GOD AND NATURE

A Theologian and a Scientist Conversing on the Divine Promise of Possibility

CURTIS L. THOMPSON and JOYCE M. CUFF

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Curtis L. Thompson

&

Joyce M. Cuff

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PREFACE

To our readers we extend a warm welcome and invite you to join us in conversation. Our conversation began back in 1983 when Thompson began teaching in the Religion Department of Thiel College where Cuff had already been teaching in the Biology Department for 2 years. Over the years our discussions became more intense as we got to know one another better and each new exchange could build on previous ones. While traveling home from an annual meeting of the American Academy of Religion in November of 2005, at which meeting Cuff had responded to papers related to Stuart Kauffman's notion of the "adjacent possible," it became apparent that we would both be interested in a joint writing project on the topic of possibilities. That was the beginning of a long journey that now culminates in *God and Nature: A Theologian and a Scientist Conversing on the Divine Promise of Possibility*. In this book we converse about the adventurous story of the universe unfolding as the divine works through nature by means of possibility. Our conversation falls into the religion and science genre, but we think we have introduced some new elements, both ideas and thinkers, into the mix as we attempt to forge a philosophical theology of nature centered on the notion of possibility. We are filled with wonder and awe over the natural world, and our discussion covers many different reasons for why this is the case. Whether the subject is chaos theory, complexity theory, the place of cooperation within evolutionary change, or theories of consciousness, we are intent on considering the relation of God to each of these. We contend that emerging reality's creative transformation has not been fully grasped until viewed in relation to the divine promise of possibility. We make the case for a religious or theological naturalism: God and nature are partners in creating reality, and so they need to be understood together.

There are many people we would like to thank. Kathy Thompson has carefully read our chapters, offered valuable comments to us, and given us her steadfast support. Paul Sponheim, Professor Emeritus of Luther Seminary in St. Paul, Minnesota, read the manuscript meticulously and provided detailed constructive critique. He has enthusiastically endorsed the fruits of our creative conversation and encouraged us all along the way. We are gladly in a position publicly to be able to express our appreciation to the two readers who evaluated the manuscript for Continuum, because they both indicated there was no need for their identity to remain anonymous. We offer a big thank you to Gregory Peterson of South Dakota State University and Heiko Schulz of the Department of Protestant Theology, Goethe-Universität Frankfurt, Germany for the words of endorsement they gave as well as their most helpful comments that led to the strengthening of the book.

The two of us were on sabbaticals for the year prior to the book being published and we did some touching up work on the manuscript in those settings. During her sabbatical, Joyce Cuff was working in a clinical lab directed by FAME Medical in Karatu, Tanzania, helping with basic lab design and working to strengthen lab services at the dispensary and in their remote rural outreach areas. She is grateful to the generous gift she received from Dr. Carl and Theresa Hoffman of Primecare Medical Inc. in support of this work. On his sabbatical, Curt Thompson was doing research and writing on the project "Dancing in God" as a Senior Research Fellow at the Martin Marty Center of the University of Chicago's Divinity School. He wants to express his thanks for financial assistance received from the Martin Marty Center and for generous support received from its Director, Bill Schweiker.

One last group of people we would like to thank is the cadre of students who were in the most recent iteration of the class "Religion and the Sciences" which the two of us team-teach. In that class, held during the spring semester of 2009, we used an earlier version of *God and Nature*, and we received many helpful insights from that set of energetic students. The class included: Sara Brackett, James Beach, Christopher Boyer, Christopher Butteridge, Matthew Duron, Sean Fogle, Andrew Frank, Matthew Hadden, Kathleen Hanlon, Ryan Hill, Jason Kearns, Ashley Light, Daniel May, Justin Munz, Heather Peck, Kayla Seidle, Kristin Shields, Joanne Schell,

Amber Trimber, Kayla Turek, and Emily Zoller. Thank you eager minds who were willing to help in this project.

We want to mention the gracious person at Continuum, Haaris Naqvi, Acquisitions Editor, with whom we have worked in the final preparation of this manuscript. Haaris has been delightful to work with, always reasonable and committed to finding a way beyond what looks like an impasse. He knows how to access possibility in the service of making tasks manageable and getting ends met.

Finally, there is a need to acknowledge our debt to the community members of Thiel College with whom we have had the pleasure to work for roughly the past three decades. Conversations with individuals on topics covered in this book have shaped the way the conversation recounted here gets told. Furthermore, faculty, staff, and administrators have willingly mixed it up with us on all the issues that come to play in attempting to move an educational institution creatively into the future. We thank all these folks for sharing of themselves with us and for helping to sustain us in our existential and intellectual journeys.

Commencements

Why this book?

As we commence it is wise for writers and readers alike to know some of the reasons this book is being written. What is it that we want to share? What are we passionate about that we think is beneficial to pass on to others? Why are we writing this book? First, we are writing this book because we care about the Earth and believe that we have to find ways to sponsor radically different perspectives coming together and allowing new, more synthetic views to emerge. We think this collaborative project of scientist and theologian engaging in productive conversation on an important theme bears witness to the type of creative partnerships in thinking and acting that need to take place to deal effectively with critical issues facing the planet.

Second, we are writing this book because we are convinced that so many others writing books are not radical enough in the sense of getting to the roots of the matters under consideration. Timid pursuit and delimited inquiry result in writing that is too compartmentalized and writers that are too deferential to the reigning gods of science or to the traditional God of religion. Our intent is to question some of the prevailing presuppositions of contemporary scientific and theological understanding and boldly to launch off in new directions.

Third, we are writing this book because we are aware of exciting ideas being developed in the broad areas of **complexity theory**, **emergence**, the holism of systems, and non-reductive scientific interpretations. We think it is valuable to enter into those areas to see what sense we can make of them, determine how these new ways of thinking are relevant to our life in the late modern sociocultural situation, and then attempt to communicate this to those who might be interested.

Fourth, we are writing this book because we believe the notion of possibility is a rich common rallying ground on which science and

religion can come together and engage in fruitful dialogue, commerce, and mutual intellectual fertilization. Through possibility, more complex levels of order emerge within which self-organizing systems are able to grow in **autonomy**; through possibility, the process of continuing creation moves ever ahead in nurturing creatures into greater freedom. Science and religion can learn from one another about possibility.

Fifth, we are writing this book because we do not want to confine ourselves and others to a version of the way things are that does not at the same time include what might be. Too many people live their lives in a flat, colorless world, drowning in the harsh, confining givens that dominate the stale march into a lackluster, hopeless future. We can be awakened to the "not yet" side of life that has brought meaning and hope to human beings down through the centuries.

Sixth, we are writing this book because we are committed to the importance of imagination in both science and religion. The human accesses possibility through the imagination. Both of these areas of life are diminished and underachieve when they lose touch with the imagination. We will be striving for all we are worth to avoid a stilted, unimaginative style, because we realize that writing not informed by a lively imagination suffers the same fate as unimaginative science and religion.

Seventh, we are writing this book because we want to flesh out ideas that we have about the nature and agency of the divine, given our focus on possibility. How is God to be understood in relation to nature, **creativity**, novelty, emergence, complexity theory? Related to this is the task of looking at laws from a perspective that is not simply mathematical. How do we understand laws of organization that allow for rampant creativity? How can something be lawful and creative?

