Re-envisioning Nature, Re-envisioning Science

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"Re-envisioning Nature; Re-envisioning Science" expresses the conviction that seizing the alternative of moving toward an ecological civilization will require humanity to overturn the mechanistic view of nature that dominated science in the modern period. Through the powerful influence of science, a mechanistic worldview came to dominate the minds, thoughts, and actions of modern men and women.

I propose instead that nature is best conceived as complex and emergent, as filled with organisms and agents. To "seize this alternative" is to call into question the reigning paradigm within which science today is being interpreted.

Now activists may at first worry that this topic is too abstract and divert attention from more urgent matters.[1] After all, are we not living on the brink of planetary disaster?

I suggest, however, that "Re-envisioning Nature; Re-envisioning Science" may represent a fundamental rethinking of the entire conference; it represents the most comprehensive alternative to modern mechanism. This work of rethinking is urgent because the consequences of this re-envisioning are far-reaching, even revolutionary. Reductive science offers us a world devoid of agents, value, and meaning. Sadly, reductive science has become *the* dominant epistemic authority, the major ideology to justify the modern way of living in and with nature. Reductionism and mechanism are deeply myopic, and ultimately inconsistent. How can one be satisfied with science as a tool if it lacks the ability to conceive scientists—the researchers themselves—as agents carrying out intentions and purposes in the world? How can one *value* science and *be conscious of* scientific insights, if one accepts a worldview in which values and minds are illusions? Maria Teresa Teixeira notes the tragedy of this view "We are not to be included in what we perceive. For we are the perceivers and our minds have come into play."[2]

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[1] The seven tracks of the conference for which this paper was written included: 1.Telling the Story: Systems, Processes, and the Present (Zach Simpson, chair); 2. Intuition in Mathematics and Physics (Ronny Desmet, chair); 3. Systems Theory, Complexity Theory, and Radical Emergence (Michael Dowd, Dongping Fan and Stuart Kauffman, chairs); 4. Beyond Mechanism: The Emergence and Evolution of Living Agents (Adam Scarfe, chair) ; 5. Ecologies, Becoming, Networks, and Value (Robert Ulanowitz and Elizabeth McDuffie, chairs); 6. Unprecedented Evolution: Human Continuities and Discontinuities with Animal Life (Spyridon Koutroufinis and René Pikarski, chairs); 7. Neuroscience and Consciousness: Toward an Integral Paradigm (Alex Gomez-Marin and Rod Hemsell, chairs).

[2] Maria Teresa Teixeira, "Purpose and Value in Whitehead's Ontology of Science," http://www.philosophyatlisbon.com/userfiles/file/Philosophy01.pdf#page=64

Let us then explore the three most important reasons to view nature as a world of interacting agents. I organize the case under the headings: how we know; what we know; and what we should do—or, to use the classical terms: knowledge, metaphysics, and ethics.

As a framework for this exploration, the conference organizers have chosen to highlight two pivotal lectures by Alfred North Whitehead, "Nature Lifeless" and "Nature Alive," published in his final work *Modes of Thought*. In the end, we will see, these two lectures have everything to do with ecological civilization. But we mustn't jump too quickly to the punch line. The standard approach is to hang out at the ecological finish line and congratulate folks as they come across. But the purpose of our working groups was more foundational. Our goal was to understand how one gets to an ecological worldview. For that, we need to ask deeper questions and think deeper thoughts. So fasten your seatbelts and get ready to do some intense philosophy. Once you've understood Whitehead's argument, you will never be tempted by the Siren song of mechanism again.

How We Know: The Great Divorce

Whitehead formulates the central question: "What are those primary types of things in terms of which the process of the universe is to be understood?"[3] That question—what is really out there?—leads quickly to the question, *and by what methods will it be known?*

Philosophers have long held that the method must be appropriate to the subject matter. Thus Aristotle argued in the *Nichomachean Ethics* that we should expect from no method more precision than the subject matter itself offers. The medieval philosophers also spoke of the fit or correspondence between the "thing" to be known and the ways of thinking of the human intellect (the *adequatio rei et intellectus*). *Scientia* or organized knowledge, the medievals said, had to possess methods appropriate to the subject matter under consideration. In short, *what science is* will be determined by *what nature is*. Nature first, science second.

