

HOW HIGHER EDUCATION IMPERILS THE FUTURE: AN URGENT CALL FOR ACTION

EDUCATION

by Peter G. Brown and Jon D. Erickson

The deterioration of environmental conditions during the last century is accelerating and threatens the future of humanity and the myriad other species with which we share heritage and destiny. Much of the Earth's fresh water is contaminated, in short supply, or subject to competing claims. The pattern and rate by which human society consumes non-renewable energy sources greatly impede an energy transition to more sustainable sources. Greenhouse gas emissions from human activities are changing the atmosphere and acidifying the oceans, and land use changes are increasing already high levels of erosion.

The physical and natural sciences have diligently quantified and projected the accelerating course of this deterioration. International consensus on climate change, biodiversity loss, ocean acidification, freshwater

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John William Waterhouse, "Echo and Narcissus"

eutrophication, and soil erosion reference just a few of the markers of a human-dominated era many now call the Anthropocene. However, while the human imprint is obvious to much of the worldwide scientific community, our collective desire and ability to change course are far less clear. While the science of global environmental change includes human society as the main driver of change, the biologists, chemists, climatologists, and other scientists who dutifully describe the decline often absolve themselves of the policy, management, and ethical questions their work implies.

In academic vernacular, describing change is seen as positive analysis, while advocating for a course of action is the domain of the normative. This is not to say that science does not recognize desirable versus undesirable states of the world. However, the scientific method and standards

of evidentiary proof take these societal goals as given and go on with answering questions directed by so-called decision makers: legislators, managers, entrepreneurs, etc. The outputs of natural sciences are taken as an input to the social sciences and humanities. While there is a rich debate over the values-free claim of science, much of the normative "what shall we do" questions are delegated to fields such as economics, finance, law, political science, and ethics.

The effectiveness of an education system where one branch describes and the others prescribes depends upon the degree of common ground. However, today we suffer from a severe case of what C. P. Snow called the "two cultures" problem over 50 years ago. The social sciences and humanities often remain disconnected from our understandings of the biophysical foundations of human civilization. Interdisciplinary and transdisciplinary efforts have made





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some progress in illuminating the multi-faceted nature of the current ominous human predicament, but most collaborations rarely question whether individual disciplines are authentic and consistent with contemporary science and its implications.

What if the natural sciences were seen as foundational to the social sciences and humanities, rather than a competing branch of knowledge? What if fields of study within the social sciences and humanities developed from a meta-physical view that embedded humanity within the Earth's biogeochemical systems, the products of life's long journey of travail and splendor, and subject to the physical laws of the Universe? What if traditionally normative fields such as economics, finance, political science, law, and ethics – fields that tell us what we ought to do – were informed by, and even reconciled with, the more positive disciplines of physics, chemistry, and biology? In the current scheme of things, it is not clear how the "ought" of the normative is informed by the "is" of the positive.

Such questions might lead to a radical revision of education systems for the Anthropocene which would be built upon contemporary understanding of the physical, chemical, biological, and social evolution of the cosmos, our world, and our place in it. The scientific narrative that begins with the big bang and extends through the emergence of life on Earth to the current era provides a new perspective on which to revise the frameworks by which we decide what to do. Such footings would provide a new ethics to help guide humanity through the planetary crises of climate change, mass extinction of species, and social conflict over growing human demands on dwindling planetary resources. The unification of physics, chemistry and biology in the 20th century provides a foundation for an education system designed in reaction to instead of blindly born of a human-dominated geological epoch.

An education for the Anthropocene is an agenda to ground the normative disciplines in contemporary science of the human-Earth relationship. *First*, we motivate such an agenda, beginning by establishing the natural sciences as foundational to a rebirth of the social sciences and humanities. *Second*, we evaluate the scientific bases of the influential normative disciplines of economics, law, and ethics. *Finally*, we outline steps to spearhead a 21st century renaissance in the social sciences and humanities akin to the 20th century revolution in science.

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THE NATURAL SCIENCES: BRANCH OR ROOT?

Until around 1800, Western civilization took its cosmological bearings primarily from two main sources. First, from the Book of Genesis of the Hebrew Bible – what Christians call the Old Testament – written down according to biblical scholars around the 6th or 5th century BCE. The second major source was the works of Aristotle (384-322 BCE), a student of Plato, and the works of Alexandrian astronomer Ptolemy (90-168 CE) who held that the sun revolved around the Earth. In its many facets and journeys over millennia, the Western tradition has been characterized by a deep dualism: humans are taken to be separate from, and fundamentally different than, the rest of life and from nature itself.