Eighth, we are writing this book because we want to show that collaboration in thinking and writing is possible. Such collaboration is possible at a personal level. We realize that this is small potatoes. However, we believe this personal sharing stands as testimony to what is possible for science and religion collaborating on a larger stage.

Ninth, we are writing this book because we want to document our conversation toward a contemporary **philosophical theology of nature**. We are in no sense able to put forth a complete

philosophical theology of nature. What we offer here are only hints and gleanings toward such. And yet, we believe that the task is an important one and that our ramblings do enjoy some success toward the execution of that task.

Tenth, we are writing this book because we want to affirm the God of promise. Possibility is employed creatively to empower, lure, move, entice, persuade, inveigle, draw, inspire, motivate, stir, encourage, enthuse, arouse, cajole, tease, tantalize, pull, invite, and attract the creation into the future. Possibility is held out before the creation as its horizon, its freedom, its adventure, its power, its hope. The ultimate reality holding out possibility and employing it creatively to bless is the God who promises to work transformatively within nature to bring it to fulfillment.

This and previous collaborations

We, Joyce Cuff and Curt Thompson, are writing this book together because of the joy we have found in collaborating in many ways over the past quarter of a century. The two of us teach respectively in biology and religion. Cuff is a molecular biologist teaching in the biology department of Thiel College. Thompson is a theologian teaching religious and theological studies in the religion department of Thiel College. We have worked together on faculty issues and in joining forces to provide faculty leadership at strategic points in the institutional life of Thiel College, which has sometimes demanded that we jointly craft documents. We have been part of larger teams engaged in interdisciplinary work, which has sometimes called for collaborating on grant-writing. Our collaboration with others on a year-long, team-taught, interdisciplinary course entitled "Science and Our Global Heritage" culminated in the writing of a textbook for the course. We have served as Co-Directors of the Global Institute of Thiel College, which again has necessitated collaborative efforts in putting together institutional conferences, workshops, and celebrations. We traveled together on a faculty trip to India and have both led student study trips abroad. We have team-taught "Religion and the Sciences" many times over the past two decades, sometimes with other faculty being involved as well. We have also attended a number of conferences together and have

appreciated the opportunity to share those mind-expanding experiences and to allow them to serve as the basis for further creative thinking.

On this specific instance of working together on a creative project it is appropriate to clarify the nature of the collaboration and, in particular, the breakdown of the writing we have done. Some of the book was created completely jointly as we constructed sentences together at the computer. Generally, it can be said that Cuff wrote the science material and Thompson the material on religion, but these pieces were then critiqued by the other, sometimes revised, and on occasion expanded by the conversation partner. To be emphasized is that there was collaboration on all of it, even if some originated with one or the other of us. There was mutual vetting of every idea so that everything in the work including various stylistic formulations and tones have combined endorsement.

What is this book about?

What are we up to in this book on "God and Nature: A Theologian and a Scientist Conversing on the Divine Promise of Possibility"? The short answer is that this book is about possibility. A little longer answer is that it is about the nature of reality in which possibility is able to function as it does. A yet longer answer is that it is about the reality of nature in which possibility is able to function as it does because of the reality of God. We contend that possibility's divine ground allows it to work its magic as it does. The initial response to this question that we offer here takes the form of a very general statement about possibility, some more extended comments on the tradition of the philosophy of nature as relevant background for our attempt at formulating a philosophical theology of nature, a quick word on the fourfold structure of each chapter, and a very brief description of content covered by the book's seven chapters.

A general word on possibility

A first introductory word on possibility can highlight two or three of its essential characteristics. Possibility lies at the center of reality. Without possibility, we would have no freedom, and if freedom

is integral to our very humanity, which we hold it surely is, then in that sense possibility too is integral to our very humanity. As we examine other organisms and reality, we can quickly conclude that the same holds for them. Possibility lies at the center of reality understood in its broadest scope.

Even though possibility is so central to reality, there are few things in life easier to overlook than possibility. We continually rely upon possibility, and yet we need not bring the possible into our consciousness, focus on the possible in critical fashion, and then act on the most appropriate possibility for benefiting the situation at hand.

Sorting out the appropriate way to relate to possibility is key for developing as healthy human beings. Awareness of possibility evokes wonder and awe, we will maintain. Human creatures have long taken delight in entertaining possibility. To overlook this delightful side of possibility is to miss out on an important dimension of life. In fact, passion for the possible, including the possibility of the impossible, constitutes an essential ingredient within human fulfillment. Recognizing the possibility that stands in ordered flux in relation to the broad world of nature also contributes to our fullness as human beings. Possibility links itself to actuality like water to the thirsty creature, providing the means for advancement of life; the possible is surely to be celebrated. Appreciating the liveliness of nature involves delving into the potency of the possible for furthering the creative process.

Investigating the ways in which nature is alive also involves recognizing how possibility presents a challenge or maybe even a problem. The challenging side of possibility concerns properly understanding the possible and properly acting on it. Possibility challenges us epistemologically or in our knowing of reality, and it challenges us ontologically or in our shaping of reality. Possibility calls us to meet our cognitive and volitional challenges by living out our human existence with thoughtfulness and efficacy. The struggle to know possibility and the struggle to bring it into actuality are not unrelated. Kierkegaard persistently pointed out how knowing possibility in thought is far different from actualizing it in existence; and some knowing only comes in the doing. Generally, though, possibility is disrespectful of any absolute division between these two orders of reality and nudges us to heed its winsome call both in matters of the head and in matters of the heart. Any serious

pursuit toward resolving the possibility puzzle must tend, therefore, to the questioning related to understanding and the questing related to acting. A complete education into possibility entails arriving at a condition of becoming that has grown somewhat comfortable with facing the ongoing twofold challenge. We intend our pursuit into the divine promise of possibility—which we realize will continue to emerge throughout our lifetimes—to include this challenging side of possibility as well as the delightful side. This book tells the story of our multifaceted pursuit of the divine promise of possibility.

A second introductory word on possibility concerns how it has been considered within various forms of culture that are contextually relevant to current thinking. Inquiring into the divine promise of possibility can be viewed in relation to the premodern, modern, postmodern, and late modern cultural configurations.

Premodern culture celebrated the power of God to bring blessings to the world including humans. Through faith in God, humans benefited from the possibility that God—the sovereign divine reality, understood as the fullness of actuality—prescribed for them in the form of law and order and expected them to heed. God was in charge as the monarchial power who ruled over life and the human was the submissive servant who humbly obeyed God's law. We could call premodern culture *a world of actuality*, since it found its center in a God understood as pure actuality.

Modern culture rebelled against the completely scripted life of the Middle Ages, recognizing the loss of humanity that accompanied worshiping a God who leaves too little room for human freedom. Modernity defiantly shouted "No" to the tyrannical deity and removed the very majestic medieval God from his reign. Within modern culture it was humanity itself that became elevated to the status of divinity, as the power of human beings to actualize possibility and to bring life to fulfillment was celebrated. We could call modern culture *a world of possibility*, since it finds its center in a humanity that it entrusts to remake the world through its power.

Postmodern culture questions the optimism of modernity and is much more suspicious of the capacity of humans to actualize possibility. Postmodern culture recognizes the shortcomings of modern culture but also knows that returning to premodern culture is out of the question. Alienated from God, world, and self, postmodern

culture is pessimistic, being very much taken with the impossible. We could call postmodern culture *a world of impossibility*, since in the wake of modernity's failure it is disillusioned over humanity's potential and despairs of moving beyond alienation, estrangement, and fragmentation.

