

IS ECONOMICS A NATURAL SCIENCE?¹

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ABSTRACT: Advocates of a more socially responsible discipline of economics often emphasize the purposive and unpredictable nature of human economic behavior, contrasting this to the presumably deterministic behavior of natural forces. This essay argues that such a distinction between “social” and “natural” sciences is in fact counterproductive, especially when issues of ecological sustainability are concerned. What is needed instead is a better notion of science—“science-with-wonder”—which grounds serious science in relational, non-Newtonian thinking.

KEYWORDS: Economics; Social Science; Natural Science; Ecology

INTRODUCTION

Many critics have decried the ability of contemporary academic economics to address the urgent problems of our day. From poverty, discrimination, and economic injustice to global climate change, nuclear proliferation, and corporate threats to national sovereignty, the issues facing our societies urgently require attention. Yet economics education and research, currently dominated by the neoclassical approach, is very heavy on formal modeling and econometrics and very light on active empirical inquiry and social engagement. In its purest form, neoclassical economic theory in fact provides a theoretical justification for neoliberal policies of total privatization and deregulation. Some economists argue that social problems are best solved by simply giving markets and private self-interest free rein, and that the correctness of this position is “proved” by mathematical models and theorems. By so emphasizing mathematical elegance and abstraction, contemporary economics tends to imply that no engagement with the gritty world or attention to human community life is necessary.

Economists’ emphasis on mathematics arises from “physics-envy” and an ambition to be “scientific.” Hence, some critics argue that the field’s lack of relevance and usefulness can be blamed on the idea that economics is or should be a science. These critics would like to clearly delineate economics, which they considered to be within the realm of *social* philosophy, from physical science, which they imagine to be governed by very different rules of *natural* philosophy. Distinguished and broad-minded economist Robert Heilbroner, for example, has argued strongly against “the increasing tendency to envi-

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sion economics as a science" (1999, 317).

This essay questions such a position, on the grounds that it is based on a misunderstanding of "science." An understanding of science that goes beyond the dualistic conception such critics employ would be more helpful in envisioning how the discipline of economics can help address contemporary problems, and particularly those related to the natural environment.

MACHINES OR MEANINGS?

Critics of contemporary economics are correct inasmuch as they argue for rejecting the idea that economies can be modeled as mechanical and deterministic machines working according to given laws. It is, indeed, very important to challenge the economy-as-machine idea. Much argument *against* the idea that capitalism could become socially responsible is based on the idea that its direction is dictated by "laws" similar to those of mechanical physics. The "forces" of profit maximization and competition, to use the neoclassical terms, are said to inexorably drive business leaders to maximize shareholder value, no matter what the cost to workers' well-being or the environment. Or the "law" of accumulation, to use the Marxist term, is said to drive capitalist economies. The course of economies, these models imply, is thus fundamentally out of the hands of people and the institutions we create. If a capitalist economy is an inexorable machine, then the only options are either to submit to it or dismantle it. I agree with the rejection of this metaphor. A socially responsible economics must go beyond this image and these options. It must challenge this mechanistic image of economies if it is to bring back in a role for human purposive and creative action (Nelson, forthcoming).

Critics go down the wrong track, however, when they characterize science as being about uncovering the "laws" of nature and draw a dividing line between natural science and economics at the existence of human volition. Human nature and human behavior are more unpredictable and subtle than the motions of the particles of physics, they often argue. Natural science deals with predictable law-abiding behavior of unconscious particles; economics deals with unpredictable social behavior of conscious humans. In drawing such a line, they draw on intellectual habits of using dualisms such as culture vs. nature, mind vs. body, human vs. animal, and freedom vs. determinism which have a long history in post-Enlightenment Western thought—and which this journal has set out to explore and challenge.

Historians of science tell us that at the time of the Enlightenment in Europe a deep shift in worldview came about. In the medieval worldview, reason and the individual were relatively unimportant: obligations to the church and feudal hierarchies came first. Time was structured with religious rituals of syncretistic origin that marked the harmony of human culture with the with the cycles of nature, celebrating the arrival of spring, the solstice, the harvest, and the equinox. Humans were perceived as deeply embedded in a larger divine, social, and natural order.

