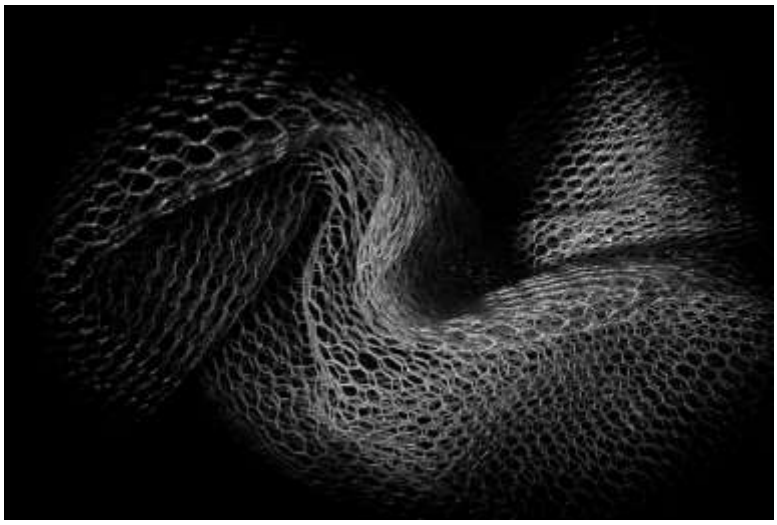
Sharing the Creativity

A Rational Path to Faith

Edward Steffes



Salisbury, Maryland
2014

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> *Science is specialization, abstraction; philosophy and religion exist to restore the total perspective, taking all legitimate concerns of man into account. Among these interests, or supreme over them, is the interest in creating*.—Charles Hartshorne[1]

Searching for the sacred

For many years, I've been trying to develop a personal philosophy that embraces the "legitimate concerns" Hartshorne refers to. In particular, I've tried to find a place in my developing worldview for both science and religion, reason and faith.

Sometime during my college years, "faith" became a negative word for me, referring only to a belief in something without rational justification. But with the benefit of almost fifty years of hindsight, I can discern in my spiritual development a dialectical process. First I distanced myself from organized religion and embraced the scientific method as its antithesis. But once I had done so, religious language stopped being so threatening, and I became interested in seeing new meaning in ancient words. I became interested in achieving a new synthesis of ancient wisdom and contemporary thought. I realized that religious conservatives do not have to own the language, deciding for all of us what words like "spirit," "God" or "faith" have to mean. Today I am very comfortable with the idea that one ought to have faith in something, and that one ought to regard something as sacred. I have reaffirmed what I think is the core of religion, which is the capacity to see the sacred within oneself and connect it to something sacred beyond oneself.

But what is sacred? The word loses its meaning if it is applied to nothing, but also if it is applied to everything. The first principle of Unitarian Universalism places humanity on sacred ground by affirming "the worth and dignity of every person." This is not an affirmation I would make about my smart phone, no matter how cleverly designed and useful it is. Faith in humanity is where our principles start, but not where they end. The sacred is also to be found in "the interdependent web of all existence," but I think that rescuing that idea from a superficial "everything-is-sacred" pantheism requires some serious study and reflection.

For me, the most meaningful word to delineate the sacred is "creativity." I do not use that word to refer to a supernatural being, a Creator, but to a set of processes at work within nature. These processes will be described in this essay as developmental, self-organizing, and purposive (value-seeking). Although these processes are very real, they are more mysterious than processes that are reducible to computation, such as the acceleration of an object by a force. They are to some extent beyond our control, and yet worthy of our faith. Scientists may not think of themselves as people of faith, but even they need a certain amount of faith in a creative process, since without it no great scientific breakthroughs are possible. Scientists manage to sustain that faith without fully understanding what creativity is or where it will take us. Who can say what we will discover next, invent next, or figure out next? And yet we can embrace the process in order to make life worth living. We actually do so all the

[1] Charles Hartshorne. 1970. *Creative Synthesis and Philosophic Method.* LaSalle, IL: Open Court, p. 4.

time whether we think about it or not, although we can enhance our creativity by becoming more conscious of it. I will argue that this can be a rational basis for our faith in humanity, and—more controversially—our faith in something beyond humanity.

In the course of developing this personal philosophy, I've had to learn to think outside of two conventional boxes. The older of the two boxes is supernaturalism, which honors the most mysterious and wonderful aspects of ourselves by attributing them to a supernatural soul. This immaterial thing supposedly gives us our ability to make free moral choices, rather than follow the impulses of our inferior bodily nature. I think that supernaturalism on the one hand overstates the differences between humanity and the rest of nature, and on the other hand underestimates the creativity of nature. Something we do not currently understand about ourselves or the universe can turn out to have a natural explanation. To me, religion is not about the supernatural; it is about the sacred, which is not the same thing.[2]

The newer of the two boxes is mechanistic reductionism. Since humanity entered the Machine Age, scientists have learned a great deal about nature by studying things as if they were machines, breaking them into parts to see how they work. Unfortunately, some thinkers have taken the machine metaphor a tad too literally, making the philosophical claim that nature, including human nature, is nothing but machinery. In the computer era, the claim is often that everything is algorithm, some computational procedure. In particular, the human mind is just a program running on the hardware of the brain. Many scholars, especially in the humanities and life sciences, find this mechanistic approach to the study of humans and other living things too limiting.

I think that the apparent conflict between science and religion arises because each of them is thinking inside its traditional box. The supernaturalism of traditional religion makes it unacceptable to many scientific thinkers, and the mechanistic reductionism of traditional science makes it unacceptable to many religious believers. Choose either box and you throw away too much.

I fear that the supernaturalist box elevates humans to something we are not, immortal beings with a soul that will survive the body. I fear that the mechanistic box *reduces* humans to something we are not, mere machines who can only do what our genetic and neural programming make us do. The thinkers I find most persuasive have helped me find a third alternative that is neither supernaturalist nor mechanistic, and yet both religious and scientific in a broad sense. It stays within a naturalistic framework, but broadens our understanding of nature to include processes that are truly creative and not entirely reducible to mechanism. It finds within human nature and nature in general the mysterious and wonderful "sacred" qualities that have been ignored by mechanistic science and misunderstood as supernatural by traditional religion. I develop this perspective with a combination of philosophical reasoning and recent scientific thinking.

[2] For an elaboration of that view, see David Ray Griffin. 2001. *Reenchantment without Supernaturalism: A Process Philosophy of Religion*. Ithaca: Cornell University Press.

Your creativity

I will try to show that creative processes operate at many levels—psychological, sociological and biological at least—and that they are connected in co-creative relationships. Persons, societies and species both create and are created within causally complex interdependent webs. The best starting point is a reflection on your own creativity, because if you cannot see it in yourself you are unlikely to see it anywhere else! Here I will focus not on unusually creative individuals or particularly creative achievements, but on the inherent creativity of human beings.

Consider what you are doing now, which (I have a hunch) is reading. Science is interested in many generic aspects of reading, such as how the eye moves to collect light from different places, how it focuses light to form an image, how it converts an image to electrical signals and sends them to the brain. Science is very good at breaking things into parts, studying the relationships among the parts, and making generalizations about how things work. But to see your own creativity, you need to reflect not on what is generic, but on what is *unique*—your reading activity *right now*. Reading *this* essay, at *this* moment, is a unique experience in your life. It is something that has never happened before, and so it is a novel addition to the whole of reality. In order to have that experience, you have to do something remarkably creative—make sense of each mark on a page by interpreting it in the context of what has come before, putting letters in the context of words, words in the context of sentences, and so forth. The relevant context expands indefinitely to include your prior experience of language and of the world to which linguistic expressions refer. If I talk about economics or evolution—and I will—your prior knowledge of the subject will help you construct the meaning of what I say. You will try to grasp what I mean by what I write, but in the end, what it means to you will be a bit different from that, since you will interpret it in the context of *your* life experience. The meaning you construct will be your own unique creation.

Not only do you interpret new information in the light of what you already know, but you also reinterpret old information in the light of the new. If I present a persuasive argument for one idea rather than another, you can make more use of that idea in your thinking and less use of something else. You can deliberately alter your own brain activity by pursuing an idea further in your own thinking and learning. One unique experience leads to another, in an unfolding creative process.

For science, what is unique is incidental. Your eye doctor's job is not to worry about whether you like to read Kierkegaard or comic books, but just to help keep your eyes working properly. For a certain kind of philosophy, however, the unique is a vital philosophical category, a clue to the creative unfolding of reality in time. The generic is the more restricted category, the one that abstracts and simplifies, easily distracting us from the fullness of lived reality.

Several modern philosophers, such as Henri Bergson and Alfred North Whitehead, have placed creativity at the very heart of their philosophies. One of my favorites, Charles Hartshorne, viewed creativity as the "ultimate abstract principle of existence." He believed that every moment of experience is a "creative synthesis" from a multitude of pre-existing realities:

> In every moment each of us accomplishes a remarkable creative act. What do we create? Our own experience at that moment. But, you may say, this experience is not of our own making, since it is produced in us by various causes. But, please note, they are many causes, not one. This is enough to show that the causes alone cannot fully determine the result. For the experience is one, not many. What causal law could prescribe in advance just how the many factors are to fuse together into a new single entity, an experience? There is no psychology textbook which seriously attempts such a thing, or sensibly could attempt it.[3]

If you reflect on the unique aspect of each experience, you will probably agree that you cannot have the same exact experience twice. Heraclitus said that "no man ever steps in the same river twice, for it's not the same river and he's not the same man." You can, of course, focus your attention on generic *aspects* of an experience, things that it has in common with other experiences. Then you can make abstract causal generalizations, observing that events of type X are routinely followed by events of type Y, other things being equal. Such generalizations are extremely useful, but they may make life appear more mechanical than it really is. Because experiences have unique as well as generic aspects, life unfolds creatively as well as mechanically, not just from generic cause to generic effect, but from one unique creation to another. Hartshorne argues that this makes it impossible to predict the future in concrete detail:

> As Bergson and Peirce insist, prediction is limited, not alone by ignorance, but by the very meaning of the future as a sphere of decisions yet unmade, issues not yet settled even by the totality of causes already operating. Reality is predictable just in so far as it is not creative, but rather mechanical, automatic, compulsive, habit-ridden. Much of life is thus uncreative and hence predictable. Science has enough to do if it seeks to trace out the mechanisms which underlie and limit creativity. The creative as such is perhaps outside the sphere of science; yet the denial of the creative…is also, and much more surely, outside its proper sphere. If anything is unscientific, it is the denial of aspects of existence because they seem inconvenient for our methods.[4]

We humans live our lives both mechanically and creatively, constantly using the generic to create the unique. Our bodies are filled with mechanisms we rely on to function predictably. The last thing I need while I'm trying to type this is for my muscles to go creative on me and do something besides move my fingers! Brain functioning too has to be highly predictable in order to process sensory information reliably. But our brains also generate a psychological process that is endlessly surprising because it consists of unique experiences. To this day, scientists have very little idea what experiences are. As far as we can tell, our most advanced machines don't have any. Some scientists working in the field of artificial intelligence express their faith in technology by predicting that a computer with conscious experiences, like Scarlett Johansson in the movie "Her," is only a short time off. I suggest, on the contrary, that conscious experience is one of the least likely phenomena in the universe to be reducible

[3] Hartshorne, p. 2. Alfred North Whitehead described experience with the memorable words, "The many become one, and are increased by one."
[4] Hartshorne, pp. 3-4

to an algorithm. In fact, I think it would be remarkable if the universe were limited to what we could do with our latest human gadgets.

