CES Musings

Chronicling the Transition from Economic-Industrial To Ecological-Cultural Societies

(November-December, 2014)

CENTER FOR ECOZOIC SOCIETIES
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AT A GLANCE

The Chronicle

By Alice Loyd (through December 7, 2014)

Consumption

With this issue we introduce the category of Consumption, a topic that becomes especially conspicuous at this time of the year. Consumption is the corollary to Pollution and Climate Change; you can't have one without the other, at least not in the Economic-Industrial model. We offer two December stories on the subject. The first might be said to highlight the malady and the second a hopeful healer.

An epidemic of homes the size of shopping centers is earning media coverage in Los Angeles. What is soon to be L.A.'s largest private home will contain 90,000 square feet, 75,000 of it for living space. It will have five swimming pools and sell for about $150 million. The article also mentions a 70,000- to 80,000-square-foot Mediterranean house; Chateau des Fleurs with 60,000-square-feet and a 40-car underground garage; a Hyatt hotel heir's castle of 50,000 square feet; and two palaces of 48,000 square feet each, one with a 250-person-capacity ballroom.

"Twenty-thousand-square-foot homes have become teardowns for people who want to build 70-, 80-, and 90,000-square-foot homes," Los Angeles City Councilman Paul Koretz is quoted as saying. The article comments, "So long, megamansion. Say hello to the gigamansion."

At the other end of the country, a crusader has stepped up to preach against the form of consumption available to the rest of us, shopping. Appropriating the character of the Christian televangelist pastor, the Reverend Billy and his Stop Shopping Choir have led "exorcisms" of cash registers. He and the choir director were arrested after a performance in the Manhattan branch lobby of JP Morgan Chase, charged with riot, trespass, unlawful assembly, and disorderly conduct. This Thanksgiving the Reverend Billy and the choir went to St Louis, Missouri, where they hosted an organic meal on the front lawn of Monsanto's headquarters before joining protesters from Ferguson.

The choir began to appear around Billy Talen when he was preaching on the street in Times Square. It seemed to grow organically as the crowd gave support to what he was saying. Their current show is "Monsanto Is The Devil," at the Public Theater's performance venue Joe's Pub in New York City. Billy explained the theme in the interview: "Monsanto's actions defeat the ability of the local ecosystem to recycle CO_2 into the plants and trees. . . . Basically, they are teaching people to distrust nature and distrust the natural world. When you don't trust the natural world, you create climate change."

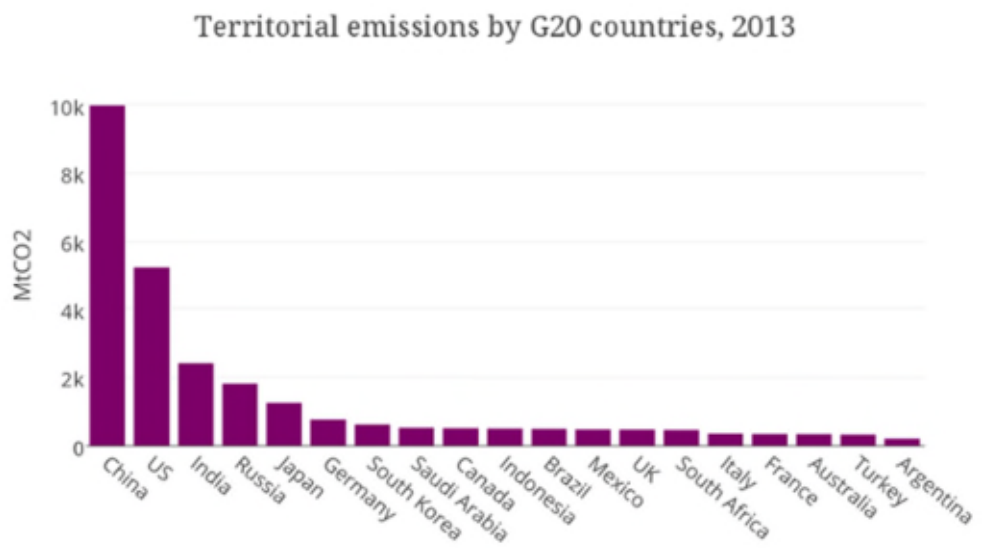
CLIMATE

At the time of this writing (December 7, 2014), the 20th session of the Conference of the Parties and the 10th session of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol is taking place in Lima, Peru. From December 1 to December 12 (later extended to December 14), the COP 20/CMP 10 is in session, with negotiators from more than 190 nations debating what countries should actually be required to promise regarding climate change: emissions, financial pledges, new technology to be shared, and/or assistance with adapting to climate impacts. The US has been leading toward the pattern of this year's talks: to have each government offer up its own voluntary target. Chief US climate negotiator Todd Stern told NPR that countries will have to "subject what they are proposing to do to full sunlight, so . . . other countries and civil society and the press and everybody else can look to see what China, the US, Europe or Japan or anybody else is proposing to do."

Prospects for progress have been improved by two notable events. Most significantly, in November the Obama administration unveiled a secretly negotiated deal between the United States and China to reduce their greenhouse gas output, with China agreeing to cap its output by 2030 or earlier if possible, and the United States pledging to cut its emissions to 26-28% below 2005 levels by 2025. The US also promised to increase its use of energy from zero-emission sources to 20% by 2030. Previously China had only pledged to reduce the rapid rate of growth in its emissions. The European Union has already endorsed a binding 40% greenhouse gas emissions reduction from 1990 levels target by 2030.

The second promising foundation for this year's climate talks is President Obama's November pledge for the US to contribute 3 billion dollars to the international climate fund aimed at helping developing countries prepare for and slow the effects of climate change. The announcement in November will encourage poorer nations to participate, since it may give hope that they can shift to non-carbon technologies while adapting to climate impacts. The United Nations Green Climate Fund, created in 2011, is an integral part of any international agreement. It asks industrialized countries and their private sector members that pumped most of the greenhouse gases into the atmosphere over the last century to now provide aid to developing countries who are trying to raise their per capita purchasing power to a more equitable level. The UK, Mexico, Korea, Germany, France and Japan are among the countries who have already committed to contribute.

The US-China agreement puts new pressure on India to announce its strategy. As the chart (below) makes clear, India is third now in emissions, but a Brookings Institution writer comments, "India could reasonably argue that its target date for peak emission should be much later than 2030. India's per capita GDP is less than half of that of China's on a purchasing power parity basis." India could argue that its target year should be extended until such time as its per capita GDP grows to match China's, which, at a rate of 6 percent per year, would not happen until 2043.



Although there are reasons to be encouraged, these are possibly outweighed by reasons for concern. A large body of scientific research warns that already it may be impossible to prevent the temperature of the planet's atmosphere from rising by 3.6 degrees Fahrenheit, given the current level of greenhouse gases already in the atmosphere and the projected rate of emissions expected to continue before any new deal is carried out. That increase is considered the tipping point at which the world will be locked into a near-term future of severe impacts. Nonetheless, "Scientists say that United Nations negotiators should not give up on their efforts to cut emissions. At stake now, they say, is the difference between a newly unpleasant world and an uninhabitable one."

December 31, 2014 Update on Lima Conference

The United Nations Framework Convention on Climate Change is one of three conventions entered into at the Earth Summit held in Rio de Janeiro in 1992. By 1995, countries who had signed the convention realized that emission reductions provisions in the Convention were inadequate. They launched negotiations to strengthen the global response to climate change, and, two years later, adopted the Kyoto Protocol. There are now 195 Parties to the Convention and 192 Parties to the Kyoto Protocol. The US is a member of the UNFCC but is not a party to the Kyoto Protocol.

A continuing source of conflict in the climate negotiations has been whether developing countries should be subject to the same emissions reduction requirements as developed countries. The Kyoto Protocol was based on the principle of "common but differentiated responsibilities." "Annex 1 Parties" (developed countries) agreed to binding emissions targets, but non-Annex 1 Parties (developing parties) did not. The First Commitment Period started in 2008 and ended in 2012. Since that time parties to the UNFCC have been trying to come to agreement on a post-Kyoto protocol. It is expected that some agreement will be reached at the

21st Conference of the Parties that will be held in Paris in late November through early December 2015. The Lima conference was preparatory for the 2015 Paris.

Some considered the Lima conference a success because it was agreed that all countries would enter into the new framework. Others considered Lima unsuccessful because again all that was required of the parties is that they make voluntary commitments to emissions reduction.

The declaration that came out of the conference was called the "Lima Call for Climate Action."

Here is the *The Guardian*'s assessment of what was agreed and what wasn't.

Prior to the Lima Conference, on November 19, 2014, the United Nations Environmental Program released its The Emissions Gap Report 2014. According to UNEP:

> The new report clearly states that to stay within the 2 degrees Celsius limit, global emissions need to:
>
> - turn the corner around 2020 and be heading downward by 2030. By 2030, global emissions should be 15% or lower than in 2010.
> - be at least 50% lower than 2010 by 2050.
> - reach net zero sometime in the second half of the century, with any remaining emissions offset by re-afforestation and other means.
>
> The UNEP Gap Report also focuses on the urgency to act now to achieve ever higher ambition before 2020.

IMMIGRATION

President Obama continued to exercise presidential initiative when on November 20 he issued an executive order on immigration reform. According to a fact sheet issued by the White House, the order involves three major elements: tougher border security to prevent illegal immigration; deportation of people who threaten national security and public safety; and registration of undocumented immigrants who have lived in the US for more than five years and are parents of US citizens or Lawful Permanent Residents. By registering and passing criminal and national security background checks, an estimated 5 million undocumented immigrants will have the chance to stay in the US without fear of deportation for three years at a time. The fact sheet states, "The President's actions will also streamline legal immigration to boost our economy and will promote naturalization for those who qualify."

The decision to exclude the parents of dreamers—along with all agricultural workers and H-1B visa seekers—highlights the legal and political challenges the administration is navigating as it aims to curb the ongoing deportation of illegal immigrants. A *Washington Post* story says, "Operating in an arena that is typically shielded from judicial review, federal government lawyers have tried to broaden the number of people who can stay in the United States while

shying away from the kind of overreach that could give Congress grounds to overrule the policy."

Congress can pass legislation to undo an executive action, but the measure would be subject to presidential veto. The Supreme Court can also declare an executive order unconstitutional as it could any other law, and the court system appears to be the route opponents are taking. In early December a coalition of 17 US states sued the Obama administration maintaining the executive order is illegal.

Presidential orders to defer deportation of certain immigrants are common, however, according to the pro-immigration American Immigration Council, whose figures are substantiated by "a number of experts," to quote from one source that analyzed the data. President Dwight D. Eisenhower in 1956 and every president since then has acted to keep families together or to shield illegal immigrants from returning to countries where they might be persecuted—39 instances in all. The action of George H. W. Bush in 1990 protected 1.5 million illegal immigrants, about 40% of the estimated number at the time, the same proportion Obama's order will affect of the current total of illegal immigrants.

As for the number of executive orders issued, Obama stands out for restraint. As of October, the President had issued 193 executive orders, the lowest total of any two-term president since Theodore Roosevelt. By comparison, George W. Bush issued 287 executive orders between 2001 and 2009, and William J. Clinton issued 308 executive orders between 1993 and 2001.

POLLUTION

On November 25 the EPA proposed to strengthen the National Ambient Air Quality Standards (NAAQS) for ground-level ozone, based on extensive scientific evidence about ozone's effects. The proposed regulation would lower the current threshold for ozone pollution to a range of 65 to 70 parts per billion, from 75 parts per billion. The EPA proposal, keeping open the possibility that the final rule could be stricter, would also seek public comment on a 60 parts-per-billion plan.

Coverage by the *NY Times* states, "The agency estimates that the new regulation would by 2025 prevent from 320,000 to 960,000 asthma attacks in children, and from 330,000 to 1 million missed school days. It also estimates that by 2025 the rule would prevent 750 to 4,300 premature deaths, 1,400 to 4,300 asthma-related emergency room visits and 65,000 to 180,000 missed workdays.

The regulation would come with a high cost to industry, which the EPA estimates would be $3.9 billion in 2025, using a standard of 70 parts per billion. The cost would be $15 billion in 2025 at a standard of 65 parts per billion. (The EPA chose 2025 as an example because that is when the agency expects the regulation to be fully in force.)

Because ozone is a byproduct of fossil fuel pollutants, energy-intensive industries, including the American Chemical Council and American Petroleum Institute, have raised the strongest objections to the changes. The National Association of Manufacturers sees it reducing GDP by $270 billion per year. The EPA defends the standard by asserting that its rules have helped improve air and water quality while the economy has simultaneously grown.

The Clean Air Act requires EPA to review the standards every five years by following a set of open, transparent steps and considering the advice of a panel of independent experts. EPA last updated these standards in 2008, setting them at 75 ppb. Environmental groups have been advocating for a lower limit on ground-level ozone since it was initially set at 75 parts per billion under George W. Bush in 2008, but an article in MarketWatch summarizes the attitude of the business community to the proposal: the-epa-pours-on-the-pain-with-new-ozone-regulations.

The agency is expected to release new coal-waste disposal guidelines later in December. In the meantime Duke Energy is polishing its green image, including by an appearance of CEO Lynn Good on 60 Minutes December 7, along with North Carolina Waterkeepers and other environmental critics of the coal ash spill in the Dan River in by Duke Energy, the world's largest utility, in February 2014.

Communications

In yet another move challenging Republican leadership, on November 10 President Barack Obama asked the Federal Communications Commission to reclassify internet service under Title II of the Telecommunications Act. In so doing the President, advocating for the internet to be regulated like any other public utility, is backing a policy commonly referred to as "net neutrality." Specific recommendations include the following:

- If a consumer requests access to a website or service, and the content is legal, an ISP should not be permitted to block it.
- Nor should ISP's be able to intentionally slow down some content or speed up others through a process often called "throttling."
- The FCC should make full use of the transparency authorities the court recently upheld, and if necessary apply net neutrality rules to points of interconnection between the ISP and the rest of the Internet.
- No service should be stuck in a "slow lane" because it does not pay a fee.
- The FCC should make these rules fully applicable to mobile broadband as well, while recognizing the special challenges that come with managing wireless networks.

In a message shown on the Whitehouse website, the President referred to the 4 million public comments calling for net neutrality. "For almost a century," he said, "our law has recognized that companies who connect you to the world have special obligations not to exploit the monopoly they enjoy over access in and out of your home or business."

ALFRED NORTH WHITEHEAD'S PROCESS THOUGHT AND RELATED IDEAS IN THE WORKS OF TEILHARD DE CHARDIN, BRIAN SWIMME, AND THOMAS BERRY

By Herman Greene

Alfred North Whitehead was a British mathematician, logician, and philosopher. His early work, as a student and professor at Cambridge University, was on mathematics and logic. The second period, 1910-24, when he had appointments at University College London and Imperial College of Science and Technology in London, he concentrated on the philosophy of science. The last period, beginning in 1924 and during which he taught philosophy at Harvard, he concentrated on metaphysics.

Whitehead came at his metaphysical reflections through the world of mathematics and physics as they developed in the first part of the 20th century, and also his knowledge of Western philosophy and theology. He sought not to understand a grand narrative, but to understand the nature of reality and to explain in categorical terms how everything comes to be. In his most important work, *Process and Reality: An Essay in Cosmology*,[1] he described his task as that of "speculative philosophy," which he defined as "the endeavor to frame a coherent logical necessary system of general ideas in terms of which every element of our experience can be interpreted."[2]

The framework of ideas he developed has become known as "process philosophy" and also "the philosophy of organism." It has been called a neo-classical metaphysics because it undertakes to frame a general metaphysical system in the manner of classical metaphysics, but does this in a new way. There are several elements of this thought system as expounded by Whitehead that are of particular importance as follows:

> *First, reality in all of its dimensions is creative.* This contrasts with the view that reality is determined by random events or change through locomotion (cause and effect determination resulting from substances in motion and controlled by the laws of motion).
>
> *Second, the essential character of reality is "becoming" or "flow" rather than "existence" or "stasis."* This is related to the concept of "cosmogenesis," the time-developmental character of the universe, developed by Brian Swimme and Thomas Berry in *The Universe Story*[3] and the understanding of which, they believe, involves the most important intellectual shift of our time.[4] In the past, according to Swimme and Berry, the universe has

[1]Alfred North Whitehead, *Process and Reality: An Essay in Cosmology,* corrected ed., ed. David Ray Griffin and Donald W. Sherburne (New York: The Free Press, 1978).

[2]Ibid., 2.

[3]Brian Swimme and Thomas Berry, *The Universe Story: From the Primordial Flaring Forth to the Ecozoic Era* (San Francisco: HarperSanFrancisco, 1992).

[4]Ibid., 2.

been seen as existing in a "spatial mode" as opposed to a time-developmental mode.[5] The universe viewed in a spatial mode was constant, unchanging, and ever-existing. Actions taken could not irreversibly affect the universe and its resources were seen as limitless.

Third, the fundamental element of reality is not "substance" but "experience" - everything comes to be through experience and everything has both a physical and mental dimension. This corresponds to Teilhard de Chardin's and Swimme's and Berry's thought that the universe has had a psychic-spiritual dimension from its beginning. The mechanistic view of the universe that became predominant in the modern era has seen the universe as material only, a collection of objects for humans to manipulate. When the universe is seen as having a psychic-spiritual aspect, it becomes a communion of diverse, self-organizing subjects.[6] Such an understanding of the universe would affect our science so that the study of organisms would not only focus on their measurable characteristics, but also on developing a feel for the organisms and their places within the larger community of life.[7] This feel for the organism would be of equal importance with the data one could collect about them. Such an understanding would also affect our understanding of the creative interactions of subjects that shape reality and serve as a check on our tendencies to introduce controls that inhibit the dynamic processes of nature. Such an understanding also would permit a reintegration of the humanistic, cultural and religious concerns of the human community with the scientific, technical, controlling aspects as a clearer understanding was reached of the ultimate and essential nature of reality as involving both a material and a psychic-spiritual dimension.

Fourth, every individual experience is influenced by the experience of everything else in the universe throughout its history. This is the philosophy of organism, which means that the universe has an organic character and everything is interrelated, experienced and remembered (valued). These relations are not only external (physical), but also internal (experiential). This corresponds to Swimme's and Berry's thought that the universe has a narrative dimension in which every particular reality is a part of a cosmic drama. It also corresponds to Berry's emphasis on establish an intimate rapport with the natural world.

Fifth, societies of multiple individuals units of experience have synergistic capabilities. This is the sociality principle and is consistent with Teilhard de Chardin's observation that the universe is moving in its evolutionary sequences toward greater complexity (toward more complex societies of individuals) and this in turn is leading toward greater capacities for consciousness. Swimme and Berry have also observed there is a tendency in the evolutionary journey of the universe to increasing complexity and consciousness.

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[5]Ibid.

[6]Ibid., 71-78.

[7]Thomas Berry, "Conditions for Entering the Ecozoic Era," *The Ecozoic Reader* (Winter 2002).

Sixth, every creative experience of becoming is also influenced by novel possibilities and the individual exercises a choice in realizing those possibilities. Thus, each individual and consequently each organism (or society of individuals) has some freedom and is in part self-determining. This corresponds to Swimme's and Berry's concepts of the differentiation of individuals and also the self-organizing characteristic, or *autopoiesis,* of individuals.[8] While there is a dynamic tension between part and whole in the universe, each individual in the universe is unique, ultimately significant and of intrinsic value, and the health of the universe and every society rests on the health of individuals.

Seventh, the future is undetermined and open and exists only as a set of possibilities that are not realized until chosen. In this understanding, the future is not mapped out by either physical causality or divine causality, but is open to creative activity. Thus, there is always cause for realistic hope and always the call for conscious, responsible, creative participation of all individuals.

Eighth, the character of existence is adventure and a quest for beauty, complex order and harmonization of contrasts of feeling. The ideal state of being then is not changelessness or being at rest, but creative adaptation and participation in a quest for beauty and harmony. Thus, the universe has a teleological, or future/end-seeking, dimension.

Ninth, reality is a pulsating sequence of events each building on the other; thus events do not occur in time, but rather create time. In Whitehead's understanding, each new event in actualizing itself apprehends those events which precede it and takes into account novel possibilities of the future in deciding its final form, at which time the event becomes an object for new emergent events. The present is perpetually emerging out of the past, but is never merely a repetition of the past. It is the emergence of these events that give time its sequential character, and thus it can be said that the events create time and time is a measure of a period of the sequential transformations resulting from the occurrence of such events. It follows that time is necessarily uni-directional from past to future. This thought is consistent with the Swimme and Berry's observation in that the universe is emergent, an evolutionary sequence of irreversible transformations.[9] Irreversibility has important implications for our actions. We cannot go back in time to recapture a lost opportunity and our actions in the present are of lasting significance. For example, when a species vanishes, it cannot be recovered. Note also that Whitehead's understanding of reality as creative process (a sequential occurrence of events building on each other) has philosophical significance for understanding that perishing and death are necessarily a part of reality, just as succession and new life are.