Late modern culture does not see returning to premodern culture as a live option. It acknowledges the value of modern culture and the value of the postmodern critique of the modern. But it does not rest content with the negativism of postmodernity. It knows that accessing the transcendent—understood now in relation to the emerging, eventful, becoming character of reality—constitutes an indispensable dimension of a rich and full life. Late modernity's critical realism will not give up autonomy in pining romantically for the placid tranquility of premodern church civilization. Neither does late modernity desire either the pie-eyed naïveté of modernity's possibility nor the nay-saying cynicism of postmodernity's impossibility. It desires instead to live out of a deep passion for the possibility of the impossible. Having passed through the modern and the postmodern, late modern culture bears the mark of a second naïveté or a mature openness to the future that recognizes the futility of closing off life from the more that comes with and through possibility. We could call late modern culture *a world of the possibility of the impossible*, since it lives out of a persistent hope that the new actuality which reality promises will indeed emerge. It links this promised emergence of novelty to the divine. God is the actuality of possibility that invites partnership in the emerging transformations that it is ever bringing into reality.

The tradition of philosophy of nature

There is a distinguished tradition of *Naturphilosophie* in the West that we want to acknowledge as being an important resource for our reflections toward a philosophical theology of nature. Many thoughts of those in this line of thinkers running down through the centuries are now seen as misguided and outdated, but it is surprising just how much of their thinking is still relevant to thinking about the central issues of our time. The thought-world of today is often times quite different, but insights into the nature of things have been grasped by every serious thinker and much can be

learned from most of these figures who were intellectual giants in their own times. It is possible that not all readers are as intrigued as we are by intellectuals in this philosophical tradition, and we suggest to that segment of our readers the possibility of skipping this particular section.

An initial thinker from the ninth century is Johannes Scotus Eriugena (*c.* 810–*c.* 877 CE). His *Periphyseon: On the Division of Nature* presents a dialogue between a teacher and a student. This Neoplatonic vision of the God-nature relation can teach us much. John the Scot sets forth a fourfold division of nature in terms of the creating but not created nature (*natura naturans non naturata*), the created and creating nature (*natura naturata et naturans*), the created but not creating nature (*natura naturata non naturans*), and the neither created nor creating nature (*non naturata et naturans*).[1] Nature or the whole of reality is a dynamic process of going out from the One as alpha and returning back to the One as omega: the first aspect of nature is the primordial divine Creator who creates but is not created, the second aspect of nature is the possibility of the universe as conceived by the divine in terms of its primordial causes, the third aspect of nature is the actuality of the universe as brought into being by the divine working through the possibilities or primal causes, and the fourth aspect of nature is the final consummate reality who receives the universe into the divine life. Here nature's theophanies are manifestations of God. In John the Scot's vision nature is alive, because divine nature or *natura* includes both God and creation.

René Descartes (1596–1650), the French philosopher, mathematician, and scientist established foundational principles for modern ways of thinking. In fact, it can be said that his **dualism** of body and mind bequeathed to future philosophers of nature the problem of overcoming the grand divide between nature and spirit.[2] We will see that he emphasizes God as a perfect being and thereby links God and being and in the process fortifies the onto-theological tradition. This tradition affirms what comes to be the orthodox theistic

[1] John the Scot, *Periphyseon: On the Division of Nature*, edited and translated by Myra L. Uhlfelder with summaries by Jean A. Potter (Indianapolis: Bobbs-Merrill Company, 1976), 2.

[2] It should be acknowledged that a consummate contemporary interpreter of Descartes, Jean-Luc Marion, insists that Descartes' thought ought not be understood as dualistic.

view that God is the "supreme being" who exists alongside other beings. Further parameters for thinking about the philosophy of nature were set by those determining how science should approach nature. Late sixteenth- and early seventeenth-century thinkers—Galileo Galilei (1564–1642), the Italian physicist, mathematician, astronomer, and philosopher, and Francis Bacon (1561–1626), the English philosopher, statesperson, and essayist—were key players in developing the modern scientific method.

Bacon, in particular, was decisive in articulating the inductive method that he believed could facilitate a fundamental break with the thinking of the past. He sought a naturalistic philosophy in which philosophy would be wedded to a science of nature so as to avoid the ubiquitous temptation to build whole systems of understanding on the basis of negligible evidence. Bacon recognized the need for restraint in investigating nature because of the human proclivity to fly off into speculative fancy and create what he identifies as four classes of "Idols" which beset the minds of humans. In his plan for investigating nature not by guessing and divining but rather by discovering and knowing, Bacon intended to "examine and dissect the nature of this very world itself" by going "to facts themselves for everything."[3] Approaching nature empirically, he made matter—whose operations are available to the senses since matter is manifested in a formed fashion with concrete characteristics—the actual content of nature. Bacon sets forth his "Great Instauration" or Renewal of the Sciences because he believed the only hope for greatly increasing progress lay in reconstructing the sciences and "keeping the eye steadily fixed upon the facts of nature and so receiving their images simply as they are."[4] In fact, he thought he had "established forever a true and lawful marriage between the empirical and the rational faculty."[5] In his *The Great Instauration* Bacon prays "that things human may not interfere with things divine," that the increase of knowledge may not bring "darkness with regard to the divine mysteries," and that the purified understanding "may give to faith that which is faith's."[6]

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[3] Francis Bacon, *The New Organon and Related Writings*, edited by Fulton H. Anderson (Indianapolis: The Bobbs-Merrill Company, 1960), 23.
[4] Ibid., 29.
[5] Ibid., 14.
[6] Ibid., 14–15.

Benedict de Spinoza (1632–1677), the Dutch philosopher of Portuguese Jewish origin, follows geometrical principles in giving expression to his *Ethics*, although the rigor of his deductions has been called into question. His method finds him progressing from a small number of self-evident definitions to a few axioms to a large number of propositions clustered around the topics of God (36 propositions), mind (49 propositions), the emotions (59 propositions), human bondage (73 propositions), and human freedom (42 propositions). He was the first to see with complete clarity mind and matter as one: "His system was the first bold outline of a creative imagination, which conceived the finite immediately in the idea of the **infinite**."[7] This provocative thinker established the basis for serious reflecting on the God-nature relation. Telling for Spinoza's philosophy of nature is the phrase "*Deus sive Natura*" ("God or nature"). He thought this expression was the most appropriate name for the single substance that comprises all reality. He states in his *Ethics*, that God, as "substance consisting of infinite attributes, of which each expresses eternal and infinite essentiality, necessarily exists."[8] Furthermore, he notes: "Whatever is, is in God, and without God nothing can be, or be conceived."[9] God, as the sole substance, is the basis for all other things, which must be understood as attributes or modifications of the singular divine substance. At the metaphysical foundation of Spinoza's thought is the one, infinite, eternal substance. Addressing the Cartesian problem of dualism under the notion of the mind, therefore, Spinoza identifies thought and extension as two central attributes: thought is an attribute of God as a thinking thing and extension is an attribute of God as an existing thing.[10] Spinoza's philosophy of nature, then, from another perspective is a philosophy of God. We can say that for him, to understand the substance of nature, one need only understand the nature of substance. We will see that his

[7] Friedrich Wilhelm Joseph von Schelling, *Ideas for a Philosophy of Nature*, translated by Errol E. Harris and Peter Heath with an Introduction by Robert Stern (Cambridge: Cambridge University Press, 1988), 15.