An important clue to the nature of the creative process is that every experience has some degree of *value*. Indeed, Hartshorne says that "the basic value is the intrinsic value of experiencing."[5] Mechanisms, on the other hand, have only extrinsic value. A circuit or a switch is inherently value-neutral; its value depends entirely on what it is used to do. An experience always has a *quality* that is felt by the one doing the experiencing. What value would anything have if no one could feel anything, and the world consisted of nothing but objects acting on other objects? Fortunately for us, life has an *aesthetic* as well as mechanical dimension, and that is central to creativity.

Hartshorne says that "aesthetic value is found in diversified, harmonious experiences. This agrees with the old formula, beauty is unity in variety." The harmony can take many forms, such as social harmony or cognitive harmony. It includes pleasant sensations, which Hartshorne describes as "our participation in harmony among our bodily members," but it is not at all limited to physical pleasure. For example, as you acquire new information by reading or listening, the experience is most enjoyable if you can literally "make sense," synthesizing disparate ideas into some unified perspective. If you experience just monotony (same old stuff) or confusion (nonsense), that is aesthetically less pleasing. Similarly, a sequence of musical notes that is either too monotonous or too random is not as pleasing as an interesting but coherent composition. The enjoyment you derive from a particular experience depends on how well you can integrate new data with old so that something is added without creating too much dissonance. The enjoyment of life is in creating something of quality, not just surviving by perpetuating existing routines and realities.

The quality of experience may be the most general purpose of life, but specific experiences give rise to more specific purposes, all aimed at some form of beauty and some kind of personal development. The experience of falling in love shifts one's aims toward building a relationship and maybe a family, beautiful ends even if the chosen means can be unpleasant (such as supporting a family by working a lousy job). We normally take for granted that rational people, unlike machines, can select their own ends and organize their own activities to achieve them. The whole person we call "I" seems to be able to exert some control over its parts, including the brain.

Creativity and causality

If you agree with what I've said so far, you are already thinking outside the box more than you may realize. Any assertion that humans are purposive, self-organizing beings is in conflict with the mechanistic and reductionist tradition in scientific thinking, which is very much alive in fields like cognitive psychology and neuroscience. That tradition has normally excluded intrinsic purpose and self-organization as legitimate causes. The usual method of analysis is reductionist, reducing the operation of the whole to the interactions of its parts, as one would study a machine. Causality is only part-to-part and part-to-whole, and the whole can only do what its parts make it do.

[5] Hartshorne's statements about value are in the chapter "The Aesthetic Matrix of Value," in *Creative Synthesis*, pp. 303-321.

The analysis of a machine is focused on "efficient causality," in which the action of one thing forces another thing to do something. In a heating system, the furnace doesn't come on because it feels cold and wants to be warmer; it comes on because the thermostat forces it to. Of course, if the analyst wants to explain how the system *came to be what it is in the first place*, the analysis must broaden to include elements of the design process: the kinds of parts required (material causality), the organization of the parts (formal causality), and the machine's purpose (final causality), to use Aristotle's complete classification of causes. For a machine designed by humans, the design process is extrinsic to the machine, so once the machine is up and running, its behavior can be explained by its operational process, its sequence of efficient cause-and-effect relationships. Studying natural systems as if they were machines also encourages this restricted kind of causal analysis. Biological anthropologist Terence Deacon observes, ""Since the Renaissance, the concept of efficient cause has become the paradigm exemplar for all fully described conceptions of cause in the natural sciences, and Aristotle's other modes of causality have fallen into comparative neglect."[6]

However, suppose the natural system to be studied has its own intrinsic capacity to *develop*—to become more than it already is. Now one might expect some sort of design process to be intrinsic, so that causal explanation would have to include how the system develops its own material parts, organization and purposes. But mechanistic reductionism still confines the causal analysis to efficient part-to-part causation, insisting that every causal process must be reducible to that.

Some scientists are highly critical of this approach. After a detailed examination of the mechanistic model, biologist Robert Rosing concluded that it is woefully inadequate for understanding living things:

> For the past three centuries, ideas of mechanism and machine have constituted the very essence of the adjective "scientific"; a rejection of them thus seems like a rejection of science itself.
>
> But this turns out to be only a prejudice, and like all prejudices, it has disastrous consequences. In the present case, it makes the question "What is life?" unanswerable; the initial presupposition that we are dealing with mechanism already excludes most of what we need to arrive at an answer.[7]

When scientists apply a strictly mechanistic analysis to human beings, the implications are startling, to say the least. The same humans who are the creative designers and masters of their inanimate machines now seem to lose their creativity and become slaves to their own machinery—their DNA or brain circuitry or social conditioning, in one kind of determinism or another.[8] Especially troubling is the disappearance of moral agency, the elimination of any independent causal role for value judgment and moral responsibility. What seems to us to be the ethical decision of a whole person is reduced to the

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[6] Terence Deacon. 2011. *Incomplete Nature.* W. W. Norton & Company, p. 59.

[7] Robert Rosen. 1991. *Life Itself: A Comprehensive Inquiry Into the Nature, Origin, and Fabrication of Life.* New York: Columbia University Press, pp. xv-xvi.

[8] The fact that there are so many kinds of determinism should be a clue that each of them is a simplification of reality and none can achieve complete predictive success. In the real world, we must synthesize our experiences from a multitude of influences. For all its faults, Freudian psychology at least understood the ego as a creative mediator reconciling the demands of body and society.

actions of amoral parts such as "selfish genes" that propel the body they construct toward their own replication. Richard Dawkins, the evolutionist well known for his mechanistic and anti-religious thinking, asked rhetorically, "But doesn't a truly scientific, mechanistic view of the nervous system make nonsense of the very idea of responsibility?"[9] Whatever programs have survived up until now tend to keep executing, whether we like the results or not. When the programs do change, the changes are often regarded as accidents, since no more creative process of self-design is acknowledged, let alone examined.

Is there an alternative that makes any scientific sense? From the reductionist perspective, claiming that a whole can control its own parts seems illogical, since the whole seems to be *nothing but* the interacting parts. Studying the interacting parts of something should reveal all there is to know about it. Recently, however, many scientists have become more interested in an alternative to reductionism known as "emergence." In very general terms, this is the idea that parts can interact in such a way as to create something new, something not entirely explainable by the parts themselves. Terence Deacon argues that this something new is best understood not as a new "thing," since a thing is indeed hard to distinguish from the parts that compose it, but a new *process*. He calls this perspective "emergent dynamics." In living systems (at least), the parts not only exert efficient causality on one another, but combine to generate systemic processes consisting of events that require the coordinated actions of many parts. One can then speak of dynamic part-whole relations in which systemic events can affect subsequent component events and vice versa. Causal agency is at more than one level, and causality is more than efficient, since the system has a capacity to make, organize and give purpose to its components. As Deacon says, "Being alive does not merely consist in being composed in a particular way. It consists of *changing* in a particular way….In an organism, the very notion of a part is process-dependent.[10]

These dynamics are admittedly complex, but we experience one form of them every day when we participate in social groups that develop themselves and their own members through reciprocal causation. Individuals come together to form social groups, but social groups transform their own members in the process sociologists call "socialization." What emerges in a social group is a systemic design process—in this case a cultural communication process—that can be distinguished from the biological and psychological processes going on within each individual. The distinct levels of process have a reciprocal or co-creative relationship, since an event on either the social or individual level can generate irreversible change on the other level. An individual's thought can change the group, and a group decision can influence the individual. A group decision is not just a sum of everything the members are thinking, but a creative synthesis of relevant contributions, as illustrated by a win-win solution achieved through a process of conflict resolution. Such decisions, once made, become part of the group culture to be internalized by the members, each of whom can adopt the goals of the group and learn to play roles that advance those goals. The result is an ongoing, creative, reciprocal process of personal and social development. That's an important aspect of our creativity. But let's see if such complex dynamics can also help explain what goes on inside an individual's head.

[9] Cited by Michael Gazzaniga. 2011. *Who's in Charge? Free Will and the Science of the Brain.* HarperCollins, p. 116.
[10] Deacon, *Incomplete Nature*, p. 25.

Consciousness

The idea of reciprocal causation involving multiple levels of process may hold the key to unlocking the mystery of consciousness. I believe that consciousness must be an emergent process, dependent upon micro-processes within the brain but also serving to synthesize and organize them.