[8]Swimme and Berry, 75-78.

[9]Ibid., 70-71.

Tenth, the universe is guided by a pervasive, integral cosmic intelligence or consciousness that has both a primordial character of love by which everything is valued, and a consequent nature by which everything that comes to be influences this intelligence and becomes a new source of possibilities within the limits of the universe as it has come to be at any given time. Thus, in this understanding, the guiding intelligence of the universe is not conceived as something that exists independently of the universe, but rather as pervasive reality within which every part of the universe exists and which brings unity and purpose to the universe in its cosmogenetic journey. This cosmic intelligence has had a variety of names from the Tao, to the Buddha nature of the universe, to God, to the implicate order, and many more.

Eleventh, the cosmic intelligence does not act through coercion, but through persuasion and lure of feeling. Thus, the cosmic intelligence does not control the universe, rather it and each individual are co-creators, and individuals have a capacity for free choice for good or ill.

Twelfth, spirituality and creativity are related concepts and they always occur in actualizing events. Therefore, the locus of spirituality is in the creativity of actual existence not in some higher realm; spirituality is not disembodied, rather it exists in the process of things coming to be; and the cosmic intelligence is ultimately grounded in the evolutionary, creative adventure of the universe.

WHAT IS PROCESS PHILOSOPHY AND WHY IS IT IMPORTANT TO THE ECOZOIC? QUESTIONS AND ANSWERS

By Herman Greene

What Is Process Philosophy?

A process philosophy is one that understands the universe as continually becoming. In the Greek tradition Heraclitus said than no person ever steps into the same river twice. He was in the process tradition. Daoism and Buddhism are also in the process tradition.

The opposite of process philosophy is not ontology, because process is an ontology. The opposites of process philosophy are substance philosophies and philosophies that see the universe as unchanging. A substance is something that requires nothing but itself to exist. In the Greek tradition, Democritus, a substance philosopher, said the world as composed of tiny bits of matter that he called atoms. In contrast, in process philosophy everything exists by virtue of its relationships.

The term “process philosophy” itself is a modern term. It came into being to describe the philosophy of Alfred North Whitehead. He privileged becoming over being in a temporal but not an ontological sense. Something has to become itself for it to be itself. Becoming is the creation of the self. Then the self becomes a being for every other future becoming (for the growth of others).

As a distance runner I learn this each time I prepare for a marathon. I can't be a marathoner, I have to become a marathoner. Further if I want to continue as a marathoner, I have to continue becoming a marathoner. What I am as a marathoner (as continually becoming a marathoner) affects others. They are infected with the possibilities of marathoning (continually becoming a marathoner). In some sense, the whole world is infected with this possibility just as I have been infected with that possibility from others who have gone before me.

What Are the Key Characteristics of a Process Philosophy?

According to the bylaws of the International Process network:

"Process" as used in these Bylaws refers to process-relational philosophies that have

- creativity,
- organic change over time,
- subjectivity, and
- interdependence

as fundamental aspects of their understandings. Such philosophies include, and are not limited to, those based on the work of Alfred North Whitehead.

What Is the Relationship between Process Philosophy and Thomas Berry's, Brian Swimme's, Mary Evelyn Tucker's and John Grim's work?

If one accepts the International Process Network's definition of process, then Thomas Berry, Brian Swimme, Mary Evelyn Tucker, and John Grim are process thinkers. If one reads Thomas Berry's work through the screens of creativity, organic change over time, subjectivity, and interdependence, then his faithfulness to process thought is evident.

Another relationship of the work of these people to process is that they have been heavily influenced by Teilhard de Chardin, who is classed as a process thinker. Teilhard de Chardin and Alfred North Whitehead did not know each other, but the work of each was influenced by Henri Bergson, also a process thinker.

Sometimes leaders of Thomas Berry's work don't like to say he is a process thinker out of concern that his work will be labelled and associated too closely with Whiteheadian thought. The concern is that this would narrow the appeal of Berry's work. This is not necessarily the case. As stated above process thought is not limited to Whitehead's thought, it is defined by the four key concepts. Without keeping these concepts in mind in the understanding and teaching of Berry's work, his message is diluted.

In his final years Berry expressly rejected process thought, but this was during a period when he made other statements that were inconsistent with his published work. Whether Berry was a process thinker and what the meaning of his late years rejection of process thought means is the subject for another paper.

Among Brian Swimme, Mary Evelyn Tucker, and John Grim, Brian Swimme is the one most closely involved with Whiteheadian process thought. He has studied Whitehead closely and taught courses on Whitehead. Mary Evelyn Tucker and John Grim are generally familiar with the ideas of Whitehead and have close associations with people in the process community.

Why Is Process Philosophy Important to the Ecozoic?

Process philosophy as a general term is important to the ecozoic because creativity, organic change over time, subjectivity, and interdependence are important to the ecozoic.

Whiteheadian thought in particular is important because it provides a philosophical undergirding for the work of Thomas Berry. For example, few people realize the usage of the term creativity began with Whitehead in is Gifford Lectures of 1927-28. He made "creativity" the centerpiece of his philosophy.

Thomas Berry uses creativity and the related term spontaneity throughout his work.

Is Philosophy, in Particular Metaphysics, Important Anyway?

Philosophy in our time has had a bad run. It is considered a technical subject of marginal importance, not where big things happen. This is in contrast to the past where philosophy generated big, widely influential ideas. This was so much the case that until the modern period in the West, science was "natural philosophy" and philosophical ideas determined that way that people understood the world, for example "nature hates a vacuum." Later science became empirically based and a scientific method was developed for testing things. No longer, many have thought, has philosophy had any bearing on what is discovered by science. With regard to metaphysics, Kant dealt a severe blow to this when he declared the way the world actually is—the noumenal world—to be a matter of speculation, and the world we experience—the phenomenal world—as being the only world we can really know. The noumenal world, the world of theology and metaphysics lost its standing except for ethical purposes.

This worked so long as the modern world worked. Now as we face the possibility that modernity is on a crash course, people are seeing that empirical science is not only *not* value neutral but it presuppose a metaphysic. The metaphysic is that the universe is composed of inert matter that through some means takes on the properties of feeling and consciousness, and strangely, nonetheless is determined and knowable by scientific laws. This metaphysic indeed does have ethical implications—nothing matters in the universe but matter and there is no accountability to a higher order of existence because there is no meaning and value inherent in the universe or the universe process.

Changing this philosophy/metaphysic won't solve any immediate problem, but without changing this philosophy/metaphysic a host of immediate problems will be insoluble. Changing this philosophy is basic. How to do so and what philosophy to substitute is challenging for many

reasons, but of the alternatives process philosophy with specific reference to Whiteheadian philosophy is the most promising.

The best statement of why philosophy is basic to cultural reform was given by E. Maynard Adams and is repeated here[10]:

> The modern period, while opening up new vistas of understanding and much progress in human affairs, has introduced many distortions in our understanding of the world. Descartes is considered the originator of modern philosophy in the West. His "Cartesian dualism" divided mind from matter. Other ontological dualisms of the modern period include fact and value, primary qualities and secondary qualities, science and the humanities, the religious and the secular, humans and nature, objective and subjective, and civilized and uncivilized. These dualisms have become natural for the modern mind, but they are not natural to nature, not even our human nature.
>
> Much can be written about how contemporary philosophy has accommodated itself to the un-natural distortions of the modern worldview. The philosopher E. Maynard Adams, in "The Mission of Philosophy Today," [11] describes how, in the modern period, scientific naturalism, based on sensory empiricism, materialism and efficient causation, seeped into and came to dominate the cultural mind. He wrote that this is attributable to the great success of science:
>
> > Empirical science provided the factual knowledge that was fruitful in making things and in the manipulation and control of the material environment. In time, the great success of empirical science in providing the knowledge base for mastery of nature, the making of useful things, and the production of wealth led to the discrediting of all other kinds of knowledge claims.[12]
>
> Further, the presuppositions of science undermined the humanistic dimensions of society and led to skepticism, subjectivism, relativism and even nihilism in the cultural sphere.
>
> > Science . . . . eliminated, normative, value, and meaning concepts, the fundamental categories of the humanities and humanistic thought in general, from its descriptive/explanatory conceptual system because they cannot be funded with meaning by sensory experience, and so statements containing them [could] not be confirmed or falsified by scientific methods of inquiry. Thus, according to the presuppositions of modern science, there are no normative

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[10]The following text that is not attribute to Adams if from Herman Greene, "Process Ecozoics," (lecture, Eco-Sophia Conference, Sophia University, Tokyo, Japan September 26, 2011).

[11]E. Maynard Adams, "The Mission of Philosophy Today," *Metaphilosophy* 31, no. 4 (July 2000): 349-64,

[12]Ibid., 354-55.

> laws, values, inherent structures of meaning, ends, or teleological causality in nature—only existential and factual structures and elemental and antecedent causes that engage them. One cannot accept modern science's descriptive/explanatory account of something as the truth about it without accepting its presuppositions about the basic structure of the world. Yet the presuppositions of science are inconsistent with the presuppositions of most religious beliefs and humanistic thought in general.[13]

Adams wrote of a "cultural mind" based on a widely shared set of assumptions and beliefs. He believed it is the province of philosophy to discover and critique the presuppositions of experience, thought, and action in the cultural mind. Further, philosophy needs to "[excavate] the inherent commitments about the categorial structures of various subject matters and the world as a whole that are hidden in these presuppositions, and to develop an account of how the culture is grounded in and maps[,or is not grounded in and does not map,] the basic structure of the world."[14] He understood the mission of philosophy as cultural critique and reconstruction, a mission few academic philosophers, at least in the Anglo-American tradition, would accept. With this understanding, and his conviction that the cultural mind contained fundamental errors about the categorial features of the world and the humanistic enterprise, he wrote:

> The mission of philosophy in our time is daunting, even overwhelming, for our basic cultural problems are philosophical. While there are other resources in the culture that must be utilized, it is only through clear philosophical analysis and education that we can come to grips with our deepest problems in a way that will overcome our cultural derangement and prepare the way for cultural renewal. We must redefine the human enterprise by shifting our priorities from materialistic to humanistic values, reassess the semantic and knowledge-yielding powers of the human mind, reexamine all sectors of the culture to determine how each is grounded in experience and related to the items, features, and structures of the world, and construct a coherent worldview that makes sense of all the realities we know, especially human existence and the whole human phenomenon.[15]

Adams understood that philosophy alone could not bring about a cultural reformation, but it was his position that there cannot be a cultural reformation without a philosophical reformation. With respect to philosophical reformation, he wrote, "It is not enough for a few philosophers to solve these problems intellectually; the solutions need to be worked out in the culture, in the experience and lives of the people, and in

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[13]Ibid., 353-54.

[14]Ibid., 357.

[15]Ibid., 356.

the social structure and the institutions of the society."[16] This meant for him that philosophers needed to be engaged in the culture working to bring about change. Of course, there are boundaries to what philosophers should do. Those philosophers who take the approach of engaging the culture are sometimes the ones who are perpetuating the errors of the modern cultural mind, or worse bring new or old distortions of understanding forward. There are good reasons, both historical and contemporary, for the cautionary ideal of the detached intellectual in the modern university, but they have become anachronisms when they serve to prevent, in this critical period of history, good philosophy from fulfilling the mission set forth by Adams. Adams offers three historical examples of how changes in philosophy functioned to bring about cultural reformation:

> [(1)] The Greek enlightenment from the sixth to the fourth century B.C.E., [(2)] the development of Christian feudalism in the wake of the collapse of the Roman Empire and its supporting culture, and [(3)] the dissolution of Christian feudalism and the emergence of modern Western civilization from the fourteenth to the eighteenth centuries. In each of these periods, philosophers exposed cultural errors in the dying civilization and helped construct and defend a new vision of humankind and the world and a culture that would support, and generate social institutions that would support, the new way of life.[17]

The transition from modernity to the ecozoic will involve an even more basic cultural reformation and philosophy, including metaphysics, has a basic role to play.

INTRODUCTION TO A REMARKABLE ESSAY AND A REMARKABLE YOUNG PHILOSOPHER: MATTHEW DAVID SEAGAL

By Herman Greene

The following essay would be a stunning accomplishment by a person of any age. It is even more remarkable that it is by Matthew David Segall, a man in his twenties. Matthew undertakes with aplomb the task of making sense of modern science and evolutionary theory in light of Whitehead's philosophy and also a vision of the ecozoic. He defines his project as "my own attempt to re-construct the philosophical basis for a viable planetary civilization."

Matthew gives me hope for the future. I don't know of a finer young, ecozoic philosopher.

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[16]Ibid., 362.

[17]Ibid., 360.

Here is his bio:

> **Matthew David Segall** is a doctoral candidate in the Philosophy, Cosmology, and Consciousness program at the California Institute of Integral Studies in San Francisco, CA. His dissertation draws primarily upon Alfred North Whitehead, Friedrich Schelling, and Rudolf Steiner, and is focused on the role of imagination in the philosophical integration of scientific theory and religious myth. His undergraduate work was in cognitive science at the University of Central Florida. He is the author of several articles and books, including *Physics of the World Soul: The Relevance of A.N. Whitehead's Philosophy of Organism to Contemporary Scientific Cosmology* (2013), "Logos of a Living Earth: Towards a New Marriage of Science and Myth for Our Planetary Future" in *World Futures,* Vol. 68 (2012), "Participatory Psychedelia: Transpersonal Theory, Religious Studies, and Chemically-Altered (Alchemical) Consciousness" in *The Journal of Transpersonal Research* (forthcoming, 2014). He also blogs regularly at footnotes2plato.com.

Some Concepts in Matthew's Essay

In order to understand Matthews' essay, you may helpful find this description of a few background concepts in Whitehead's philosophy.

> *Before I go on, if what follows here or in Matthew's paper seems confusing, just think of the universe as a continually developing piece of jazz music made up of zillions of notes played by creative musicians seeking novelty, rich harmonies and beauty.*

Whitehead's cosmology does not begin with the large scale structures of the universe. Rather it begins with the smallest units of existence, the actual occasions, or drops of experience, of which the universe is composed. In his cosmology, each of these drops of experience comes into being through the influence of factors internal and external. His cosmology is "atomic" in the sense that the universe is composed of minute events that make up all there is, but not in the sense that each atomic event is a substance existing in its own right and having only external relations with other atoms. The existence of each event is its becoming (in Whitehead's technical language, its "concrescence"). Each event has a subjective-creative aspect.

Events form societies. Societies exist but the events that make them up come into being and then perish. You can think of this like a person's liver. It seems like an enduring object, but its cells are replaced every 150 days. You can also think of this like pixels on a TV screen. The pixels together make up the pictures (analogous to societies), but the pixels flash on and off. The atomic events, that is to say "actual occasions," in Whitehead's scheme are much smaller than cells or pixels, they exist at the tiniest possible scale. Also they don't just flash on and off, they inherit from past events and project something new forward. Societies have synergistic characteristics not possible in any one event.

In the process of concresence events reach a final form. This form is an expression of an eternal object. Eternal objects are all the ways that things can become actual in the world. They are squares, circles, colors, tones, feelings, and more. Whitehead took the idea of the forms from Plato and then changed them. Whitehead's eternal objects don't exist in an abstract world of forms, but rather in actualizing events. An eternal object is anything that can be abstracted from a particular experience and can recur again. For example, redness is in a specific event, but can recur in other events. Whitehead described eternal objects as "pure potentials for the specific determination of fact," and "forms of definiteness." There are potentials that have not been realized and those possibilities exist by virtue of the ordering of eternal objects in the primordial nature of God. Some have difficulty with Whitehead's reference to the term God and prefer to think simply of the primordial order of the universe.

In understanding this myself I think of a piano. It has 66 notes, but the notes are not the strings—the strings give rise to the notes. The notes are harmonically related to each other, not because of the strings but because of the nature of the notes themselves. The notes exist as potentials apart from the strings of any piano. They only come into being, however, when the note is played on the strings. Without the harmonic order of the notes (again not something given by the strings), we wouldn't have the possibilities of the music that we have. There are limitless possibilities for creativity on a piano, but only because there are 66 harmonically related notes (eternal objects) that can be played by the piano player striking the strings.

Thomas Berry points out that science can tell you how many times the strings vibrate, but it can't hear the music. Both the vibrations of the string and the notes are "real," but they are real in a different way. The notes and the effects they have are something real in themselves.

In much of modern philosophy, what is real is the vibration of the strings and the music is our subjective reception or interpretation of the vibrations. To think this what is what Whitehead calls the bi-furcation of nature. It separates the world into what is real and the human response which is subjective. Whitehead seeks to understand nature in a way that all that we experience—emotion, thought, beauty, feeling, compassion, are real in nature.

This is what Thomas Berry was about as well. He wrote on pages 32-33 of *The Great Work:*

> To appreciate the numinous aspect of the universe as it is communicated in [the Earth] story, we need to understand that we ourselves activate one of the deepest dimensions of the universe. [That the] special intellectual, emotional, and imaginative capacities [we recognize in ourselves] have existed as dimensions of the universe from its beginning is clear since the universe is ever integral with itself in all its manifestations throughout its vast extension in space and throughout the sequence of its transformations in time. The human is neither an addendum to, nor an intrusion into the universe. We are quintessentially a dimension of the universe.
>
> *And if all of the above or what is in Matthew's paper seems confusing, just think of the universe as a continually developing piece of jazz music made up of zillions of notes played by creative musicians seeking novelty, rich harmonies and beauty. Then keep reading.*

PHYSICS OF THE WORLD-SOUL: THE RELEVANCE OF ALFRED NORTH WHITEHEAD'S PHILOSOPHY OF ORGANISM TO CONTEMPORARY SCIENTIFIC COSMOLOGY

Matthew David Segall

Alfred North Whitehead (1861-1947)

Editor's Note: Alfred North Whitehead was a British mathematician, logician and philosopher. His early work, as a student and professor at Cambridge University, was on mathematics and logic. The second period, 1910-24, when he had appointments at University College London and Imperial College of Science and Technology in London, he concentrated on the philosophy of science. The last period, beginning in 1924 and during which he taught philosophy at Harvard, he concentrated on metaphysics. His philosophy is known as both philosophy of organism and process philosophy.

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INTRODUCTION: FROM PHYSICS TO PHILOSOPHY

> *How shallow, puny, and imperfect are efforts to sound the depths in the nature of things. In philosophical discussion, the merest hint of dogmatic certainty as to finality of statement is an exhibition of folly.*
>
> —Whitehead[1]

> *Philosophy begins in wonder. And, at the end, when philosophic thought has done its best, the wonder remains.*
>
> —Whitehead[2]

This essay is written in preparation for my dissertation, tentatively titled *Imagination between Science and Religion: Towards a Cosmotheandric Process Philosophy.* In this forthcoming dissertation, Alfred North Whitehead's and Friedrich Joseph Schelling's voices will play starring roles in my own attempt to re-construct the philosophical basis for a viable planetary civilization. Special attention will be paid to the methodological role of imagination in both scientific theorization and religious mythopoeia. Raimon Panikkar's "cosmotheandric experience," wherein Universe, God, and Human are the triune ultimates in terms of which experiential reality is to be interpreted, will provide the imaginative background guiding my philosophical speculations.[3]

In this essay, I will focus on Whitehead's organic cosmology, but Schelling's and Panikkar's conceptions of reality will never be far from my mind. The title of this essay is itself a nod toward Schelling's *Naturphilosophie,* which seeks to integrate humanity's ancient spiritual longing for wisdom and compassionate consciousness with its modern scientific knowledge of an evolutionary cosmos.

The important place of philosophy, from Whitehead's similarly anthropocosmic perspective, is that of the critic of the abstractions of the specialized sciences. It follows that:

> Philosophy is not one among the sciences with its own little scheme of abstractions which it works away at perfecting and improving.[4]

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[1]Alfred North Whitehead, *Process and Reality*, corrected ed., David Ray Griffin and Donald W. Sherburne, eds. (New York: The Free Press, 1979), xiv (originally published in 1929).

[2]Alfred North Whitehead, *Modes of Thought* (New York: The Free Press, 1968), 168 (originally published in 1938).

[3]Raimon Panikkar, *The Rhythm of Being* (New York: Orbis Books, 2010), 34.