The early modern scientific empiricists argued in a similar manner. As Richard Rorty notes in his famous book, *Philosophy and the Mirror of Nature,* the early modern thinkers relied on the model of perception to say what the world "really is." On this view, light waves move outward from the things themselves and impact the eye; nerve impulses then carry the information into the brain, where an internal image is formed of "the thing out there." The image is not the thing, of course; but as long as the image "corresponds" to what's really out there, knowledge is obtained.

Interestingly, even modern theologians availed themselves of the same picture. Karl Barth famously argued in the opening of his *Church Dogmatics* that there is just one necessary and sufficient condition if some area of inquiry is to qualify as science: it must possess methods of knowing that are appropriate to the thing that is to be known. Barth believed that Christian theology possesses the ideal method for knowing God: receptive openness to God's self-revelation in Christ. Theology is therefore *die Wissenschaft Gottes,* the science of God—just as physics is the science for the physical world.

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[3] Alfred North Whitehead, Modes of Thought (Toronto: Macmillan, 1938; New York: Free Press, 1968), 144. All subsequent parenthetical references are to this edition.

This was the *one* modern answer to how we know*: the world constructs our knowledge of it.* The second answer reversed the two poles, claiming instead that *we construct the world.* Recall the work of René Descartes. At the dawn of the modern age, Descartes famously proclaimed that he could distinguish between illusion and reality by the "clearness and distinctness" of his own ideas. The inner certainty of the knower became the sole authority for what could count as knowledge. (Consider the parallels with the Reformation theologian Martin Luther: hearing the voice of God within, or hearing it in the scriptures, was for him a higher authority than any human institution, such as the church.)

Immanuel Kant deepened this "Copernican Revolution" in epistemology. Knowledge, he said, is the result of the constructive activity of the human mind. The mind takes raw or unformed sense data (phenomena) and imposes "the categories of the understanding" upon them. At first this did not sound like relativism, since Kant believed that *all* sentient beings impose the same 12 identical categories whenever they construct "the world of our experience." But Kant's insistence on universality lasted only a few decades after his death. Before the middle of the ninth century, Riemann made the case for non-Euclidean geometries. That is, a variety of different geometries can be useful for science, opening the door to effectively random systems of categories. Suddenly, the order of the medieval world began to collapse. Now, it appeared, agents can impose methods of their own choice upon raw sense data, and *whatever results* may pass as knowledge.

Modern philosophers found themselves confronted with a dichotomy that they were never able to overcome—the dichotomy between objectivism and relativism. Successful predictions and the replication of experiments convinced scientists that their methods really did provide accurate knowledge of reality. By contrast, the rapidly expanding circles of interpretation in literature, philosophy, and religion convinced students of the humanities that each new method, each new way of seeing or reading a text, produces its own world. W.V.O. Quine described these multiple ways of seeing as "webs," Thomas S. Kuhn called them "paradigms," and Nelson Goodman called them "ways of world making." The feminist philosopher Donna Haraway expresses a similar viewpoint when she declares that "all knowledge is situated knowledge." Marshall McLuhan expresses the same judgment more dramatically: "the medium *is* the message."

By the end of the modern period, the modern worldview was rent asunder by the fatal divergence of its two great "cultures," science and the humanities. Most of the damaging dichotomies that define modern existence are symptoms of this great divergence: objective versus subjective, fact versus value, body versus mind, materialism versus idealism, the physical versus the spiritual, science versus religion.

Each one of these dichotomies expresses the same dual tug. If the ways of knowing must (and can) bend to nature-as-it-really-is, then you get objectivism. If the multitude of interpretations come first, such that what you "know" depends on what method you happen to choose, then you get relativism. Modern thought never resolved this conundrum. Instead, it remained forever caught in the pincer movement between the two. Or, to change the metaphor, modern thought vacillated perpetually between absolutism and relativism like the alternating current that powers the lights in your house.