Neuroscientists have been in something of a quandary about consciousness, sometimes admitting that they are just baffled by it, sometimes playing down its causal significance, and sometimes insisting that whatever it is, it must be reducible to some computational procedure that a computer could perform. Until recently, most neuroscientists have recognized only micro-to-macro influences, regarding conscious experience as only an effect, not a cause, of neural interactions. They have wondered if consciousness really matters, since it sometimes seems to be a passive spectator who shows up late to the game. Our brains often react automatically to a stimulus and initiate an action before we are conscious of our own reaction. But don't we also have conscious experiences that actively alter our own brains, like seriously reflecting on the ideas of neuroscientists? Why bother to become more conscious of how our brains work, or anything else, if consciousness doesn't matter? As philosopher and cognitive scientist Jerry Fodor says:

> If it isn't literally true that my wanting is causally responsible for my reaching, and my itching is causally responsible for my scratching, and my believing is causally responsible for my saying…If none of that is literally true, then practically everything I believe about anything is false and it's the end of the world.[11]

Michael Gazzaniga is one neuroscientist who refuses to dismiss conscious mental states as merely passive reflections of unconscious brain activity. He says:

> I do not think that brain-state theorists, those neural reductionists who hold that every mental state is identical to some as-yet-undiscovered neural state, will ever be able to demonstrate it. I think conscious thought is an emergent property….that mind is a somewhat independent property of brain while simultaneously being wholly dependent upon it. I do not think it possible to build a complete model of mental function from the bottom up…
>
> We humans enjoy mental states that arise from our underlying neuronal, cell-to-cell interactions. Mental states do not exist without those interactions. At the same time, they cannot be defined or understood by knowing only the cellular interactions. Mental states that emerge from our neural actions do constrain the very brain activity that gave rise to them. Mental states such as beliefs, thoughts, and desires all arise from brain activity and in turn can and do influence our decisions to act one way or another. Ultimately, these interactions will only be understood with a new vocabulary that captures the fact that two different layers of stuff are interacting in such a way that existing alone animates neither.[12]

[11] Cited by Deacon, *Incomplete Nature*, p. 5.

[12] Gazzaniga, pp. 130, 107. I also like Gazzaniga's pithier summary: "You'd never predict the tango if you only studied neurons."

The new vocabulary we need may include the concepts of macro and micro process and their reciprocal relationship. I much prefer that to "layers of stuff," which could easily be misconstrued as two physically distinct parts of the brain. Clearly that's not what Gazzaniga means, since he emphasizes that consciousness is "distributed everywhere across the brain," just as I would say that a group's culture is distributed across the members of a group. I think that experiencing is a macro-neural process, constantly generated by micro-neural processes involving cellular interactions in response to sensory inputs. A particular experience is a macro-event generated by and synthesized from a large number of micro-events. As you have novel experiences, your memory of those experiences must be widely distributed so that many micro-neural processes can be shaped by them.

In addition, I would argue that the quality of the experience matters. Some of the thoughts and sensations that enter your consciousness contribute more than others to a harmonious experience. Brain activity that creates harmony is favored over brain activity that creates mental dissonance. In thinking about a problem, you sustain lines of thought that seem to help and curtail those that don't. Unlike mechanical data processing, thinking is inherently value-seeking and hopefully enjoyable, not just externally programmed. That's not to deny that your thoughts are also shaped by their consequences in the external social and physical world.

From this perspective, an experience is partly *pre*determined by the state of the brain prior to the experience, along with the state of the entire body and its environment. But it is also partly *self*-determined by the inherently value-seeking reorganization of the brain during the experience. It is this self-design that is not entirely computable, because of its ongoing novelty and aesthetic quality. Self-design has been largely invisible to traditional science, which looks only for part-to-whole causality. At the same time it has been seen by traditional religion as something supernatural, the action of an immaterial, immortal soul that can outlive the body. This is disparaged as the "ghost in the machine" by materialists who have no faith in ghosts (but extraordinary faith in machines). I think we are neither ghosts nor just machines. I think that self-design is a fully natural process, but with mysterious and wonderful effects. It is the process by which human beings develop themselves and use their brains and bodies to create something of value.

Thinking this way isn't easy. We understand how our machines work, but we have not understood how *we* work, how a fully natural being can generate a creative process, which alters the very body that generates it. That's probably why so many people either deny human creativity or attribute it to a supernatural soul. Any description that tries to go beyond mechanism sounds fanciful. Creative synthesis remains a deep mystery, bound up with the deep mysteries of consciousness and time. It lies partly beyond our scientific laws, computer algorithms and technological control. But I see no reason to claim that it lies beyond nature. On the contrary, *it is our nature*.

Scientists working in many fields are now seeing beyond reductionism and mechanism. Robert Laughlin, the Nobel-prize-winning physicist, says, "What we are seeing is a transformation of worldview in which

the objective of understanding nature by breaking it down into ever smaller parts is supplanted by the objective of understanding how nature organizes itself."[13]

The mechanical and the creative have to coexist in human life. The earth turns; the heart beats; the eye sees; the car starts—over and over again. At the same time, each new experience of all these things and a multitude of others is a little creation that opens up possibilities for further creation, since each step builds on what has already been created. Each life is a creative process with its own unique history. What is mysterious and wonderful is that this history aims toward beauty, the enrichment of life by discovering and integrating more diversity, although the process is often a struggle. Living means participating in the struggle to create something of intrinsic value, not just fatalistically accepting whatever is. It means trying to make what beauty one can, even in the ugliest of situations, and even with the suspicion that one's personal creative process will end with the death of one's body. The fact that we strive to do so is good reason for affirming that human beings—unlike computing machines and robots—have "inherent worth and dignity." That's a good start down a rational path to faith, although not the whole journey.

Social creativity

I have already used human social organization as an example of a creative, systemic process. Without the social dimension of creativity, one could get the impression that the only purpose of life is to enhance the quality of one's *own* experience. But if there's anything the religious traditions agree on, it's the ideal of loving others as one loves oneself, and that means caring about what *they* are experiencing. Philosophical and religious wisdom teaches that people can create greater beauty through love than through selfishness. This applies most obviously to the most loving of interpersonal relationships. But once we accept the principle that unity-in-diversity is a value to be sought in social organization as well as in psychic organization, we can apply it on even larger scales.

A social level of process emerges as soon as any two people interact. Each interaction event is a creative synthesis, a unique intersection of two personal developmental histories. An act of social communication is not the same kind of event as an individual thought. Since each listener interprets the speaker's words or actions in the context of prior personal experience, what is actually communicated is a novel synthesis of what each speaker/actor is able to express and what the other is able to understand. Personal process and social process are reciprocally related. People make relationships, but relationships—especially the most intimate ones—also shape people (and of course literally make new people through procreation). Both levels of process are purposive, seeking some form of unity-in-diversity. Designing a relationship so that it achieves social harmony and personal satisfaction for both parties is not easy. Persons have to grow into the relationship, and the relationship has to grow to accommodate the personalities. That is already very challenging, even before considering the relationship's participation in larger social networks.

[13] Robert Laughlin. 2005. *A Different Universe*. New York: Basic Books, p. 76.

The general principle of reciprocal relationship connecting creative processes on multiple levels applies throughout society, in groups, organizations, institutions and entire societies. Thinking about society this way invites us to participate consciously in these creative processes. Once again it requires us to think outside the two boxes that have inhibited creative thinking. Religion has sometimes encouraged a belief in supernaturally ordained institutions, such as the one true church, divine-right monarchy, or patriarchal family. A more scientific perspective has sometimes viewed institutions as impersonal machines to which people can only conform, especially industrial economies and totalitarian states. As a sociologist, I welcome the application of the scientific method to the study of society. Nevertheless, an approach that is too mechanistic and reductionist can limit our understanding and narrow our moral vision.

The case of neoclassical economics illustrates the problem. Neoclassical economics attempts to show how economic outcomes—in particular, how much of each product is produced and consumed and at what price—can be calculated from information about households and firms. In theory, each household has a set of consumption preferences that would maximize their utility or "happiness," as well as a possible consumption plan for each possible combination of prices. Each firm has a set of available production processes, including a most profitable production process for each possible combination of prices. According to the law of supply and demand, lower prices encourage consumption of a commodity but discourage its production, while higher prices discourage consumption but encourage production. Neoclassical economics defines an equilibrium state where goods are priced just right to balance supply and demand. The theory shows that this may also be considered an efficient state of affairs where both profits and utility are higher than they would be at other levels of production and consumption for each good.

By focusing on quantifiable and logically related variables, such as the price of a good and the economic demand for it, the neoclassical model can calculate macroeconomic outcomes from microeconomic decisions (at least in computer simulations, since real data for households and firms are hard to come by). It has a rigorous mathematical formulation and can be applied to a great variety of markets.[14] What the model lacks, however, is any developmental dynamics. Its results are computed instantaneously and deterministically from the microeconomic inputs. There is always an equilibrium, but never an actual process by which an economy moves toward equilibrium or away from it. And what is particularly striking to a sociologist, economic and social *organization* play no role, either as a variable or a process. The market is always perfectly competitive; the price of labor has nothing to do with whether or not the workers are organized; and the ability of a firm to set prices has nothing to do with how big it is (that will come as a surprise to Walmart's suppliers). Large-scale social changes like the information revolution remain in the background, although no economist would deny that they can have huge effects on what products are produced, how they are produced and at what cost. In other words, there is no reciprocal macro-to-micro causation, just simple determination of the whole by the parts.

[14] Lee Smolin has provided an excellent analysis of the most rigorous formulation of neoclassical economics, the Arrow-Debreu model, in "Time and symmetry in models of economic markets," at http://arxiv.org/abs/0902.4274 .

Any abstract model is a simplification of reality, and one cannot fault a theorist for not being able to include everything. The problem here is that the most creative aspect of economic reality, the ongoing organization of the economy, is what is left out. For example, one of the concerns about the information revolution is that so far the economic benefits of higher productivity have accrued to a relatively small segment of society, while the incomes of the middle class and the poor have been stagnating. Something similar happened in the early twentieth century with the mechanization of manufacturing. Initially the manufacturers hogged the benefits, not necessarily because that was most beneficial for the economy as a whole, but because they could get away with it. Only after a tumultuous period of economic depression, union organizing, and expansion of government's role in the economy, did rising productivity translate into higher incomes for workers, a broadening of the middle class, a shorter work week (fought for by labor and eventually mandated by government), and the sustained economic growth of the postwar era. In the real world, it takes time to get it right, and large-scale economic and social forces have a role to play in reshaping microeconomic behavior. The neoclassical economic model describes the economy like a machine that is fully operational and always working just fine, thank you, not an ongoing creation of social organizing processes.