[4]Whitehead, *Science and the Modern World* (Cambridge: Cambridge University Press, 1960), 83 (originally published in 1925).

Rather, the philosopher is always at work attempting to harmonize the abstract sciences (e.g., physics, chemistry, biology, psychology, sociology), both internally among themselves, and more generally with our deep moral intuitions and aesthetic feelings regarding the archetypal values inherent to the universe. In this sense, Whitehead sees philosophy's principle import to be "the fusion of religion and science into one rational scheme of thought."[5]

One of the major premises of this essay is that contemporary scientific cosmology has passed into an epicyclic phase of theoretical development.[6] The present disorganized assemblage of scientific hypotheses regarding the fundamental laws and material components of the universe has left contemporary cosmology on the verge of a paradigmatic shift whose existential significance may surpass even that of heliocentrism or evolutionism (though it will need to include rather than contradict these paradigms). Whitehead was among the first initiates into this new cosmological story, but grasping the novelty of his vision also requires remembering the insights of the ancients, even if in a modern context. This essay therefore situates Whitehead's animate cosmology in the context of the larger historical arc of Western natural philosophy dating back to Plato. It also brings Whitehead's philosophy of organism into conversation with several components of contemporary scientific cosmology–including relativistic, quantum, evolutionary, and complexity theories–in order to both exemplify the inadequacy of traditional materialistic-mechanistic metaphysics, and to display the relevance of Whitehead's cosmological scheme to the transdisciplinary project of integrating these theories and their data with the presuppositions of civilized society. This data is nearly crying aloud for a cosmologically ensouled interpretation, one in which, for example, physics and chemistry are no longer considered to be descriptions of the meaningless motion of molecules to which biology is ultimately reducible, but rather themselves become studies of living organization at ecological scales other than the biological.[7]

Almost a century ago, Whitehead warned that if physicists did not begin to reassess the outdated imaginative background of mechanistic materialism in light of their own most recent cosmological discoveries, the scientific enterprise would as a result "degenerate into a medley of *ad hoc* hypotheses."[8] Despite the conceptual revolutions of the 19th and 20th century (e.g.,

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[5]*Process and Reality, 15.*

[6]*Science and the Modern World*, 124.

[7]Ibid, 97.

[8]Ibid., 23.

evolutionary, relativity, quantum, and complexity theories), scientific materialism remains the *de facto* natural philosophy of Western civilization. It imagines the universe as

> irreducible brute matter . . . spread throughout space in a flux of configurations . . . in itself . . . senseless, valueless, purposeless . . . following a fixed routine imposed by external relations.[9]

Such a picture of ultimate reality leaves no room for life or consciousness. It seems likely that this metaphysical oversight is among the reasons for (post)modern civilization's ecological and socioeconomic crises. A coherent philosophy of nature has yet to take root among civilization's intelligentsia. Several centuries from now, if historians still exist, and if a new image of reality and with it a new civilization are in the process of flowering, the 20th century will stand out not only for its world wars and widespread environmental devastation, but for its disorienting scientific discoveries (like relativity and quantum theories) and the earthshaking technological inventions which resulted (like the atom bomb and the microchip). For a century, the greater part of the thinking heads of our civilization have been distracted by the electronic gadgetry and wartime glory afforded by technoscience.[10] This distraction has allowed them to overlook the philosophical incoherence of mechanistic materialism. Whitehead, one of the handful of historically sensitive scientists to grasp what was happening, wrote in 1925 that "The progress of science has now reached a turning point":

> The stable foundations of physics have broken up. . . . The old foundations of scientific thought are becoming unintelligible. Time, space, matter, material, ether, electricity, mechanism, organism, configuration, structure, pattern, function, all require reinterpretation. What is the sense of talking about a mechanical explanation when you do not know what you mean by mechanics? *[Science] must become philosophical.*[11]

The incoherence of mechanistic materialism stems from its neglect of the importance of harmonizing our theoretical knowledge of nature with the presuppositions of our ethical values, artistic projects, and spiritual aspirations. Unlike any of humanity's premodern cosmologies, modern scientific materialism has been predicated upon a metaphysical bifurcation separating human consciousness from the surrounding cosmos. This dualism between consciousness and cosmos is the fatal flaw at the core of modern scientific cosmology. Whitehead's philosophy of science is characterized by the attempt to correct for the widespread deployment of the fundamental fallacy of *bifurcation,* along with its daughter

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[9] Ibid.

[10] Unlike traditional science, still the cousin of philosophy, which sought to "confer an intelligible order on what confronts us," for technoscience "to understand is to be able to transform." Isabelle Stengers, *Thinking With Whitehead: A Free and Wild Creation of Concepts* (Cambridge, MA: Harvard University Press, 2011), 11.

[11] *Science and the Modern World, 23* (italics added). By way of comparison, Schelling's *Naturphilosophie* was similarly an attempt "to allow natural science itself to *arise* philosophically." F. W. F. von Schelling, *Ideas for a Philosophy of Nature,* trans. Errol Harris and Peter Heath (Cambridge, UK: Cambridge University Press, 1988), 5 (originally published 1787).

fallacy, that of *misplaced concreteness.* In effect, modern science has sacrificed intuitive understanding of the concrete passage and organic unity of the actual universe for the abstract knowledge of its mathematical formulae and mechanical models. No other fallacy occupied Whitehead's critical attention more than the bifurcation of nature: as we will see, he initially wandered out of mathematical physics and into the arena of full-fledged metaphysical cosmology precisely in order to integrate what had become dissociated. "Coherence," writes Whitehead, "is the great preservative of rationalistic sanity"[12]; without it, neither cosmology nor civilization would be possible.

Despite the need for greater philosophical coherence in contemporary scientific cosmology, many leading physicists are growing increasingly impatient with philosophers. Freeman Dyson writes

> For most of the twenty-five centuries since written history began philosophers were important. . . . They had a deep influence in the practical worlds of politics and morality as well as in the intellectual worlds of science and scholarship. . . . Compared with the giants of the past, [twentieth and twenty-first century philosophers] are a sorry bunch of dwarfs. . . . So far as the general public [is] concerned, philosophers [have become] invisible.[13]

Dyson at least has hope for the future importance of philosophy, if only it becomes willing to ask the big questions once again. Other physicists have become outright dismissive of the entire enterprise of philosophy. "Philosophy is dead," writes Stephen Hawking, because it "has not kept up with modern developments in science, particularly physics."[14] Lawrence Krauss similarly argues that much of contemporary philosophy suffers from "intellectual bankruptcy"[15]:

> When it comes to the real operational issues that govern our understanding of physical reality, ontological definitions of classical philosophers are, in my opinion, sterile.[16]

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[12]*Process and Reality*, 6.

[13]Freeman Dyson, "What Can You Really Know, *The New York Review of Books*, November 8, 2012, 20.

[14]Stephen Hawking, *The Grand Design* (New York: Random House, 2010), 5.

[15]Lawrence Krauss, *A Universe from Nothing: Why There Is Something Rather Than Nothing* (New York: The Free Press, 2012), xiv. Krauss claims to bring "nothing"–traditionally a topic for metaphysical speculation–into the purview of natural science such that it can be used to explain the creation of the universe materialistically (i.e., as the result of blind chance and causal necessity without meaning or purpose). I return to his ideas in a later section in connection with Terrence Deacon's less reductionistic scientific characterization of "nothing" in Terrence Deacon, *Incomplete Nature: How Mind Emerged from Matter* (New York: W.W. Norton & Company, 2013).

[16]Lawrence Krauss, "The Consolation of Philosophy," in Scientific American, April 27, 2012, http://www.scientificamerican.com/article.cfm?id=the-consolation-of-philos&page=2 (accessed 11/15/2012).

Like Hawking and Krauss, Stephen Weinberg is also of the opinion that scientists need not take the complaints of philosophers seriously:

> To tell a physicist that the laws of nature are not explanations of natural phenomena is to tell a tiger in search of its prey that all flesh is grass . . . with or without [philosophers], we will continue to [search for scientific explanations of natural phenomena].[17]

In response to such criticisms, it must first be said that Whitehead was well aware of the danger of supposing that our present definitions, whether they be in the language of mathematical physics or of metaphysical ontology, somehow already contain all the words, phrases, or formulae applicable to the analysis of experiential reality: he called this supposition "The Fallacy of the Perfect Dictionary."[18]

> We experience more than we can analyze. For we experience the universe, and we analyze in our consciousness a minute selection of its details.[19]

For Whitehead, the role of philosophy is akin to that of poetry: to introduce novel fundamental ideas and verbal expressions as an aid to the ongoing adventure of civilization.[20] This obviously makes philosophy's goals a great deal broader than those of physics; but as I hope to spell out in the course of this essay, it is essential to the health of civilization that lines of communication between philosophy and science remain open and mutually informative. Whitehead, a mathematical physicist by training, had just as much criticism for the habits of his own discipline as for philosophy. He placed the blame for the sorry state of both disciplines primarily on the process of professionalization, which pushes society's brightest minds to become narrow-minded specialists and technicians with little interest or respect for anything but the operational abstractions of their own field. The fragmentary proliferation of technoscientific disciplines during the 19th and 20th centuries mostly discouraged grand attempts at integration akin to those of philosophers past. "Sometimes it happens," writes Whitehead,

> that the service rendered by philosophy is entirely obscured by the astonishing success of a scheme of abstractions in expressing the dominant interests of an epoch."[21]

Whitehead's approaches to philosophy and to science are not typical of his age. A natural born integralist, he came to them from several angles at once: as a mathematician seeking truth in

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[17]Stephen Weinberg, *Dreams of a Final Theory* (London: Vintage Books, 1993), 21-22.

[18]*Modes of Thought,* 173.

[19]Ibid., 89.

[20]Ibid., 174

[21]*Science and the Modern World,* 58.

harmonious pattern, as a physicist attempting to describe the fundamental forces of nature, as a pragmatic educator searching for a viable pedagogy, and as an ally of the Romantic poets in their protest against abstraction on behalf of the concrete values inherent to the universe. According to contemporary interpreter Isabelle Stengers, Whitehead's central concern is precisely modern science's

> lack of resistance to the intolerant rule of abstractions that declare everything that escapes them frivolous, insignificant, or sentimental.[22]

Much of the hostility directed at philosophers by the physicists mentioned above would seem to be a result, not only of their lack of resistance, but of their outright celebration of the power of abstractions to explain away the depths of mystery inherent to lived experience. In contrast to the triumphant attitude fostered by scientific materialism, Whitehead does not look to natural science, or to philosophy, for reductive explanations. Rather, his philosophizing seeks "direct insight into depths as yet unspoken."[23] The purpose of philosophy is not to explain away mystery, but to add to it "some grasp of the immensity of things, some purification of emotion by understanding."[24]

As an aid to understanding the radical novelty of Whitehead's mature cosmological scheme, it is important to first grasp the essential features of his early reflections on the history and philosophy of science. It is to these reflections that the next section turns.

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[22]*Stengers, 136.*

[23]*Modes of Thought, 174.*

[24]Ibid., 168-69.

THE SUNSET OF MATERIALISM:
WHITEHEAD'S PHILOSOPHY OF SCIENCE

> *The sun rose on the flawless brimming sea into a sky all brazen–all one brightening for gods immortal and for mortal men on plow lands kind with grain.*
>
> —Homer[25]

> *God invented sight and gave it to us so that we might observe the orbits of intelligence in the universe and apply them to the revolutions of our own understanding.*
>
> —Plato[26]

> *When you understand all about the sun and all about the atmosphere and all about the rotation of the earth, you may still miss the radiance of the sunset.*
>
> —Whitehead[27]

For ancient poets like Homer, the sun was a being of tremendous spiritual significance. The immense beauty of its rising and setting brought forth a dramatic display of the abiding moral harmony underlying the cosmos. For ancient philosophers like Plato, the sun was similarly a sign of the highest Good, but its visible light was thought to be only partially responsible for the shower of colors drenching earth and sky. Participating in the sunlit phenomena of the outer world was an inner noumenal light emanating from the eyes. Plato suggested that this inner light flows gently outward through the eyes from a psychic fire kindred to that animating the sun. It meets and coalesces with the light of the sun (or at night, the moon and stars) to bring forth the beauty and splendor of the universe.[28] Plato's was a participatory account of our knowledge of nature, such that soul and world were understood to synergistically intermingle in each act of perception. He considered the eyes the noblest of the senses,

> source of supreme benefit to us, in that none of our present statements about the universe could ever have been made if we had never seen any stars, sun, or heaven. As it is, however, our ability to see the periods of [the heavens] has led to the invention of number, and has given us the idea of time and opened the path to inquiry into the nature of the universe.[29]

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[25]Homer, *The Odyssey,* trans. Robert Fitzgerald (Garden City, New York: Doubleday, 1961), bk. 3, lines 1-4.

[26]Plato, *Timaeus,* 47b-c.

[27]*Science and the Modern World*, 178.

[28]Plato, *Timaeus,* 45a-d.

Not only was Plato's cosmology inclusive of perceptual experiences in its definition of nature, it felt divine *eros* and saw eternal *eidos* at work throughout the cosmos. The circling stars, sun, and moon were considered to be living gods, humanity's wisest teachers. In his survey of European history, Whitehead places Plato at the center of the first great period of intellectual development, a period with deep influences on all subsequent thought.[30] In the main, Plato's cosmological scheme and account of visual perception, as articulated most profoundly in the dialogue *Timaeus*, reigned among Europe's intelligentsia for more than 1,500 years.[31] It was not until the height of the scientific revolution in the 17th century that his participatory premises were rejected by the next wave of great geniuses.

"In the year 1500," writes Whitehead, "Europe knew less than Archimedes who died in the year 212 BCE."[32] The commonsense assumption of a person living in 1500 was that Earth stood stationary at the center of a sacred series of eternally circling heavenly hosts. Below the moon, four elements composed everything; above it, something far subtler was thought to be at work. "Yet in the year 1700," continues Whitehead, "Newton's *Principia* had been written and the world was well started on the modern epoch."[33] The new analytic methods of Descartes, Galileo, and Newton succeeded in breaking the bond between the numinosity of the soul and the phenomenality of the world, bifurcating nature into two distinct substances, the material and the mental. Humanity's understanding of its relationship with the universe underwent a fundamental transformation.

Three hundred years later, despite the evidences of modern physical science, the average 21st century person still unhesitatingly refers to the setting of the sun, to the red hues of its surrounding sky, and to the waning of its warmth as it sinks beneath the horizon. From the perspective of the well-trained mathematical physicist, such a person's commonsense is mistaken: the sun does not set, nor is it warm, nor is its ambiance red. Its sinking, like its warmth and color, are only subjective appearances, artifacts of our perception and not facts of nature. "If the living creature were removed," argued Galileo, the first to formalize nature's bifurcation in terms of primary physical and secondary psychical characteristics, "all these qualities would be wiped away and annihilated."[34] The warmth and hue of a sunset, continues

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[29]Ibid., 47a

[30]*Science and the Modern World*, 38.

[31]Arthur Zajonc, *Catching the Light: The Entwined History of Light and Mind* (New York: Oxford University Press, *1993), 21.* Plato's cosmology's only serious challenger was Aristotle.

[32]*Science and the Modern World*, 13.

[33]Ibid.

[34]Galileo Galilei, "Excerpts from The Assayer," trans. Stillman Drake, in *Discoveries and Opinions of Galileo* (New York: Doubleday, 1623/1957), 274.

Galileo, "are no more than mere names so far as the object in which we locate them are concerned."[35] They reside not in the essential nature of the cosmos, but in the arbitrary names of consciousness. Plato's insight into the erotic coupling of inner/spiritual light with outer/physical light has been degraded into the dualistic modern theory of "two natures . . . one the conjecture and the other the dream."[36] Scientific materialism, in other words, has come to oppose our personal experience of nature (the dream) to an abstract model of nature theorized to be the impersonal cause of that experience (the conjecture).

Following upon Galileo's initial bifurcation of nature, Descartes brilliantly articulated the ontological and epistemological underpinnings of modern scientific materialism. The eclipse of the illusory geocentric cosmos by the mathematical elegance of Copernicus' heliocentric model (as improved upon by Kepler) made it clear to Descartes that sensory perception could not be trusted for scientific purposes. Science was to become the study of the mechanisms of the extended things (*res extensa)* of nature, a study guided by the exact mathematical measurement of primary qualities like length, width, height, mass, and motion. Religion, on the other hand, was to retain responsibility for shaping the unearthly substance of the soul, providing moral guidance for existentially troubled thinking things (*res cogitans)* like us. Secondary qualities like color, sound, and taste were left to the free play of artists to be combined and recombined for the purpose of heightening the pleasure of appearances, rather than penetrating deeper into the archetypal dimensions of reality.[37]

In the intervening years since the scientific revolution, a new civilization guided by the ideals of the Enlightenment has taken root on every continent. By 1850, the values of industrial capitalism, justified by the mechanistic cosmology of scientific materialism, had infected much of the Western world, forever altering traditional forms of agriculture, manufacturing, transportation, communication, and religious practice. "[All] thought concerned with social organization," writes Whitehead,

> expressed itself in terms of material things and of capital. Ultimate values were excluded. They were politely bowed to, and then handed over to the clergy to be kept for Sundays. A creed of competitive business morality was evolved . . . entirely devoid of consideration for the value of . . . life. The workmen were conceived as mere hands, drawn from the pool of labor. To God's question, men

[35]Ibid., 274.

[36]Alfred North Whitehead, *The Concept of Nature* (Cambridge: Cambridge University Press, 1964), 31 (originally published 1920).

[37]Prior to the differentiation of art, science and religion in the modern period, art served primarily a religious function as a sort of window from the earthly into the archetypal realm. See *Science and the Modern World,* 20. Art also served science by mastering perspective, allowing for realistic representations of nature. See Ibid., 45.

> gave the answer of Cain– "Am I my brother's keeper?"; and they incurred Cain's guilt.[38]

Today, at the peak (if not the beginning of the decline) of humanity's technoscientific mastery over nature, a coherent cosmology capable of guiding the adventure of civilization safely into the next millennium is just beginning to take root. Still, our knowledge remains fragmented, our society teetering on the brink of self- and world-destruction. What seemed like the cure for all ignorance in the 17th century has since become a curse. Our technoscientific way of knowing– constructed on the metaphysical assumption of the bifurcation of subject and object, fact and value, meaning and matter–threatens the continued existence of the community of life on Earth.

Beginning in the early 1920s, Whitehead interrogated modern science and industrialism, not to dismiss them,[39] but to remind them of what *they* had dismissed. He asks: "What has happened to us?" According to Stengers, this question is not an attempt to condemn scientific materialism for the wayward course of civilization, but is rather

> a resource for telling our stories in another way, in a way that situates us otherwise–not as defined by the past, but as able, perhaps, to inherit from it another way.[40]

Whitehead's creative retrieval of the history of natural philosophy is organized around a new concept of nature and a novel way of framing the activity of science. Instead of construing the task of science to be that of overcoming subjective illusion in order to reach objective reality, as many modern thinkers have done, Whitehead takes the speculative risk of defining nature otherwise: nature becomes, quite simply, "what we are aware of in perception."[41] "Everything perceived is in nature," says Whitehead, "We may not pick and choose."[42] This reframing of science's understanding of nature cannot be judged as "true" or "false" *a priori*; to judge it fairly, we must first trust it enough to take the "leap of the imagination"[43] it implies, waiting eagerly to see in what way it transforms experience. Passing judgment on the veracity of Whitehead's new concept of nature requires first deploying it, experimenting with its effects in the world, establishing its relevance to the values of actual life. Materialist enemies of his

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[38]Ibid., 181.

[39]"I assume as an axiom that science is not a fairy tale." *Concept of Nature*, 40.

[40]*Stengers,* 14.

[41]*Concept of Nature,* 28.

[42]Ibid., 29.