[8] Benedict de Spinoza, *The Ethics*, in *The Chief Works of Benedict de Spinoza*, vol. 2, translated from the Latin with an introduction by R. H. M. Elwes (New York: Dover, 1955), Part I, Proposition XI, 51.

[9] Ibid., Part I, Proposition XV, 55.

[10] Ibid., 83–84.

distinction between two aspects of nature will be suggestive for later philosophers of nature, especially Schelling. Spinoza's pantheistic vision with its insistence on immanence met with resistance because of the lack of transcendence; many thinkers taking seriously his thought have adjusted his philosophy so that it assumes a panentheistic rather than a pantheistic form.

Isaac Newton (1643–1727), the English physicist, mathematician, astronomer, and natural philosopher synthesized many currents of thought at the turn of the seventeenth century and stood for early eighteenth-century thinkers as the emblematic representative of the new natural philosophy. Newton, of course, established the foundation for classical mechanics with his describing of the three laws of motion and universal gravitation, which enabled him to explain celestial phenomena hitherto unexplainable and provide a physical basis for the new Copernican worldview. Not incidental for later theorists was his view of matter as extended, hard, impenetrable particles, which view informed his analysis. Newton's writings are full of references to God, but his "Newtonian science" provided a secular alternative to the reigning theological explanations of the day, with his "Nature" furnishing an able alternative to "will of God" language.[11] In fact, on his view these two were related, for the divine will "had decreed a mechanism that worked automatically without further interference."[12] Newton's philosophy of nature in the eighteenth century, like Aristotle's philosophy that became so influential in the thirteenth century, served as a comprehensive framework for organizing all the thoughts of the day's culture. But as always is the case, interpretation makes all the difference. Do we conclude that this greatest scientist of the English-speaking world has given us only the scientific rationalism of Newtonian mechanics or do we also acknowledge some of the more theologically imaginative and speculative aspects of his philosophy of nature? One of the purposes of this book is to consider supplementary alternatives to the single-dimensioned, mechanistic or physicalist worldview bequeathed by Newton to the modern

[11] John Herman Randall, Jr., "Introduction: What Isaac Newton Started," *Newton's Philosophy of Nature: Selections from His Writings*, edited and arranged with notes by H. S. Thayer (New York: Hafner Press, 1953), ix.
[12] Ibid., ix–x.

world, and we believe that a closer scrutiny of Newton himself could effectively employ him in support of that project.

Another intellectual giant who must be mentioned is Immanuel Kant (1724–1804), the German thinker who was arguably the greatest philosopher of the Enlightenment and the pioneer of German idealism. Kant articulates his philosophy of nature most directly in his 1786 *Metaphysical Foundations of Natural Science*. In the first paragraph of this writing's Preface, Kant—in alluding indirectly both to Descartes' problem of a dualism between body and mind and to Spinoza's two central attributes—notes that nature "has two main divisions, in accordance with the main distinction of our sensibility, one of which comprises the objects of the *outer*, the other the objects of the *inner* sense; thus rendering possible a two-fold doctrine of Nature, the doctrine of body and the doctrine of soul, the first dealing with *extended*, and the second with *thinking*, Nature."[13] This writing provides a conception of matter, which Kant holds is gained by investigating objects of external sense. These objects become known by their motion, and the understanding of them can be developed by noting four different ways of considering an object. Kant thereby divides the work into four parts dealing respectively with the metaphysical foundations of phoronomy (which considers motion "as pure *quantum*, according to its composition, without any *quality* of the moveable"), dynamics (which regards motion "as belonging to the *quality* of the matter, under the name of an original moving force"), mechanics (where matter "with this *quality* is conceived as by its own reciprocal motion in *relation*"), and phenomenology ("where its motion or rest [is conceived], merely in reference to the mode of presentation or modality, in other words as determined as phenomenon of the external sense").[14] In the chapter on "Dynamics" in his *Metaphysical Foundations of Natural Science*, Kant discussed the construction of matter. He understood matter as being held together by opposite forces maintained in a tensive balance. In this chapter he argues that both the attractive force and the repulsive force are essential in matter's constitution and that these two cannot be separated from one another in the concept of

[13] Immanuel Kant, *Metaphysical Foundations of Natural Science*, translated and edited by Michael Friedman (Cambridge: Cambridge University Press, 2004), 3.
[14] Ibid., 12.

matter. Material bodies result from the union of these two forces.[15] Schelling would pick up on this dynamic understanding of matter.

In the wake of Kant, the threesome of Fichte, Schelling, and Hegel take their place as the other pillars of German idealism. Johann Gottlieb Fichte (1762–1814) developed his own transcendental philosophy in his *Wissenschaftslehre* in response to Kant's question of how our experience is possible. He drew on Spinoza in furthering Kant's philosophy. In *The Science of Knowledge* Fichte stated his belief that the materialist's project—of denying the independence of the self and attempting to construe the self and its reason as an accidental product of things in the world—remains forever incapable of achievement. The choice of beginning points is between the self and the thing, and Fichte was convinced that the nature of the human doing the philosophizing requires that one choose the former, that is, the self. On Fichte's view nature is the product of the self's positing. The self's positing of itself is its own activity, and the not-self or nature is posited in the self as a counterpositing, but this counterpositing of the not-self presupposes the identity of the self, in which something [the self] is posited and then something [the not-self] set in opposition to this.[16] In other words, "*in the striving of the self there is simultaneously posited a counterstriving of the not-self, which holds the former in equilibrium.*"[17] In Fichte's philosophy of nature, then, we encounter a radical subjectivizing whereby the self-developing ego provides the ground for nature which is finally merely a series of necessary thoughts for the mind. We celebrate the significance of subjectivity that is one of Fichte's legacies, but in our formulations of God's relation to nature we do not affirm human subjectivity as the source of all reality.

The thought of Friedrich Wilhelm Joseph Schelling (1775–1854), the German philosopher who identified himself closely with Romanticism, went through three major periods during the course of his life: the early period of *Naturphilosophie*, which counters Fichte in affirming both nature and spirit as fully real; the middle period of identity or absolute philosophy in which he plumbs to the depths of his philosophy of nature in articulating

[15] Ibid., 33–74.

[16] J. G. Fichte, *The Science of Knowledge*, edited and translated by Peter Heath and John Lachs (Cambridge: Cambridge University Press, 1970, 1982), 106.

[17] Ibid., 251.

the identical absolute substratum implicitly present as the source undergirding both nature and spirit; and the final period of his positive philosophy in which the concrete reality of existence is given its due. Schelling's *Ideas for a Philosophy of Nature*—the first 1797 edition of which fell in his early period and the second, revised 1803 edition in the second period—is a good representative text of his philosophy of nature.[18] Kant's "metaphysical-dynamic" understanding of matter, rather than Newton's particle understanding, provided the background for Schelling's philosophy of nature.[19] This view of matter as constituted by the polar opposition of attractive and repulsive dynamic forces held in balance allows Schelling to explain phenomena such as combustion, light, kinds of air, decomposition of water, electricity, and magnetism. In this his identity philosophy phase, Schelling depicts all the polarities of nature as the division of an original, absolute unity. This dynamic conception of nature facilitates the emergence of new realities over the course of nature's unfolding. The unfolding proceeds from the absolute, with the manifestation of the real bringing about a differentiation of reality that is at the same time a disclosure of the multifarious world of the ideal. This unity of real and ideal can be achieved, believes Schelling, because at bottom nature is mind made visible and mind is invisible nature.[20] Schelling's ready engagement in speculative thinking has marked him as suspect for many scholars; we believe his creative writings have much to offer to those rethinking the connection between God and nature.