How economists model the world has implications for moral responsibility and social policy. In principle, a mathematical model can be neutral on ethical and policy questions. Just because it can calculate a price for labor in the absence of collective bargaining or minimum wage legislation doesn't mean that such things shouldn't exist. In practice, however, the neoclassical model has become a set of rose-tinted glasses through which economists view markets. They visualize the economy as an efficient computing machine that is not to be tampered with, especially not by government. Whatever the "free market" does must be right, since it so efficiently balances the profit motives of sellers with the utilities perceived by buyers, in accordance with the natural law of supply and demand. The exclusively mechanistic model idealizes the market as a mechanism for *computing* value, but leaves out the larger processes by which society *defines and enhances* value.

For example, a labor market balances the supply and demand of the various kinds of labor by computing wages. Free-market advocates see the wages paid as the "right" wages, efficiently allocating workers among forms of work and fairly rewarding their utility to employers. One problem is that the most powerful market players—large employers as opposed to disorganized workers, for example—automatically have more weight in the computation, so acceptance of the results implies acceptance of the existing power structure. Another is that the market wage overlooks the human potential of workers and their families, and low market wages inhibit the development of that potential. If families have too little income to afford good child care, education, job training and health care, that can hurt economic development in ways not captured by the model.

In the neoclassical view, pursuing one's economic self-interest is fine ("greed is good") because the market mechanism (Adam Smith's "invisible hand") reconciles competing interests to arrive at the best solution for society. The individual interests themselves are just taken at face value and not assumed to require any development. The more complex dynamics suggested here would include a systemic cultural learning process that contributes to more enlightened self-interest, so that economic actors can be led to sacrifice short-term gain for some larger good, such as environmental protection or investment in the

development of human potential. These dynamics define a legitimate role for democratic government, education, and yes, religion. Millions of people turn to organized religion for guidance on moral questions, and social justice should be at least as high on the sermon agenda as family morality. Churches played a strong supporting role in the reform movements of the early twentieth century, and may do so again. But too often, economists trained in the neoclassical model regard such influences as nothing but threats to economic efficiency. Such are the results when an oversimplified model of reality is mistaken for the whole of reality.

We pay a price in moral responsibility if we turn incomplete science into flawed social policy, implicitly valuing some economic machinery at the expense of the human beings whose ends it is supposed to serve. No doubt our economic models will change, as societies and their economies (and their economists!) develop. Just this year, a new economic theory by Thomas Piketty has generated a lot of excitement by addressing the timely issue of growing economic inequality.[15] Piketty's method is a blend of mathematical analysis and historical interpretation, with more regard for the economy as an ongoing social creation. One of his key propositions is that the portion of national income going to capital (investors) depends on the difference between the rate of return on capital and the economic growth rate.[16] He fears that a lower growth rate in the twenty-first century may take us back to an economy in which getting ahead through wage increases is harder, having capital to invest is crucial, and society is dominated by an upper class living off inherited wealth. Political events and policies have curbed wealth accumulation before, notably in the early twentieth century when war and depression caused a dramatic collapse of capital and progressive taxation was introduced. Piketty believes that democracy will have to defend itself against excessive inequality with new policy measures, especially taxation on accumulated wealth instead of just on current income.

Whether one agrees with Piketty or not, ongoing historical interpretation has a role to play in making sense of the world. History doesn't unfold mechanically for societies any more than it does for individuals. No abstract formula or algorithm foretells the future in any detail. The same general *kinds* of events, like recessions, can occur more than once, so economists can make some abstract generalizations about them. But history can repeat itself only in the abstract; each recession will be different in its particulars. Not only that, but every society is trying to create a better world for itself, and so it can learn from its mistakes. Many economists feel that the recent recession would have been worse if the government had not taken dramatic measures to maintain financial liquidity, something that the Hoover administration failed to do after 1929. If we understand why the twenty-first century is shaping up to be a new "Gilded Age," we can do something about it.

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[15] Thomas Piketty. 2014. *Capital in the Twenty-First Century*. Translated by Arthur Goldhammer. Cambridge: MA: The Belknap Press of Harvard University Press.

[16] That conclusion follows logically from two fundamental relationships: (1) Over time, the ratio of total capital to annual income approaches the ratio of the savings rate to the growth rate of the economy. (2) Capital's share of annual income must equal the capital/income ratio times the rate of return on capital. So capital's share of annual income is highest when the growth rate is low and the return on capital is high, other things being equal. I've discussed this more fully at http://edsteffes.me/2014/05/15/capital-in-the-twenty-first-century/ .

An awareness of multiple levels of creative process clarifies and expands the concept of creative synthesis on the personal level. At each moment, each of us stands at a crossroads of many developmental processes—our own personal development, the development of others with whom we interact, the development of the social institutions in which we participate, the development of humanity and other species on this planet. All of these processes shape us simultaneously, calling upon us to act creatively to reconcile competing aims. We can simplify things by excluding certain processes from our consciousness (climate change, what climate change?). Life will be more routine and predictable if we serve narrow ends, such as the wellbeing of those of our own social class. We become more creative when we expand our consciousness to encompass more of the unbounded context within which we live. That's one conception of "enlightenment."

Faith in humanity

Humanity is remarkably creative on both the psychological and social levels. Does an appreciation of this creativity provide a rational basis for faith in humanity? Does history flow toward some beautiful creation, at least in the long run?

We can observe a general trajectory in human history toward more complex organization and more extensive communication. Although humans developed a wide range of cultures adapted to different environments before the rise of politically organized states, early societies were small and isolated, so the typical person had access to far fewer cultural resources. Today's nationally and increasingly globally integrated cultures bring together more diversity, offering individuals far more choices compared to the more provincial cultures of the past. That much seems consistent with the description of an aesthetic process as tending toward unity-in-diversity. And yet, so much of what humanity has wrought seems—well, less than beautiful. Is humanity worthy of our faith?

The good news is that human creativity has certainly added to the richness of reality and the fullness of individual lives. Surely we benefit from new ideas, new inventions, new artistic creations, new ways of organizing to get things done. One general effect of creativity has been to diversify life, giving us more ways of thinking and living. Just think of the wealth of ideas available to us today, the variety of artistic genres, the diversity of occupations, the pluralism of religious expression, the proliferation of products and services, the intermingling of ethnicities.

On the other hand, creativity does have a darker side. Economists like Joseph Schumpeter have used the term "creative destruction" to describe how new institutions sweep away the old, most notably in the history of capitalism. Not all creations are compatible. The creation of one thing can cause the destruction of something else, as when the expanding power and territory of the United States caused the destruction of indigenous cultures. Fear that one's own creations will be destroyed can encourage violent resistance to what others are trying to create. And so humans also create the means with which to destroy or dominate their adversaries.

If creative processes are just zero-sum games, with creation equally balanced by destruction, then they are not worthy of our faith. If white people can only flourish at the expense of people of color, men at

the expense of women, the market economy at the expense of the democratic state, capital at the expense of labor, science and technology at the expense of religion and ethics, humanity at the expense of the environment, and so forth, then we have no rational reason to put much faith in humanity. But the saving grace of humanity may be our ability not only to innovate and diversify, but to organize the diversity in a way that maintains some unity of a larger whole. The aesthetic aim of unity-in-diversity does seem to apply as a large-scale social principle. It is, it seems to me, the highest ideal of a democratic society, to respect diversity but maintain orderly processes for resolving disputes without destroying one another. Democracy is hardly perfect or universal, but it has been catching on. The historic decline of colonialism suggests that as countries become more integrated into a global system, dominant countries have more difficulty retarding or distorting the development of weaker ones. Cultural diffusion from one country to another is a powerful force for mutual development and international cooperation. Within countries, the trend has been toward the extension of human rights to more categories of people.

Martin Luther King said that "the arc of the Moral Universe Is long, but It bends toward Justice" (paraphrasing a statement by the nineteenth-century Unitarian minister Theodore Parker). May we also say that it bends toward beauty, the incorporation of diversity into a richer unity? The two ideas fit pretty comfortably together, since justice may be impossible without a recognition that people contribute to common goals in many different ways, yet all deserve a share of the common benefits. In the long run, the development of part of a system is hard to sustain without the development of the whole. Shared creativity eventually proves more successful than self-serving creativity. Evolutionary psychologist Robert Wright makes the similar argument that biological and cultural evolution both favor non-zero-sum games.[17]

Humanity's place in nature

If an appreciation of human creativity does lead reasonably to a faith in humanity, that sounds like a good reason to be a humanist! But should we stop with humanity? Can a similar argument provide grounds for extending our faith further? Can we find something beyond ourselves to consider sacred, in a world where traditional religion has lost much of its credibility?

Traditional Christianity attributes ultimate creativity to a supernatural Creator. It sees humans as one of God's creations, but places us above the rest of nature because of our supernatural souls, the supposed source of our capacity to act freely and morally. God is the supreme Lawgiver, handing down moral laws that humans *should* obey and natural laws that nature *must* obey.

Secular humanism eliminates the supreme Creator and Lawgiver, but retains the idea of natural laws. These are often regarded as eternal or primordial, somehow existing above and beyond the natural events to which they apply (although in what Platonic or supernatural realm they could exist is an interesting question).

[17] Robert Wright. 2000. *Nonzero: The Logic of Human Destiny.* New York: Pantheon Books.

This puts humanity in a somewhat ambiguous position. On the one hand the elimination of a supernatural God would seem to promote us to a *higher* place, since it leaves us free to make our own moral rules, deciding for ourselves what is best. In addition, our unique scientific knowledge of natural laws gives us a godlike view of nature and an unprecedented degree of control over it. On the other hand, the elimination of the supernatural soul would seem to demote us to a *lower* place, since we are now completely *within* nature and completely controlled by the natural laws we're trying to understand. As discussed earlier, reductionist science appears to render human agency irrelevant by acknowledging only mechanism and part-to-whole causality: Humans are controlled ultimately by their neurological and genetic "programming." Are humans the masters of the universe, or its mere slaves?