Much of 20th-century philosophy was dithered away in the fruitless struggle to defend one pole of the opposition against the other. But I ask you: when a battle between conflicting

concepts appears unwinnable—when the decision between them seems impossible—what do you do? At some point, don't you pause to wonder whether, perhaps, the mistake lies in how you are formulating the question?

When you suddenly begin to see the two sides as complementary pieces of a single whole, you have made the transition from a modern to a postmodern worldview. Alfred North Whitehead is one of the central advocates of this constructive postmodern view. I have chosen the title "Mind vs. Matter" in order to suggest that the problem is not the two terms but the "versus" in the middle. If our seven working groups are able to make progress over the coming three days, it is because they are willing to leave the modern dichotomy behind.

What We Know: Many Methods, Many Regions

We are looking, then, for a whole to which so-called mind and so-called matter both contribute. Unlike the moderns, we begin with the complementary interactions of nature and method—of what is and how we know.

The advantages of this Gestalt-switch immediately begin to make themselves felt. The new approach allows us, first, to subdivide the sum total of nature into regions. "Regional thinking" expresses the both/and nature of the postmodern commitment: the different regions are defined by the specific methods that we use to understand in each case; but it is *the one world* that we seek to understand. Consider some examples: the methods of chemistry are appropriate for the region of medium-sized molecules, as the region of organic chemistry is appropriate for large biomolecules. The region of inquiry called genetics helps us to understand the part of nature in which genomes evolve based on selection pressures that operate on the phenotypes that genes code for. The region called 'primatology' includes all methods that help to explain a specific group within nature's animal kingdom. The inquiries that fall under the heading 'ecology' study systems of interacting organisms within nature, including both the living and the nonliving components of these systems.

I deeply support the pluralism of postmodern science. Too often the history of science has looked like the history of philosophy. We philosophers are famous for "totalizing," for placing "all things" or "all reality" under the control of a single theory. Philosophers are hyperactive when it comes to theorizing; we tend not to worry very much about the data. But what may be a virtue among philosophers is the cardinal sin among scientists. Science errs when it hands over control of all reality to a single method. Just one scientific field ought never to serve as the knowledge standard for *all* parts of nature—not particle physics, not quantum physics, not string theory. A variegated world requires a plurality of explanations and explanatory methods.

Something beautiful happens, I suggest, when we start to see nature through the many lenses of these many different methods. I call it a "natural piety"… the piety of a naturalist. The different methods of knowing, applied to the different regions of the world, produce a complex collage of insights. You learn different things from chemistry, cell biology, morphology, population genetics, ecosystems theory. You learn different things from studying a person as a psychological entity, as a member of a social group, in terms of her culture, as a product of biological evolution…and the list goes on. Re-envisioning science and nature in an adequate way requires rethinking a multitude of different regions of scientific practice.

I've just made a strong claim about science, and I don't want you to miss it. I dispute that science, as science, justifies the claim that all regions of nature are best explained by the laws and methods of *just one region* of nature. It may well be that the laws of physics constrain all behaviors in biology, and that biochemistry constrains how our brains work. But it doesn't follow that physics best explains all biological phenomena, or that the biochemistry of the brain best explains your acts of charity and compassion. Scientists *qua* scientists cannot stand above, or outside of, the many methods of the many regions of the world.

Why "Nature Lifeless" Can't be the Best Philosophy

We can't determine the best science; but can we determine the best philosophy? Notice the difference between the two. Scientists can, and should, limit their methods to the appropriate regions. Philosophers, by contrast, offer general theories that help people recognize similarities across the regions. Years ago, Stephen Pepper called these "world hypotheses."

There are very many different world hypotheses that we could consider—uncountably many. To waste no time, let's focus right in on the two world hypotheses that Whitehead considers: *nature lifeless* and *nature alive*. These also happen to be the two options that have most dominated the debate about nature for centuries now.