The Enlightenment and the rise of science brought a radically new idea: the think-

ing individual and the scientist could rise above and control nature. Reason, consciousness, choice, and the human individual moved to the center of the worldview, while spirituality, habitual behavior, obligation, and animal and physical nature moved to the margins. Science became identified with reason, logic, detachment (and masculinity), contrasted to what was now seen in retrospect as an old-fashioned medieval view characterized by emotion, superstition, submersion in nature (and femininity—see Harding 1986, E.F. Keller 1985).

The problem with a dualistic worldview, however, is that it create gaps that are inevitably difficult to jump over or consistently bridge. If the world runs by logic and equations, why do we think we find meaning in it? If economies are deterministic machines, how can human purpose have any effect? If human bodies (including brains) obey the laws of animal nature, how is it that humans are distinguished by free minds? If the world is mechanical, how can it also be moral and valuable?

The early Enlightenment thinkers resolved this last problem by positing a divine origin for this finely ordered creation: the big machine we are all in, they claimed, carries out God's purpose and that is what makes it wonderful and meaningful. This image, however, became increasingly untenable over time as—especially after Darwin—people noticed that the study of the “clockwork” could run along just fine without recourse to a “Clockmaker.” Darwinian thought, in its later developments, also much complicated the Enlightenment notion of the scientist-studying-passive-nature by raising the idea that evolution—not the insertion by the divine of a rational essence into a material body—created the very mind of the scientist.

Some thinkers have, of course, tried to get around dualistic (e.g., mind vs. body, meaning vs. mechanism) thinking by attempting to jump completely to one side (and/) or the other. Thoroughly reductionist notions of science claim that the world really is all determinism and natural laws: our sense of purpose, choice, and meaning is merely an epiphenomenal illusion—a trick of nature in the service of blind evolutionary processes. All sense of wonder is denied.

Contemporary neoclassical economics, with its central image of (rather agency-free) agents who follow laws of mathematical maximization, at its fundamentals falls largely into this camp. The more an economic issue—exchange rates, poverty, pollution, whatever—can be wrung out and dried, stripped of real-world content and context, drained of emotive salience and addressed without apparent purposive intent, the more “scientific” and high-status one's research appears. The idea that high mathematical theory might sometime be applied to a real-world problem is given a sentence or two in the grant proposal or in the conclusion to a paper, but the real game is in the mathematics itself. Technique has taken precedent over content or consequences. The underlying, unstated philosophy behind this towering accumulation of mathematical modeling, of course, is that the world is such that it is amenable to such mathematical modeling: that it runs according to strict logic and laws describable by abstract functions.

In the opposite camp are romantic thinkers, to whom the world is really all about spirit, poetry, aesthetics, freedom, or the like. The anti-intellectuals in this group include

creationists who reject Darwinian theory because it contradicts the biblical Book of Genesis. Given a choice between what we can learn from physical anthropology and what we are told by (rather medieval) religious dogma, they choose dogma. The intellectuals in the group include the poets and artists and writers who continually look for meaning (or angst about its lack) in literature and art while regarding science as a rather pedestrian and unimaginative affair.

Yet, in an important way, neoclassical economics can be classified in this group, too—as profoundly romantic as well as profoundly reductionist. Defining economics as the study of *rational choice*, neoclassical economics treats human physical bodies, their needs, and their evolved actual psychology of thought and action as rather irrelevant. The notion that humans are created as rational decision-makers is, from a physical anthropology point of view, just as ludicrous as the notion that humans were created on the sixth day. The notion of humans as disembodied minds following rules of completeness, transitivity and independence of irrelevant alternatives is romantic through and through (Kahneman 2003).

Most people muddle through, one way or another, combining naïve dualism, reductionism and romanticism while trying not to think of the philosophy behind their beliefs overly much. A person who is a thoroughly detached reductionist at work will be thoroughly emotionally attached to her three-year-old child. The romantic poet is glad that the person who works on his car pays attention to Newtonian mechanics. The Christian will feel that God works in spiritual ways, and not pay too much attention to the part of her creed that says “I believe in the resurrection of the body.” The neoclassical economist applies reductionist techniques to romantic notions, and, typically, washes his hands of social responsibility while in a professional role. We deal with the split between nature perceived as mechanical, and our own lives perceived as meaningful, mostly by not thinking about it too much.