One solution to this paradox is philosophically indefensible: View *some* humans as the masters and others as slaves. Create a society ruled by the best technocrats money can buy—the high priests of technology worship—and reduce the rest of us to mere objects of technological control. While such a distinction is possible as a division of power and labor in society, philosophy demands a more unified conception of human nature and a more consistent ethical treatment of human beings.[18]

We need a new way of thinking about humanity and nature, an alternative to both supernatural religion and reductionist science. If the reductionist view of nature is incomplete, as many philosophers have argued and many scientists now acknowledge, *both* humanity and the rest of nature may be more creative than science or religion has previously acknowledged. They may, in fact, be co-creators, so the question of who is master and who is slave becomes moot.

Back in 2006, I gave a talk on biologist Stuart Kauffman's book, *Investigations*, in which I explored the spiritual implications of his non-reductionist view of nature. Two years later, Kauffman made those implications explicit in a book called *Reinventing the Sacred: A New View of Science, Reason and Religion.*[19] I was pleased to see that he now put creativity at the very heart of his conception of reality. He even defined God as "the very creativity of the universe."

Now I certainly don't want to get hung up on the word "God" here. Too many discussions of religion begin by invoking some conception of God learned in childhood—a patriarch on a heavenly throne perhaps—and then debate the existence of such a person. Better to approach it the other way around, I think. Start by reflecting on existence, and then ask what is most sacred about it. As Kauffman says, "May we find the creativity in nature sacred whether we are atheists or believers in a God who breathed life into the universe of ceaseless creativity."[20]

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[18] Jaron Lanier, a leading computer scientist as well as artist and musician, has imagined a technological dystopia in *Who Owns the Future?* 2013. New York: Simon & Schuster. He complains that the owners and programmers of the most powerful computer systems are reaping the rewards of information technology, while turning the ordinary people whose data are collected into uncompensated objects of technological manipulation. Unlike many Silicon Valley types, he puts his own faith in people more than machinery, and wants them to receive rewards commensurate with their information contributions.

[19] Stuart A. Kauffman. 2008. *Reinventing the Sacred: A New View of Science, Reason and Religion*. New York: Basic Books.

[20] Kauffman, *Reinventing the Sacred*, p. 45.

The obvious objection to regarding nature as creative or sacred is the destructiveness of nature toward humans, as in natural disasters. One response to that objection is to remind ourselves that humans do terrible things to one another too, and yet humanists manage to retain their faith in humanity. Nature can be cruel, but nature is also our creator and sustainer, having created us through the evolutionary process and sustained us with enough resources for the human population to flourish on earth. On balance, nature has done far more to create us than destroy us. Another response is to encourage a little humility on our part. We are only one species on this one planet, so what gives us the right to judge the whole of nature solely by what it does for *us*? Isn't that just as anthropocentric as the belief that a supernatural God placed us above nature? If we take the larger view, life is not a zero-sum game, in which humans are pitted against the rest of nature. The relationship can be mutually creative rather than mutually destructive, as the ancient metaphor of nature as sacred mother suggests.

Biological creativity

Kauffman is especially noted for seeing self-organizing processes at work within organisms, ecosystems, and the biosphere as a whole. For him that is the key to understanding how living systems can evolve at all.

The first thing Kauffman does in *Investigations* is quote the eighteenth-century philosopher Immanuel Kant's *Critique of Judgment*:

> An organized being is then not a mere machine, for that has merely *moving* power, but it possesses in itself *formative* power of a self-propagating kind which it communicates to its materials though they have it not of themselves; it organizes them, in fact, and this cannot be explained by the mere mechanical faculty of motion.[21]

In the Machine Age, biologists rejected Kant's position and adopted a mechanistic conception of organisms. The twentieth century saw both the discovery of the DNA molecule and the invention of the computer. Relating the two, biologists began to think of DNA as the genetic "program" that tells an organism what to be. But in the absence of any external programmer or internal creative process to design the program, biologists had to maintain that evolution only required accidental changes in gene sequences, with the fittest accidents preserved through natural selection. Organisms had to be at the same time more wonderful but less creatively designed than machines made by humans; they had to be "accidental robots blindly running randomly generated programs."[22] Becoming was reduced to accidental variations in being. Around the same time, behaviorist psychologists were arguing that humans develop their habits of behavior through mindless trial-and-error and cybernetic feedback from the environment, rendering thinking irrelevant. In neither case was any creativity or self-organizing capacity required.

The traditional theory of mutation and natural selection, which Kauffman calls the "poster child for reductionist thinking," works from part to whole—from the DNA molecule to the proteins, the cells, the

[21] Kauffman, *Investigations*, p. v.
[22] Deacon, *Incomplete Nature*, p. 37.

organism, the population, and the species. In the words of Francis Crick, one of the discoverers of the DNA molecule, "DNA makes RNA, RNA make protein, and proteins make us."[23] The organism as a whole has no active role in this story. It is just the passive carrier of its genes, on the one hand, and the helpless victim of natural selection on the other. What seems to be taken for granted is that random changes in DNA translate automatically into altered structures and functions that can then be tested by natural selection. It all seems very simple—too simple, as it turns out.

Evelyn Fox Keller's *The Century of the Gene* describes just how much biologists are coming to question this reductionist view:

> For almost fifty years, we lulled ourselves into believing that, in discovering the molecular basis of genetic information, we had found the "secret of life"; we were confident that if we could only decode the message in DNA's sequence of nucleotides, we would understand the "program" that makes an organism what it is. And we marveled at how simple the answer seemed to be. But now, in the call for a functional genomics, we can read at least a tacit acknowledgment of how large the gap between genetic "information" and biological meaning really is.[24]

In other words, it's a long way from a DNA sequence ("information") to a specific structure or function (biological "meaning"), and one doesn't follow automatically from the other. The same gene can make many different proteins; which one depends on the complex regulatory dynamics of the cell as a whole. That's one place to look for a self-organizing process. Using an aesthetic rather than mechanistic metaphor, Keller compares the genome to a musical score that the musicians rewrite as they play it.

Here are a few things that evolutionists are now saying, from Jablonka and Lamb's book, *Evolution in Four Dimensions*:

> The popular conception of the gene as a simple causal agent is not valid….
>
> The geneticists themselves now think and talk (most of the time) in terms of genetic networks composed of tens or hundreds of genes and gene products, which interact with each other and together affect the development of a particular trait….
>
> The stretch of DNA that is "a gene" has meaning only within the system as a whole. And because the effect of a gene depends on its context, very often a change in a single gene does not have a consistent effect on the trait that it influences….
>
> Cellular and developmental networks are so complicated that there is really no chance of predicting what a person will be like merely by looking at their DNA….

[23] Quoted by Evelyn Fox Keller. 2000. *The Century of the Gene.* Cambridge: Harvard University Press, p. 54.
[24] Keller, *The Century of the Gene*, pp. 7-8.

> Cells are able to make controlled changes in their DNA. These changes are part of normal development, and, like any other developmental process, they are regulated by the cellular environment….
>
> Not all mutations are haphazard mistakes; rather, some mutations are "directed."…Evolution by natural selection has led to the construction of mechanisms that alter DNA in response to the signals that cells receive from other cells or from the environment….
>
> With very few exceptions, the differences between specialized cells [liver cells, kidney cells, etc.] are epigenetic [developmental], not genetic. They are the consequences of events that occurred during the developmental history of each type of cell and determined which genes are turned on, and how their products act and interact.

And most important for evolution:

> The claim that one can think about evolutionary change in terms of individual gene mutations that have, on average, small, additive, beneficial effects and accumulate over a long time to form a phenotypic adaptation is problematical and often untenable. The complex interactions between genes, and between genes and environments, mean that the effects of genes on the reproductive success of individuals are often nonadditive. What we know about development tells us that *we should be thinking about networks, not single genes, as the unit of evolutionary variation* [emphasis added].[25]

Consistent with this newer view, Kauffman's theory might be called a theory of nested self-organization, since he describes self-organizing *genetic networks* within self-organizing *organisms* within self-organizing *ecosystems* within a self-organizing *biosphere.* These levels of organization are reciprocally related, so that each larger system depends on smaller-scale activity but also organizes it.

Genetic networks

Instead of switching on or off independently, each of the thousands of genes in a genome is regulated by as many as ten others. That means that genes switch on or off in highly coordinated patterns, and the organization of the network as a whole limits what the cells do with their genetic information. It also structures the flow of changes when a gene variation occurs. An "avalanche" of changes can ensue, but the probable size of the avalanche varies depending on how complicated and densely interconnected the network is. Based on both computer simulations and empirical research, Kauffman distinguishes three hypothetical situations or "regimes":

- In an *ordered regime*, the number of connections is relatively low and the average gene is controlled by very few others. A cell will settle into a cycle consisting of a relatively small number of system states, with most genes constantly on or off. Most mutations in this system will have minor effects. The system is something like a rigidly bureaucratic organization where

[25] Eva Jablonka and Marion J. Lamb. 2005. *Evolution in Four Dimensions: Genetic, Epigenetic, Behavioral, and Symbolic Variation in the History of Life.* Cambridge: MIT Press, Kindle edition, locations 88-1438.

each worker sticks to a routine and reports to one superior, a structure with only limited creativity.

- In a *chaotic regime*, the number of connections is higher, with each gene influenced by more others. Many genes are switching on and off, and the system is prone to large cascades of changes which radically change cellular functioning. Here a social analog might be an adolescent peer network easily caught up the latest fad, for better or worse.
- Kauffman believes that evolution favors a type of organization in which genetic networks are in the ordered regime, but close to the critical boundary between order and chaos. This is called *self-organized criticality* or being *on the edge of chaos*. Then it will experience small avalanches of change fairly often, but the riskier large avalanches of change only rarely. A social analog might be an organization with semi-autonomous work teams where innovations can flow more freely within groups than across them. Organization of this kind strikes a balance between adding novelty and preserving order, another example of unity-in-diversity. That successful species evolve toward this type of self-organization is a remarkable conclusion of Kauffman's work.