[43]*Process and Reality, 4.*

philosophy tend to lack the negative capability[44] required to pursue the consequences of Whitehead's unbifurcated image of the universe; they refuse to pay attention to what Whitehead's concepts make important. Instead, they remain bound within the limits of the same old poorly composed problems (e.g., "how does the brain secrete consciousness?", or "what sort of thing is curved space-time?"). Whitehead's cosmology and philosophy of science require the invention and deployment of novel concepts of space, time, causality, and consciousness. These concepts pose new problems for science, allowing it to become attentive to the relevance of both quantitative patterns *and* qualitative perceptions in the passage of nature, releasing it from the irrational and polemical desire to replace concrete experience with abstract explanation. In this sense, Whitehead's scientific method can be compared with Goethe's "gentle empiricism," which similarly rejected mechanical explanations, instead pursuing nature's reasons by learning to participate more fully in the archetypal patterns interwoven with experience itself.[45] "The divergence of [scientific] formulae about nature from the appearance of nature," argues Whitehead, "has robbed the formulae of any explanatory character."[46]

Equipped with a new kind of science, we can ask again, "What has happened to us?" We must be sensitive to both what Whitehead's concept of nature discloses and what it makes recede into shadow. In what way does it transform the adventures of science and civilization? What becomes important when the task of natural philosophy is not to explain away value, meaning, and subjectivity at all costs, but rather to avoid the bifurcation of nature at all costs? Whitehead's new concept of nature, should we commit ourselves to it, implies that

> the red glow of the sunset should be as much part of nature as are the molecules and electric waves by which men of science would explain the phenomenon.[47]

Whitehead's reframing of the task of science together with his redefinition of nature should not be construed as the imposition of limitations upon scientific knowledge. His aim is not to restrict what science can know, but to remind science what it already knows, and what its knowledge presupposes. By defining nature as "what we are aware of in perception," Whitehead explicitly brackets "mind" (i.e., "that which perceives") from nature. This bracketing is done in order to avoid struggling to answer badly formulated problems, such as the so-called "hard problem" of how the brain produces the mind. Posing such a problem immediately drags

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[44]"Negative Capability, that is, when a man is capable of being in uncertainties, mysteries, doubts, without any irritable reaching after fact and reason." John Keats' letter to his brothers, December 22, 1817; available at http://www.poetryfoundation.org/learning/essay/237836?page=2 (accessed December 20, 2014).

[45] Arthur Zajonc, *Catching the Light: The Entwined History of Light and Mind* (New York: Oxford University Press, 1995)*, 203.*

[46]*Modes of Thought, 154.*

[47]Ibid.

science into metaphysics, into reflection upon "both what is perceived and what perceives."[48] Metaphysics seeks after the nature of nature beyond what we are aware of in perception, and so pursuing such questions would negate the speculative wager whose consequences for experience Whitehead's philosophy of science is trying to spell out. For now, says Whitehead, "we leave to metaphysics the synthesis of the knower and the known."[49] Later in his philosophical career, when he turns to full blown cosmological speculation, Whitehead will be forced to tackle such metaphysical issues; but in his early philosophy of science, he keeps his eye on the prize: a coherent foundation for our scientific knowledge of nature. From Whitehead's re-imagined point of view, the questions of science "do not enable [it] to formulate the problem of the 'mind' because these questions and their answers presuppose it."[50] Science is a way of knowing nature; therefore, the pursuit of knowledge of nature presupposes that there is a knower, i.e., a mind.

> Knowledge is ultimate. There can be no explanation of the "why" of knowledge; we can only describe the "what" of knowledge.[51]

If science is going to commit itself to the pursuit of knowledge of nature, there can be no going behind knowledge to explain it by some more fundamental activity (e.g., neurochemistry). The possibility of scientific explanation cannot itself be scientifically explained. Whitehead's decision to bracket mind from what we are aware of in perception is not the same as the materialist's decision to bifurcate nature into primary (physical-scientific) and secondary (psychological-aesthetic) qualities. Instead of turning science against commonsense experience through "heroic feats of explaining away,"[52] Whitehead defines the truth of science in terms of its experimental achievements and experiential disclosures.[53] The numinous glow of the sunset as experienced by the poet comes again to be rooted in nature, no less an aspect of what we come to be aware of in perception than the wavelengths of the photons detected by the sophisticated instrumentation of the physicist. The data of science, no matter how abstract and seemingly removed from everyday experience, must ultimately be translatable back into

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[48]*Stengers*, 34-36.

[49]Ibid., 49; *Concept of Nature* 28.

[50]*Stengers*, 35

[51]*Concept of Nature*, 32.

[52]*Process and Reality, 23.*

[53]Or in William James' terms (a major influence on Whitehead), scientific truth becomes subject to the tests of pragmatism and radical empiricism, respectively.

some operational technique or direct observation. "If the abstractions [of science] are well-founded," says Whitehead,

> that is to say, if they do not abstract from everything that is important in experience, the scientific thought which confines itself to these abstractions will arrive at a variety of important truths relating to our experience of nature.[54]

The "photon," for example, is not just an invention of the physicist, nor is it simply a fact of nature. The photon is what the physicist has come to be aware of in his or her perception of light as a result of certain replicable experiments, laboratory technologies, theoretical images, and mathematical equations. The photon, as a scientific-object, is said to be abstract only in that it cannot be grasped in isolation from the "whole structure of events" or "field of activity" (i.e., the creative advance of nature) to which it belongs and through which it endures.[55] From the perspective of Whitehead's philosophy of science, the abstract will never be able to offer a satisfactory explanation for the concrete.[56] The wavelength of a photon does not explain the perception of redness, nor does even a connectionist model of neurochemistry explain the artist's aesthetic encounter with a beautiful sunset. Whenever scientific materialists try to provide such heroic explanations, they succeed only in offering descriptive commentaries in terms of the scientific objects most fashionable in their time–commentaries that presuppose the very thing they pretend to have explained away: consciousness. The only valid method of explanation from Whitehead's point of view is the reverse of the materialist's, an explanation which traces the genesis of abstractions back to the concrete consciousness and perceptual presences from which they emerged.[57] A science that seeks to explain the concrete by way of the abstract all too easily falls prey to a form of knowledge production whose adequacy is judged instrumentally, i.e., in terms of its capacity to *transform* and *control* nature, rather than ecologically, i.e., in terms of its capacity to *understand* and *relate* to nature.

Whitehead's aim in pursuing the philosophy of science was largely in service of pragmatic experience and commonsense: he sought to leap across and straddle the fissure bifurcating nature into the facts of physical reality on the one side and the values of psychical appearance on the other.[58] In order to achieve this end, he struggled to imagine a participatory mode of attending to nature–a nature no longer objectified into the inert stuff instrumentally manipulated by an alienated technoscientific mode of knowing. Instead, Whitehead sought to disclose nature to awareness as a community of relationships shaped by the social desires and individual decisions of living organisms. Organisms cannot be characterized merely by mass, extension, and velocity; they are creatures enjoying the value of their own experience, which

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[54] *Science and the Modern World*, 58.

[55] *Concept of Nature,* 170-171.

[56] *Stengers*, 99.

[57] Ibid., 110.

[58] Ibid., 38.

itself is initially inherited from the feelings of others. Contrary to Galileo, Descartes, and Newton, Whitehead's vision of the cosmos is ecological: the final real things are individual living organisms, each dependent on their relationships to others for their continued existence as themselves.

By the late 1920s, Whitehead had given up on the problems that framed his earlier inquiry into the philosophy of science in order to pursue the riskier adventure of metaphysics. "Riskier" because "the recourse to metaphysics is like throwing a match into the powder magazine. It blows up the whole arena."[59] For the later, more explicitly metaphysical Whitehead, "mind" can no longer be bracketed from a neatly delimited "nature." The imaginative enjoyment of the poet and the intellectual reflection of the theoretician resulting from the beauty of the setting sun must themselves be understood as ingredient in the creative advance of the universe. Mind must find its foothold in the midst of things themselves, an inhabitant of nature and not its transcendental knower. In the next section, I further unpack Whitehead's venture beyond the philosophy of science into the formidable project of constructing a coherent cosmology justifying the civilized phases of human society.

[59]*Concept of Nature*, 29.

WHITEHEAD'S ONTOLOGY OF ORGANISM

> *Lo! keen-eyed, towering Science!*
> *As from tall peaks the Modern overlooking,*
> *Successive, absolute fiats issuing.*
>
> *Yet again, lo! the Soul -- above all science;*
> *For it, has History gather'd like a husk around the globe;*
> *For it, the entire star-myriads roll through the sky.*
>
> *In spiral roads, by long detours,*
> *(As a much-tacking ship upon the sea,)*
> *For it, the partial to the permanent flowing,*
> *For it, the Real to the Ideal tends.*
>
> *For it, the mystic evolution . . . .*
>
> —Walt Whitman[60]

> *Everything happens for the first time, but in a way that is eternal.*
>
> —Jorge Luis Borges[61]

From Whitehead's perspective, a successful cosmological scheme should aim to exhibit itself "as adequate for the interpretation of . . . the complex texture of civilized thought."[62] To this end, the cosmologist's central motivation must be

> to construct a system of ideas which brings the aesthetic, moral, and religious interests into relation with those concepts of the world which have their origin in natural science.[63]

Already an important difference can be marked between contemporary scientific cosmology and Whitehead's more philosophical (and cosmotheandric) approach to cosmologizing. Following his metaphysical turn in the late 1920s, Whitehead sought nothing less than the integration of our artistic, religious, and scientific intuitions into one general scheme of thought. The typical aim of the modern scientific cosmologist, even when they claim to be pursuing a "grand unifying theory," or "theory of everything," is obviously far less integral in

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[60]Whitman, "Song of the Universal," in *Leaves of Grass* (New York: Barnes and Noble Classics, 1892/2004), 380.

[61]Jorge Luis Borges, "Happiness," trans. Stephen Kessler, in *Selected Poems*, ed. Alexander Coleman (New York: Penguin, 1999), 441-42.

[62]*Process and Reality*, xi.

[63]Ibid., xii.

scope: only the empirico-mathematical features of the physical world are given systematic treatment, while everything else, no matter its importance to civilized human life, is, at best, bracketed as irrelevant, and at worst, explained away as illusory. The specialized operational/instrumental methods of contemporary scientific cosmology have allowed it to precisely measure and carefully dissect much of the known world, but the materialistic ontology providing its imaginative background has lead it to "exclude itself from relevance to the ordinary stubborn facts of daily life."[64] For example, average law-abiding citizens must go about their day under the assumption that they bear some responsibility for their actions, despite the fact that materialistic interpretations of neuroscience leave no room in the brain for anything remotely resembling consciousness, much less free will. Scientific materialism leaves us in the impossible position of having to affirm in theory what we are unable to deny in practice.

Whitehead had little doubt that the technological applications of modern science would continue to transform civilization. Technologically speaking, science is only becoming more intensely relevant to daily life. Indeed, the technological applications of science have come to dominate not only human life, but the entire Earth community. It cannot be denied that the increase in physical power which has resulted from rapid technoscientific advance has afforded civilization the opportunity for social betterment; but it has also brought us perilously close to destroying ourselves.[65]

"It may be," says Whitehead,

> that civilization will never recover from the bad climate which enveloped the introduction of machinery . . . . The world is now faced with a self-evolving system, which it cannot stop.[66]

As was discussed earlier, modern technoscience has excelled at transforming and controlling what it has not adequately understood and cannot morally or aesthetically appreciate. The scientistic presupposition that "matter in motion is the one concrete reality in nature," such that "aesthetic values form an . . . irrelevant addition," has proven itself to be an error of disastrous proportions.[67] It is precisely this materialistic ontology and its accompanying instrumentalist epistemology that Whitehead's cosmological scheme endeavors to re-imagine. Instead of pursuing science in abstraction from the values of earthly life, Whitehead's cosmology seeks to replace the traditional scientific conception of *mechanism,* along with the traditional religious conception of *deism,* with a novel conception of *organism.* With mechanistic substance as its foundational concept, modern science's bifurcation of nature into

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[64] *Process and Reality*, xiii.

[65] *Science and the Modern World*, 182-183.

[66] Ibid., 181,183.

[67] Ibid., 182.

objective natural facts and subjective human values is inevitable. With a conception of organic process as his starting point, Whitehead is able to articulate a cosmology whose details elucidate, rather than eliminate, the common sense values of civilized life, such as moral responsibility, aesthetic appetition, and veritable knowledge (or goodness, beauty, and truth, respectively).

"If nature really is bifurcated," argues another of Whitehead's contemporary interpreters, Bruno Latour,

> no living organism would be possible, since being an organism means being the sort of thing whose primary [physical] and secondary [psychical] qualities–if they exist–are endlessly blurred.[68]

Whitehead's philosophy of organism rejects the bifurcation of such qualities, as well as any type of arbitrary ontological dualism. Nonetheless, it must be admitted that the widespread acceptance of dualism during the modern period implies that, as an abstract scheme, it can prove elucidatory of the texture of experience in some instances. Whitehead criticizes Descartes' mind/ matter dualism for its incoherence due to excessive abstraction, but adds that "[his] system obviously says something that is true."[69] Whitehead appropriates much from the modern natural philosophical tradition, all the while keeping in mind that "the chief error in philosophy is overstatement."[70] By way of his method of imaginative generalization, Whitehead is lead to experimentally construct[71] an alternative cosmological scheme that is ultimately rooted in *creative process,* rather than *static substance,* and whose fundamental categories are *actual occasions, prehensions,* and *eternal objects,* rather than *minds, representations,* and *matter.* The dualistic Cartesian problematic is not thereby eliminated or explained away; rather, it is transformed.[72] The relationship between actual occasions and eternal objects is no longer one of *duality,* where neither kind of entity requires the other in order to exist, but of *polarity,* such that the being of eternal objects cannot be grasped in abstraction from the becoming of actual occasions, or vice versa. Whitehead avoids the modern bifurcation of nature (which restricts experiential value only to the human sphere and relegates everything non-human to the status of "vacuous actuality"[73]) by recognizing that every organic occasion or ecosystem of occasions–whether it be an electron, a bacterial

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[68]Bruno Latour, foreword to *Stengers*, xiii.

[69]*Process and Reality, 6.*

[70]Ibid., 7.

[71]His method is experimental in that it redesigns the philosophical instrument of language "in the same way that, in physical science, pre-existing appliances are redesigned." Ibid., 11.

[72]Ibid., 108.

[73]The bifurcation may be thus *anthropocentric,* or it may, when pressed, become *biocentric,* such that it restricts value to the biological sphere, thereby denying it to the physical or cosmic as such.

colony, a sequoia, a bottle-nosed dolphin, a human civilization, a star, or stellar society (a galaxy)–is constituted by both a physical pole inheriting the feelings of realized actual facts and a mental pole anticipatory of realizable eternal possibilities.

As for the special significance of the human sphere, the *conscious* mental pole of "high grade" organisms like Homo sapiens is said to be so advanced in *degree* that it appears also to become different in *kind.* Whitehead is able to preserve what is elucidatory in the binary theocosmic or cosmoanthropic formulations of reality while at the same time jettisoning the substantialist ontology that would draw them back into the modern bifurcation dissecting the living body of the cosmos straight down the middle.[74] The philosophy of organism avoids having to invoke incoherent accounts of the emergence of mind from matter, or value from vacuity, by recognizing that conscious human experience is only a special case of a more general, or cosmic, mode of experience. For Whitehead, to exist at all is already to experience, and to experience is to value:

> Realization is . . . in itself the attainment of value. . . . Aesthetic attainment is interwoven [with] the texture of realization.[75]

While the orthodox materialistic natural philosophy begins by assuming the two independently existing substances, mind and matter–where material objects are modified by external relations of locomotion, and mental subjects are modified by internal (or private) cogitations representative of external (or public) objects–Whitehead's philosophy of organism begins with "the analysis of process as the realization of events disposed in an interlocked community."[76] Actual occasions, as the final realities of which the universe is composed, are self-creating buds of experience, each one uniquely itself even while it remains internally related to every other occasion in the creative community of the universe. Occasions are interrelated by way of the pattern of eternal objects characterizing for each of them the qualitative aspects of the other occasions in their community. Eternal objects "interpret [occasions], each to the other,"[77] such that they come to find themselves related to one another in an extended space-time continuum according to certain invariant geometric principles,[78] principles which are explored in a subsequent section in the context of a discussion of Whitehead's philosophical critique of Einstein's relativity theory.

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[74]*Science and the Modern World*, 132.

[75]Ibid., 89-90.

[76]Ibid., 138.

[77]Ibid., 137.

[78]Ibid., 145.

"The solidarity of the universe," writes Whitehead, "is based on the relational functioning of eternal objects."[79] As relational entities, eternal objects cannot themselves *cause* actual occasions, they can only characterize the *how* of prehension. "[Eternal objects] are adverbial, rather than substantive," according to Whiteheadian interpreter Steven Shaviro, in that "they determine and express *how* actual [occasions] relate to one another, take one another up, and 'enter into each other's constitutions.'"[80] Each actual occasion is, in this sense, nothing but the multiplicity of prehensions of other occasions (as characterized adverbially by eternal objects) which it unifies. But in another sense, as a self-unifying creature, an occasion not only prehends and reiterates the realized spatiotemporal pattern of the settled past, it adds a new value (itself) to the ongoing evolution of the universe. Whitehead coined the term *concrescence* to refer to the "production of novel togetherness" resulting from the completed satisfaction of each occasion of experience.[81] By way of concrescence, a particular actual occasion's many prehensions of other occasions becomes one, thereby adding one more realized unity of experience to the ongoing creative advance of the cosmic community: "The many become one, and are increased by one."[82]

It is important not to think of prehension resulting in an actual occasion "having" experience of other occasions, as though an occasion were "the unchanging subject of change."[83] This would inevitably lead back to the classical, bifurcated conception of mental subjects qualified by their private representations of supposedly public material objects. "If this be granted," argues Whitehead, "there is no escape from solipsism."[84] It was only by arbitrary recourse to the goodness of an omnipotent God that Descartes was able to re-establish any meaningful epistemic connection between ideas in the soul and matters of fact in nature. For the philosophy of organism, an actual occasion is not a pre-existent subject qualified by its representations of ready-made objects; rather, an occasion is better characterized as a dipolar "subject-superject."[85] The "subject" phase of a concrescing occasion emerges from the prehensions of antecedent occasions which it unifies, while in the "superject" phase the occasion, having attained satisfaction as a unified drop of distinctly patterned experience, immediately perishes into "objective immortality," such that it can be prehended by subsequently concrescing actual occasions. Whitehead expresses the perpetual perishing of

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[79]Ibid., 137.

[80]Steven Shaviro, *Without Criteria: Kant, Whitehead, Deleuze, and Aesthetics* (Cambridge: The MIT Press, *2009), 37;* quoting *Process and Reality, 148-149.*

[81]*Process and Reality*, 21.

[82]Ibid.

[83]Ibid., 29.

[84]*Science and the Modern World*, 137.

[85]*Process and Reality, 29.*

subjectivity into objective immortality in terms of his "principle of relativity," such that "it belongs to the nature of a 'being' that it is a potential for every 'becoming.'"[86]

Actual occasions, then, are describable in two ways, as "being" and as "becoming." These ontological designations are not independent, since, according to Whitehead's correlative "principle of process," an occasion's "being" arises from its "becoming": *"how* an actual [occasion] *becomes* constitutes *what* that actual [occasion] *is*."[87] The description of an occasion according to its genetic "becoming" provides an account of the occasion's own subjective aim (its final cause), while the description according to its extensive "being" provides an account of its superjective effect as prehended by other occasions beyond itself (its efficient cause).

By conceiving of the basic constituents of the world as unified prehensive processes of causal inheritance and conceptual anticipation, rather than static, isolated substances qualified by accidental predicates, Whitehead is able to preserve the unique identity of each individual organism without at the same time so exaggerating their separateness that continuity with the larger ecosystem of other organisms is broken.

Thus far, my account of the fundamentals of Whitehead's philosophy of organism has been rather abstract, which is to say purely *metaphysical;* but before moving on to further explicate its implications in the context of contemporary *physical* theory, it may be helpful to examine exactly what role *abstraction* itself plays in Whitehead's cosmological scheme.

"In any occasion of cognition," says Whitehead,

> that which is known is an actual occasion of experience, as diversified by reference to a realm of entities which transcend that immediate occasion in that they have analogous or different connections with other occasions of experience.[88]

Whitehead here makes reference to the realm of "eternal objects," or "pure potentials," which "connote a kind of cosmic geometrical/genetic code."[89] The eternal objects contribute to the definiteness of actual occasions without themselves being reducible to the experience of any particular occasion, since "eternal objects are the same for all actual [occasions]."[90] Many contemporary thinkers, laden with the nominalistic presuppositions of the modern age, come to Whitehead's metaphysics expecting everything to be explained according to immanent

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[86]Ibid., 22.

[87]Ibid., 23.

[88]*Science and the Modern World, 142-143.*

[89]Catherine Keller, *Face of the Deep: A Theology of Becoming* (London: Routledge, 2003), 198.