A BETTER NOTION OF SCIENCE

Those who argue that economics should *not* be thought of as a science, however, are reacting against a rather dated image of what the natural sciences are about. More recent work in physics demonstrates that the natural world is not through-and-through the billiard-ball universe envisioned in the Newtonian model. That model does a good job of explaining physical phenomena on the scale we observe with our unaided abilities of human perception. Wheels, levers and billiard balls will move as predicted by Newtonian equations. However, in the centuries since Newton, when scientists have examined phenomena that are much bigger (e.g., in astronomy) or much smaller (e.g. in particle physics), the image of the natural world as a mechanical and deterministic machine has been shown to be inadequate. Study of black holes, quantum mechanics, and complexity bring in elements that cannot be explained with mechanical notions. Energies, interrelations, a large role for randomness, and fundamental unpredictability are now recognized as important parts of the nature of “nature.”

In contrast to an image of science as about the uncovering of the laws and rules governing a passive and mechanistic nature, there has long existed an alternative image. This is the idea of science as a purposeful enterprise, motivated at its base by both a curiosity about the world and a desire to solve problems at hand. The essence of such a science is skepticism and an absence of dogma—even, when the case demands, about the dogma that the world must be seen as strictly ordered by deterministic natural laws. This kind of science demands a questioning attitude, creative thought, an open mind, a habit of returning again and again to observation, a capacity to maintain attention to detail, a willingness to tolerate and investigate the “outlier” cases, the patience to methodically investigate alternative explanations, and the sense to notice how one’s knowledge changes the world. A common element in the work of those who pursue such a science is an idea of the world as made up of evolving processes and their intricate interrelationships, instead of as fundamentally made of billiard-ball-type units.²

SCIENCE-WITH-WONDER

While it is possible to fall into reductionist, romantic, or dualist traps even when one starts with such a notion of science—these being the dominant cultural ways of understanding the world, it would be odd if many didn’t follow these temptations—I believe that such a notion, consistently held, opens up a radically different alternative that transcends these unsatisfactory positions.

This might be called “science-with-wonder.” It is thoroughly grounded in observation and investigation, without the least patience for dogma, superstition or *deus ex machina* explanations. But the very observations and investigations that inspire it also, by bringing the scientist face to face with the intricate interrelationships underlying phenomena, inspire awe and wonder, and a sense of value. The sense of value, in turn, can inspire responsibility and compassion.

I have noticed this sense in the work of a number of contemporary scientists. For example, evolutionary biologist Richard Dawkins said in his lecture, “Science, Delusion and the Appetite for Wonder,”

There is an appetite for wonder, and isn’t true science well qualified to feed it?

It’s often said that people ‘need’ something more in their lives than just the material world. There is a gap that must be filled. People need to feel a sense of purpose. Well, not a BAD purpose would be to find out what is already here, in the material world, before concluding that you need something more. How much more do you want? Just study what is, and you’ll find that it already is far more uplifting than

2. This sense of the world being composed of processes rather than substances was important, for example, in the American Pragmatist philosophy of William James and John Dewey in the early 20th century. While most of their work was confined to applying this insight to the social sphere, the early 20th century philosophy of Alfred North Whitehead and the contemporary physics of Ilya Prigogine and Isabel Stengers (1997) extend it to the physical dimension as well. (For more on application of these insights to economics, see Nelson 2003).

anything you could imagine needing. (1996)

While people may disagree about Dawkin's notions of the "selfish gene" and "memes," the sort of science he talks about is neither desiccated (as a reductionist's would be) nor at some level of mental existence above the phenomenal plane (as a romantic's would be).