"Nature lifeless" takes its model from the pre-biological sciences, physics and chemistry. That means that, on this view, *living agents* are not explanatory units. Nature lifeless can point to rabbits and squids and other living agents; it can recognize them as things to be explained. The behaviors of living agents are then explained in terms of non-living factors: underlying physical laws, catalytic systems of chemicals, the way that genes code for proteins, osmosis through a cell wall. In each case, the reductive scientist *models* the behavior of what ordinary language calls agents, using non-agential explanations.

Think of the parallel with calculus. The calculus considers quantities that come very close to a whole number. We thus say that (for example) we will treat 0.999 continuous *as if it were exactly 1*. Similarly, "nature lifeless" jumps from *agent-like* processes to agents, acting *as if* the two were identical. Thus nature lifeless treats a genetic algorithm *as if* it were describing the formation of an agent; in neuroscience, it treats brain biochemistry *as if* this were sufficient to describe the decision making of a person; in an ecosystem, it treats quantitative changes in the system *as if* they were the results of animal agents and their intentions and actions.

Of course, in the end *as if* means *isn't really.* On this approach, *agents* don't really explain agent-like behavior; the lower-level, lifeless regularities do the explaining. Whitehead argues that the result is "merely a bloodless dance of categories."[4] Nature, on this view, "is described as made up of vacuous bits of matter with no internal values, and merely hurrying through space."[5] Again, as Maria Teresa Teixeira notes, on this view "*We* are not to be included in what we perceive. For we are the perceivers and our minds have come into play."[6]

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[4] Alfred North Whitehead, Modes of Thought, 1938 (NY: Free Press, 1968), 144.

[5] Ibid, 158.

[6] Maria Teresa Teixeira, "Purpose and Value in Whitehead's Ontology of Science," http://www.philosophyatlisbon.com/userfiles/file/Philosophy01.pdf#page=64, emphasis added.

Much follows once you have adopted "nature lifeless" as your worldview. Indeed, a whole worldview follows…a worldview that has birthed a disastrous way of living in nature and with other agents. It's the task of Whiteheadians to identify what has been wrought by the "nature lifeless" view, including how it has defined the modern world and determined its treatment of the planet and its inhabitants.

Let's summarize this "nature lifeless" view before we leave it behind. On this view, scientific explanations don't appeal to agents and their intentions. Once you've explained agents in terms of non-living forces and laws, you don't really need the language of agency anymore. Agency language has been explained away.

As agent-language is evacuated of its force, so too are all the characteristics of agents: values, purposes, goals, intentions—and with them, all the features of personhood and of human life that we, as human agents, value the most. Gone also, by the way, are the values pertaining to broader groups of agents: families, societies, communities, religious traditions. Of course, these *words* may still survive in the resulting sciences; but they no longer express the values and existential realities that they once expressed. As Whitehead notes bitingly, "all reference to life was suppressed."[7] Not only human agents are placed under erasure; the study of *all* living agents suffers. The entire biosphere becomes harder to understand…and harder to value.

How We Live: "Nature Alive" and the Ecological Mindset

And that, in short, is the philosophical dilemma bequeathed to us by modernity. Modern physics gives us process, activity, and change. It gives us "rules of succession," but not the meaning, value, or purpose of that succession. Whitehead asks, "How do we add content to the notion of bare activity? Activity for what, producing what, activity involving what?"[8]

Hence our turn to the other option that Whitehead identifies: *nature alive*. Remember the postmodern both/and that I identified above: nature presents as multiple regions, and differing regions are comprehended using differing methods. The "nature lifeless" view draws its methods from the pre-agential world, from physics and chemistry, and extends them upward and outward to all of nature. The "nature alive" view, by contrast, begins with the opposite assumption. There are regions of nature that are best explained in terms of the behaviors of agents. These regions require scientific and explanatory methods that capable of parsing what agents do and why.

Just as everything changed when "nature lifeless" became the overarching framework for living in the world, so everything changes when you understand yourself as one real agent in a world teaming with other agents. Now the various features of personhood and of human life become real constituents of the world: values, purposes, goals, and intentions. Whitehead's analogy is intriguing, "The energetic activity considered in physics is the emotional intensity entertained in life."[9] Seen in this way, we are "implicat[ed] in the creative advance."[10]

Agents and the Community of Life

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[7] Whitehead, *Modes of Thought*, 144.