These sources were combined into a powerful synthesis by Thomas Aquinas toward the end of the 13th Century. Of course, in the centuries that followed, the synthesis was not without its powerful critics whose names shine brightly in the history of science: Copernicus (1473-1543), Galileo (1564-1642), Kepler (1571-1630), and Newton (1643-1727) to name just a few. Beginning in the early part of the 19th century a new perspective began to take center stage in the

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work of the Scottish geologists who insisted that the Earth was of very ancient origins and was subject to slow changes over millennia. This helped to lay the groundwork for Darwin's *On the Origins of Species* published in 1859, which is incompatible with the idea that man is specially created as asserted in the Book of Genesis. The discoveries in the latter part of the 19th and through the 20th century led to a new synthesis built around the ideas of complex systems and evolution that undercut the ontological dualism central to the older understandings of the human place on Earth and in the Universe.

Remarkably, the deep dualism embedded in Western culture from its inception remains a powerful force in the academy and world alike. In particular, the scientific narrative has not adequately informed our decision-making frameworks. Grounded in 17th and 18th century European Enlightenment versions of the Thomistic synthesis, these systems of thought have remained largely uninformed by the developments of 19th and especially 20th century science.

We should think of these and other such disciplines as orphans – their intellectual parents are dead, but they remain alive in pedagogy and practice. Orphan disciplines can be divided into at least two groups. First, there are several normative structures that shape and mediate humanity's relationship with life and the world. These are directly prescriptive, and include disciplines such as economics, finance, law, political science, ethics, and philosophy. At the same time, there is an applied set of disciplines that also suffer from deep ontological inconsistencies with the contemporary scientific synthesis. Engineering takes it for granted that the Earth belongs to humanity and may be significantly modified, often at will, to suit our (even whimsical) purposes. Conventional agricultural instruction in universities assumes that "food security" applies only to persons, and treats farm animals as if we had rightful dominion over them. The field of business, the most popular topic of undergraduate and Master's degrees in North America, takes as its central charge to make short-lived human enterprises profitable over fixed time horizons with little or even no regard for impacts on the Earth's life support systems. More broadly, it can be argued that many of the social sciences are orphan disciplines in that they rely on the assumption of a sharp nature-culture divide.

Limited progress has been made in opening a dialogue between the orphan disciplines to new parents within the natural sciences through multidisciplinary or interdisciplinary endeavors. However, to extend the metaphor, these collaborations are more often viewed as marriages of consenting adults with equally relevant perspectives, than as adoption by new parent disciplines. In short, these efforts often operate on the assumption that disciplines are well grounded and authentic, but they rarely question whether these frameworks are informed by and consistent with well-grounded science.

This is not to say that the modern scientific synthesis provides a complete understanding. While the quest cast by the Enlightenment for a "theory of everything" was taken up in earnest by Einstein (1859-1955) and 20th century physicists to unite the micro world of the quantum to the macro world of general relativity, it nevertheless remains elusive. Where untested theory within the natural sciences has yet to deliver hard-won fact is at the very edges of scale and time, from the sub-atomic level to the origins of the universe. However, if the academy is to be relevant in addressing the unraveling ecological foundations of civilization, then research and education should purposefully reconcile worldviews between the natural sciences, social sciences and humanities.

RE-GROUNDING THE HUMAN-EARTH RELATIONSHIP

Building scientific foundations to social inquiry has found some success in the more "positive" social science disciplines such as psychology and anthropology. Such previously isolated fields have built alliances with the natural sciences based on neuroscience at small scales and short horizons, and evolutionary biology at large scales and long horizons. However, there is less discourse with the intellectual traditions of the explicitly normative disciplines that operate at scales of household, community, and nation state, over time frames characterized by political and economic cycles guided by an often short-sighted human animal. In what we've called "orphan" disciplines – fields of study wandering the halls of academia who have long since lost their metaphysical and scientific parents – we give students

maps of the world, but they are not maps of where we are. In order to constrain the scope of our critique and resulting project, we consider three normative and highly influential disciplines of economics, law, and ethics.

