

Emergence: Nature's Mode of Creativity

A GUIDE TO THINKING ABOUT EMERGENCE

by Loyal Rue

Abstract. A basic survey of the issues that arise in discussing emergence is presented, together with suggestions on how the concept should be approached. Emergence is an alternative to reductionism. The emergence story invites us to see that nothing transcends nature like nature itself; it is a radically new way to think about the natural order, and it reshapes our ideas of matter. Special attention is given to the idea of meaning in life. Three options are discussed for thinking about the meaning of life: that it is fundamental to the nature of things, that it is an illusion, and that it is an emergent property of matter. The third option is favored—that the universe has no *telos*, and yet makes possible the spontaneous emergence of purpose. Caution is advised against exploiting the idea of emergence. The most important task is to understand the science of emergence and only then to move into interpretations from the humanities and theology.

Keywords: emergence; humanities; meaning; reductionism; science; *telos*; transcendence

Sometimes the unexpected happens. That is a big part of the emergence story—unpredictable outcomes, spontaneous novelty, gains in order where we might expect losses. Another big part of the story is the challenge to reductionism. We are likely to hear a fair amount about reductionism in the discussion of emergence, so it might be well to freshen up a few terms.

In the most general sense reductionism is the idea that complexity can be boiled down to simplicity. Most discussions of reductionism make distinctions between methodological reductionism, epistemological reductionism, and ontological reductionism. *Methodological reductionism* is the least

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controversial; it is basically the analytical approach to any subject matter. *Analysis* means “to dissolve,” and the basic method in all domains of intellectual inquiry is to dissolve wholes into constituent parts so that the parts can be studied independently. *Epistemological reductionism* is the practice of using theory from a lower level of complexity to help us to understand what is going on at higher levels of complexity. Epistemological reductionism is indispensable in science, especially in applied sciences such as medicine and engineering, where it is essential for understanding why things break down. So: methodological reductionism is about technique, and epistemological reductionism is about theory. The most controversial form of reductionism is *ontological reductionism*. This form embodies a thesis about reality. Ontological reductionism claims that complexities in nature are merely piled-up simplicities. The idea is that the parts of a complex whole are more real than the whole, or that the whole really is “nothing but” the parts. Margaret Thatcher is famous for her quip that societies do not exist, only households exist. That is the idea in a nutshell—that the units, the parts, the elements are the true realities, and everything else is just more of the same.

The emergence story, by contrast, invites us to see that nature often is more *than* the same, that genuine novelty may be *real-ized* (made real) as complexity is increased. The emergence story is about transcendence. I do not mean in the supernatural, “skyhook” sense; I mean that the emergence story invites us to see that nothing transcends nature like nature itself.

Emergence is about new realities, but that does not mean that some new kind of stuff enters the picture. What enters the picture is new relationships between components that are already there and absolutely must be there. When existing parts enter into new dynamical relations, new realities appear. Societies *do* exist when households engage in the right relationships.

We also hear a good deal about parts and wholes when we consider emergence, about relations and dynamics, and about self-organizing systems and irreducible properties and unexpected realities. We hear some rather extraordinary claims about how nature works, and that means that everybody here¹ will be faced with a challenge. It is always challenging to comprehend extraordinary phenomena. But the speakers will be challenged as well because, as philosophers constantly remind us, extraordinary claims call for extraordinary evidence. So we must be on the lookout for the evidence, and let’s not be timid about making sure we get it.

One does not have to listen very long to emergence talk before getting the message that here is a radically new way to think about the natural order—yet another Copernican revolution in science, yet another major paradigm shift. And we should expect that this revolution, like the others, is going to present a challenge to our prerevolutionary ways of thinking. Do you remember how incredulous you were when you first encountered

the paradoxical implications of relativity theory, or how stymied you were when you tried to make sense out of quantum mechanics? We have to expect strangeness of this sort as we try to get our heads around the ideas of this conference.

It may serve us well to remember the advice of Francis Bacon, who was concerned that progress in science could be obstructed by what he called “idols of the mind,” that is, old habits of thought that might get in the way of new insights and understanding. We aren’t going to be able to think in new ways, Bacon insisted, until we first identify some of our deep prejudices and then try to bracket them out of our reasoning, insofar as we can (Bacon, Book 1, sec. XXXVIII).²

Having said this, I am going to offer two small bits of Baconian advice. The first is: *Get the grunge out*. What I mean is that the emergence paradigm might be obstructed in some ways by what I call the grunge theory of matter. There is nothing at all scientific about the grunge theory. It is basically a metaphysical notion, or, more accurately, an example of folk philosophy that has achieved the status of common sense. The grunge theory has a low estimation of matter. Matter isn’t much—just grunge, just bare uninteresting stuff. Matter becomes interesting only when the laws of nature whip it into shape. The grunge theory takes the view that matter and the laws of nature are independent—grunge here, eternal laws over there—and we get an orderly creation only when the laws of nature come to bear upon the grunge. This is the picture we get in the Genesis story: nothing but misty chaos, or grunge, until God’s word is brought to bear.

