causation: A change in Molecules leads to a change in Mind

We can, however, choose to operate in the reverse causal direction. If I am feeling depressed, I can *consciously choose* to drag myself out of bed, in order to go for a walk in nature, soaking up its sights and sounds. I can *consciously choose* to meditate or spend time in silence. It has been demonstrated that such activities produce changes in brain chemistry and, over time, take advantage of the brain's inherent plasticity to rewire neural circuitry.¹¹ These and other cognitive strategies have also shown themselves to be effective in enhancing mood. This is Downward Causation.

Downward Causation: A change in Mind leads to a change in Molecules

An exploration of such concepts can be found in the brilliantly named book by Nancey Murphy, *Did my Neurons make me do it?*¹² It describes an alternative to reductionist philosophy which goes under a number of names, including *Non-Reductive Physicalism*.

Our human capacity for Downward Causation, *consciously choosing* to influence and modify our underlying biochemistry, our psychology and our behaviour is truly remarkable.

One exemplar in this field is Mathieu Ricard. Ricard completed a PhD in bioscience, but then chose a different path, becoming a Buddhist monk, a path he has followed for over 50 years. During this time, he has exemplified a merging of the active and the contemplative life, having founded numerous NGOs in India and Nepal for the benefit of the disadvantaged, and having become a master in contemplative practice. For over twenty years, Ricard has also worked with neuroscientists around the world in mapping the human brain in various states of consciousness. Some of this contemplative neuroscience research has had very practical applications. Something called *Compassion Meditation* has been identified as a strategy to enhance positive mood by activating neural networks associated with reward and affiliation.¹³ Such an approach has been suggested as a potent strategy for first-line responders in preventing burnout from empathy fatigue. This demonstrates that we can choose, as a conscious strategy, to engage in practices which enhance our capacity to live more compassionately and cooperatively with others on our Earth.

A very poignant example of downward causation is the human capacity to transcend intolerable circumstances. Viktor Frankl, survivor of Auschwitz, observed in that hell-on-Earth, behaviour which goes against our natural human inclination for self-preservation. He observed certain individuals who, hated by the Nazis, refused to hate back. He observed certain individuals, their bodies tormented by starvation, who chose to give away their bread to a stranger in greater need. In that nightmarish situation, Frankl discovered what he called the last of the human freedoms:

“Everything can be taken from a man but one thing: the last of the human freedoms—the power to choose one's attitude in any given set of circumstances, to choose one's own way.”¹⁴

As extraordinary is the nature of consciousness, and the ability to consciously choose our actions, to influence, through downward causation, those lower-level entities from which our consciousness emerged, I question whether human consciousness really represents the endpoint of emergent development.

Is this as good as it gets?

We humans are such a mixed bag.

We exhibit much that is inspiring.
We exhibit much that is wholly depressing.

We living human beings are capable of consciously choosing to transcend appalling circumstances, and to demonstrate compassion and selflessness.

We living human beings are also capable of consciously choosing to indulge in our own trivial desires, to ignore the far greater needs of others, to wage war, and to inflict environmental devastation on our planet.

We appear, on one level, to be utterly insignificant in the cosmic scheme of things, a bothersome and unnecessary species on one planet, in one solar system out of hundreds of billions in our galaxy, which is one galaxy in countless billions in our wider universe.

And yet, if the process of abiogenesis is as stupendously unlikely as some argue, the Earth may be the only living planet in our universe, making the Earth very special indeed, and we conscious human beings also very special. Our human brains may actually be the most complex objects in our universe, and, through our emergent minds, the universe has become self-aware. A heady reality indeed.

But is this *it*?

Is *this*, to pose the question from a Jack Nicholson movie, *as good as it gets*?

And, by “this,” I am referring to the emergent evolution of human consciousness.

Has the process of emergence, with the emergence of so many levels of complexity over 13.8 billion years, now finally ended, *or is there more to come*?

The Next Big Thing

There is no compelling reason to think that emergence has come to an end. The real question is, what is *The Next Big Thing*?

By The Next Big Thing, I'm not talking about the evolution of some new species. That's really neither here nor there. Instead, *I am wondering what the nature of the Next Big Emergent Level will be.*

We have seen the emergence of life from non-living matter, and the emergence of consciousness from the merely living. What comes next?

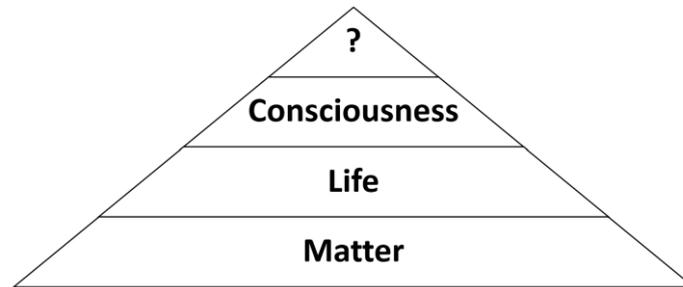


Figure 2: What will be the next level of emergence?