George Wilhelm Friedrich Hegel (1770–1831), includes his philosophy of nature as the second part of his *Encyclopedia of the Philosophical Sciences*, situated between the first part on logic and the third part on philosophy of spirit. Most Hegel scholars judge the philosophy of nature to be the weakest portion of his philosophical system. Nature, for Hegel, is that from which spirit emerges. His philosophy charts the spiritual progression from the universal through the particular to the individual. The logic tends to the universal, the philosophy of nature to the particular, and the philosophy of spirit to the individual. Nature contains the differences or otherness that must be sublated or overcome in order

[18] Schelling, *Ideas for a Philosophy of Nature*.
[19] See Robert Stern, "Introduction," *Ideas for a Philosophy of Nature*, x–xi.
[20] Ibid., 42.

for spirit to appear. God's continual creation both differentiates particular realities, releasing them as being, and preserves them, holding them as moments of other-being, and "this continuous creation/preservation is the *wisdom* of God in nature."[21] Hegel wants to show that the mind which observes nature itself emerges from nature, and this is because slumbering in nature is the divine spirit which makes possible all kinds of new future events. Nature does not in itself contain the actuality that is the full counterpart of God's Spirit, but it contains the divine promise of possibility for the emergence of a spiritual reality capable of being such a counterpart. Our philosophical theology of nature is not strictly Hegelian, but we do hold that with Hegel the world of nature and spirit came to be understood as unfolding within God and that this insight demarcates a major turning point in the philosophy of nature.

Another intellectual, less well-known than the others considered in this section, is the Danish physicist Hans Christian Ørsted (1777–1851). Ørsted, world-renowned for his discovery of electromagnetism in 1820 and Professor of Physics at the University of Copenhagen, stands out in nineteenth-century Danish history as one of its most popular figures.[22] Ørsted the physicist was influenced by Schelling's philosophy of nature. Ørsted's 1850 *Aanden i Naturen* or *The Spirit in Nature*[23] argues that natural laws are eternal laws of reason and affirms an evolutionary view: "This development began with the lower forms, and advanced by gradual steps to higher, till at length in the most recent periods a creature was produced, in which self-conscious knowledge was revealed."[24] Ørsted speaks of "the eternal creative Spirit" as the "conciliatory principle" operating in a nature that is very much alive, and concludes: "Thus do the truths

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[21] Peter C. Hodgson, *Hegel and Christian Theology: A Reading of the* Lectures on the Philosophy of Religion (Oxford: Oxford University Press, 2005), 146.

[22] Bern Dibner, *Oersted and the Discovery of Electromagnetism* (New York: Blaisdell, 1962), 67 notes that the high esteem in which Ørsted was held is evidenced by the fact that over 200,000 people including the king of Denmark, the crown prince, ministers, and foreign ambassadors joined in his funeral procession.

[23] Hans Christian Ørsted, *Aanden i Naturen* [*The Spirit in Nature*] (Kjøbenhavn: A. F. Høst, 1850). Not having access to the Danish original for writing these pages, we utilized the English translation: Hans Christian Oersted, *The Soul in Nature, with Supplementary Contributions*, translated from the German by Leonora and Johanna B. Horner (London: Henry G. Bohn, 1852).

[24] Ibid., 108.

of Natural Science continually approach nearer those of Religion, so that at last both must be united in the most intimate connection."[25] Ørsted experienced the aliveness of nature and was convinced that a full account of it needed to utilize language of the Spirit. We introduce Ørsted because he is a remarkable but neglected figure in the history of the philosophy of nature. We will not, however, be drawing on his insights in our constructive project.

Among the Danish people who admired the physicist Ørsted was the young Søren Kierkegaard (1813–1855). In fact, Ørsted was one of the six University professors who read and approved Kierkegaard's dissertation on *The Concept of Irony* before his oral defense. Kierkegaard held a deep appreciation for the natural sciences and those who engaged in scientific investigation of the natural world. While recognizing that many scientists merely concentrated on a miniscule topic of research and ended up contributing to a fragmenting of the world, he also acknowledged having been impressed by those exceptional figures, such as Ørsted, who made their observations in relation to the totality of nature and dared to speculate concerning the grander contours of reality.[26] Kierkegaard wrote in 1835 that, even though the natural sciences inspired him, they did not become his principal area of study because he was interested most in life itself: he always wished most to clarify and solve the riddle of life. He maybe didn't manage that, but his writings—on the becoming of existence through the passionate actualizing of possibilities presented by the future—have provided a basis for the movement of existentialism and have been closely studied by those wanting to learn more about the dynamic features of their own freedom. In a world of scientific objectivity and speculation, Kierkegaard sensed the call to make room for subjectivity and the truth to be gained through existential inwardness. We regard him as a valuable resource to contribute to the science and religion dialogue, a role he has not often been asked to play. He will be one of our primary interlocutors.

Ralph Waldo Emerson (1803–1882), the American essayist, poet, and transcendentalist also wrote provocative words about nature and its harboring of potential spiritual events. In his 1836

[25] Ibid., 108–109.

[26] Joakim Garff, *Søren Kierkegaard: A Biography*, translated by Bruce H. Kirmmse (Princeton: Princeton University Press, 2005), 52.

essay on "Nature" he states that all science has the single aim of finding a theory of nature.[27] Nature ministers to the human and "always wears the colors of the spirit" (11). Nature reaches out its arms to embrace the human and gives its beauty which transforms itself in the mind and leads to new creation. As the symbol of spirit, nature conspires to emancipate us and to have all its parts perceived by the human together bear testimony to "the reverential withdrawing of nature before its God" (50). Influenced by Plotinus (204/5–270 CE), Emerson understood the dimensions of nature as the outer clothing of a spiritual presence that was nature's origin and goal.[28] Nature "is the organ through which the universal spirit speaks to the individual, and strives to lead the individual back to it."[29] Spirit is creatively present throughout nature, not acting upon us externally but rather in and through us. With humanity resting upon the bosom of God, there are no bounds to the possibility that lies before the human. One of America's genuinely original thinkers whose prose is unparalleled for its clarity of expression and communication of wisdom, Emerson contributes notably to the philosophy of nature. While we do not engage his thought to a great extent in our conversation, we do enjoin somewhat more extensively the thinking of Friedrich Nietzsche (1844–1900), the German philologist, philosopher, and cultural critic who read Emerson most closely and advocated a philosophy of life.

The American pragmatic philosophers Charles Sanders Peirce (1839–1914), William James (1842–1910), and John Dewey (1859–1952) also made their contributions to the understanding of nature. This was not, though, because they concentrated very directly upon it. Their claims about nature tended to be set forth more indirectly in the context of dealing with other issues and concerns. The **pragmatist** conceives the objects of nature in terms of the effects or practical consequences they might conceivably have.

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[27] Ralph Waldo Emerson, *Nature: Addresses and Lectures* (Boston: Houghton, Mifflin and Company, 1903), 1–77, 4. The two following parenthetical page references are to this work.