[90]*Process and Reality*, 23.

process alone. They are surprised by his introduction of the hierarchy of eternal objects, not to mention the divinity envisaging it, both of which can at first seem to be rather *ad hoc* additions to his cosmology. Whitehead introduces them, however, with the aim of maintaining the overall coherence of his scheme. He writes:

> It is the foundation of the metaphysical position which I am maintaining that the understanding of actuality requires a reference to ideality. The two realms are intrinsically inherent in the total metaphysical situation.[91]

Once again displaying his allegiances both to mathematical physics and to poetry, Whitehead recognizes that "the interfusion of events" constituting cosmogenesis participates in eternity as much as time, being infected as much by the values of actual nature as by the ghostly traces of "colors, sounds, scents, [and] geometrical characters . . . required for nature and . . . not emergent from it."[92] Only actuality has value, but in order for "actual value" to find its metaphysical definition, some reference to the adjacent possibilities provided by ideality is necessary. Each actual occasion of experience realizes itself as a complex unity of valued patterning; this patterning displays itself as a subjective harmonization of the prehended superjective values achieved in the occasion in question's causal past. The experiential achievement of some more or less complex unity of patterning is only felt as valuable to the occasion which realizes it because this occasion simultaneously feels, via the divinely envisaged gradation of the infinite set of eternal objects as they are relevant to its unique situation, those definite possibilities which remain abstract because unrealized in its concrescence. In other words, a drop of experience

> is decisive in proportion to the importance (for it) of its untrue propositions: their relevance to the [occasion] cannot be dissociated from what the [occasion] is in itself by way of achievement.[93]

Each occasion becomes what it is by not being what it isn't. Whitehead is able to avoid a dualism between actuality and ideality by showing how the realization of definite concrete values requires the ingression of what "is not" alongside the prehension of "what is." In this sense, the prehension of actuality and the ingression of possibility cannot be defined in isolation.[94] Each must require the other if a coherent account of both the solidarity and the separability of the universe is to be articulated. Eternal objects have a "twofold role," in that they both relate occasions to each other (allowing the creative many to become the one created universe) and unify occasions for themselves (allowing the one universe to become

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[91] *Science and the Modern World*, 143.

[92] Ibid., 97.

[93] Ibid., 143.

[94] *Stengers*, 189.

many again). The open-ended creative advance of the actual universe in this way depends on both conjunction and disjunction, both unification and differentiation.[95]

Having crowned creativity "the universal of universals characterizing ultimate matter of fact," Whitehead needed to account for the unique character of more mundane matters of fact (i.e., finite actual occasions). How is the infinite creativity conditioning the universe to be canalized into the decisive prehensions and relevant evaluations characterizing the concrescence of each of its unique, finite creatures? To answer this question, Whitehead was lead to bring forth a novel concept of divinity. The only difference between God and every other actual occasion is that divine experience appears to occur in the reverse direction to that of finite experiences, such that God's mental pole is primary while God's physical pole is consequent.[96] God's mental pole is described as the primordial creature of creativity, the first act of unfettered conceptual valuation responsible for ordering the realm of eternal objects. God is thus simultaneously a creature of Creativity and, by its persuasive influence on the decisions of finite actual occasions, a condition limiting the otherwise chaotic potency of Creativity.

> By reason of this complete valuation, the objectification of God in each derivate actual [occasion] results in a graduation of the relevance of eternal objects to the concrescent occasion in question. . . . Apart from God, eternal objects unrealized in the actual world would be relatively non-existent for the concrescence in question.[97]

God, as the "primordial superject of creativity," is the first fact giving any definite face to the otherwise impersonal creative advance. God's primordial nature assures that every finite occasion of experience subsequent to God's initial act of envisagement includes in its physical prehension of the actual world a conceptual prehension of the realm of possibilities *as relevant to it*. In this way, those abstract potentials remaining as yet unrealized in a particular occasion's actual world nonetheless find their definite relation to that occasion and its world without having to float into their situation from nowhere.[98] According to Whitehead's "ontological principle," "the general potentiality of the universe must be somewhere . . . this 'somewhere' is the non-temporal actual entity": God.[99]

As was already mentioned, God is a dipolar actual occasion like every other, "finding [itself] in the double role of [agent] and [patient] in a common world."[100] God's primordial envisagement

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[95]*Process and Reality*, 21.

[96]Or perhaps it is finite experience that appears backwards?

[97]*Process and Reality*, 31.

[98]Ibid., 32.

[99]Ibid., 46.

[100]Ibid., 315.

of eternal objects occurs in abstraction from finite actual occasions; it is accomplished by God alone. As such, the primordial aspect of God's nature remains deficient in actuality. While the abstract order of creation depends upon God's agential "adjustment of the togetherness of eternal objects," the concrete values of creation depend upon the "infinite patience" of God's consequent pole, God's "tender care that nothing be lost."[101] God experienced in full concreteness (i.e., as a living, cosmic personality) is not the distant unmoved mover or all-powerful creator of traditional religious metaphysics, but the poet and lover of the world, "the fellow-sufferer who understands."[102] Whitehead's imaginative description of God has more in common with the intermediary World-Soul of Plato's *Timaeus* than it does with the "wholly transcendent" Jehovah of Newton's *Scholium*, "creating out of nothing [by fiat] an accidental universe."[103] I continue the comparison between Whitehead's God and Plato's World-Soul in the final section of this essay. The next section concerns the relevance of Whitehead's philosophy of organism to evolution, relativity, quantum, and complexity theories, each in turn.

[101]Ibid., 346.

[102]*Process and Reality*, 346, 351.

[103] Ibid., 95.

WHITEHEAD AND CONTEMPORARY SCIENTIFIC THEORY

> *The general principles of physics are exactly what we should expect as a specific exemplification of the metaphysics required by the philosophy of organism.*
>
> —Whitehead[104]

Since its eruption in the 17th century, modern science has instigated profound re-orientations in the outlook and self-conception of European civilization. More recently, in the last century and a half, various discoveries have forced upon science the need for no less fundamental a transformation of its own presupposed materialistic-mechanistic ontology. This transformation, understood in the light of Whitehead's organic ontology, is the focus of this section. To begin, let us take stock of what has happened: In 1859, Darwin published *On the Origin of Species*, wherein he described, according to the special abstractions proper to biology, a process which would later come to be known more generally as the theory of evolution:

> There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.[105]

In the early 1880s, while Whitehead was still a student of mathematics at Cambridge, "physics was supposed to be nearly a closed subject," with just a few minor details left to be explained in terms of Newton's fundamental principles. "No one sensed what was coming," according to Whitehead: "By 1900, the Newtonian physics were demolished, done for!"[106] The whole notion of fixed laws of nature imposed upon the behavior of ready-made material particles in absolute time and space, which Darwin's mechanistic biology took for granted as its foundation, had been called into question by relativity and quantum theories. "The appeal to mechanism on behalf of biology," wrote Whitehead in 1925,

> was in its origin an appeal to the well-attested self-consistent physical concepts as expressing the basis of all natural phenomena. But at present there is no such system of concepts.[107]

Arguably, almost a century after Whitehead's remark, physical science still lacks anything approaching such a systematic account of nature. While several candidate theories uniting relativistic and quantum effects have been proposed, due to lack of empirical confirmation or mathematical coherence, none of them has succeeded in garnering the widespread support of

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[104] Ibid., 116.

[105] Charles Darwin, *The Origin of Species* (New York: Barnes and Noble Classics, 1859/2004), 384. Darwin added the words "by the Creator" in the second edition.

[106] Lucien Price, *The Dialogues of Alfred North Whitehead* (New York: Mentor, 1954), 277.

[107] *Science and the Modern World*, 97.

the physics community. Quantum electrodynamics (QED) is generally understood to have successfully unified quantum mechanics with at least special relativity, but because it leaves out gravitational effects, and because its approach remains largely *instrumental*, it does little in the way of providing a truly unifying theory of nature.[108] According to physicist Leon Lederman,

> Gravity is our number one problem as we attempt to combine particle physics with cosmology. . . . Here we are like the ancient Greeks, waiting and watching for something to happen, not able to experiment. . . . Without bringing the gravitational force into the family of quantum forces, we'll never understand the details of the Big Bang or, in fact, the deep, deep structure of elementary particles.[109]

Though it remains mechanistic in orientation, QED, unlike 19th century physics, can longer claim that its mechanical accounts reflect a reality independent of its experimental instruments. What was originally a mechanistic *ontology* meant to explain nature has become a mechanistic *epistemology* meant to operationally describe it; as a result, metaphysical realism in science has devolved into nominalism. This allows instrumentalist approaches to quantum mechanics to avoid the philosophical challenge of having to integrate the spooky paradoxes of wave/particle duality and non-locality into their hypothesized materialist ontology. Instead, as Whiteheadian physicist Michael Epperson suggests, instrumentalists can defer their philosophical failings by invoking the fact that "quantum mechanics is simply a tool used to predict the outcomes of measurements under specific conditions."[110] Even if its mechanistic models cannot be unambiguously proven to reflect the reality of nature in itself, "nature" (whatever it is) can be made, at least under laboratory conditions, to agree with QED's operational predictions to an extremely high degree of statistical accuracy. According to philosopher of science Karl Popper, this instrumentalist mindset among physicists is a result of a lack of respect for the importance of philosophy in framing the way problems are posed in physics: "It is a tradition which may easily lead to the end of science and its replacement by technology."[111]

Supposing a properly physical (if not fully metaphysical) "grand unifying theory" is eventually discovered, there still remains the philosophical problem of unifying physics with biology, psychology, and spirituality. During the latter half of the 20th century, a number of explanatory and descriptive strategies began to be developed in an attempt to tackle aspects of this problem, all of which could be said to fall under the general umbrella of complex systems theory. Many of these scientific approaches to theretofore intractable philosophical problems

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[108]Lederman, *The God Particle: If the Universe is the Answer, What is the Question?* (New York: Mariner Books, 2006), 277.

[109]Ibid., 99.

[110]Epperson, *Quantum Mechanics and the Philosophy of Alfred North Whitehead* (New York: Fordham, 2004), 33.

[111]Karl Popper, *Quantum Theory and the Schism in Physics* (New Jersey: Rowman and Littlefield, 1956), 100.

became possible, not because humanity suddenly developed a finer imagination, but rather because we developed finer technological instruments.[112] Computer modeling now provides scientists with God-like powers of simulation; however, deep philosophical issues remain regarding how such simulations can be said to relate to reality.

Keeping the limits of modeling in mind, the key concept that has arisen out of work on complexity theory is undoubtedly that of *emergence*. Simply defined, emergence is that process by which the components of a system begin to interact in such a way that the behavior of the system *as a system* can no longer be understood by reduction to the sum of its components. Even more succinctly put, emergence is said to have occurred whenever a whole exhibits properties which are greater than the sum of its parts. The most recent attempt to unify the emergent stages of nature by applying the principles of complexity is that of biological anthropologist Terrence Deacon in his book *Incomplete Nature: How Mind Emerged from Matter* (2012). Regarding the history of the concept of emergence, Deacon writes that

> it has been used to describe the way that living and mental processes depend upon chemical and physical processes, yet exhibit collective properties not exhibited by non-living and non-mental processes, and in many cases appear to violate the ubiquitous tendencies exhibited by these component interactions.[113]

Deacon's path-breaking scientific work in this area provides an ideal comparison with Whitehead's philosophy of organism, in that both seek to articulate a processual account of the universe no longer restricted to the efficient causes of strict mechanism, or to the nominalist epistemology of instrumentalism, but open to the creative organic influence of formal and final causality. The two also provide an ideal contrast, in that they each set out to think nature on somewhat different metaphysical footing. Whitehead begins his path by balancing his thinking upon the speculative stance that *experience* pervades the natural world, which is to say that a universally communicated texture of experience links everything in the cosmos.[114] Deacon begins his climb toward knowledge of nature from a somewhat off-kilter panmaterialist posture that assumes experience and value (in his terms, "ententionality") emerge atop a basically purposeless material flux. Despite their differing philosophical presuppositions, it is nevertheless possible to re-interpret Deacon's scientific contribution as a specific application of Whitehead's more general cosmological scheme. In other words, despite Deacon's dissatisfaction with panexperientialism, without something like Whitehead's radical reconstruction of the metaphysical foundations of scientific materialism, Deacon's account of the emergence of biotic and psychic phenomena from physics and chemistry remains literally *incomplete*. Deacon's and Whitehead's approaches are compared and contrasted in more detail in a later subsection. The philosophical commitments differentiating their approaches to the

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[112] *Science and the Modern World*, 107.

[113] Terrence Deacon, *Incomplete Nature: How Mind Emerged from Matte*r (New York: W. W. Norton, 2012), 549.

[114] *Process and Reality*, 4.

emergence of complexity should become clearer if I first unpack Whitehead's startlingly novel interpretations of 20th century physics and his cosmological generalization of evolutionary theory.

The Imaginative Generalization of Evolutionary Theory

> *In the most literal . . . sense the lapse of time is the renovation of the world with ideas. [The universe is] passing with a slowness, inconceivable in our measures of time, to new creative conditions, amid which the physical world, as we at present know it, will be represented by a ripple barely to be distinguished from non-entity.*
>
> —Whitehead[115]

The main outlines of the doctrine of evolution, on Whitehead's reading, must be "[absorbed] as the guiding methodology of all branches of science."[116] Grasping the transdisciplinary significance of evolution requires the "negative capability" mentioned earlier, a willingness to consign oneself to the speculative risks Whitehead's philosophy of organism has proposed for thinking. Because all our knowledge depends upon abstraction, the point is not to avoid it but to do it gently, such that our knowing leaves the concrete life of the world unharmed and intact. Whitehead's contribution to the philosophical integration of the special sciences and their abstract domains of relevance is derived from what he calls his method of "imaginative generalization." Metaphysics is the imaginative attempt to express in language the most general features of experience, and therefore, of nature. Every special science devises its own instruments: the instrument of metaphysics, the science of sciences, is language.[117] Like physics, metaphysics should be undertaken as an experimental practice, only the experiments are to be performed on language itself. "The success of the imaginative experiment," according to Whitehead, "is always to be tested by the applicability of its results beyond the restricted locus from which it originated."[118]

In the case of the connection between evolutionary theory and the new physics, Whitehead's experiment is to imaginatively generalize Darwin's specialized concepts of variability, reproduction, and inheritance, such that evolution comes to describe the activity of self-organizing entities at every scale of nature, no longer just the biological. In this sense, as was mentioned earlier, biology becomes the study of the evolution of the larger organisms, while

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[115]Whitehead, *Religion in the Making* (Edinburg: Cambridge University Press, 2011), 100, 144 (originally published 1926).

[116]*Science and the Modern World*, 101.

[117]*Process and Reality*, 11.

[118]Ibid., 5.

physics becomes the study of the evolution of the smaller organisms.[119] "I am . . . a thoroughgoing evolutionist," says Whitehead,

> Millions of years ago our earth began to cool off and forms of life began in their simplest aspects. *Where did they come from?* They must have existed in potentiality in the most minute particles, first of this fiery, and later of this watery and earthy planet.[120]

Einstein's famous equation $E=MC^2$ demonstrates that "mass [is] the name for a quantity of energy considered in relation to some of its dynamic effects"; this leads, according to Whitehead, to the displacement of matter by energy as the most fundamental concept in physics. But what is energy other than

> the name for the quantitative aspect of a structure of happenings [a structure] that depends on the notion of the functioning of an organism?[121]

That is, if energetic activity is to be understood in its full concreteness, and not just as mathematical functions in an abstract equation, then some reference must also be made to the mental functions of the self-realizing but prehensively interrelated creatures of the actual world (i.e., to purposeful organisms in an ecology). Whitehead explains:

> Evolution, on the materialistic theory, is reduced to the role of being another word for the description of the changes of the external relations between portions of matter. . . . There is nothing to evolve. . . . There can merely be change, purposeless and unprogressive [and] there is material [or energy] which endures. On the organic theory, the only endurances are structures of activity, and the structures are evolved [units of emergent value].[122]

After Whitehead's imaginative generalization, evolution by the reproductive inheritance of variations under selective pressure becomes evolution by the rhythmic propagation, or vibratory reiteration, of actual occasions along historically organized routes, whereby a specific occasion's conformal physical prehensions of past actualities (the cause of structural inheritance) become synthesized with its novel conceptual prehensions of future possibilities (the source of structural variation) into some enduring pattern of experiential value. In other words,

> There is a rhythm of process whereby creation produces natural pulsation, each pulsation forming a natural unit of historic fact.[123]

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[119] *Science and the Modern World*, 97.

[120] Price, 277.

[121] *Science and the Modern World*, 96.

[122] Ibid., 101.

[123] *Modes of Thought*, 88.

These processes of evolutive concrescence "repeat themselves to the crack of doom in the creative advance from creature to creature."[124] Whereas in the Darwinian version of the theory, a pre-existent environment of inert material in empty space is considered to be the sole source of selective pressure, in the Whiteheadian version, organisms are understood to be co-creators of their own environments.[125] Also, whereas in the Darwinian theory the competitive struggle for existence is considered the primary engine of evolution, in the Whiteheadian version, cooperative interaction becomes the essential factor for long-term survival. Wherever resilient ecosystems are found, whether at the atomic, biotic, or anthropic level, it is evident that their success is a result of an association of organisms "providing for each other a favorable environment."[126] Whitehead offers a descriptive example of the evolution of atomic ecologies:

> Thus just as the members of the same species mutually favor each other, so do members of associated species. We find the rudimentary fact of association in the existence of the two species, electrons and hydrogen nuclei. The simplicity of the dual association, and the apparent absence of competition from other antagonistic species accounts for the massive endurance which we find among them.[127]

In the image of the cosmos constructed by the philosophy of organism, evolution comes to refer not only to the process of biological speciation in the earthly mesocosm, but also to wider micro- and macrocosmic ecologies of individualizing energetic activity. Evolution, in its most general outlines, is a theory relevant to the entire scope of cosmic history. Just as Copernicus' heliocentric theory threw Earth into motion, thereby turning the medieval world upside-down, under the new requirements of the evolutionary theory, the sturdy mechanistic cosmos of modernity has been turned inside-out, revealing an organic cosmogenesis creatively advancing through emergent stages of organization. Cosmogenesis, resting on the infinite potential of literally *nothing* (i.e., the quantum vacuum), has since its eruption been rushing toward more and more complex forms of realization over the course of billions of years.

Cosmic evolution began with the "primordial Flaring Forth," after which the earliest generation of primate organisms emerged out of the "cosmic fecundity" of the quantum vacuum.[128] In Whitehead's philosophy of organism, this fecundity finds its place as the ultimate principle of his metaphysical scheme: Creativity. Creativity is "universal throughout actuality," such that it eternally pervades creation to infect each and every one of its creatures with sparks of

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[124] *Process and Reality*, 228.

[125] *Science and the Modern World*, 105.

[126] Ibid., 104.

[127] Ibid., 104-105.

[128] Brian Swimme and Thomas Berry, *The Universe Story: From the Primordial Flaring Forth to the Ecozoic Era, A Celebration of the Unfolding of the Cosmos* (San Francisco: Harper, 1992/1994), 21.

potentiality.[129] As the geologian Thomas Berry and the evolutionary cosmologist Brian Swimme suggest,

> Though the originating power gave birth to the universe fifteen billion years ago, this realm of power is not simply located there at that point in time, but is rather a condition of every moment of the universe, past, present, and future.[130]

In Whitehead's scheme, even God is creaturely, and therefore conditioned by the power Creativity. As discussed in the last section, Creativity is also conditioned or concretized in turn by God's all-embracing valuation of the multiplicity of potentialities, thereby providing each finite organism with erotic lures encouraging the sort of harmonious functioning that has led to the stages of enduring societal organization characteristic of the universe.[131]

Whitehead's organic primates–or, speaking metaphysically, actual occasions–cannot be understood in isolation; like all biological creatures on Earth, with both their ecological relations in the present and their evolutionary relations in the past, primate organisms are bound together as co-creators in a multiform cosmogenetic community, all of which emerged from one original unfathomably powerful energy-event. "At the base of the serene tropical rainforest," write Berry and Swimme,

> sits this cosmic hurricane. At the base of the seaweed's column of time is the trillion-degree blast that begins everything. All that exists in the universe traces back to this exotic, ungraspable seed event, a microcosmic grain, a reality layered with the power to fling a hundred billion galaxies through vast chasms in a flight that has lasted fifteen billion years. The nature of the universe today and of every being in existence is integrally related to the nature of this primordial Flaring Forth.[132]

The primitive beings which first emerged from the Flaring Forth have come since Whitehead's day to be known by the standard model of particle physics as the muon and tau leptons, along with the charm, strange, top, and bottom quarks, collectively called the fermions.[133] These fundamental organisms have mostly evolved, or decayed, since the Big Bang into the more familiar electrons, protons, and neutrons which make up (as organelles, so to speak) the larger atomic organisms of the periodic table of elements. Left out of this picture are the bosons, or force carriers, like gluons, photons, and the as yet undetected graviton. In Whitehead's organic terms, bosons and fermions can be described according to the two types of vibration,

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[129]*Process and Reality*, 164.