Organisms

The controlled generation of novelty at the genetic level is only part of the self-organization story. Kauffman is also interested in how the organism as a whole makes use of its biological structure as it maintains and develops biological function. An organism is a self-sustaining system, acting on its own behalf to accomplish what it must in order to maintain its own activity. Kauffman calls it an "autonomous agent," to distinguish it from an object that is merely acted upon by its environment. Organisms have to identify sources of energy, constrain that energy in order to perform work, and use some of that work to maintain the conditions under which further work can occur, especially the continued availability of energy. In order to identify sources of food or other favorable conditions for maintaining its work cycles, an organism must be able to detect properties of its environment, especially properties that are relevant to its organized activities. Aspects of life often associated only with humans—meaning, purpose and value—are already present at simpler biological levels. One of Kauffman's favorite examples is a bacterium swimming in a direction:

> Here, the bacterium detects a local glucose gradient, which is a sign of more glucose in some direction. By altering its behavior and swimming up the gradient, the bacterium is *interpreting* the sign. The bacterium may, of course, be *mistaken*….Neither "signs," "interpretation," nor "mistakes" are logically possible in physics, where only happenings occur. Thus *meaning* has entered the universe.[26]

Not only that, but "glucose has *value* to the bacterium," and "getting food is the *purpose* of the activity." An autonomous agent has the "know-how" to use its own body to accomplish its purposes. "Watch the myriad subtle turnings on and off of genes, metabolic switching, mechanical twitching, sensing of glucose gradient, swimming and tumbling upstream to higher glucose concentrations. It knows how all

[26] Kauffman, *Reinventing the Sacred*, pp. 86-87.

right…."[27] Bacteria can even respond to shortages in the environment by switching on genes that are normally inactive, such as a gene to make an amino acid that is normally available in the food supply.

This striving, purposive agent has an active role to play in the emergence of new function, by making use of either a new structure or an existing structure in a new situation. As Darwin recognized, the same structure can have many possible uses, not all of which are functional and selectively significant in a particular environment. "An incidental feature with no selective significance in one environment might turn out to have selective significance in another environment."[28] Such a feature is called a *preadaptation*. In a recent PBS program, paleontologist Neil Shubin gave the example of two bones essential to the human ear, which evolved from bones in the reptilian jaw. They lost their use for biting but found a use in hearing. If an animal is trying to do something in a particular environment, then whatever available structures help it to do that thing can be selected in that environment. When humans domesticated cows and became reliant on dairy products, natural selection could then favor human bodies that were good at digesting lactose. Any way of using the biological material, even if it is acquired by learning, can affect survival chances and the distribution of genes in the gene pool. Or as Jablonka and Lamb put it, "Animals are therefore not just passive subjects of selection, because their own activities affect the adaptive value of their genetic and behavioral variations."[29]

Kauffman believes that self-organization is an important addition to our understanding of how evolution works. It bridges the gap between mere possibilities—random variations that *might* turn out to be useful—and actualities—variations that are actually *used*. The new use by the autonomous agent is what turns the molecular material into a new organic function, and thus a preadaptation into an actual adaptation. "Self-organization may require that we rethink all of evolutionary theory, for the order seen in evolution may not be the sole result of natural selection but of some new marriage of contingency, selection, and self-organization."[30]

Ecosystems

Kauffman also explores the reciprocal relationship between organisms and ecosystems. Instead of just saying that organisms adapt to their ecological niches, he describes organisms and their niches as *coevolving*. An ecosystem is a network of organisms, and like a genetic network, its organization falls somewhere on a spectrum from highly ordered to chaotic, with implications for the fitness of the organisms within it.

The most highly ordered ecosystem would be one with only a small number of species, each evolving at a modest rate. Each organism's adaptations change the ecological niche of one or more of the others, but not enough to endanger its survival. The system settles into a pattern in which the ratio of each species' population to that of the others is roughly stable. None of the species can improve its fitness further, as measured by population size or longevity.

[27] Kauffman, *Investigations*, p. 111.
[28] Kauffman, *Reinventing the Sacred*, p. 132.
[29] Jablonka and Lamb, location 2256.
[30] Kauffman, *Investigations*, p. 60.

At the other extreme is a chaotic ecosystem with a larger number of species and higher mutation rates. Each species has trouble maintaining adaptive behavior, let alone improving it, since its environment is subject to so many disruptions arising from the mutations of others. "All organisms keep changing their genotypes in a persistent 'arms race,' and hence the coevolving population never settles down to an unchanging mixture of genotypes."[31] Extinctions of one or more species are common.

Kauffman concludes that "fitness…can be highest at an intermediate position on the order-chaos axis, near the poised phase transition." He believes that over time, evolution favors not only organisms that are well adapted to their environments, but ecosystems that maximize the average fitness of the species within them:

> Over evolutionary time, ecosystems may self-tune to a transition regime between order and chaos, maximizing fitness, minimizing the average extinction rate, yielding small and large avalanches of extinctions that ripple or crash through the ecosystem. We are all bit players who strut and fret our hour upon the stage, and then are heard no more. But we may collectively, and blindly, tune the stage so each will have the best chance at a long, long hour.[32]

If so, evolution is a non-zero-sum game resulting in a beautiful balance of unity-in-diversity. Although the details of the proposed self-tuning process are not known, Kauffman makes a few intriguing suggestions. For one thing, as the number of species in an ecosystem increases, it is harder to add additional species without complicating the interactions among them in a destabilizing way. The resulting extinctions would simplify the system, returning it to a less chaotic regime.

The biosphere

Kauffman generalizes his model of the self-organizing, evolving ecosystem to the entire biosphere and beyond:

> As an average trend, biospheres and the universe create novelty and diversity as fast as they can manage to do so without destroying the accumulated propagating organization that is the basis and nexus from which further novelty is discovered and incorporated into the propagating organization.[33]

Kauffman describes this process of diversifying and unifying as being "partially beyond scientific law".[34] Life itself, and living things in their many forms, emerge as qualitatively new organizations of existing physical things. Biological organization is not reducible to those physical things or computable from the physical laws governing them. The laws of physics don't predict that life will exist at all, let alone how a particular organism will be organized. Physical laws allow a vast array of possibilities—many kinds of chemicals, many kinds of organic molecules, many kinds of species and ecosystems. They permit the

[31] Stuart Kauffman. 1995. *At Home in the Universe: The Search for Laws of Self-Organization and Complexity.* New York: Oxford University Press, p. 221.
[32] Kauffman, *At Home in the Universe*, pp. 223-224, 235.
[33] Kauffman, *Investigations*, p. 85.
[34] Kauffman, *Reinventing the Sacred*, p. 130.

emergence of many different higher-level systems, but are too abstract to fully explain the appearance or behavior of any of them. New variables, categories and laws have to emerge along with the new realities. Biologists are interested not only in physical effects but biological *functions*, which is not even a concept in physics. Physicists can observe that a heart both pumps blood and makes a sound as it does so, but biologists decide by studying the whole organism that the first effect has more functional significance than the second. As we've seen, the appearance of a new function is an emergent event, not computable from a structural change in the body. Sometimes it's just a matter of finding a new use in a novel situation for what's already there.

This line of reasoning challenges the idea that primordial or eternal universal laws (either deterministic or statistical) explain everything, or that more specific laws such as laws of biology or human behavior can be deduced from universal laws. Instead, novelty emerges and is incorporated into order, and new laws emerge describing that revised order. Just as corporate law didn't exist before corporations, biological laws didn't exist before living things.[35] Nature is hardly lawless, but at any one time, existing laws are too abstract to define future events completely, so things get determined step by step rather than once and for all "in the beginning."

Since evolution is a series of emergent events, it unfolds historically rather than predictably or mechanically. The number of possibilities is vast. For example, typical proteins within the human body are about 300 amino acids long. Even using the more conservative figure of 200, the number of possible proteins of that length is about 10^{260}. Allowing a tiny fraction of a second to make each protein, it would take 10^{39} times the amount of time since the Big Bang to explore all the combinations even once. Then consider all the possible structures that could be made from the proteins, and all the possible functions that could be performed by the structures in all the possible environments. When the number of possible states is vast compared to the number of states that can be explored in a finite time, a system has a unique history. "*History enters* when the space of the possible is vastly larger than the space of the actual."[36] Unlike simpler systems that cycle through a small number of possible states in a predictable way, the biosphere never repeats itself.

> At levels of complexity above atoms, the universe is on a pathway, or trajectory, that will never repeat. For example, in the evolution of the biosphere, from molecules to species, what arises is almost always unique in the history of the universe. Using the physicist's technical term, the evolution of molecules and species in the biosphere is vastly nonrepeating, or nonergodic.

Predicting the future of a biological system would require anticipating every possible use of every possible structure within every environment the system might encounter. "Virtually any feature or interconnected sets of features in an organism might, in the right selective environment…give rise to

[35] Physicist David Bohm has elaborated on this view in *Causality and Chance in Modern Physics* (Kindle edition, 2004). He argues for a "qualitative infinity of nature" in which the number of different kinds of things that can exist is unlimited, and the emergence of qualitatively different entities is a game changer: "The most essential and characteristic feature of a qualitative transformation is that new kinds of causal factors begin to be significant in a given context, or to "take control" of a certain domain of phenomena, with the result that there appear new laws and even new kinds of laws, which apply in the domain in question" (p. 36).

[36] Kauffman, *Reinventing the Sacred*, p. 123.

novel functionality." Without a fixed set of variables and possible values, "we cannot write down the equations among the variables and solve for the forward evolution of the biosphere the way we can for the balls on a billiard table."[37]

In the evolution of the biosphere, we see a creative process that bears a striking resemblance to the human historical process. Both processes are non-repeating and non-computable. Both emerge from the confluence of many micro-level processes, and at the same time shape those processes, selectively sustaining activities that best fit the emerging whole. Both processes diversify and unify ways of living in a non-zero-sum game that creates more than it destroys. The human creative process is much more conscious and more rapid, and therefore more obvious. But we shouldn't lose sight of the fact that we owe our own creativity to that larger creativity of which we are a part. How can we not include that in our conception of the sacred?