Or consider Gerald Edelman and Giulio Tononi, who have studied at great length the relationship between the brain and the mind—between the material world and consciousness:

[C]onscious thought is a set of relations with a meaning that goes beyond just energy or matter (although it involves both)...[T]he mind...is both material and meaningful...There are no completely separate domains of matter and mind and no grounds for dualism...It is the amazingly complex material structures of the nervous system and body that give rise to dynamic mental processes and to meaning. (2000, p. 219)

Or consider the words of 1983 Nobel Laureate cytogeneticist Barbara McClintock, who said, "I start with a seedling, and I don't want to leave it...So I know every plant in the field. I know them intimately, and I find it a great pleasure to know them... Plants are extraordinary" (quoted in E. F. Keller 1983, pp. 198-99). Or consider this little insight into the view of psychologist Daniel Kahneman, who received the Prize in Economic Sciences in Memory of Alfred Nobel in 2002 for his work on the actual psychological bases of perception and choice: "However, this marvelous creation [the human cognitive system] differs in important respects from...the rational agent assumed in economic theory" (2003, p. 1454).

Notice the value-laden adjectives in these descriptions—"uplifting," "amazing," "extraordinary," and "marvelous." Science-with-wonder studies *and* appreciates phenomena at the same time. In fact, the deeper is the study, the deeper is the appreciation.

Such a non-dualistic view of matter and meaning, however, is terribly hard to hold on to, given dominant cultural understandings—and even the way our language is structured. For example, one term used to describe a project such as Edelman and Tononi's is that they are seeking to "naturalize" consciousness—that is, to describe the mind as arising from material causes without recourse to alternative (purely mental or spiritual) substances. However, if you look up the definition of "to naturalize" in the Oxford English Dictionary, you find: "naturalize (7. b.) To reduce to a purely natural basis; to free from the supernatural or miraculous." In a sense this is correct—*deus ex machina* appeals to the supernatural are, as previously stated, not acceptable. But in another sense, the definition leans much too far towards a reductionist interpretation. In an important way, what Dawkins, Edelman and Tononi, McClintock, Kahneman and others are saying is that nature itself is *all* "miraculous." It is amazing, marvelous, uplifting, extraordinary, and valuable.

This sense of wonder is one we can all touch, if we pause for a moment to perceive, as a child would, that we somehow exist, in bodies and space and time and relation-

ships, in a way over which we have no control and which we can hardly hope to begin to understand. This sense of awe at just *being* is also likely at the base of our human spiritual impulses, although it has very little to do with any particular religious dogma or creed. At such a moment of wonder at all of existence, the material and the spiritual—the sense of being in a body and the sense of being part of something large and precious—are one and the same.

ECONOMICS-WITH-WONDER

How could this different notion of science help us create a more healthy, just, and sustainable economic world?

First, science-with-wonder challenges the mechanistic notions of a socially amoral capitalism at a very basic level. Without such a challenge to dualistic conceptions of science versus meaning, the critics' project can be relegated, by conventional thinkers, to the realm of "socio-economics"—perceived and portrayed as a sort of soft-headed, touchy-feely (read: feminine) area—while mathematical modelers keep the academic high ground of being (read: masculine) "scientific economists." The basic dualistic image of purposeful humans versus a grinding, profit-maximizing mechanical capitalism would remain untouched.

Second, a notion of science-with-wonder could help transform economics back into a useful endeavor by shifting its focus from technique back to content and consequences. Techniques such as mathematical modeling and econometric hypothesis testing are not "wrong." In fact they can sometimes be quite useful. But a habit of excessively and reductionistically focusing on an extremely narrowly-defined set of techniques is detrimental. It takes our attention *away* from the phenomenon we purport to study, rather than leading us further *into* it. Science-with-wonder is motivated by a sense of curiosity and concern, leading to a desire to carefully investigate and deeply understand the subject matter. The best economists I have known exemplify this approach. Most economists I have known, unfortunately, seem to be more motivated by personal professional ambition. Given the current state of the profession, this is most quickly satisfied by proving oneself clever at mathematical manipulation using accepted (though erroneous) models of human behavior.