[130]Swimme and Berry, 17.

[131]*Process and Reality*, 244.

[132]*Swimme and Berry,* 21.

[133]Lederman, 62.

"vibratory locomotion" and "vibratory organic deformation."[134] Organic deformation describes the wave-like aspect of primate organisms (i.e., their continuous transition, or duration, of realized pattern, as felt from within), while locomotion describes the particle-like aspect (i.e., their discontinuous epochal realizations, as felt from without).

The entire genus of atoms did not appear all at once. Prior to the assistance of the higher-level activity of stars (i.e., the process of stellar nucleosynthesis), no elemental organisms heavier than hydrogen and helium were able to stabilize out of lower-level energetic activities. But before most stars could emerge, hydrogen and helium had to collect into huge swirling clouds, which became galaxies.[135] At the center of these early galaxies there emerged black holes (whose gravity was so intense not even light could escape), further securing the next stage of evolutionary complexity. According to astrophysicist Caleb Scharf, the influence of "energy feedback" from these early black holes played a crucial role in forming the stars and planets making up the universe we know today.[136] Star formation was first catalyzed as a result of the rapid revolution of the black holes at the center of galaxies, which generated gravitational density waves that "shocked clouds of hydrogen and helium to condense rapidly into thousands of stars at a time."[137] Had this rapid process of star formation continued unabated, the raw hydrogen and helium gas of most of the galaxies in the universe would long ago have become far too hot to form any new stars.[138] Fortunately, the energy feedback effects of supermassive black holes has kept star formation in check. In effect, the eating habits of black holes allow them to act as cosmic thermostats, "making sure the porridge of intergalactic matter is not to hot and not too cold."[139] Black holes have played a fundamental role in the evolutionary adventure that gave rise to our present cosmic ecology.[140] According to Scharf,

> The fact that there are *any* galaxies like the Milky Way in the universe *at this cosmic time* is intimately linked with the opposing processes of gravitational agglomeration of matter and the disruptive energy blasting from matter-swallowing black holes. Too much black hole activity and there would be little new star formation, and the production of heavy elements would cease. Too little black hole activity, and

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[134]*Science and the Modern World*, 121-125.

[135]Current evidence suggests a few very large but short-lived stars may have formed before the galaxies. *Universe Story*, 34.

[136]Caleb Scharf, *Gravity's Engines: How Bubble Blowing Black Holes Rule Galaxies, Stars, and Life in the Cosmos* (New York: Scientific American, 2012), 210.

[137]*Swimme and Berry*, 34.

[138]Scharf, 202.

[139]Ibid., 143.

[140]Ibid., 164.

> environments might be overly full of young and exploding stars–or too little stirred up to produce anything.[141]

Galaxies and black holes can be understood as analogous to massive cellular systems, where the regulative role of the black hole is akin to that of the central nucleus of a cell. Like all other organisms, galaxies appear to have a finite life-span, beyond which they can no longer produce new stars. The nested feedback loops at work to secure the self-organizing dynamics of a biological cell are obviously far more complex and adaptive than the simpler feedback exhibited by black holes; but nonetheless, the general analogy seems to hold.

Space-Time in an Ontology of Organism

> *The metrical properties associated with space-time should not be defined a priori, but should characterize the pattern of the environment that is inseparable from [the endurance of organisms].*
>
> —Stengers[142]

Whitehead's amendments to the general theory of evolution follow from his desire to re-construct the theory on the basis of the demands of post-Newtonian physics, as he understands them. As a result of relativity theory, the pre-existent geometrical structure of the spatio-temporal environment can no longer be taken for granted; a further result of relativity is the displacement of static material substances by dynamic energetic processes as fundamental to nature. As a result of quantum theory, the activity of this energy must be understood in terms of the definite values achieved by the momentary synergy of rhythmic vibrations, where the emergence of a complete pulse of energy, or organic bud of experience, requires a stretch of time for its unfolding.[143] The abstract point-instants of mechanistic materialism, be they Newtonian or Einsteinian, become concrete actual occasions in Whitehead's reading of the new physics. The discoveries of the 20th century regarding the nature of space, time, and energy are a warning against the misplaced concreteness that would "abstract from change [in an attempt] to conceive the full reality of nature *at an instant*."[144]

By 1920, Whitehead had already published two books exploring the implications of relativity theory for the philosophy of science.[145] In June 1921, Whitehead met and had several in depth

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[141]Scharf, 204.

[142]*Stengers*, 168-169.

[143]*Science and the Modern World*, 122.

[144]*Modes of Thought*, 145.

[145]Alfred North Whitehead, *An Enquiry Concerning the Principles of Natural Knowledge* (New York: Dover Publications, 1982) (0riginally published 1919), and Alfred North Whitehead, *The Concept of Nature* (Cambridge: Cambridge University Press, 1964) (originally published 1920).

conversations with Einstein during the latter's stay with the philosopher and statesman Richard Haldane in London. Accounts offered by those present suggest that Whitehead made several gentle attempts over the course of two days to convince Einstein "to give up his identification of the [curved] geometry of space-time and the physics of gravitation."[146] Einstein admitted he had difficulty grasping Whitehead's radically novel metaphysical scheme. It was a little more than a year later, in September of 1922, that Whitehead published *The Principle of Relativity* in an attempt not only to more fully work out the proper philosophical rendering of Einstein's scientific discovery, but to provide an alternative set of gravitational field equations no longer based on the notion of curved space-time. The book follows on the heels of the famous debate between Einstein and Henri Bergson, which took place in April of 1922 at the Société Française de Philosophie in Paris. At stake in this debate was not only "the status of philosophy *vis à vis* physics"–that is, it was not only "a controversy about who could speak for nature and about which of these two disciplines would have the last word."[147] It was also a *political* debate about the proper roles of science and philosophy in society, especially in regard to international relations. Bergson had recently been appointed president of the International Commission for Intellectual Cooperation, a precursor to UNESCO. Einstein, originally a member of the Commission and a vocal supporter of its internationalist mission, would eventually resign, largely as a result of his disagreement with Bergson concerning relativity.[148]

Bergson's tremendous popularity prior to confronting Einstein began to wane, probably due to the perception that he was willing to ignore scientific facts if they contradicted his irrational intuitions. This orthodox narrative, retold most recently by the anti-philosophical physicist Alan Sokal,[149] has it that Bergson lost the debate because he did not understand the mathematical physics behind relativity. Following the recent revival of interest in Bergsonism,[150] the orthodox narrative is increasingly being called into question.[151] The specifics of Bergson's alleged "mistake" regarding the details of Einstein's twin paradox are beyond the scope of this

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[146]Ronny Desmet, "Did Whitehead and Einstein Actually Meet?" in *Researching With Whitehead: System and Adventure*, eds. Franz Riffert and Hans-Joachim Sander (Freiburg: Verlag Karl Alber, 2008), 154.

[147]Canales, Jimena. "Einstein, Bergson, and the Experiment that Failed: Intellectual Cooperation at the League of Nations." in *Modern Language Notes* 120, no. 5 (December 2005): 1169; available at http://www.fas.harvard.edu/~hsdept/bios/docs/canales-Einstein,%20Bergson%20and%20the%20Experiment%20that%20Failed.pdf (accessed 11/18/2012).

[148]Ibid., 1175.

[149]See Alan Sokal and Jean Bricmont, *Intellectual Impostures: Postmodern Philosophers' Abuse of Science* (London: Profile Books, 1998).

[150]Largely a result of the influence of Gilles Deleuze (see http://plato.stanford.edu/entries/bergson/#7 [accessed 11/18/2012]).

[151]See Canales generally; Val Dusek, "Clarity, Charity and Criticism, Wit, Wisdom and Worldliness: Avoiding Intellectual Impositions," Metascience 9, no. 3 (2000), 358-366; pre-publication manuscript available at http://www.physics.nyu.edu/sokal/dusek.html (accessed 11/18/2012).

discussion, but suffice it to say that, contra Sokal and other scientific critics, Bergson was well aware of the observational facts concerning the comparison of different time-systems.[152] His critical approach to relativity theory was based on *metaphysical*, not *physical* grounds. Like Whitehead, Bergson was not contesting the general physical validity of Einstein's theory. Rather, Bergson simply wanted to establish, despite Einstein's protests, that the scientific confirmation of relativity theory was not the end of the matter regarding the philosophical understanding of time.[153]

Regardless of whether or not Sokal's criticisms of Bergson's alleged misunderstandings are justified, he would have a far more difficult case trying to dismiss Whitehead, whose grasp of the mathematical and physical principles at stake arguably surpassed even Einstein's.[154] "The essence of [the structure formed by space-time]," wrote Whitehead in 1922,

> is that it is stratified in many different ways by different time-systems. This is a very peculiar idea which is the product of the speculations of the last 15 years or so. We owe the whole conception notably to Einstein . . . no one can study the evidence in its detail without becoming convinced that we are in the presence of one of the most profound reorganizations of scientific and philosophic thought. But so many considerations are raised, so diverse in character, that we are not justified in accepting blindfolded the formulation of principles which guided Einstein to his forumlae.[155]

Whitehead set out in his book on relativity to "[carefully scrutinize] the fundamental ideas of physical science in general and of mathematical physics in particular."[156] As discussed earlier, his reaction to the disorienting discoveries of the new physics led him to re-assess the philosophical foundations of scientific materialism, which had been assumed with great (instrumental) success since the time of Newton. Though Einstein was initially suspicious of philosophy's role in physics, as is evidenced both by his debate with Bergson and by his signature of a 1913 anti-metaphysical positivist manifesto,[157] he came late in life to respect the

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[152]See Canales, 1170-1171.

[153]Bergson, "Discussion avec Einstein," in *Mélanges* (Paris: Presses Universitaires de France, 1972), 1345.

[154]"Professor Whitehead seems to me to have brought out the character of space and time in his treatment of relativity more thoroughly than Einstein or even Minkowski himself has done." Richard Haldane, *The Reign of Relativity* (New Haven: Yale University Press, 1921), 110. See also letters exchanged between Einstein and his first wife, Mileva Einstein-Maric, herself an accomplished mathematician, which suggest that Einstein required her help with some of the more difficult aspects of his equations. "Did Einstein's Wife Contribute to His Theories?", *New York Times,* March 27, 1990, available at http://www.nytimes.com/1990/03/27/science/did-einstein-s-wife-contribute-to-his-theories.html (accessed 11/18/2012).

[155]Whitehead, *The Principle of Relativity* (New York: Cosimo, 2007), 59, 67 (originally published 1922).

[156]Ibid., 40.

[157]Stanley Jaki, *The Road of Science and the Ways to God* (Edinburgh: Scottish Academic Press, 1978), 182.

importance of philosophical reflection upon the conceptual background of science. In his foreword to physicist and philosopher Max Jammer's historical study of the concept of space, written in 1953, Einstein admits that

> the scientist makes use of a whole arsenal of concepts which he imbibed practically with his mother's milk; and seldom is he ever aware of the eternally problematic character of his concepts. . . . He uses these conceptual tools of thought as something . . . immutably given . . . which is hardly ever . . . to be doubted. How could he do otherwise? How would the ascent of a mountain be possible, if the use of hands, legs, and tools had to be sanctioned step by step on the basis of the science of mechanics?[158]

Here, even though Einstein affirms science's practical need to take its conceptual tools for granted, he also seems to approach Whitehead's characterization of philosophy as "the criticism of abstractions which govern special modes of thought."[159] Further, in 1950, Einstein remarked that every genuine physicist "is a kind of tamed metaphysician," no matter how much lip service he or she may pay to positivism.[160] This taming is achieved, according to Whitehead, by holdings one's "flight in the thin air of imaginative generalization" accountable, upon landing, to "renewed observation rendered acute by rational interpretation."[161] Unfortunately, Einstein's more mature views on the proper disciplinary relationship between philosophy and physics have still not been fully digested by contemporary materialistic scientists.

In his debate with Bergson, Einstein insisted that no such thing as "philosophical time," or what Bergson called "duration," existed; rather, there was the real "physical time" revealed by natural science, and the illusory "psychological time" experienced by human consciousness.[162]

Whitehead's unflinching commitment to an organic philosophy of nature prevented him from accepting Einstein's blatant bifurcation:

> It follows from my refusal to bifurcate nature into individual experience and external cause that we must reject the distinction between psychological time which is personal and impersonal time as it is in nature.[163]

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[158]Albert Einstein, Foreword to Max Jammer, *Concepts of Space: The History of Theories of Space in Physics* (Mineola: Dover, 1993), xiii-xiv.

[159]*Modes of Thought*, 49.

[160]Einstein, "On the Generalized Theory of Gravitation," in *Scientific American*, Vol. 182, Issue 4, April 1950.

[161]*Process and Reality*, 5.

[162]Bergson, "Discussion avec Einstein," 1346

[163]*Principle of Relativity*, 66.

Whitehead differs from Bergson in that he sought to re-construct science itself on an organic basis, whereas Bergson was content to leave science to its mechanical models and instrumental methods. He conceived of science as the result of "intelligence," rather than "intuition," meaning that its approach to nature is necessarily mediated by artificial instruments and laboratory techniques; therefore, science can offer no insight into the immediate life of things.[164] "For [natural science's] object," writes Bergson, "is not to show us the essence of things, but to furnish us with the best means of acting on them."[165] Though Whitehead does not share Bergson's dualism between the activity of living organisms and the passivity of material mechanisms (since for Whitehead, all sciences are the study of dipolar organismic occasions), he does share his sense that Einstein's abstract account of relativity in terms of mechanical clock-time obscures the true import of the theory as regards our experience of concrete temporality (i.e., *duration*). The time of the physicist, as measured by a clock, "merely exhibits some aspects of the more fundamental fact of the passage of nature," according to Whitehead. "In this doctrine," he continues, "I am in full accord with Bergson."[166]

The agreement between Whitehead and Bergson concerns the way in which concrete temporality is inevitably *spatialized* in the process of being translated into the abstractions of physics. Mechanical clocks quite literally flatten the passage of time into discrete units of distance meant to represent seconds, minutes, and hours. So far as it goes, such spatialization is necessary for the coordination of civilized life. But it is important not to forget what this translation obscures when we endeavor to understand the creative advance of the actual universe: the clock itself–like everything else in the universe, from carbon atoms to stars to the person who consults it–*is aging*. To be *aging* is to be always in irreversible organic *process*. In a process ontology like Whitehead's, an actual entity doesn't "have" an age, as though it were an accidental property of an underlying substance; rather, the very essence of an entity is to age, to emerge out of a definite past and pass into an indefinite future. In Whitehead's words:

> [To discuss] present fact apart from reference to past, to concurrent present, and to future, and from reference to the preservation or destruction of forms of creation is to rob the universe of essential importance.[167]

Even a physicist who has mastered all the mathematical formulas and techniques of measurement cannot avoid the philosophical quandaries which arise from a moment's reflection upon the fact that his or her conscious presence is necessary in order for the clock, or

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[164]C. F. Delaney, "Bergson on Science and Philosophy, in *Process Studies* 2, no. 1 (1972): 29-43.

[165]Henri Bergson, *Creative Evolution* (New York: Henry Holt and Company, 1911), 93.

[166] *Concept of Nature*, 54.

[167]*Modes of Thought*, 84.

any measuring instrument, to get itself read.[168] Our direct experience of concrete existence–whether we are artists, clergymen, homemakers, or astrophysicists–reveals nature to be an irreversible process of becoming, a creative advance. This fact stands in sharp contrast to Einstein's incredible remark:

> For us believing physicists, the distinction between past, present, and future is only an illusion, even if a stubborn one.[169]

The philosopher Niels Viggo Hansen boils down what is at stake in the debate between Einstein, Bergson, and Whitehead by asking about the meaning of "fact," both as it is assumed in our concrete (temporal) experience of a specious present, and as it is assumed in the abstract (spatialized) notations of physics:

> If there is any such thing as a fact . . . then either there are temporal facts (e.g., that you have *already* read the previous sentence) or there are atemporal facts (e.g., that your reading of it is *later than* my writing of it). . . . Bergson was right that . . . we cannot seriously hold at the same time both that there are concrete facts involving distant simultaneity, and also that such facts cannot exist in the physical universe. Surely one could claim that such immediate facts are eliminated in the production of physical descriptions . . . but if concrete facts of co-presence are there before clocks . . . are used, they will still be there in the background when [clocks] are employed.[170]

Where Bergson goes wrong, according to Hansen, is in claiming that our concrete experience of co-presence, or durational simultaneity, is somehow universal. It is as if he claims to have some special intuitive access to what is happening right now on the surface of Mars, even though all the theoretical and experimental evidence of relativistic physics suggests that distant happenings are not instantaneously communicated to our concrete experience.[171] Whitehead's novel solution to this paradox regarding the irreconcilable notions of "fact" is to construe the concrete simultaneity of an actual occasion's specious present as a *local*, rather than a *global*, fact. Such a construal entails rejecting the often implicit ontologization of the Einsteinian notion of a ready-made 4-dimensional fabric of space-time "out there" within which actual occasions

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[168]See Canales, 1176-1177.

[169]Einstein to Vero and Mrs. Bice, March 21, 1955. Einstein Archive, reel 7-245; reprinted in *Albert Einstein-Michele Besso Correspondence 1903-1955* (Paris: Harmann, 1972), 537-538.

[170]N. V. Hansen, "Spacetime and Becoming: Overcoming the Contradiction between Special Relativity and the Passage of Time," in *Physics and Whitehead: Quantum, Process, and Experience*, ed. Timothy Eastman and Hank Keeton (New York: State University of New York, 2003), 150.

[171]It takes anywhere between four and 20 minutes for light to travel from Mars to Earth, depending on our relative orbital locations. It is important to note here that the non-local effects of quantum physics makes the issue of instantaneous communicability more complicated. I explore this issue below, but suffice it to say for now that Whitehead's account of the ingression of eternal objects into actual occasions allows for a coherent integration of the relativistic limits placed on *efficient* causality with the non-local *formal* causality of quantum physics.

would unfold, or through which the plane of the present would slide as an indication of global simultaneity (as Bergson seems to have believed[172]). Actual occasions are not to be pictured as if they were bits of matter located *in* a pre-given spatiotemporal "loaf"; rather, the abstract geometry of space-time described by the Lorentz transformations, or by Whitehead's alternative tensor equations,[173] is derivative from the most general pattern of experience realizable by the actual occasions constitutive of our cosmic epoch. In other words, the geometry of curved space-time itself emerges from the character, taken collectively, of individual drops of experience. These self-creating and other-prehending drops of experience are the final real things of which reality is composed. These processes are what is concrete, while space-time is an abstraction from the concrete. "Whitehead is explicit about the idea," writes Hansen,

> that the concrete dynamism of processes can be understood as the ground of extension rather than the reverse. This is the first element of the Whiteheadian solution to the tension between extension and becoming: the modalities are not really situated in space and time at all, but in the concrete processes whose web of relations gives rise to space and time.[174]

Metaphysically speaking, that space-time is *abstract* doesn't mean it isn't *real*, only that it isn't *actual*. Space-time is a system of modalities, a configuration of forms, or, in Whitehead's terms, a definite patterning of eternal objects that has ingressed into the prehensive unifications of actual occasions. Eternal objects, as discussed earlier, have a relational function: their ingression allows for the solidarity, or extensive continuity, of the universe by providing actual occasions with the definite adverbial "how?" characterizing their prehensions of other occasions. This "two-way function" shapes both the private experience, or "subjective form," of an occasion, and grants this form publicity, so as to offer it as an objective datum for the larger society of occasions within which the occasion becomes and perishes.[175] Among the most fundamental set of adverbs characterizing the "how?" of the mutual prehensions of our cosmic epoch is the system of geometrical modalities known to physics as space-time. Also among the

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[172]See Gilles Deleuze, *Bergsonism*, trans. Hugh Tomlinson and Barbara Habberjam (New York: Zone Books, 1991), 82.

[173]See *Principle of Relativity*, 139.

[174]Hansen, 154.