[28] Robert S. Corrington, *The Community of Interpreters: On the Hermeneutics of Nature and the Bible in the American Philosophical Tradition*, 2nd edn, Studies in American Biblical Hermeneutics, 3 (Macon, GA: Mercer University Press, 1987, 1995), 93.

[29] Emerson, *Nature*, 62.

Meaning and truth, then, are geared toward the measured effects of things. Therefore, the pragmatist is finally interested in the practical matter of getting the job done, and this means concentrating on problem solving. Nature is a reality that one must deal with in solving problems. Nature is a reality one must learn about for effective accomplishment of the task at hand. This is not to say, however, that there is not much to be learned about nature in the rich writings of these thinkers. All three of these thinkers are present at the margins of our conversation about God and nature.

Alfred North Whitehead (1861–1947), the British mathematician, physicist, and philosopher developed a philosophy of nature that emphasizes relationships and process. He conceives nature as a complex organism of interlocking connections secured by the interior grasping power of self-creative entities. Playing an essential role in the process of reality is God, who brings order by holding possibility in relation to actuality and who sustains the creative advance by functioning as a limiting principle that facilitates actualization. God, the eternal provider of possibility, gives direction to the unfolding of reality and also ever receives the world into Godself, so that the world is "in" God. Whitehead's "panentheistic" vision of God is carried further by Charles Hartshorne (1897–2000), who stresses the distinction between God's essence and God's existence. God's essence is absolute and abstract while God's existence is relative and concrete or actual. God contains the universe. We are not in God's essence; but while we are outside God's essence, we are inside of God's actuality. Hartshorne speaks of the analogy between the God-world relation and that of the mind-body: God's relation to the world is in some important ways analogous to the relation of the mind to the body. Whitehead's philosophy of nature includes a constitutive place for God. His systematic understanding of reality is a theological philosophy of nature that serves as the chief among many intellectual resources in our philosophical theology of nature that formulates the relation of God to nature. Even in offering a modification of Whitehead's understanding of God's relation to creativity, we are nevertheless reliant upon the fundamental Whiteheadian vision of what he calls the creative advance of reality.

The natural world is thought about very creatively by Pierre Teilhard de Chardin (1881–1955), the French Jesuit priest and theologian educated as a paleontologist and philosopher. Affirming scientific evolution and an imaginative theological perspective,

he envisions nature as a cosmic process of becoming on the way to a consummate ending. Four central claims convey a sense of his viewpoint. First, humanity is part of a universal evolutionary process moving from alpha to omega. Second, the main stages of this upward-moving process are fourfold: there is first the cosmosphere or the inanimate world; second, the biosphere or the animate world; third, the noosphere or the human world; and fourth, the Christosphere or the realm of Christ. The third claim is that Christification will lead to fulfillment and everything will be received into Christ. Finally, anthropogenesis or humanity becoming human and Christogenesis or the world being drawn to Christ will lead to a sudden eruption of the evolutionary process, due to increased psychosocial pressure. However, Christ's coming at the end will be an act of God, though prepared for by natural evolution. We do not follow de Chardin on details, but we do hope that our conversation is animated by a spirit of openness, sensibility, exploration, speculation, and adventure such as was embodied in the life and work of this wide-ranging thinker.

Some might rightly question the inclusion of our last thinker, Martin Heidegger (1889–1976), in a cavalcade of stars in the history of the philosophy of nature. Heidegger did not focus explicitly on nature. He did concentrate, though, on the question of the meaning of being, and his philosophical deliberations are relevant to the philosophy of nature and to our study of possibility. In his classic work *Being and Time*, Heidegger identifies Dasein as the entity each of us is that manifests to us the structure of being; it thus gives us entrance to ontology because inquiry into being is one of our possibilities. Dasein means "being-there," so the term continually reminds us that thinking ought not forget its situatedness in concrete life and that all philosophy is hermeneutical or involving the thinker in interpretation. On Heidegger's reading, this is precisely what Western philosophers from Descartes to Husserl have forgotten: in their search for theoretical knowledge they have forgotten about being, about the pre-theoretical dimension of life's facticity, about the natural understanding that unfolds in ordinary life. Heidegger's phenomenology tends not to the intuiting of things but to things insofar as they show themselves.[30] For

[30] S. J. McGrath, *Heidegger: A (Very) Critical Introduction* (Grand Rapids, MI: William B. Eerdmans Publishing Company, 2008), 30.

him, the meaning of being is found in time, temporality. Dasein is charged with the task of coming "to be," and this occurs in relation to the future. Dasein lives life forward; it is a being toward possibility. Its future is determined by its past: future possibilities are determined by Dasein's past decisions, by what it has done with itself thus far. Responding to this task involves a movement from being lost in the world of the masses, with its conventional ways of thinking and operating that level possibilities, to becoming an individual that has appropriated who it is and taken on its own project that is carried out in relation to distinctive possibilities. This is the transition from inauthentic toward authentic existence. This movement calls for courage to face anxiety and resolve to face the death that awaits each one of us. We include Heidegger here because his whole project of remembering the question of the meaning of being is an attempt to take seriously what we speak of as wonder and awe in relation to nature that he believes has largely been lost in our modern, technological culture and society.

The fourfold structure of the chapters

The current religion and science dialogue is rife with possibility. In this volume we hope to engage you in a lively exploration of the complexities of emerging reality. Possibility is at the heart of the dynamic character of nature in its creative transformation. Possibility provides the all-important link between God and nature. The book tells a narrative of the cosmos in its splendid manifold capacity for expansive creativity. It documents the step-wise development of reality from its earliest beginnings to its robust achievement in human self-consciousness, with an eye ever on its future potential. The interconnected character of the reality being described is also reflected in the interconnecting of major themes that the book accomplishes. As the narrative unfolds, classical and contemporary thinkers from many quarters are engaged as discussion partners in articulating what we are describing as a philosophical theology of nature. Conceptual pairs, in which the two concepts play off of each other, provide the structure for each of the seven chapters, with usually the first concept being more scientific in character and the second more religious in tone. These paired or partnered complementary terms—chronology and creation, **contingency** and

consilience, chaos and connectivity, complexity and **coinherence**, cooperation and compassion, consciousness and co-creation, and creativity and creator—help to thematize the tensive quality of reality in process. These concepts help to structure the progressing narrative. Within each chapter the two concepts are first investigated independently, then interdependently, and finally in relation to the divine. The conversation around the more familiar topics of chaos, complexity, and consciousness is enriched by marginal excursions into related areas, the **adjacent possibles**, which invite the reader to consider ancillary details that contribute to a more complete story. We basically assemble these disparate pieces of the puzzle so that the final picture that emerges is one of a universe in which possibility is as alluring as actuality. Envisioned is a divine Creator who works in and through the possibility of creation to lure it into fuller manifestations of creative transformation.

An overview of the seven chapters

In our collaborative writing project, we are exploring work that is being done on complexity theory and emergence, with a special focus on the work of biologists such as Stuart Kauffman, Lynn Margulis, Terrence Deacon, and Steven Pinker on the role played by self-organization and the emergence of new structures of order in the creative exploration of the possible. We want to connect these exciting developments to thinking about life's possibility that has gone on and is going on in religion and theology, especially by such thinkers as Søren Kierkegaard, G. W. F. Hegel, F. W. J. Schelling, Alfred North Whitehead, Paul Tillich, Philip Clayton, Catherine Keller, John C. Caputo, and Richard Kearney. Our creative research centers on bringing together two worlds of thought—the natural scientific and the theological-religious. The focal point for this synthesis is the concept of possibility. This is a fertile arena for fresh research. We know of no other writing that has concentrated on possibility as the prime locus of conversation between science and religion.