Third, science-with-wonder adds particular insight to the issues of human relationships with the rest of the natural world. An Enlightenment approach, of course, would state this as "human relationships *with* the natural world" since humans in that view are portrayed as somehow apart from and above our bodies—divinely or romantically blessed with a gift of reason and consciousness found, presumably, nowhere else in nature. Science-with-wonder does not deny the existence of our amazing capacity for consciousness, but grounds this as part of a continuum of processes *of* nature, rather than portraying it as a hard wall separating us *from* nature. There is an incredible hubris in science-*without*-wonder approaches that see human inventiveness and technological advance as the way to solve environmental problems. "It doesn't really matter how

much we deplete the ozone or warm up the climate,” such reasoning suggests, “because we have faith that in the future we will be able to *think* our way out of any problem we create now.” There is also a rather scary variety of wonder-without-science that suggests that ecological collapse is part of an inescapable divine plan for end times salvation, and therefore also need not be prevented (C. Keller, 1996). To the extent we, first, separate mind from matter (or spirit from matter) and, second, then identify with mind (or spirit), the result is that matter appears to not be particularly relevant, or at least not particularly our responsibility.³

CONCLUSION

The problem is not that economic life is too closely associated with the natural world. On the contrary, what we need to develop is precisely our capacity to identify ourselves as integrally a part of nature. We need to leave behind the notion of ourselves as minds (or spirits) somehow above and apart from nature, and see material and ecological concerns as very much our affair, and very much our own responsibility. To do this, the notion of science as the study of mechanism must be left behind. The study of social behavior, including economic behavior, must become “naturalized” (in the simultaneously “miraculous” sense).

Economics is, in short, a natural science. A biologist in awe at the complexity of a coral reef is unlikely to carelessly toss his or her Styrofoam cup into the ocean. One can hope that economists who are able, through deep and careful observation and open minds, to develop a sense of awe at the complexity of the interplay of human social organization with the bodily basis of existence will be similarly inspired to protect and preserve it.

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3. Because the term “nature” has become so closely associated with “natural law,” I must reiterate that I am using the term to refer to amazingly complex evolving processes that span dimensions we might commonly try to separate out as material, mental, and spiritual. In no way do I mean that there is some substantive, given, unchanging nature out there for us to simply discover. My position is quite consistent with a social constructivist understanding of knowledge and identity. In fact, if you start with the recognition that as human organisms our knowledge and our very means of knowing and perceiving have been dynamically shaped in conjunction with specific environments and needs, you cannot avoid the conclusion that a great deal of what we think we “know” about the world is knower-dependent and highly contingent. However, I also reject strongly subjective versions of social constructionism and the literary turn in Pragmatism, since these seem to me to fall back into mind/body dualistic traps by neglecting bodily experience.

BIBLIOGRAPHY

- Dawkins, Richard, 'Science, Delusion and the Appetite for Wonder', Richard Dimbleby Lecture, November 12, 1996,
http://www.edge.org/3rd_culture/dawkins/lecture_p1.html
- Edelman, Gerald M. and Giulio Tononi, *A Universe of Consciousness: How Matter Becomes Imagination*, New York, Basic Books, 2000.
- Harding, Sandra, *The Science Question in Feminism*, Ithaca, Cornell University Press, 1986.
- Heilbroner, Robert L., *The Worldly Philosophers*, 7th ed., New York, Simon and Schuster, 1999.
- Kahneman, Daniel, 'Maps of Bounded Rationality: Psychology for Behavioral Economics', *American Economic Review*, vol. 93, no. 5, 2003, pp. 1449-1475
- Keller, Catherine, *Apocalypse Now and Then: A Feminist Guide to the End of the World*, Boston, Beacon Press, 1996.
- Keller, Evelyn Fox, *A Feeling for the Organism: The Life and Work of Barbara McClintock*, New York, Freeman, 1983.
- Keller, Evelyn Fox, *Reflections on Gender and Science*, New Haven, Yale University Press, 1985.
- Nelson, Julie A., 'Confronting the Science/Value Split: Notes on Feminist Economics, Institutionalism, Pragmatism and Process Thought', *Cambridge Journal of Economics* vol. 27, no. 1, 2003, pp. 49-64.
- Nelson, Julie A., *Economics for Humans*, Chicago, University of Chicago Press, forthcoming 2006.
- Oxford English Dictionary*. 2nd Edition, 1989. On-line.
- Prigogine, Ilya with Isabelle Stengers, *The End of Certainty : Time, Chaos, and the New Laws of Nature*, New York, The Free Press, 1997.