Humanity and nature revisited

Evolution has endowed the human species with the intelligence to expand beyond our original ecological niche, spread widely over the globe, adapt to a wide variety of conditions, build societies of great complexity, extend our longevity, and multiply our numbers exponentially. We in turn have unquestionably altered life on this planet. The trouble is that we may have become so dominant that our self-serving creativity is becoming ecologically unsustainable. Our success has encouraged us to assert a kind of human exceptionalism, just as the success of the United States has encouraged American exceptionalism. We like to put ourselves above nature, either by claiming a special relationship with God or a godlike knowledge of timeless scientific laws, in either case regarding nature as a set of inferior objects to be controlled technologically for our benefit.

The emerging alternative is to regard the biosphere as a self-organizing system with its own integrity, its own creativity, and its own project to create diversity while maintaining order. That is what I think the Unitarian Universalist seventh principle is calling us to honor, when it advocates "respect for the interdependent web of all existence of which we are a part." That principle encourages a sense of humility in the face of the sacred and a faith that the biosphere "knows what it's doing." What it requires of us is to channel our creativity so that our innovations are supportive rather than destructive of the web of life. That's easier said than done, as we are only beginning to appreciate the implications.

Our technological success, not sufficiently tempered by a proper understanding of our place in nature, seems to be setting up a lethal conflict between ourselves and other living things. Evidence is mounting that human activity is causing a mass extinction of other species. Zakri Abdul Hamid, the founding chair of the UN's Intergovernmental Platform on Biodiversity and Ecosystem Services, has warned, "We are hurtling towards irreversible environmental tipping points that, once passed, would reduce the ability of

[37] Kauffman, *Reinventing the Sacred*, pp. 132-133. To put it more formally, we have to define a configuration space with possible variables and values before we can calculate a system's path through that space. One thing we cannot calculate is the expansion of the configuration space itself by the addition of a new variable, such as an emergent function.

ecosystems to provide essential goods and services to humankind."[38] Scientists know of only five previous mass extinctions in the past half-billion years, usually attributed to natural disasters like asteroids hitting the earth, volcanic eruptions, or extraordinary glaciation. Most of the time the biosphere manages to maintain its order near the edge of chaos, but the unprecedented impact of our one species on millions of others simultaneously could set off the rare avalanche of catastrophic change that sends the system over the edge. At the very least, that could be a major setback in diversification, impoverishing the biosphere and ourselves and maybe leading to our own extinction.

Our faith in humanity, based on some confidence that human history flows toward beauty, is of little value without some regard for the beauty of nature. If nature and humanity are co-creators in the interdependent web, our faith has to encompass both. Acknowledgement of the creativity of nature can be the basis for a new spiritual ecology. It can provide an alternative to the religious view popularized by Senator James Inhofe, former chair of the Senate Committee on Environment and Public Works, that we don't have to worry about environmental problems like climate change because "God's still up there" and he will control the environment for our benefit. If God is better viewed as the creativity of nature, and is "in here" instead of "up there," then creating a sustainable way of life is up to us in cooperation with the rest of nature.

Universal creativity?

The All Souls Unitarian Universalist Church of Brattleboro, Vermont, declares in its covenant, "We covenant with one another…to show reverence for the divine in all there is."[39] If the divine is the creative, how far does it extend?

Kauffman cautiously suggests that creativity is universal, not just a feature of the earth's biosphere. The idea of universal creativity is appealing, because it would ground our own creativity in something even more fundamental, a "ground of being" that truly deserves to be called sacred. In process philosophy, that ground of being is *becoming*, the ultimate creative process.

Atheists seem quite sure that there is no Supreme Being. Can they also be sure that there is no Universal Becoming? If there isn't, then the universe is an anomaly, a beautifully organized system with neither a supernatural organizer nor a self-organizing process. To those who think that everything is mechanics, the universe can only be a large machine because that's all anything can be. And since machines left to themselves can only run down or break down, the arrow of time must point toward the disordered state that scientists call maximum entropy, equilibrium, or the "heat death of the universe." Living systems can maintain their order for a time, as long as their solar energy holds out, but disorder must win in the end. It's the *law*, they say, in this case the second law of thermodynamics.

But not all scientists are sure that a law describing isolated systems like atoms of gas moving randomly in a box applies to the universe as a whole, which displays a remarkable and persistent complex order. If

[38] Common Dreams, 5/28/2013, "UN: Accelerating Biodiversity Loss a 'Fundamental Threat' to the Survival of Humankind." www.commondreams.org/headline/2013/05/28-6 .
[39] Thanks to Rev. John Wright for calling our attention to this covenant.

the foregoing description of humans and other organisms is accurate, then mechanical systems and more creative, self-organizing systems both exist. Without knowing what if anything lies beyond our universe, how can we know whether the universe is a closed mechanical system or an open self-organizing system? If it's the latter, then the arrow of time can point toward unity and diversity, and we and the beauty of life we experience can be "at home in the universe," to use Kauffman's phrase. I lean toward the view that if the beauty of nature is not due to supernatural organization, then it must be due to a universal self-organizing process.

In what follows, I'll try to answer two philosophical and scientific objections to this view. The first is that the marvelous unity-in-diversity of our universe is just a fluke, an accident. The second is that the passage of time is an illusion, so that everything that can ever exist already does exist, and *nothing is ever being created at all*. Both of these views have substantial support among physicists. In challenging them, I will draw heavily on the new work of physicist Lee Smolin.

The finely tuned universe

Physicists often regard the beautiful complexity of our universe as an accident, because they see no other way to account for it. The known laws of physics allow for a vast multitude of *possibilities*, but they do not explain the realities of our particular universe because they don't explain the initial conditions under which the laws apply. The laws of physics do not predict that a universe will necessarily contain stars and galaxies and heavy elements, let alone organic molecules and living things. These things can only appear under the most precisely defined conditions, the precise values of at least twenty physical parameters, such as the gravitational constant *g* and Planck's constant *h*. A universe with the values of the parameters drawn at random would have little chance of being as complex as ours. For example:

> The initial expansion rate of the universe, which is set by the initial conditions, seems to have maximized the production of galaxies and stars. Had it been much faster, the universe would have diluted too quickly for galaxies and stars to form. Had it been too slow , the universe might have collapsed directly to a final singularity before stars got a chance to form. The expansion rate was ideal for the production of lots of stars, and it is the stars that, by pouring hot photons into cold space for billions of years, keep the universe away from equilibrium.[40]

It's as if an acoustic piano appeared out of nowhere, with all its strings exactly the right lengths to be in perfect tune, all ready to make beautiful music. Either we need to invoke a Supreme Piano Tuner above nature or ask how nature accomplishes this on its own. The known laws of physics are surprisingly helpless to answer the question of why *this* universe, as opposed to something far less organized and interesting. Stephen Hawking has acknowledged the gap between theoretical possibility and marvelous

[40] Lee Smolin. 2013. *Time Reborn: From the Crisis in Physics to the Future of the Universe*. Boston: Houghton Mifflin Harcourt, p. 206.

actuality: “Even if there is only one possible unified theory [of physics], it is just a set of rules and equations. What is it that breathes fire into the equations and makes a universe for them to describe?”[41]

Smolin believes that the answer must lie in the universe’s history, even if that includes some reality that existed before the Big Bang. Scientists should look for a process by which the initial values of our universe got set, seeking evidence for that process in “information left in remnants (if any) that survived the birth of our universe.”[42] If a child at birth is a carrier of information inherited from the past, why not a universe at its birth?

What Smolin proposes is no easy task. Few physicists have been able to imagine such a creative process, let alone look for it. Many have insisted instead that the values of the essential parameters must be set by chance, as if our particularly complex universe won some cosmic lottery. Of course, the odds of someone winning the lottery improve as the number of players increases, so scientists make the lottery theory more plausible by imagining a large number of parallel (causally isolated) universes, each with its own initial conditions drawn at random. The most probable ones—the vast majority—are simpler and less interesting than ours, with no possibility of life. Our universe is one of the rare ones with extraordinary complexity because it must be, or we wouldn’t be here studying it! That last bit of reasoning is known as the “anthropic principle,” a term that only calls attention to just how anthropocentric the argument is, as if anything that makes *us* possible needs no further explanation! Smolin regards this line of reasoning as unscientific and untestable, since the multiple universes it requires are only imagined, not observed. They are articles of faith, but faith in what? Just chance, randomness, ultimate meaninglessness—nothing that could be regarded as sacred.

Smolin isn’t buying it. “We know that our universe wasn’t produced by random choice, because of the many properties it has that would be extraordinarily unlikely to result from such a choice.”[43] He believes that both the laws of our universe and its initial conditions must have evolved over time. For other universes to have any explanatory relevance for ours, they must be *prior*, not parallel. This theory is in principle testable, since what is prior can leave behind evidence.

> If the Big Bang has no past, the choice of laws and initial conditions is arbitrary and there will be no such tests. Nor will there be any tests of scenarios in which a vast or infinite population of universes exist whose Big Bangs are all causally disconnected from ours. In a scientific cosmology, the postulation of parallel universes, universes that are causally unconnected to ours, cannot help us explain any property of our own universe. We conclude that the only way to have a scientific cosmological theory that can make falsifiable predictions is if the laws evolved in time.[44]

[41] Bruce Rosenblum and Fred Kuttner. 2006 *Quantum Enigma: Physics Encounters Consciousness*. New York: Oxford University Press, kindle edition, location 3876.
[42] Lee Smolin. 2013. *Time Reborn: From the Crisis in Physics to the Future of the Universe*. Boston: Houghton Mifflin Harcourt, p. 249.
[43] Smolin, *Time Reborn*, p. 205.
[44] Smolin, *Time Reborn*, p. 120.