[8] Ibid, 147.

[9] Ibid, 232.

[10] Whitehead, *Modes of Thought*, 146.

How far we have come from "Mind vs Matter"! We now recognize those terms as shorthand for a false dichotomy. Leaving it behind opens doors to a more adequate science of life. The forms of life, as Whitehead says, "touch upon human mentality at their highest, and upon inorganic nature at their lowest."[11] Measured against the continuities, the deeper unity, the differences among agents now make more sense.

Under the new paradigm, beyond mechanism, life is permeated by goals, purposes, and directions. What we call "mind" and "matter" have become deeply interconnected, and both are transformed as they become Siamese twins. Among our fundamental experiences, Whitehead insists, is the "direct feeling of the derivation of emotion from the body."[12] Yet we are also aware of "our own state of mind directly preceding the immediate present of our conscious experience."[13] "Bottom-up" and "top-down" factors intermingle in our experience. And indeed, biologists are now discovering that the biosphere is permeated by both bottom-up and top-down causality, as systems biology and ecosystem studies are now revealing.

"Nature alive" also allows us to view ourselves differently. Whitehead recognizes that "The one individual is that coordinated stream of personal experiences, which is my thread of life or your thread of life. It is that succession of self-realization, each occasion with its direct memory of its past and with its anticipation of the future. That claim to enduring self-identity is our self-assertion of personal identity."[14]

Gone is the anthropomorphism of old; we now see that human agents share their essential features with *all* living agents. Whitehead's focus on "occasions of experience" leads him to recognize that "creative activity belong[s] to the very essence of *each* occasion."[15] For all living agents, "the process of self-creation is the transformation of the potential into the actual."[16] Each occasion of experience has its own aim,[17] and no living agent can be comprehended apart from its aims. We seek not a biology without teleology, but rather a biology capable of enunciating the "immanent teleology" that undergirds all life…the goal-driven drives manifested by every living agent.

At the end of the day, where all of this points, at least for Whitehead, is the affirmation of "mutual immanence"[18] or, as he beautifully puts it, "We are in the world and the world is in us."[19] Using the word "soul" as shorthand for the experience of all living things, Whitehead writes that "the world is in the soul" and "the soul itself [is] one of the components within the world"[20]—a view that came to be known as panpsychism or panexperientialism.

Conclusion: All are Interrelated; We are Connected to All; We are Responsible for All

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[11] Ibid, 150.
[12] Ibid, 159-160.
[13] Ibid, 160.
[14] Ibid, 161.
[15] Ibid, 151 (emphasis added).
[16] Ibid, 151.
[17] Ibid, 152-153.
[18] Ibid, 164.
[19] Ibid, 165.
[20] Ibid, 163.

The title of this chapter, "Mind versus Matter," alludes to a core theme that runs across the philosophy of science. Questions of consciousness arise in quantum physics; questions of agency, meaning, and value arise across the biological sciences; and the most fundamental questions of who we are as embodied beings are raised in contemporary neuroscientific studies of the relationship between brains, thoughts, emotions, and consciousness.

> A philosophy of processes and events explores manners of being rather than states of being, "modes of thought" rather than any supposed essence of thought, and contingent interactions rather than unchanging substances. It focuses, you might say, on adverbs instead of nouns.[21]

We have made seven discoveries over the course of these reflections:

(1) It is time to free ourselves from the modern dichotomy between objectivism and relativism. We are not forced to choose between methods that perfectly reveal the objective world on the one hand, and interpretations that randomly create subjective worlds on the other.

(2) *Instead, science qua science requires a plurality of methods, depending on which regions of nature one is studying*.

(3) *The choice* against *agents—"nature lifeless," as we called it—is not only damaging for science; it is devastating for our understanding of ourselves and our relationships with livings things around us.*

(4) *Everything changes when we move to the paradigm of "nature alive." Now we study, and belong to, a world where agents are central*. On this view, the features that are fundamental to our own experience of the world are actually embedded in the world. Aims and purposes are manifested by agents all around us (and within us). It follows that *we* are embedded in the world as well. Rather than being a lone island of meaning in a sea of cosmic meaninglessness, each of us is a center of awareness and value, inhabiting a world permeated by similar centers.