[175]*Process and Reality*, 164.

most fundamental set of adverbs are the mathematical fields of force known to physics as gravity and electromagnetism.[176]

> These mathematical relations belong to the systematic order of extensiveness which characterizes the cosmic epoch in which we live. The societies of [organisms]–electrons, protons, molecules, material bodies–at once sustain that order and arise out of it. The mathematical relations involved . . . thus belong equally to the world perceived and to the nature of the percipient. They are, at the same time, public fact and private experience.[177]

Whitehead's reference to our "cosmic epoch" is important, since it is a reminder that the 4-dimensional character of space-time as we experience and measure it today is contingent and could change as the creative advance of the universe continues to unfold. The "laws" of nature, and the structure of space-time, are not eternal, nor necessarily universal.[178] They are the result of widespread, habitual forms of organization achieved by the mutual prehensions of the most encompassing society of actual occasions which communicate with our experience.[179] "How do we know," asks Whitehead, "that only one geometry is relevant to the complex happenings of nature?" He continues:

> This planet, or this nebula in which our sun is placed, may be gradually advancing towards a change in the general character of its spatial relations. Perhaps in the dim future mankind, if it then exists, will look back to the queer, contracted three-dimensional universe from which the nobler, wider existence has emerged.[180]

The cosmic habits called "laws of nature" by contemporary physicists are extremely stable relative to the individual novelty achievable by high-grade, conscious occasions (like multicellular animals) because they are derived from the decisions of very simple, low-grade actual occasions (like electrons). The "mental pole" of these occasions is negligible: they are statistically dominated by the habitual "physical feelings" of their environment, and so almost always reproduce the systematic order of the eternal objects characterizing that environment with little in the way of autonomous flashes of creativity.[181]

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[176]Unlike Einstein, whose conception of a ready-made "fabric" of space-time allowed him to explain gravity as a pseudo-force which really results from the warping of the fabric due to presence of massive objects, Whitehead described gravity as a genuine physical force, like electromagnetism. *Principle of Relativity*, 91.

[177]*Process and Reality*, 326.

[178]*Stengers*, 168.

[179]*Process and Reality*, 98.

[180]*Modes of Thought*, 57.

[181]*Process and Reality*, 245.

To sum up, Whitehead's reformed principle of relativity is based on the metaphysical priority of actual facts, or occasions of experience, from which the geometrical order of spatiotemporal extension is derived.[182] Through an abstractive process of logical construction rooted in the coordination of the somewhat fragmentary nature of individual occasions of experience, the general character of space-time holding true for our cosmic epoch can be produced.[183] While Einstein's proposal of a universal and *a priori* space-time implies a taut, already fully woven fabric whose spatial curvature is modified by the material bodies situated within it, Whitehead's alternative theory of a coordinated plurality of space-times implies a fraying fabric always in the process of being repaired by the dipolar physical-mental concrescences of organismic occasions of experience. In this way, Whitehead translates many of the properties that Einstein's general relativity defines *a priori* into empirical, or *a posteriori* facts.[184] Instead of privileging the misplaced concreteness of an abstract space-time that would "[separate] an organism from its environment" such that "the endurance of the former and the patience of the latter [is defined] in terms of right [or "law"], not of fact," Whitehead emphasizes the contingency of the evolved habits currently holding sway over the ecology of organisms shaping our cosmic epoch, no matter how general or universal they may appear at this time.[185]

Whitehead terms the general character of space-time "the uniformity of the texture of experience."[186] "The physical world [i.e., the extensive continuum of space-time]," he goes on, is,

> in some general sense of the term, a deduced concept. Our problem is, in fact, to fit the world to our perceptions, and not our perceptions to the world.[187]

Here, Whitehead directly contradicts Einstein's famous statement that our immediate experience of temporality, while perhaps necessary for civilized life, is in reality nothing but a persistent illusion no longer to be believed in by professional physicists. Whitehead's reconstruction of relativity theory so as to avoid the social and ecological perils of the bifurcation of nature is not based on a denial of Einstein's *physical* formulations, but a denial of the unconscious imaginative background shaping Einstein's *metaphysical* interpretation of these formulations. Following Stengers, it can be said that Whitehead's philosophy of organism

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[182]*Epperson*, 5.

[183]Alfred North Whitehead, *The Aims of Education* (New York: The Free Press, 1957), 162-163 (originally published 1929).

[184]*Stengers*, 168.

[185]Ibid., 169.

[186]*Aims of Education*, 163.

[187]Ibid., 165.

aims not to belittle or deny the abstractions of the scientific intellect, as Bergson seems to, but rather to articulate an

> ecology of abstraction . . . that creates the possibility of a mutual aesthetic appreciation between specialists of precision and adventurers of generalization.[188]

Quantum Decoherence and the Incompleteness of Nature

> *[Creativity] prevents us from considering the temporal world as a definite actual creature. For the temporal world is an essential incompleteness*.
>
> —Whitehead[189]

Epperson argues that Whitehead's account of the process of concrescence, the centerpiece of his metaphysical scheme, provides "an extremely precise, phase-by-phase exemplification" of contemporary "decoherence-based interpretations" of quantum mechanics.[190] Unlike the instrumentalist interpretations that have spun off Niels Bohr's account of quantum effects in terms of *epistemological* "complementarity," quantum decoherence offers a full-fledged *ontological* description of quantum reality.[191] Further, unlike Hugh Everett's "many worlds" interpretation, the decoherence-based approach provides a more ontologically parsimonious, not to mention less empirically question begging, account of the unfolding of the physical universe. And finally, unlike the quantum cosmogonies offered by Hawking and Krauss, which purport to explain the random emergence of the actual universe *ex nihilo* from the sheer potentiality of the "quantum void," decoherence-based interpretations avoid the logical incoherence of having to posit a realm of pure potentiality utterly independent of, and somehow responsible for generating, concrete actuality.[192] Whitehead, as discussed earlier, also describes something akin to the "quantum void," or "vacuum," from which all potency is ceaselessly born: Creativity. But, in order to maintain the coherence of the fundamental categories of his metaphysical scheme (such that all ideas require one another for their meaning), the sheer potentiality of Creativity is said always to be conditioned by at least one actual creature.[193] The primordial creature of Creativity is God. Subsequently to God, Creativity also comes to be conditioned by the passage into objective immortality of finite actual occasions.[194] Potentiality, in other words, has never been untouched by actuality.

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[188]Stengers, 141.

[189]*Religion in the Making*, 80.

[190]Epperson, 129.

[191]Ibid., 33.

[192]Epperson, 18; Krauss, *Universe from Nothing*, xiv.

[193]*Process and Reality*, 3.

[194]Ibid., 31.

The decoherence interpretation of quantum mechanics, like Whitehead's philosophy of organism, presupposes the givenness of facts, rather than trying to offer some arbitrary *ex nihilo* explanation of their spontaneous appearance. According to Epperson,

> Actuality is necessarily presupposed by . . . potentiality, such that the latter cannot be abstracted from the former. This is both a logical requirement and a requirement of quantum mechanics, which describes the evolution of actual facts and their associated potentia–not the evolution of vacuous potentia into actuality.[195]

In other words, quantum mechanical descriptions *presuppose* actuality, and so cannot explain its emergence by reference only to potentiality. Nonetheless, potentiality does have a significant role to play in both decoherence-based and Whiteheadian accounts of the evolution of the universe. In 1958, probably independently of Whitehead's earlier re-incorporation, Werner Heisenberg argued that quantum effects demanded that something like Aristotle's concept of "potentia" be brought back into the philosophy of nature.[196] The decoherence interpretation describes the way a quantum event, or wave-function, first arises from the actualized facts of the past, evaluates the potentia relevant to its situation, and finally selects among those potentia to bring about the collapse of its wave-function, thereby realizing some novel actual fact.[197] It is a process of "evolutions from actuality to potentiality to actuality."[198] In Whitehead's terms, the concrescence of an actual occasion passes through several phases: 1) the occasion prehends the initial data provided to it by the multiplicity of objectively immortal occasions making up its past actual world, negatively prehending those elements which are irrelevant to its situation, 2) the occasion, through a process of integration of simpler feelings into more complex feelings, unifies its many prehensions of its actual world into one, objective datum, 3) the objective datum is felt by the subjective form of the occasion, which is the complex qualitative pattern of eternal objects characterizing how this occasion experiences its world, 4) the occasion, having satisfied its subjective form, perishes into objective immortality to become the data prehended by further occasions.[199] The end result of this process is the emergence of a novel actuality.

Earlier, in a discussion of the inherent limits to our experience of simultaneity based upon the finite (but invariant) speed of light, I mentioned a further complexity based upon quantum non-locality and the difference between efficient and formal causality. Efficient causes are those influences involving the direct transmission of feeling from one actual occasion or society of

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[195] *Epperson*, 7

[196] Heisenberg, *Physics and Philosophy* (New York: Harper and Row, 1958), 185.

[197] *Epperson*, 8-9.

[198] Ibid., xii.

[199] *Process and Reality*, 221.

occasions to another, as when a flashlight shines in my eyes or a baseball breaks through a window. They are *physical* causes. Formal causes, from both a Whiteheadian perspective on reality more generally and a decoherence-based perspective on quantum physics more specifically, can involve instantaneous, non-local affection of the potentia of distant actual occasions. These are *conceptual* causes. To illustrate the difference, Epperson uses the example of an asteroid that has just been knocked by a comet into a collision course with Earth.[200] Although in terms of physical influence, we will not be affected by the incoming asteroid until the photons reflecting off its surface reach Earth, in conceptual, or potential, terms, the asteroid's change of course has instantaneously affected the potentia describing Earth's ongoing evolution. Further clarifying the difference between efficient and formal causality, Epperson writes:

> "Causal influence," in the Whiteheadian scheme, is operative in the physical pole or primary stage (the conformal phase, or phase of causal efficacy), and is bound by the speed of light according to the theory of special relativity; "causal affection" is operative in the mental pole or supplementary stage, and is not limited by special relativity.[201]

If the local relativistic relationships of causal influence among actual occasions were not supplemented by the non-local quantum relationships of logically ordered potentia, the reality of an asymmetrical passage of time from closed past to open future would be impossible to account for. On the purely relativistic reading, time is symmetrical: causality works just the same whether you run it forward or backward. But from the perspectives of quantum decoherence, thermodynamics, Whitehead's process philosophy, and our own direct experience, time is intrinsically irreversible.[202]

The physical account of the decoherence of a wave-function and the metaphysical account of the concrescence of an actual occasion both imply a panexperientialist ontology of constructive becomings, rather than a materialist ontology of ready-made beings. In a materialist ontology, reality is identified with actuality.[203] This implies that nothing new ever really emerges, since all that can be has already been actualized. Change is merely apparent, the re-shuffling of static parts that are externally related. In an ensouled process ontology like Whitehead's, actuality and potentiality are organically integrated so as to allow for a genuinely creative cosmos where, though the past is settled, the future remains wildly open. New forms of fact are always

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[200]Epperson, xii-xiii.

[201]Ibid., 228.

[202]Ibid., 234.

[203]Ibid., xii.

emerging, though none ever exists in isolation from its environment. "In sharp contrast [to mechanistic materialism,]," writes Epperson,

> [in] Whitehead's cosmology as exemplified by the decoherence interpretations of quantum mechanics, the universe is. . .characterized as a fundamentally complex domain with an inherent aim toward an ideal balance of reproduction and reversion–a balance formative of a nurturing home for a seemingly infinitely large family of complex adaptive systems such as ourselves.[204]

Epperson explicitly connects Whitehead's metaphysical scheme, along with the decoherence-based account of quantum mechanics, to efforts in the complexity sciences to account for the regularity and diversity achieved by the various examples of emergent order at all scales in nature.[205] In Whitehead's terms, emergence concerns the achievement by actual occasions of novel forms of "structured society," be they physical (atoms, stars), biological (cells, plants), or psychological (animals, humans).[206]

For contemporary complexity scientist Terrence Deacon, mentioned earlier, coherent accounts of emergence also depend upon the ontologization of potentiality alongside actuality. Deacon coins the term "absential" to refer to those features of nature that, while not physically present, nonetheless have an important role to play in the emergence of the higher order organizational levels of biology and psychology.[207] The role of these absential features would suggest that nature is in some sense "incomplete." The recognition of this incompleteness leads Deacon to flirt with something like Whitehead's panexperientialist process ontology, where

> no object, event, or interaction–down to the most fundamental physical interactions, such as between elementary particles–is complete in itself, [meaning that] all aspects of physical causality implicitly depend on something extrinsic that is not physically present "there."[208]

But in the end, Deacon remains unsatisfied with Whitehead's approach, since it seems to assume what he is setting out to explain, namely, how experience and value emerge later on up the scale of complexity from otherwise numb, purposeless matter. Deacon attempts to avoid what he calls "homuncular" accounts of the emergence of complexity from physical processes, which he says include information theoretic accounts as well as Whitehead's. Information theory suggests that all physical processes can be interpreted as computation-performing

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[204]Ibid., 17.

[205]Ibid., 198.

[206]*Process and Reality*, 100.

[207]Deacon*, Incomplete Nature*, 3.

[208]Ibid., 78.

operations.[209] As a result, physical processes "can be treated as though [they have] mentalistic properties."[210] Although Deacon admits to being favorably influenced by Whitehead early in his career, especially in respect to his attempt to save realism as against nominalism in natural philosophy, he eventually became dissatisfied by Whitehead's seeming need to "[sneak] in homunculi at a very, very low level. . .the level of subatomic quantum events."[211] From Deacon's scientific perspective, building in anything like purpose or feeling at the basement level of actuality doesn't explain anything; rather, only "if you can show how [these are] generated [will] you have an explanation for [them]."[212]

From Whitehead's philosophical perspective, science cannot explain the emergence of experiential qualities like value, purpose, and feeling out of dumb physical activity. Whitehead's understanding of what constitutes a proper explanation seems to be the reverse of Deacon's, in that for Whitehead, natural philosophy cannot explain the emergence of what is concrete (i.e., value and experience), but only of what is abstract. New possibilities are always emerging into actuality (or in Whitehead's terms, novel eternal objects are always ingressing); actuality itself, on the other hand, must be intrinsically evaluative for explanations of such emergence to remain rational instead of miraculous. The emergence of complex forms of organization like galaxies and stars, for example, already requires an explanation in terms of some aim intrinsic to physical activity. "The element of value," writes Whitehead,

> of being valuable, of having value, of being an end in itself, of being something which is for its own sake, must not be omitted in any account of an event as the most concrete actual something. 'Value' is the word I use for the intrinsic reality of an event.[213]

In other words, no value, no reality. Akin to Deacon's scientific desire to avoid humuncular explanations is Whitehead's philosophical desire to avoid employing the dubious concept of "vacuous actuality." This concept "haunts realistic philosophy,"[214] according to Whitehead, which is borne out by the example of Deacon's realism, where experience is purported to emerge from dumb matter. "Apart from the experience of [actual occasions]," writes Whitehead, "there is nothing, nothing, nothing, bare nothingness."[215]

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[209]Ibid., 75.

[210]Ibid., 374.

[211]Deacon, personal communication on April 26, 2012.

[212]Ibid.

[213]*Science and the Modern World*, 89.

[214]*Process and Reality*, 29.

[215]Ibid., 167.

This fundamental divergence of metaphysical first principles may at first seem like a matter impossible to settle other than by subjective preference. As mentioned earlier, aside from their metaphysical differences, Deacon's account of the emergence of biological and psychological forms of organization can be read as adding much needed specificity to Whitehead's more general account. In this sense, their approaches are complementary. But there are other criteria from which to judge the overall coherence of each of their approaches.

Deacon claims to prefer a perspective of radical emergence, wherein infinitely many novel forms of organization are possible, while he regards Whitehead's cosmological scheme as somehow restricting the open-endedness of emergent evolution.[216] On the other hand, Deacon admits that there are limits on the evolution of this novelty, offering a rather sophisticated account of these limits based upon the notion of hierarchically nested constraints.[217] The question is, what constrains the emergence of novelty at the *cosmic*, rather than specifically biological or psychological scale? According to Deacon's scientific account, cosmic constraint is afforded by the interplay between the biased probability of entropic orthograde processes and the emergent contragrade processes supported by thermodynamic work.[218] Once constraints at the thermodynamic level are established, higher-order constraints can emerge to secure what Deacon calls "morphodynamic", and then "teleodynamic," modes of organization.

Whitehead also offers an account of limitation, but his rests on a far more general, and therefore metaphysical, basis. As discussed in a preceding section, the unfathomable potency of Creativity being the ultimate category of his scheme, Whitehead needed a principle of limitation, or concretion, to account for how anything of definite value could come to exist. Whitehead calls his principle of limitation, or concretion, "God." Instead of basing limitation on some particular tendency in the physical world, as Deacon does, Whitehead asks what must be the case, metaphysically speaking, for physical "tendencies" to be possible at all: "What is the status of the enduring stability of the order of nature?"[219] Whitehead's answer to this question depends, again, on what is to count as a valid means of explanation. From his perspective, the aim of any genuine philosophical explanation is to produce "self-evidence," or "sheer disclosure."[220] This aim can never be finally realized due to the fact that "language halts behind intuition."[221] In this sense, "all explanation must end in an ultimate arbitrariness."[222]

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[216]"I see emergence as an open-ended process, while [Whitehead] does not," Deacon, personal communication on April 26, 2012.

[217]Deacon, *Incomplete Nature*, 423.

[218]Ibid., 230, 247.

[219]*Science and the Modern World*, 88.

[220]*Modes of Thought*, 49.

[221]Ibid., 49.

Nevertheless, although total disclosure cannot finally be achieved, the penetration of our understanding can be increased.[223]

Many contemporary scientists, Deacon included, would seem to have little patience for traditional theology. Whitehead generally shares their distaste for those philosophers and theologians who, "anxious to establish the religious significance of God," succumbed to the unfortunate habit of paying him "metaphysical compliments."[224] The God of Western religion has tended to be fashioned in the image of an imperial ruler.[225] Rather than making God an exception to the principles holding true of every other actual occasion, Whitehead's God is "their chief exemplification."[226] Why then does Whitehead risk the scorn of atheistic or agnostic scientists and philosophers by calling his principle of concretion "God"? "Because," writes Whitehead,

> the contemplation of our natures, as enjoying real feelings derived from the timeless source of all order, acquires that "subjective form" of refreshment and companionship at which religions aim.[227]

God's primordial act of concretion cannot be rationally explained, since this divine act provides the foundation for rationality.[228] That the universe has some definite character, some order, realized along certain limits despite the onrush of Creativity possessing no intrinsic reasons of its own, requires explanation. But in attempting to explain how this definite order could be possible, we come to the very limits of reason. As a panexperientialist, Whitehead's allegiance is ultimately to empiricism. "The general principle of empiricism," he writes,

> depends upon the doctrine that there is a principle of concretion which is not discoverable by abstract reason. What further can be known about God must be sought in the region of particular experiences, and therefore rests on an empirical basis.[229]

It follows from Whitehead's allegiance to empiricism that the progress of the general science of metaphysics and the special sciences alike depends upon a certain faith, or "ultimate moral intuition into the nature of intellectual action."[230] Whitehead's approach also has rationalist

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[222]*Science and the Modern World*, 88.

[223]*Modes of Thought*, 51.

[224]*Science and the Modern World*, 161.

[225]*Process and Reality*, 342.

[226]Ibid., 343.

[227]Ibid., 31-32.

[228]*Science and the Modern World*, 161.

[229]Ibid., 161.

aspects, but he always checks the impulse for theoretical explanation with the requirement that "there be 'given' elements so as to form the material for theorizing."[231] God is such an element, the primordial reason conditioning the creative flux, though not itself rationally explainable.

As discussed earlier, God is that actual entity responsible for grading the relevance of the infinite multiplicity of eternal objects. "Apart from God," writes Whitehead, "there could be no relevant novelty."[232] In other words, it is God's primordial role to provide each concrescing actual occasion with possibilities graded as relevant to the givenness of its unique situation. Without this provision, eternal objects yet to be realized in the actual world would be all but non-existent for the occasion in question.[233] It follows from Whitehead's ontological principle that as of yet unactualized possibilities, or eternal objects, cannot float into actuality from nowhere.[234] Eternal objects yet to be actualized by any finite actual occasion have already been conceptually prehended by the divine non-temporal actual occasion. God is that non-temporal actual occasion which conceptually prehends, and thereby evaluates, the infinite set of eternal objects, thereby adjusting, or conditioning, creativity so as to allow a definite order to emerge in the ongoing course of cosmogenesis. "The adjustment is the reason for the world," writes Whitehead; he continues:

> It is not the case that there is an actual world which accidentally happens to exhibit an order of nature. There is an actual world because there is an order in nature. If there were no order, there would be no world. Also since there is a world, we know that there is an order. The ordering entity [God] is a necessary element in the metaphysical situation presented by the actual world.[235]

In respect to Deacon's desire both to "save Plato, or to save realism,"[236] and to describe a cosmos with open-ended possibilities of emergent order, it is difficult to see how this could be achieved without some cosmic principle of concretion to provide the basis for the emergence of forms of order relevant to the actual occasions, or societies of occasions, in question. That biological and psychological forms of order have emerged in the course of time would be nothing short of a miracle unless the tendency to harmony was basic to creation itself, already there "in the beginning." Epperson likens this harmonious tendency, or "subjective aim" provided by God "by which nature regulates herself without determining herself," to the

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[230]*Process and Reality*, 42.