The nature of time

The idea that the laws and initial conditions of our universe must have evolved over time raises the most fundamental question of all, the reality of time as a real succession of events. Einstein's relativity theory conceptualized time as one dimension of a four-dimensional configuration called "spacetime." This suggested the idea of the "block universe" where all times as well as all spaces co-exist. If past, present, and future co-exist, then nothing is actually being created and there is no real becoming at all. The passage of time is a subjective illusion arising from our inability to experience more than one time at once. Einstein was troubled by that implication, since it contradicts our fundamental belief in a real "now" separating what has already happened from what has not yet happened; but he couldn't see an alternative consistent with relativity theory.

Einstein liked "gedankenexperiments"—mental experiments—so let's try one to see if we can make this work. When I see a car coming down my street, suppose it is *really* at all points in its journey, although I am only able to see it at one place at a time. Okay, maybe that's just a limitation of my consciousness. But now suppose that I'm the one driving the car down the street. Now I have to imagine that *I* am really at all points on my drive—and in my whole life for that matter, but let's keep it simple—although I am subjectively aware of being only at one point at a time. When I'm at point A, I'm really also at point B, although I'm not aware of it yet. But wait a minute! How can I *become* aware of it without real changes occurring in my brain? And since all times co-exist, all my mental states must also co-exist, so I must already be aware of being at point B, although I'm not aware of being aware of it. This leads to an infinite regression of contradictory statements:

> I am only at point A.
> But no, I am also at point B, although I'm not aware of it.
> But no, I *am* aware that I'm at point B, although I'm not aware that I'm aware of it.
> But no, I *am* aware that I'm aware that I'm at point B, although I'm not aware that I'm aware that I'm aware of it…
> …And so forth, *ad infinitum*.

This is rational thinking? The idea that the passage of time is only subjective, not objective, has self-contradictory implications. It radically separates our experience of the world from the world itself, even though we are part of the world. It forces us to deny our own becoming in order to affirm the world as a timeless block of reality. That is the ultimate reduction, reducing becoming to mere being, and it makes us *unrecognizable to ourselves*. (That's generally what happens when we try to reduce our concrete lived reality to an abstraction.) Becoming is the aspect of reality that is most real to us. Process philosophers believe that it is the starting point for any rational philosophy—not just "I think; therefore I am"; but "I experience; therefore I become!" Without that, does anything make sense?

Smolin describes a theory of "shape dynamics" that he believes can solve this problem by reformulating relativity theory.

> In a word, in general relativity size is universal and time is relative, whereas in shape dynamics time is universal and size is relative. Remarkably, though, these two theories are equivalent to

> each other, because you can— by a clever mathematical trick that isn't necessary to go into here—trade the relativity of time for the relativity of size….
>
> Thus, shape dynamics achieves an accord between the experimental success of the principle of relativity and the need for a global time demanded by theories of evolving laws and hidden-variable explanations of quantum phenomena. As noted , one quantity not allowed to change when you expand and shrink scales is the overall volume of the universe at each time. This makes the overall size of the universe and its expansion meaningful, and this can be taken for a universal physical clock. Time has been rediscovered.[45]

I am not qualified to evaluate this theory, but I find it hopeful that some physicists are now beginning to take time seriously again and describe the universe in a way that at least allows for creativity. If the past and only the past has already happened, then the future may be more open than the past. Whether the future really is more open than the past depends on what is happening in the Now that separates the two. Is it something creative, or something entirely predetermined by the past?

The philosopher Bergson said, "Time is invention, or it is nothing at all."[46] From this process perspective, each moment is a unique actualization of possibility, which determines something that was not already completely determined. The future gets determined step by step, moment by moment. This is how I experience the world. The alternative, usually called determinism, says that even if the future has not happened yet, what will happen has been predetermined by what has already happened in the past. Creativity and freedom are illusions arising from our ignorance of the causal relationships connecting past, present and future. Nothing truly creative happens in the present, so the only possible creative moment is some primordial moment of creation when everything that will ever happen got determined. That moment could be the Big Bang, if one is willing to treat it as the beginning of all reality, avoiding the question of what determined the Big Bang itself.

The determinist view is open to a number of objections. It depends for its cogency on the success that scientists have achieved in predicting the future by applying laws based on data from the past. But such laws are abstractions that predict the generic, not the unique: how the eye works but not what it is seeing right now, as explained earlier. Trying to base a complete philosophy on the abstractions of science is exactly what Hartshorne warned against in the opening quotation. It is also an over-interpretation of the mechanistic metaphor, an unwarranted assumption that everything in nature must have the predictability or computability of a machine. Scientists themselves are now questioning that. Perhaps the strongest objection arises from the recognition that human beings (at least) are experiencing subjects as well as objects of scientific observation and analysis. On the one hand, the more that is known about objects, the more predictable they become. But on the other hand, the more that is *known by subjects*, the *less* predictable they become. Humans were much more enslaved by their pasts when they lived in provincial, tradition-bound villages. Today's information-rich "global village" offers far more opportunities for synthesizing new ideas and lifestyles. That's probably why the advance

[45] Smolin, *Time Reborn*, pp. 170-171.
[46] David Ray Griffin, ed. 1986. *Physics and the Ultimate Significance of Time.* Albany: State University of New York Press, p. xi.

of science has not destroyed our sense of our own freedom, as one would expect if determinism were true. In the Information Age, it is ever more obvious that we cannot know what we will create next, because we cannot know what information the world may bring to us or how we will synthesize it with what we already know. Determinism is both impossible to demonstrate and at odds with the way we experience every moment.

I see no compelling rational argument for determinism, but I do see a compelling argument for believing in creativity, a good reason for Hartshorne to hold it supreme over all legitimate human concerns. Creativity is an enhancement of *value*, the aesthetic dimension of reality broadly defined to include cognitive and ethical as well as artistic beauty. In the end there is a difference between acting compulsively and acting purposively, between just letting mechanical processes go where they go and organizing them to create something new and hopefully better. Creativity implies a degree of self-determination in the present, as opposed to complete pre-determination by the past. The past has a determinative power in an abstract, generic way. I can only do what my human body is capable of doing, for example; but within any such generic limitation, the possibilities remain vast.

"Time is invention or it is nothing at all." The mystery of creativity and the mystery of time may be the same mystery. Assuming that time existed long before humans and other animals came along, human creativity may be a special case of a more general creativity that is fundamental to the temporal world. And if the temporal world is the only world, then the ultimate reality may be the universal creative process. There is nothing more fundamental with which to explain it, since the process and its artifacts are all there is. Over time, the ultimate process generates creative subprocesses, including yours and mine.

Creativity and faith

Now I am ready to attempt a definition of the key terms in this discussion:

- Creativity is a natural, ongoing process of synthesizing the new from the old—and the new *with* the old—to achieve a richer unity-in-diversity. More technically, it is a non-repeating, non-computable systemic process generated by many component processes, but also directing and constraining those processes.
- Faith is a reverence for the interconnected web of creative processes, which gives meaning and direction to one's own creativity by connecting it to the creativity of others. It enables us to live in anticipation of greater beauty and motivates us to contribute to that beauty.

To live without faith is to go through the motions of living without meaningful connection or purpose. To live with *insufficient* faith is to be oblivious to too many of the creative processes to which we could contribute. One may have faith in oneself but not others, faith in technology but not people, faith in market mechanisms but not the democratic process, faith in humanity but not the rest of nature. I would rather call my perspective "spiritual universalism" than "secular humanism," since the latter easily gives an impression of lacking reverence, or of confining one's reverence to humanity. I believe that spiritual universalism has much to offer to a world badly in need of enlightenment.

To skeptics (including this writer), religion has too often been an exercise in wishful thinking, conjuring up comforting visions of a powerful but benevolent father-figure or an afterlife of eternal bliss. One may reasonably ask whether spiritual universalism is another such exercise, in this case projecting onto nature a human wish for unity-in-diversity. Why in the world should nature be as creative as we fancy ourselves being, or conform to any human aesthetic standard?

I certainly do not maintain that the world was designed for humanity, as some religions would have it. We are just new kids on the cosmic block, so any deep aesthetic connection must be more a matter of humanity being designed by nature. But what is nature, ultimately? Once we liberate our thinking from the restrictive assumption that everything is machinery, an aesthetic dimension of reality becomes more plausible. If reality is inescapable temporal, as process philosophers maintain, then how can anything exist without coming into existence and co-existing with things that already exist. What else could creation be then, if not the emergence of novelty and the harmonization of new and old—in other words, diversification and unification? Whenever a composer adds one more note to a composition, but preserves the harmony of the whole; whenever a scientist suggests a new hypothesis but relates it to an existing body of theory; whenever a person participates in a human conversation, saying something new but making it relevant to what has already been said; they are doing what the universe has been doing for over thirteen billion years. Humanity must have acquired our appetite for unity-in-diversity from nature, making it the most natural thing in the world that we would find ourselves in a co-creative relationship with the universe. We create because it is our nature to do so, and it is our nature to do so because we couldn't have evolved if we weren't fit for the universe that made us. If universal creativity is what is most sacred about nature, then our creativity is our share of the divine nature, and we are indeed made in the image of "God"!

Living into mystery

Something wonderful and mysterious is at work in the world. It is not reducible to mere chance or timeless law. It is endlessly surprising, but rarely chaotic. It adds more than it subtracts. It diversifies and unifies. We know about it through our direct experience of it, and that helps us recognize it when we see it beyond ourselves. Time is real; becoming is real; creativity is real; beauty is happening!

We have good reason to have faith in the creative process, at many levels—faith in ourselves, in our relationships, in humanity, in nature. Faith looks beyond what already is, without fully knowing what will be. We understand what already is by looking backward, but as Kauffman says, we must live our lives forward. The future is not fully computable from the past, and we wouldn't want it to be, since then we could only accept it fatalistically, as beautiful or ugly as it turned out to be. Our faith in creativity—our own and one another's—is what allows us to look forward not just with resignation, but with anticipation of beauty yet to come. As Stuart Kauffman says, "Because we cannot know, but must live our lives anyway, we live forward into mystery. Our deep need is to better understand how we do so, and to learn from this deep feature of life how to live our lives well."[47]

[47] Kauffman, *Reinventing the Sacred*, p. 232.