(5) *The key feature of agent-centered existence is community*. We know ourselves as members of communities —vast networks of interdependent communities of living agents. No longer can humanity be singled out as the "thinking animal" (*zoon logikon*) stranded within a world of machines. Sensations, perceptions, feelings, emotions, thoughts, awareness—the various attributes of agents emerge across the biosphere, manifesting in different forms and functions in different environments and different stages of evolutionary time.

(6) *A community of agents is a community of value*. The things that we value are valued by other agents. All agents seek pleasure and aim to avoid pain; all perceive and respond to their environment; all seek to actualize the potential of the greatest thriving appropriate to their nature. Kant's famous dictum applies to all: *treat others never merely as a means to an end, but always at the same time as ends in themselves*. The implications of this insight for the global environmental movement are monumental.

(7) *We are simultaneously responsible for all the communities of value-laden agents with whom we interact.* Obligations emerge as we recognize that other living agents are far more like us than

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[21]Steven Shaviro, "Self-Enjoyment and Concern: On Whitehead And Levinas," http://www.shaviro.com/Othertexts/Modes.pdf

we had hitherto acknowledged. If we are one step in a chain of development of similar agents—or better: if we are one center of experience in a vast community of "experiencers"—then we share a responsibility for others, as they do for us (to the extent that they are able). We have discovered that the others are ontologically like us; they suffer in every way as we do. As Whitehead puts it, each occasion [of experience, *i.e.*, each living thing] "is an activity of concern, in the Quaker sense of that term. It is the conjunction of transcendence and immanence. [Each] is concerned, in the way of feeling and aim, with things that… lie beyond it."[22] Communities of interdependence are simultaneously communities of responsibility, as David Griffin writes:

> A reenchanted, liberating science will be fully developed only by people with a postmodern spirituality, in which the dualisms that have made modern science such an ambiguous phenomenon have been transcended, and only in a society organized for the good of the planet as a whole.[23]

The global climate crisis can be addressed only through an intimate working partnership between the natural sciences, the humanities, and the world's religious and spiritual traditions. Any view of science, or of religion, that forecloses the possibility of these collaborations entails a *de facto* suicide for our species. The synthetic vision sketched by Whitehead and defended in this chapter is meant to inspire a different mode of living in the world. The details of the vision will be worked out in the more concrete (and thus more important) discussions that are taking place in conferences and working groups and publications around the planet. Ever more concrete agendas for action are being developed and implemented in experimental communities or what we call "ecological laboratories."[24] But without rethinking the fundamental vision of Nature, as humanity must do, all activist efforts will eventually sputter out, like a fire with inadequate fuel.

I close with a final quote from Whitehead:

> Philosophy begins in wonder. And, at the end, when philosophic thought has done its best, the wonder remains. There have been added, however, some grasp of the immensity of things, some purification of the emotion by understanding…The aim at philosophic understanding is the aim at piercing the blindness of activity [in order to discover its purposes and goals].[25]

So: let's welcome each other to this world filled with cousins, with agents like ourselves. We are images of them, as they are of us. If we did not stand on the shoulders of giants, we would not be here now, breathing and interacting and thinking.

Honor and value these cousins who exist around you. Not as a mere projection of yourself, not in an anthropomorphic way. Rather, honor them as part of the interdependent web of life, whose value manifests both in the whole *and* in the parts — and not just in the parts that are us. This is not anthropomorphism; it is *biophilia*. We know ourselves because we belong to a vast community, without which we would cease to exist. We find relatives wherever we turn in

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[22] Whitehead, *Modes of Thought*, 167.

[23] Griffin, "Preface", in *The Reenchantment of Science*, xiii.

[24] See the new organization, Toward Ecological Civilization, at EcoCiv.org

[25] Whitehead, *Modes of Thought*, 168-169.

the biosphere. We are coming to understand ourselves as a community of communities. Let's join in sharing this responsibility for all, to the extent that the power within us lies.