[231]Ibid., 42.

[232]Ibid., 164.

[233]Ibid., 31.

[234]Ibid., 244.

[235]*Religion in the Making*, 91.

[236]Deacon, personal communication on April 26, 2012.

concept of "effective complexity" employed in complexity theory.[237] It could be said that this tendency is "built in" to the universe, but this phrase is likely to foster an image of a transcendent divine craftsman who programmed every detail of the universe, "building in" its properties before the moment of creation even occurred. In his famous cosmological dialogue *Timaeus*, Plato uses a similar image to tell his "likely story" about the genesis of the cosmos. *Timaeus* also employs other images to account for cosmogenesis, including that of an indwelling World-Soul, and that of a formless mediatrix for form called the Receptacle. Were Plato alive today, he may have emphasized these latter images as the more appropriate rhetorical choices for mythologizing his cosmology. Whitehead not only attempts to "save Plato" from the myth of a transcendent demiurge, but also to save modern theology from the jealous tyrant imagined by Job, and modern science from the deistic mechanical engineer imagined by Newton. To do so, he re-imagines God as immanent to every finite actual occasion, the cause of their feeling an "urge towards the future based upon an appetite in the present."[238] God does not determine the specific decision each finite occasion will make regarding this "initial aim." God only supplies each occasion with the complex feeling of the graded relevance of all the possibilities available to it in any given moment. Which of these possibilities it chooses to realize is a free decision on its part, a freedom conditioned also by the objective immortality of the past decisions of all the other historical routes of concrescence populating its cosmic community. God's valuation is persuasive enough that a cosmos with not only stars and galaxies, but living planets and intelligent civilizations has emerged. In the final section, the implications of Whitehead's reformed Platonism will be explored, with special attention paid to the need to mythologize his metaphysics so as to excite the aesthetic, emotional, and moral appetites in a way that purely rational discourse cannot.

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[237]Epperson, 236.

[238]*Process and Reality*, 32.

TOWARD A PHYSICS OF THE WORLD-SOUL

> *In my view the creation of the world is the first unconscious act of speculative thought; and the first task of a self-conscious philosophy is to explain how it has been done.*
>
> —Whitehead[239]

> *The religious insight is the grasp of this truth: That the order of the world, the depth of reality of the world, the value of the world in its whole and in its parts, the beauty of the world, the zest of life, the peace of life, and the mastery of evil, are all bound together–not accidentally, but by reason of this truth: that the universe exhibits a creativity with infinite freedom, and a realm of forms with infinite possibilities; but that this creativity and these forms are together impotent to achieve actuality apart from the completed ideal harmony, which is God.*
>
> —Whitehead[240]

> *This, then, in keeping with our likely account, is how we must say divine providence generated the actual world as a truly living thing, endowed with soul and intelligence.*
>
> —Plato[241]

Whitehead suggests that Newton's *Scholium* and Plato's *Timaeus* "are the two statements of cosmological theory which have had the chief influence on Western thought."[242] Although the *Scholium* provides "an immensely able statement of details" applicable to the deduction of truths within a specific domain of physical activity, its deductive prowess "conveys no hint of the limits of its own application."[243] Newton's abstract conceptions of space, time, and matter as ready-made, and of eternal laws imposed by a transcendent designer, were undeniably useful, in that they provided the paradigmatic basis for two centuries of scientific progress. But the tremendous instrumental success of the Newtonian scheme had the practical effect of leading many to fall into the fallacy of misplaced concreteness by overgeneralizing its simplified

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[239]*Aims of Education*, 164.

[240]*Religion in the Making*, 106.

[241]Plato, *Timaeus*, 30b-c.

[242]*Process and Reality*, 93.

[243]Ibid., 93.

abstractions as if they could explain the full complexity of concrete reality. "The *Scholium* betrays its abstractness," writes Whitehead,

> by affording no hint of that aspect of self-production, of generation, of φύσις, of *natura naturans*, which is so prominent in nature. For the *Scholium*, nature is merely, and completely, *there*, externally designed and obedient.[244]

As was discussed in the prior section, Whitehead's generalization of evolutionary theory requires that both potentiality and actuality be ingredient in any concrete depiction of nature. Nature as already produced, as *natura naturata*, as simply *there* and entirely *actualized*, provides only half the picture. Unlike the static cosmos of Newton, who Whitehead believes would have been confused by the modern doctrine of evolution, Plato articulated a cosmological scheme involving the emergence of order out of an original chaos, an account which already implicitly suggests an evolutionary process.[245] There are aspects of Plato's *Timaeus* that may seem foolish today, but "what it lacks in superficial detail," according to Whitehead, "it makes up for by its philosophic depth."[246] This depth has allowed Plato's speculative cosmology to outlast Newton's more arbitrary construction. The theory of cosmogenesis offered by the latter, involving "a wholly transcendent God creating out of nothing an accidental universe," has been abandoned by contemporary physicists and process theologians alike as gratuitous.

Plato's account of cosmogenesis, in contrast, avoids the Newtonian theory of *creatio ex nihilo*. Instead, the cosmos is said to emerge from the interplay of divine intelligence (νοῦς) and physical necessity (ἀνάγκη), such that the divine cannot violently command but must erotically persuade the cosmos to take shape out of chaos.[247] The Greek word ἀνάγκη means not only "necessity," but also connotes "need" or "urge": apropos Whitehead's creative retrieval of Plato's scheme, this suggests that God, whose primordial conceptual pole is itself deficient in actuality, necessarily experiences a *yearning* after concrete fact.[248] This yearning is productive of the consequent physical pole of God, which lovingly *receives* the freely actualized decisions

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[244]Ibid., 93.

[245]Ibid., 93, 95.

[246]Ibid., 93.

[247]John Sallis, *Chorology: On Beginning in Plato's Timaeus* (Bloomington: Indiana University Press, 1999), 91.

[248]*Process and Reality*, 33.

of every finite occasion, no matter how discordant, into the harmony of its completed nature.[249] "The action of God is its *relation*," writes process theologian Catherine Keller,

> by feeling and so being felt, the divine invites the becoming of the other; by feeling the becoming of the other, the divine itself becomes [affirming] an oscillation between divine attraction and divine reception, invitation and Sabbath.250

There are many other parallels to Whitehead's cosmotheogony in *Timaeus*. The usual translation of one particularly relevant passage is as follows:

> The god wanted everything to be good and nothing to be bad so far as was possible, and so he *took over* (παραλαμβάνω) all that was visible–not at rest but in discordant and disorderly motion–and brought it from a state of disorder to one of order. . .[251]

The phrase "took over" (παραλαμβάνω) is misleading if interpreted only actively and not also passively: in this case, as both *taking over* responsibility for forming, and at the same time *receiving* the givenness of chaos.[252] This double sense of παραλαμβάνω mirrors Whitehead's dipolar conception of divinity as both conceptually active in envisaging the abstractive hierarchy of eternal objects and physically passive in receiving the multiplicity of finite concrescent occasions into its everlasting concrescence. The divine, for both Whitehead and Plato, is not an all-powerful creator, but an all-preserving co-creator:

> He does not create the world, he saves it: or, more accurately, he is the poet of the world, with tender patience leading it by his vision of truth, beauty, and goodness.[253]

Although Plato attempts in *Timaeus*, and Whitehead in *Process and Reality*, to articulate the most rational account possible of the genesis of the universe, in the end they found it necessary, due to the obscurity of their topic, to speak mythically by telling a "likely story" (εικώς μύθος). The Greek word εικώς is sometimes translated as "probable," meaning likely but not entirely certain ("it goes something like this. . ."). As with the translations above, this choice can be misleading. The translation of εικώς as "likely" conveys the superficial meaning of "probable," but this rendering should not obscure the subtler meaning of "likeness," closely associated with the Greek word for "icon" or "image" (εἰκών). In Plato's cosmogenic myth, the universe is said to be the most beautiful image that it was possible for the divine to co-create. The beauty of a thing being a result of the noetic order and harmony it radiates, it follows that the divine had to find some way to imbue the cosmic image with intelligence. Because "νοῦς

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[249]Ibid., 349.

[250]Keller, 198.

[251]Plato, *Timaeus*, 30a.

[252]Sallis, 57.

[253]Whitehead, *Process and Reality*, 346.

[intelligence] cannot be present in anything without soul [ψυχή]," the God made the universe as a living creature or animal (ζῷον), a being endowed with soul.[254]

It is at this point that a tension emerges in Plato's story. Although not all-powerful, the Demiurge in Plato's Timaeus is described as a maker, or artisan. It is strange that the Cosmic Animal, or World-Soul, is said to have been *made* by the Demiurge, since normally living creatures are not fabricated by an artisan, they are *born*. This raises questions about how Plato conceives of divinity. "To find the maker and father of this universe is hard enough," writes Plato, "and even if I succeeded, to declare him to everyone is impossible."[255] There has been much commentary over the ages concerning the meaning of this double designation of the Platonic God as both "maker" and "father." Plutarch's interpretation is helpful, if not entirely elucidatory:

> [In] the case of a maker, his work, when done, is separated from him, whereas the origination and force emanating from the parent is blended in the offspring . . . which is a . . . part of the procreator. [The] cosmos is not like products that have been molded and fitted together but has in it a large portion of vitality and divinity, which god sowed from himself in the matter and mixed with it.[256]

The Demiurge, then, is a maker, but a *fatherly* maker whose life force is wedded with that which has been brought to birth. Still, it seems awkward, to say the least, that the cosmos is said to have been born from a single male parent. Plato resolves this tension by introducing another cast member into his cosmogonic drama: the Receptacle (ὑποδοχή), or "wetnurse of all becoming."[257] Whereas the fatherly Demiurge is said to *beget* the beautiful form of the cosmos, the motherly Receptacle is said to *bear* it.[258] Plato's account of the Receptacle is meant to be an accessible image for a closely related, but far more obscure concept, that of the Khora (Χώρα). The Khora is described as the "third kind" mediating between the eternal being of the Ideas and the becoming of the cosmic image. "Its nature," writes Plato,

> is to be available for anything to make its impression upon, and it is modified, shaped and reshaped by the things that enter it. . . . The things that enter and leave it are images of those things that always are [Ideas/ειδών], imprinted after their likeness in a marvelous way that is hard to describe . . . . It is in fact appropriate to compare the receiving thing to a mother, the source to a father, and the nature [physis/φύσις] between them to their offspring.[259]

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[254]Sallis, 57-58.

[255]Plato, *Timaeus*, 28c.

[256]Plutarch, *Platonic Questions*, II, 1, quoted in Sallis, *Chorology*, 52 note 7.

[257]Plato, *Timaeus*, 49a.

[258]Sallis, 58 note 14.

[259]Plato, *Timaeus*, 50c-d.

The Cosmic Animal or World-Soul, then, is the offspring of the khoric mother and eidetic father. While standard readings of Plato's written corpus tend to fall into a two-world interpretation, where physical becoming is said to poorly imitate perfect metaphysical being, ambiguities in Plato's account make it difficult to determine whether, in generating an ensouled cosmos, the separation between the eternal Ideas and the becoming of the physical cosmos is canceled.[260] From Whitehead's perspective, this ambiguity can be hermeneutically massaged to save Plato from the incoherence of dualism. After all, Plato himself explicitly disclaimed "the possibility of an adequate philosophical system" that might permit the "variousness of the Universe . . .to be fathomed by our intellects."[261] Whitehead's reformed Platonism insists upon the worldly immanence of the divine, thereby erasing any ultimate separation between the Demiurge and the Receptacle. Instead, their supposed offspring, the World-Soul, is said to supply the universe's harmonious tendencies through the dipolarity of its own nature. Conceiving of the World-Soul as an *emanation* issuing from a transcendent deity, as some Platonic interpreters have done, "obscures the ultimate question of the relation of reality as permanent with reality as fluent"; the coherence of Whitehead's scheme requires, in contrast, that the Cosmic Animal be understood as a *mediator*, sharing in the natures of eternity and time alike.[262] The Cosmic Animal is not a free creation of an acosmic divine architect, but a creature of Creativity.

Whitehead reads *Timaeus* as offering an account of a World-Soul

> whose active grasp of ideas conditions impartially the whole process of the Universe [and] on whom depends that degree of orderliness which the world exhibits.[263]

Without this active grasp by the living intelligence of the mediating World-Soul, the ideas would remain frozen and lifeless and would have no way of characterizing actuality or partaking in the creative process of cosmogenesis. Plato further describes the way the Cosmic Animal "contains within itself all the living things whose nature it is to share its kind."[264] As Whitehead puts it, the organic process of each actual occasion "repeats in microcosm what the universe is in macrocosm."[265] It is this correspondence between the World-Soul and the varying grades of finite souls, including humans, that affirms the co-creative role of every organism, no matter how seemingly insignificant: "all [play] their part in conditioning nature by the inherent

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[260]Sallis, 69-70.

[261]Whitehead, *Adventures of Ideas* (New York: The Free Press, 1961), 52 (originally published in 1933). Whitehead is here referring to Plato's discussion in his Seventh Letter written to Dion's followers.

[262]Ibid., 130.

[263]Ibid, 147.

[264]Plato, *Timaeus*, 31a.

[265]*Process and Reality*, 215.

persuasiveness of ideas."[266] An erotic ferment inwardly permeates every creature, persuading all ever onward toward novel intensities of harmonic experience. In this sense, Eros, the divine element in the world, functions less to preserve stability than to evoke intensity.[267] For example, even stars, our sidereal ancestors, are not everlasting: only by way of their sacrificial death could the heavier elemental creatures required for biological life have been brought forth. Similarly, the upward trend of biological evolution towards more complex species depends upon a selective process whereby the inability of an individual organism to adapt its way of life to changing circumstances "[entails] the death penalty for impertinence."[268] The cosmic desire for the intensification of experience is more powerful than the private fear of death. "It is in this way," writes Whitehead,

> that the immediacy of sorrow and pain is transformed into an element of triumph. This is the notion of redemption through suffering which haunts the world.[269]

Whitehead calls the process of erotic evocation of intensities by the World-Soul, whereby egoistic aims are sublimated by their inclusion in a greater whole, a "Supreme Adventure."[270] He describes the Adventure as an inverted renovation of Plato's Receptacle, a "medium of intercommunication" necessary for the unity of all things.[271] While the Receptacle is "void," "bare of all forms," "and abstract from all individual occasions," the Adventure includes "the living urge towards all possibilities [realizable by] the [actual] occasions of the advancing world each claiming its due share of attention."[272] The divine dimension of the cosmos, the World-Soul, is the "Great Fact" explicatory of our Supreme Adventure. As discussed above, the divine nature is dipolar, including a primordial and a consequent aspect, or as Whitehead also describes them, an "initial Eros" and a "final Beauty." Whitehead's poetic genius reaches its highest pitch when he reflects upon this Great Fact in the concluding lines of *Adventures of Ideas*:

> It is the immanence of the Great Fact including this initial Eros and this final Beauty which constitutes the zest of self-forgetful transcendence belonging to Civilization at its height. At the heart of the nature of things, there are always the dream of youth and the harvest of tragedy. The Adventure of the Universe starts with the dream and reaps tragic Beauty. This is the secret of the union of Zest with Peace:–That the suffering attains its end in a Harmony of Harmonies. . . . In this way the World receives its

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[266] *Adventures of Ideas*, 148.

[267] *Process and Reality*, 105.

[268] *Stengers*, 112.

[269] *Process and Reality*, 350.

[270] *Adventures of Ideas*, 294-295.

[271] Ibid., 134.

[272] Ibid., 295.

> persuasion towards such perfections as are possible for its diverse individual occasions.[273]

While the World-Soul's primordial valuation of the multiplicity of eternal objects is unchanging "by reason of its final completeness," its consequent feeling of the evolving multiplicity of actual occasions remains always incomplete.[274] In this sense, although the community of finite organic occasions makes up the unity of the Cosmic Animal, the latter "is not a static organism"; rather, "[it] is an incompletion in process of production."[275] Process theologian Roland Faber has described Whitehead's theology of becoming as an "*eschatological ad-vent*" wherein the divine is caught up in the always ongoing adventure of all that was, is, and will be.[276] The ensouled universe is therefore best described not simply as Whole, or as One, but as an

> open movement of wholeness that cannot be united by any rational account [because it] harbors the Eros of unpredictable novelty and incommensurable diversity.[277]

Whitehead's emphasis on openness and diversity makes comparisons with neo-Platonist schemes of the emanation of the Cosmic Animal from the "One beyond being and non-being," as Plotinus and Proclus often described it,[278] rather troublesome. Nonetheless, physicist Simon Malin argues that Whitehead's approach is in some ways complemented by such schemes, wherein a process of divine effulgence or "overflowing" leads to the ordered involution of a series of stages:

> Thus the One produces Nous, Nous produces Soul, Soul produces nature, and nature produces the sensible world. . . . In the case of the World Soul . . . it is the contemplation of the perfect intelligence and order of the Nous that gives rise, as a kind of unintentional overflow, to the order of nature.[279]

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[273]Ibid., 296.

[274]*Process and Reality*, 345.

[275]Ibid., 214-215.

[276]Roland Faber, "De-ontologizing God: Levinas, Deleuze, and Whitehead," in *Process and Difference: Between Cosmological and Poststructuralist Postmodernisms*, eds. Catherine Keller and Anne Daniell (Albany: State University of New York Press, 2002), 222-223.

[277]Roland Faber, "Surrationality and Chaosmos: For a More Deleuzian Whitehead," in Roland *Secrets of Becoming: Negotiating Whitehead, Deleuze, and Butler*, eds. Roland Faber and Andrea Stephenson (New York: Fordham University Press, 2011), 158, 163.

[278]Following Plato, *Republic* 509b and *Parmenides* 137cf.

[279]Simon Malin, *Nature Loves to Hide: Quantum Physics and the Nature of Reality, a Western Perspective* (Singapore: World Scientific Publishing, 2012), 201-202.

While some analogy can be drawn between the Nous and Whitehead's conception of the primordial nature of God, in the emanationist scheme, the many actual occasions of the physical world are given no agency or co-creative role whatsoever, nor is God attributed with a consequent nature allowing it to *become-with* the many occasions of the world as our fellow-sufferer. Whitehead dismissed such overly rationalized schemes because they lack the experiential adequacy demanded by our religious intuitions of a God who feels and can be felt, and our aesthetic intuitions of a continually creative cosmos. "God is *in* the world, or nowhere," writes Whitehead,

> creating continually in us and around us. This creative principle is everywhere, in animate and so-called inanimate matter, in the ether, water, earth, human hearts. . .In so far as man partakes of this creative process does he partake of the divine, of God, and that participation is his immortality, reducing the question of whether his individuality survives death [to] irrelevancy. His true destiny as co-creator in the universe is his dignity and his grandeur.[280]

The rationality of Whitehead's cosmological scheme remains provisional, experimental, imaginative, and always pluralistic. It is an "adventure of hope," not a search for the certainty of a final systematic theory that would "explain away" mystery.[281] For Whitehead, not only does philosophy begin in wonder, "at the end, when philosophic thought has done its best, the wonder remains."[282] Whiteheadian rationality is guided by an unwavering commitment to *relationality*, whereby "there is an essence to the universe which forbids relationships beyond itself."[283] To search for a "beyond" is to violate the rationality of relationality. Instead of anxiously running from the abyssal chaos at the root of all things in search of the secure Ground offered by traditional accounts of a One beyond being, or an omnipotent Creator, Whitehead celebrates the "within-beyond" of a groundless "creative drive undermining any static dichotomy between cosmos and chaos."[284] God, a creature of Creativity like each of us, suffers and enjoys the unpredictable adventures of a chaosmos in which "everything happens for the first time, but in a way that is eternal."[285]

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[280] Price, 297.

[281] *Process and Reality*, 42; *Adventures of Ideas*, 174.

[282] *Modes of Thought*, 168.

[283] *Process and Reality*, 4.

[284] Faber, "Surrationality and Chaosmos," 165.

[285] Borges, "Happiness," 441.

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