I will allow Robert Hazen, a researcher in the field of Origin of Life research to offer a tentative response:

“Is human intelligence the highest possible emergent state? Or is it possible that there might be higher orders of emergence? If so, then it's also possible that our individual brains can no more comprehend such a state than a single neuron can comprehend consciousness. Perhaps the universe holds levels of emergence beyond individual consciousness and beyond even the collective accomplishments of human societies. If that's true, then the story of life's origins and evolution is far from over. Indeed, perhaps the story has only begun.”¹⁵

Such an idea may sound absurd at first blush, until we realize that something even more absurd has *already* occurred: that at least on one planet, life and consciousness have emerged from a previously non-living universe.

What might such a new emergent reality look like?

Toward an Ultimate Theory for the Emergent Wonder of Existence

We have considered the concept of scientific theories as explanatory and predictive frameworks for making sense of the wonders of our world. All such theories are incomplete, and subject to change. A recurring theme in science, as we've seen, is the willingness to overturn previously held theories in favour of better explanatory frameworks.

Science has not only benefited humanity in innumerable practical ways, but its understanding through its theories has also provided an even deeper appreciation for the marvels of existence.

The so-called Three-Tiered Universe of the ancients, once thought to be constituted by the heavens, the earth and the underworld, has been replaced by a vast universe comprised of billions of galaxies, staggering in its age, size and complexity. A universe, once thought to exhibit absolute space and time, has been replaced by a relativistic and unified four-dimensional spacetime, which is warped by, and which directs in turn the movements of the celestial bodies. The ancient elements of earth, air, fire and water have been replaced by quarks, gluons and electrons which combine to form the 92 elements of which we humans, together with everything else in our universe are comprised. The inner workings of living organisms have been elucidated in all their awe and complexity. The notion of a soul added to inanimate matter to give it life and consciousness has been replaced by the equally astonishing concept of emergence.

Science, as we've seen, has been very successful at exploring Aristotle's first three explanatory levels: the *material*, the *formal* and the *efficient* causes. It has been much less focussed on addressing the *final cause*: what is the meaning and purpose of existence?

There are many scientists who assert that this is not a scientific question, but instead a religious or philosophical one. Some scientists may even assert that there is no purpose to existence whatsoever. Biologist Richard Dawkins and physicist Steven Weinberg fall into this category:

“Humans have always wondered about the meaning of life... life has no higher purpose than to perpetuate the survival of DNA... life has no design, no purpose, no evil and no good, nothing but blind pitiless indifference.”
(Richard Dawkins)¹⁶

“The more the universe seems comprehensible, the more it also seems pointless”
(Steven Weinberg)¹⁷

Dawkins and Weinberg are offering philosophical rather than scientific commentary, but they may, of course, be right. There may be no meaning or purpose to existence other than what we humans choose to attribute to it. After all, in a hypothetical lifeless universe that was devoid of conscious beings capable of asking and seeking to answer such a question, what possible “meaning” could be said to exist? We humans are *meaning-makers*, and each human person seeks to make sense of their existence and of existence as a whole.

That much is a given, but is there *another* level of “meaning” and “purpose” which transcends our very subjective human attribution of meaning and purpose? Perhaps if this higher meaning and purpose exists at all, we may presently be incapable of discerning it. Perhaps, if a higher meaning and purpose has any reality, it may only be discernable at higher levels of emergence than merely individual human consciousness.

When we enter the realm of final causes, of meaning and purpose, we enter a realm which disquiets many people because it smacks of religion.

Albert Einstein once famously said:

“I want to know how God created this world. I am not interested in this or that phenomenon, in the spectrum of this or that element. I want to know his thoughts. The rest are details.”¹⁸

Einstein’s “God” was certainly not the theistic God of the Judeo-Christian tradition, and not a god in any normal sense of the word. Einstein was speaking metaphorically about what might be termed *Ultimate Reality*: not a supernatural god, but rather the ultimate and wholly natural ground of everything that is. As a physicist, he wasn’t satisfied with the shut-up-and-calculate school of physics which eschewed the deeper questions. Had Einstein been an art historian inspecting the statue of David, I am sure he would have wanted to ask the Final Cause question: to know the mind of Michelangelo. The physicist whose stellar imagination revealed curved spacetime to the world, wanted to get “behind the scenes,” to understand Aristotle’s Final Cause, and to know “The Mind of God,” as per the title of the book by physicist Paul Davies.¹⁹

Science will no doubt continue to do what it does best, namely to discover new facts and to peel back, one layer at a time, the mysteries of existence (e.g. dark matter and dark energy), and to embody these new understandings in new and improved theories. And, hopefully there will continue to be scientists who, like Albert Einstein, Niels Bohr and Paul Davies, refuse to ignore the deeper questions.