Let us consider another view for a moment. I call it the exalted theory of matter. The exalted view basically says that there are no laws of nature—that is, no eternal laws that exist independently of matter. Matter alone is sufficient. On the exalted theory all you have is matter and the properties of matter. What looks to us like a law of nature is really nothing more than our attempt to describe the properties of matter. The properties of matter are not endowed from the outside.

If we take the exalted view of matter, it is easier to see the possibility that absolutely new properties of matter might arise spontaneously—properties that could never be predicted from the properties we know about. The classic case is the surface tension of water. This is a real property, but it’s an emergent one, not simply more of the same. An omniscient description of the properties of hydrogen and oxygen would not include a description of surface tension. When absolutely new properties of matter show up, we may say that absolutely new laws of nature also show up. Nature makes things up as it goes along, and this includes making up new laws.

Another piece of Baconian advice: *Never say “never”!* If we take the exalted view of matter, and if brand new laws of nature can take force in the form of brand new properties of matter, we may have to set aside our longstanding prejudice against miracles. By *miracle* I do not mean an event

that violates the laws of nature at the behest of a supernatural agent. I mean some logically possible event—call it *X*—that is so outrageously improbable that we cannot imagine how it could ever happen. That is, we are ignorant of any properties of matter that would allow *X* to occur.

Are you with me? A miracle is an event so improbable that we cannot fathom it, and we cannot fathom it because we don't know of any properties that might allow it.

Now, we could be ignorant of these properties just because we haven't discovered them yet. Or, we could be ignorant because the properties are not there to be discovered. If the properties are there and we finally discover them, *X* was not a miracle after all but only appeared to be due to our ignorance. But if the properties of matter are not there to be discovered, *X* (if it happened) would be a real miracle. And if we have a prejudice against miracles we might say that *X* could never happen because the laws of nature (that is, the properties of matter) will not allow it to happen.

But suppose some new property of matter emerges—a completely new element, for example—such that it makes *X* a little bit less improbable. This could happen. In fact, it has happened many times. The very first atoms of oxygen that appeared in a star eons ago made this conference less improbable, and the appearance of carbon atoms made it even less improbable. So here you get the picture of new properties of matter increasing the probability for other new properties of matter, and so on. If we get a sufficient number of probability-enhancing intermediate steps, we may have to downgrade *X* to something that is no longer outrageously improbable. Do you see what happens? An event that would have been a genuine miracle might become an event that has a fair chance of happening. Surprising new properties of matter emerge, and when they do they change the odds for other properties, and these change the odds for others. So go ahead and bet on a few miracles, but you may want to hold off until the odds improve. It is true that miracles happen all the time, but the thing is, they never happen *before* their time.

If we think about emergence in these ways—that is, if we offload the grunge theory of matter, and if we are mindful of changing odds—we should be ready for all of the lectures ahead of us. We will know what to look for. We'll be looking for new properties of matter that have potential for enhancing probabilities, and we'll be looking for intermediate steps.

Let me tell you what specifically I look for when I listen to talk about emergence. But first I will tell you *why* I'm looking.

During the past year I have become interested in questions that have to do with the meaning of life. It seems to me that emergence thinking may have something important to contribute to the problem of the meaning of life. I take the view that all meaning is essentially teleonomic, or teleological. That is, in order for something to have meaning, or for some *one* to have a sense of meaning, there must be some *telos*—some end, or goal, or

point. I'll spare you all the arguments behind such a claim and just ask you to assume for the moment that if there's no end, if there's no purpose, there is no meaning.

If this is the case, we are left with three options for thinking about the meaning of life. One option is that *telos* (purpose, meaning) is built right into the fabric of the cosmos—that it's *there*, an inherent or endowed property in the fundamental nature of things. And if it's there, perhaps it can be discovered by inquiry or revealed in some way. This is the idea you find in the Judaeo-Christian tradition, where God created the world as an instrument for carrying out God's purpose. You find a similar notion in Aristotle, who thought that every event, every change in the natural order, happened according to some final cause or inherent purpose. You find the same idea in process philosophy, where God is at work down there at the quantum level offering goal-relevant options to each momentary pulse of reality. So the first option is that teleology is real and that it is one of the defining attributes of the natural order.