The first chapter sets the stage for what is to come by highlighting key moments in the cosmic story of creative transformation. We look at the notions of chronology and creation before listening to the testimonies of science and religion on ten major episodes in

the creative advance. The chapter closes with a consideration of the significance of the common cosmic story for culture, science, and religion.

Chapter 2 picks up on two fundamental premises of the book, namely, the contingency of all finite reality and the consilient feature of all emerging reality. While the first chapter presents the cosmic scope and context for the development of the ensuing chapters, this second chapter sets the stage for possibility. Contingency and consilence are fundamental conditions in relation to which we will be understanding our central notion of possibility.

Advancing the themes of the previous chapter, the third chapter sets forth the first in a series of four probings that penetrate into reality in ever more subtle and nuanced ways. Chapters 3 through 6 highlight respectively four concepts of contemporary thought—chaos, complexity, cooperation, and consciousness. These notions are articulated descriptively as emergent properties of reality. Chapter 3 scrutinizes the relation between chaos and connectivity and how this relation leads to the emergence of novelty.

In Chapter 4 we develop the notion that reality's exploration of the possible is conditioned by the intensification of agency. The connectivity of chaos is potentiated further in the complexity of coinherence. As the autonomous capacity of the individual is fortified in relation to the complex whole, its power of the possible is likewise enhanced.

The fifth chapter marks a transition in our narrative in that we leave behind the safer and less provocative probing of a more quantitative nature and move into uncertain and adventurous inquiry that is more qualitative. Cooperation and compassion are indeed found in the world of nature, but they also can function summatively and normatively for the reality we are investigating. Our point is that they are required for experiencing some of reality's highest possibilities.

Chapter 6 only begins to plumb the depths of possibility provided by consciousness. Through the subtleties of the co-evolving relation of language and the brain, consciousness allows human beings to participate in the ongoing creativity of reality with a distinct capacity for intentionality that gives its co-creating special status. Humans are able to operate in harmony with the divine in bringing into actuality the manifold possibilities that lie before us.

The seventh and final chapter makes claims about the relation between creativity and the Creator God. Here we draw together notions that we have been developing, namely, consilience, connectivity, chaos, complexity, coinherence, and compassion. Affirmed is a God whose decisive freedom and embracing love work through possibility in gently nudging the creation into greater fullness of becoming and thus being.

The conversation concerning the divine promise of possibility has now commenced. You, the reader, have also commenced the process of joining in on our conversing. We invite you to make yourself comfortable as you work through the book. A glossary has been provided as a convenient tool for quickly refreshing yourself on the meaning of key technical terms. These terms on their first appearance are presented in bold font. We hope you are able to immerse yourself in the unfolding discussion of this book and that through it you will be led to think about new possibilities concerning the relation of God and nature.

1

Chronology and creation

Wonder and awe are natural attractors of the imagination of human beings. Both science and religion have their roots in this primal experience of the mystery of the creation's possibility. The pursuit of possibility carried out by our ancestors long ago continues right up to the present, as we too are captivated by the same wonder and awe. In our best moments, when our sensibilities are keenest, we feel the vibrant life of nature seeking new ways and forms to break away from its past. As we probe into nature's possibility for advancing creatively we experience an expansion of human understanding. However, as we push back the horizon and come to know more and more, we also come to learn more about the unknown. Our education into possibility expands our appreciation for what is, what has been, and what might be. Stirred by wonder and awe, we human beings are not content with less than a comprehensive perspective. We seek an inclusive chronology and an affirmation of the whole cosmos as the creation of an ultimate reality.

Comprehensive chronology

Basic assumptions of affirming chronology

Nature might not be transparent, but it is translucent. Nature presents itself to us and we can read it like an open book. Of course, reading is a process that needs to be learned, and reading the book

of nature calls for discipline. Over a century ago American naturalist and essayist John Burroughs (1837–1921), noted: "In studying Nature, the important thing is not so much what we see as how we interpret what we see."[1] In this chapter "what we see" correlates rather nicely with the notion of chronology and "how we interpret what we see" with that of creation. Reading the book of nature appropriately, according to Burroughs, calls for seeing with one's reason as well as with one's perception: "The power to see straight is the rarest of gifts; to see no more and no less than is actually before you; to be able to detach yourself and see the thing as it actually is, uncolored or unmodified by your own sentiments or prepossessions."[2] In our study of nature we will stress the danger of dismissing our sentiments altogether because they too give us very important information about nature and must be seen as part of nature itself. Through perception and reason we have access to reading the book of nature.

Teilhard de Chardin contended too that in the verb "to see" lies the whole of life. His only aim in writing *The Phenomenon of Man* was "to try to see," so that he could develop a whole view of the unfolding human that was true to our extended experience as human beings.[3] True seeing of nature, of course, is not an easy accomplishment. Emerson saw this clearly:

> Few adult persons can see nature. Most persons do not see the sun. At least they have a very superficial seeing. The sun illuminates only the eye of the man, but shines into the eye and the heart of the child. The lover of nature is he whose inward and outward senses are still truly adjusted to each other; who has retained the spirit of infancy even into the era of manhood. His intercourse with heaven and earth, becomes part of his daily food. In the presence of nature, a wild delight runs through the man, in spite of real sorrows. Nature says,—he is my creature, and . . . he shall be glad with me.[4]

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[1] *The Writings of John Burroughs*, 23 vols (Boston: Houghton Mifflin Company, 1905), vol. 12, 231.
[2] Ibid., vol. 12, 238.
[3] Pierre Teilhard de Chardin, *The Phenomenon of Man* (New York: Harper & Row Publishers, 1959), 31, 35.
[4] Emerson, *Nature*, 8–9.

The wonder within us over the world before us is like a wild delight running through us, and we attribute this wild delight to nature being alive. The two of us are respectively well into the era of womanhood and manhood, but we have managed to retain the spirit of infancy when it comes to relating to nature.

The basic point, then, is that we are assuming that the universe and its history are knowable and intelligible. Significant secrets of nature's mystery can be unlocked. This is a key presupposition of all science. Scientific understanding depends upon the fact that the universe is lawful and exhibits regularities, so that its unfolding creative events can be interpreted and explained in terms of the observed relationships and patterns in nature. Many in the scientific community adhere to a reductionistic and atomistic approach to understanding reality. Burroughs himself, for instance, insists that, if we are asking about the exact truth of a given reality in nature, "then there is but one interpretation of nature, and that is the scientific."[5] Lest we peg Burroughs as operating with a narrow vision, we recall that he gave us that memorable quote: "The lesson which life repeats and constantly enforces is 'look under foot.' You are always nearer the divine and the true sources of your power than you think."[6] So while he urges us to limit our interpretation of nature, so that we are sure not to acknowledge more than is actually before us, he would also agree with us in our concern that we not be so rigorous on the trimming of our focus that we end up experiencing less than is before us. In our probing we are especially sympathetic with the camp of inquiry that is holistic, ever on the search for processes of self-organization that require acknowledging reciprocal relationships, organic wholes, complex networks, and emergent orders. Methodological reductionism, too, we acknowledge as having made wonderful contributions to expanding our knowledge of the universe. But holism, we believe, needs to be given its place as well. The process of unfolding possibility advances by virtue of the drive toward balance exhibited by nonequilibrium systems. Although these events and the realities contributing to them are contingent, a directionality (which is not to say an all-out, comprehensive purpose) can be discerned in the novel expressions of the

[5] *The Writings of John Burroughs*, vol. 12, 196.