- Why is there something rather than nothing?
- Could the fundamental parameters of the universe, so fine-tuned as to permit the existence of life, have been different?
- Is there an as-yet-undiscovered factor or force of nature which favours the formation of life?
- Where is the phenomenon of emergence ultimately taking the universe, and what is The Next Big Thing we might expect? (e.g. something beyond individual consciousness, such as collective consciousness or something even more “absurd”?)

If Aristotle and the Greek philosophers of the 4th Century BCE had been presented with our modern scientific understanding of such things as evolution by natural selection, curved spacetime and quantum entanglement, would they not have been stunned and amazed?

In the far future, what astonishing mysteries of the natural world will be unraveled by science? What behind-the-scenes marvels of nature’s secret ways will be disclosed? If we could glimpse those marvels now, would we not likewise be awestruck, scarcely able to believe our eyes?

Let us hope that our descendants, as they develop ever better theories of nature, will retain the awe and wonder of existence, as they too anticipate, and perhaps even experience *The Next Big Thing*.

NOTES

- ¹ “A Brief Visit With Einstein” quoted from the Sundheim Group, accessed 23 March 2026. <https://www.sundheimgroup.com/a-brief-visit-with-einstein/>
- ² “Putting Einstein to the Test,” from The National Institute of Standards and Technology (NIST), accessed 23 March 2026: <https://www.nist.gov/atomic-clocks/a-powerful-tool-for-science/putting-einstein-test>
- ³ Richard Dawkins, *The Selfish Gene* (Oxford University Press, 1976), quoted in Good Reads, accessed 23 March 2026: <https://www.goodreads.com/work/quotes/1746717-the-selfish-gene>
- ⁴ Francis Crick, *The Astonishing Hypothesis: The Scientific Search for the Soul* (Scribner Book Company, 1994).
- ⁵ “Society and the Conservative Party,” BBC News accessed 23 March 2026: <https://www.bbc.com/news/uk-politics-38553797>
- ⁶ Julia Baird, *Phosphorescence: On Awe, Wonder & things that sustain you when the world goes dark* (HarperCollins 2020).
- ⁷ “Aristotle on the Soul,” University of Washington, accessed 24 March 2026: <https://faculty.washington.edu/smcohen/320/psyche.htm>
- ⁸ Harold Morowitz, *The Emergence of Everything: How the World became Complex* (Oxford University Press 2002), p.23.
- ⁹ Richard Dawkins, *The God Delusion* (Transworld Publishers, 2006), p. 137-138.
- ¹⁰ Paul Davies, *The Fifth Miracle: The Search for the Origin and Meaning of Life* (Simon & Schuster 1999).
- ¹¹ Norman Doidge, *The Brain that changes itself* (Scribe 2010).
- ¹² Nancey Murphy and Warren S. Brown, *Did my Neurons make me do it? Philosophical and Neurobiological Perspectives on Moral Responsibility and Free Will* (Oxford University Press 2010).
- ¹³ Klimecki OM, Leiberg S, Ricard M, Singer T. *Differential pattern of functional brain plasticity after compassion and empathy training*. Soc Cogn Affect Neurosci. 2014 Jun;9(6):873-9. doi: 10.1093/scan/nst060. Epub 2013 Apr 10. PMID: 23576808; PMCID: PMC4040103. See: <https://pmc.ncbi.nlm.nih.gov/articles/PMC4040103/>
- ¹⁴ Viktor Frankl, *Man’s Search for Meaning* (Beacon Press 1959).
- ¹⁵ Robert Hazen, *Origins of Life* lecture series. The Great Courses, The Teaching Company, 2005. Accessed 29 September 2025. <https://plus.thegreatcourses.com/origins-of-life>.
- ¹⁶ Goodreads, accessed 24 March 2026, quoting Richard Dawkins: <https://www.goodreads.com/quotes/8719428-humans-have-always-wondered-about-the-meaning-of-life-life>
- ¹⁷ Goodreads, accessed 24 March 2026, quoted from Steven Weinberg, *The First Three Minutes* (Bantam Book 1977): <https://www.goodreads.com/quotes/139051-the-more-the-universe-seems-comprehensible-the-more-it-also>
- ¹⁸ Alice Calaprice (Ed.), *The Expanded Quotable Einstein* (Princeton University Press, 2000), 202, accessed on 22 October 2025 at: <https://archive.org/details/expandedquotable00eins>.
- ¹⁹ Paul Davies, *The Mind of God* (Simon & Schuster 1992).