The second option is that teleology is not real but merely an illusion. We all know that early modern science deliberately threw Aristotle's final causes out of the picture. Let the philosophers and theologians bother about purpose and meaning; meanwhile, science will ignore the *Why?* questions and concentrate on *how* things happen. Of course, many thinkers have gone well beyond simply ignoring final causes to argue that final causation is purely an illusion, it doesn't exist. Oh, yes, we all *say* that the river winds its way through the landscape so that it might join the sea. And we all say that the heart pumps blood so that the body will be nourished. But nobody means that literally. There is no *so-that* logic in nature; nature manifests the logic of *because-of*. The river winds its way to the sea because of gravity, and the heart pumps because of neural impulses. Philosophers and theologians can talk all they want about the *why* of things, the point of things, but the reality is that they are deluded—and they are deluded for the very simple reason that there is no purpose built into nature.

So the first option is that teleology is an essential characteristic of the universe, and this suggests that the meaning of life is objectively there, to be discovered and articulated. And the second option is that there is no genuine *telos* anywhere in reality, and this suggests that there is no meaning to life beyond the subjective illusions cooked up by fanciful theologians and romantic existentialists.

But consider a third option. Might it be that *telos* is an emergent property of matter? Maybe the universe was, as Steven Weinberg thinks, completely void of any point or purpose for most of its aimless and completely meaningless history. Maybe matter behaved exclusively, as Richard Dawkins thinks, according to a blind *because-of* logic for billions of years. But then, quite unexpectedly, the odds favoring a new kind of causality came within

reach. Could it be that a pointless *because-of* logic created the conditions for the pointful *so-that* logic of biological function?

Imagine that: a universe with no *telos*, no purpose, no agenda—a universe that just inadvertently made possible the spontaneous emergence of purpose. What is that? Irony? Paradox? Whatever it is, it's weird, because it implies that if there is any genuinely purposeful behavior in the universe, it serves absolutely no purpose. An emergent theory of meaning implies that the existence of meaning is itself totally void of meaning.

Think about that! Surface tension is one thing, but the genesis of purpose and meaning is something else. Brand new properties of matter and brand new laws of nature, maybe—but a whole new logic of causation? To me, that sounds like something from nothing.

That is what I mean by an extraordinary claim that cries out for extraordinary evidence. You can see why Aristotle, process thinkers, and others would be motivated to insert teleology into the fabric of the cosmos from the get-go. Why? Because the prospect of getting *so-that* logic from *because-of* logic seems ridiculous. And you can see why skeptics would be motivated to write teleology off as a complete illusion. For the same reason—it seems ridiculous.

But what if it isn't? What if it just happened that the odds changed and that a miracle of meaning spontaneously came to pass? What if it is the case that there was absolutely no purpose behind the emergence of purpose? Now that *would* be something.

We should not be surprised if this part of the emergence story doesn't wash down very easily. After all, the weight of good old conventional reasoning still favors one of the first two options—purpose from the get-go or no purpose at all. That is where common sense takes us. But then, this does not pretend to be a conference about common sense. It's a conference about nature transcending nature.

I'll end these reflections with a warning: *Look out for loonies!* Beware of anyone who is a bit too eager to seize the day. We live in a profoundly uncritical culture, a culture that positively invites opportunists and charlatans of every sort to plunder science for new discoveries and sensational tidbits that may be twisted into a theme for weekend workshops or even movies. Consider the tortured version of quantum theory in the movie *What the Bleep Do We Know?* Or consider what happens when postmodernist Poo-Bahs have a go at finding moral insights in Einstein's theory of relativity. It strikes me that the emergence paradigm may just be the mother lode for pop-cultural exploitation. There is a lot of potential in these extraordinary claims for widening the eyes and making people say "wow" and "gosh." Give emergence theory a little public exposure and pretty soon anything at all can become an emergent property. This could be a bonanza for new-age therapists. Happiness, joy, satisfaction in life, weight loss, good grades, great sex, immense wealth—these are all emergent properties, and

if you come to the workshop and buy the book we'll show you how to unlock your potential for living a gloriously emergent life.

And what about the possibilities for theological interpretations of emergence? or emergent interpretations of theology? How long before someone enlightens us with the idea that God the Father created the conditions for the emergence of God the Son, who created the emergent conditions for God the Spirit?

The point I am trying to make is that we should be cautious when the time comes to integrate the science of emergence into a larger picture of how things are and which things matter. I mention this now because it may help us to constrain ourselves and to stay focused on the science. This IRAS (Institute on Religion in an Age of Science) conference is mostly about the science of emergence, and its next conference will consider what to make of it. These two conferences exemplify a rule that I believe should govern all IRAS conferences: *Science first, humanities foremost*. That is, let us first take the time and effort to get the science right. Then if there is anything more to say it may be worth listening to.

NOTE

1. A version of this paper was originally delivered at the Star Island conference, "Emergence: Nature's Mode of Creativity," organized by the Institute on Religion in an Age of Science, 29 July–5 August 2006.

2. Bacon's *Novum Organon* (trans. James Spedding, Robert Ellis, and Douglas Heath) is available at http://www.constitution.org/bacon/nov_org.htm.