[6] http://www.gaia.com/quotes/John_Burroughs?page=2.htlm (accessed October 15, 2010).

expanding universe. We are assuming that our claims of chronology are not unrelated to our claims concerning creation. In this sense, the chronology we articulate is more of an enriched version than some would be willing to entertain or digest.

Chronos and kairos

It is worth noting that we as humans have the capacity to move beyond the space and time in which we are situated to generate a cosmic chronology. As creatures who remember the past and anticipate the future, we are able to construct a chronology that reaches back to the very origins of time and space and that extends ahead into a yet undefined future. Our present is richly endowed, then, not only with the present of the present, but also with the past of the present and the future of the present. Chronology builds on our capability for self-transcendence. Embedded within temporality, we humans as finite creatures actualize our humanness in the process of becoming. We have a need to understand our lives. We cannot meet that need without grasping our status in relation to the whole and within the grand cosmic sweep of time. The Greeks helpfully distinguished two notions of time. They used the word "*chronos*" for quantitative time, that is, the sequencing of events in the inexorable march of time. They used the word "*kairos*" for qualitative time, that is, to designate those moments that are packed with meaning, pregnant with possibility. No human chronology is utterly void of kairos considerations. We will be making an effort to pay special attention to kairotic moments and events. One such event has been named a "frozen accident." This is a contingent event resulting in a transformation that marks a new chapter in the chronology. Moments of kairos such as these must be included in a comprehensive chronology. As chronology becomes ever more comprehensive, it takes on characteristics of creation.

Pace, periods, and naming

In identifying the sequence and timing of significant events within a comprehensive chronology, one is confronted with evidence of irregular patterns of unfolding realities. Bursts of creative expression appear to be followed by spans of greater stability and uniformity. Images of the Big Bang and the Cambrian Explosion—the

roughly 50-million-year period during which the major groups of animals came into being—can be contrasted with the putatively stable 2.5-billion-year span of exclusively prokaryotic (or most primitive) life on planet earth. Our proclivity for organizing and ordering our world leads us to structure the whole by selecting general features of particular time spans that are frequently separated by kairotic transformations. A comprehensive chronology is dependent upon this periodizing process by which the understanding of the whole is given depth and texture through the combination of focused exploration of the particular periods and the summative conclusions from critical comparison. Here naming is an important part of the process of making sense of life. Language, with all its inherent power and limitations, is used to create the chronology of the universe and to communicate its story. In this sense a comprehensive chronology naturally leads to a creation story.

The age of the universe

A brief word is in order on the age of the universe. Scientists are not in agreement on this, so revisions are offered regularly. Most suggestions over the recent years have ranged from 10 to 15 billion years, with the strongest case being made for between 13 and 14 billion. We mention this to acknowledge that this is a matter on which full closure has not been reached. The debate will continue. Part of the difficulty revolves around the fact that various approaches can be used to determine the universe's age. One approach is to estimate the age using a cosmological model based on the Hubble constant and the densities of matter and dark energy. According to this model-based estimation the universe's age is 13.7 billion years. Actual age measurements, rather than estimations, can take place employing other approaches. Radioactive decay can determine how old a given mixture of atoms is and then an estimate can be made of the age of the chemical elements involved. This leads to definite ages of chemical elements since they have solidified into rocks, with the oldest of Earth's rocks being 3.8 billion years and the oldest meteorites being 4.56 billion years old, which latter number indicates the age of the solar system. Two other approaches involve concentrating on what is called "oldest star clusters" and estimating their age by way of measuring their luminosity or focusing on "the oldest White Dwarfs" (the oldest, coldest, and faintest stars)

and estimating the time they have been cooling. For our purposes, we will be simply assuming that the universe is about 14 billion years old.

Comprehending creation

To comprehend is to take in and grasp mentally and understand relatively fully. The creation extends back 14 billion years and includes all that has come into being through the process of becoming under the creative activity of God. One does well to gain a general sense of the scope and grandeur of that glorious commonwealth of creativity's unfolding. Mystery runs deep enough through this commonwealth that an exhaustive comprehension of it on our part would be ridiculous and presumptuous to expect. Creation's mystery is real and needs to be celebrated and respected. Equally real, though, is nature's call for us to come and see what makes her tick. Our appreciation of nature's mystery ought not lead to silencing her call for us to engage in the serious effort to comprehend creation. Nature is alive because of her creative aspect and we give expression to her liveliness by investing ourselves in comprehending that grand created aspect of nature that we call creation.

Basic assumptions of affirming creation

We are assuming that to affirm the creation is to constitute a world. The philosopher Martin Heidegger has formulated helpful thoughts on what is meant by a world.[7] A world is a universe of meaning that is grounded in language and that provides the plausibility structure for action. This universe of meaning is experienced as a realm of possibilities. World and creation go hand-in-hand because to regard the universe as created is to see it in relation to its ultimate source. We human beings live *in* an environment, but we live *out of* a world. World orients both theoretically and practically. On the one hand, one's world gives intellectual or ontological

[7] Martin Heidegger, *Being and Time*, translated by John Macquarrie and Edward Robinson (New York: Harper & Row Publishers, 1962), "The Worldhood of the World," 91–148.

orientation by grasping the way things are, by identifying possibility that has been actualized. On the other hand, one's world gives ethical or existential orientation by intuiting the way things might be, by imagining possibility that might be actualized. Creative individual and communal human projects of thought and praxis transpire in the creation, which is world recognized as gift.

Affirming creation involves the assumption that the creation is knowable and intelligible because reality is ordered in such a way that the basic subject-object divide can be transcended. There is a fundamental coherence or harmony between our personal world of meaning and the public world of commerce in which we operate. This orderliness of the actual creation makes possible our projects. Another basic assumption concerns the distinction between the sacred and the profane. Scholar of religion Mircea Eliade has shed light on this sacred/profane distinction.[8] Part and parcel of acknowledging a world as meaningful, knowable, orderly, and orienting is acknowledging a cosmos whose ultimate source is the sacred. Manifestation of the sacred in human experience and cultures orders time and space. Special, revelatory events and places serve as vehicles for experiencing the power of the divine. Even the postmodern cynic resonates at one level or another to the truth of this primal vision of the religious experience of humankind. We are assuming, then, that to affirm the creation is to embrace the universe as good, to endorse the reality of freedom as a gift from the sacred, and to acknowledge all interdependent created realities as dependent finally upon the Creator. We again assume in this context that our claims of creation are not unrelated to our claims of chronology. In this sense, the creation we articulate is more tethered to the earthy judgments of science than some would be willing to accept.

Diversity and unity

The scientist readily acknowledges the grand diversity of reality and its importance in the generation and maintenance of the creation. However, engaging the scientist's attention with greater intensity is

[8] Mircea Eliade, *The Sacred and the Profane: The Nature of Religion*, translated by Willard R. Trask (New York: Harper & Row Publishers, 1961).