Economics for the Anthropocene

Conventional economics is mostly taught and used in the formulation of policy without any systematic connection to understanding of biophysical processes of supply and neurological foundations of demand. In contrast, an economics grounded in contemporary science would frame economic production as biophysical transformation towards socially constructed ends. For example, the field of ecological economics provides one compelling example of building a study of the human economy that is viewed as a complex social system embedded in the biophysical universe and grounded in the evidentiary standards of physical and biological sciences.¹

The primary unit of analysis in economics is at the margin, with “efficiency” criteria as the golden-rule for resource allocation. In contrast, complex socio-ecological systems exhibit discontinuity, irreversible thresholds, emergent phenomena, and co-evolutionary change. Evolutionary change is characterized by hierarchies of selection, historical contingency and random events. In evolutionary systems it is impossible to change one thing and hold everything else constant. Embracing an embedded economic system rejects the simplicity of marginal analysis.

Building an economics from scientific underpinnings would also reject the purely monetary foundations of economic analysis. The implicit assumption of cost-benefit analysis of the substitutability between manufactured and natural capital conflicts with the first law of thermodynamics, dictating that nothing can be created without low entropy matter and energy from earth systems. Framing choices in monetary value can also “crowd out” moral behavior, and ignores the importance of lexicographical preferences where people (real human-beings) are unwilling to trade-off environmental and social benefits for economic costs. Research on time preference also points to the existence of hyperbolic discounting, where distant future benefits are evaluated more than the near term. The diversity of human values and the capacity to care for future generations calls for a “values plural” approach to decision-making such as multi-criteria decision analysis.

An even more narrow expression of value can be found in the field of finance, a second generation orphan of our metaphor. Like economics, finance is taught as a self-contained system with no clear mechanisms to account for environmental limitation or unfair outcomes. While the recent global financial crisis has sparked renewed interest in explanations of inherent instability of the financial economy, even the most broad-minded insights remain largely unrelated to the biophysical dimensions of the economy. However, the flows and uses of money influence the world’s biophysical systems profoundly; they influence who is rich and who is poor, exacerbating the inequality of wealth

distribution and political power. They are inherent drivers of the loss and fragmentation of ecosystems, extinction of species, overexploitation of natural resources, and a changing climate.

Ultimately, an alignment with a scientific standard of proof would lead to abandoning the rational actor model central to economics and finance. This representation of the human decision-maker strips away any social or environmental context. However, results from experimental economics involving actual human behavior cast doubt on the general validity of a model built on assumptions of an isolated, self-regarding individual at a point in time. Preferences are instead dependent on social context, individual histories, and conscious preference development. A more complex model of human decision-making would incorporate a sense of fairness and socially contingent decision-making rooted in the sociobiology of moral reasoning.

Toward an Earth Systems Jurisprudence

A foundation of law in many liberal cultures is the strict protection of private property defined from a purely anthropocentric perspective. However, the main thrust of current scientific understanding, particularly ecology, directly challenges the idea of severability on which a liberal understanding of property depends and underscores the interconnection between public goods and private property. In addition, the assumption that humans are the sole rightful owners of the Earth finds no footing in an evolutionary worldview. As with ecological economics, calls for an “ecological law” requires that the foundation of the law is not ownership; but the characteristics of the planet and the living systems that it supports.²

A key postulate of liberal politics is that people may live how and where they wish, pursuing what John Stuart Mill called purely self-regarding actions.³ Yet, ecology and the two laws of thermodynamics, plus the overwhelming evidence concerning anthropogenic causes of climate change and of the destructive effects of contamination of air, water and arable lands, clearly reveal that such acts are rare at best. Indeed, the foundations of both political and economic liberalism must be rethought from the ground up.

The implications of re-envisioning our place in the world could not be more far-reaching. Once sinks have become saturated, as is the case with the global carbon sink, burning fossil fuels harms and even kills other people. Anthropogenic climate change increases droughts; takes food from the mouths of those at the edge of starvation; adds to sea-level rise, flooding farmland and contaminating aquifers; and increases the frequency of massive storms, which destroy the infrastructure of civilization. Simply put, emitting greenhouse gases violates the golden rule, an ethic of reciprocity at the heart of nearly every cultural, religious, and scientific basis of human nature.

Climate change is a major factor in the destruction of the web of life: imagine the bird seeking her nest in the swamp only to find it a dry and lifeless place; or the terminus of

¹For a review of the field, see: Gowdy, J. and J.D. Erickson, “The Approach of Ecological Economics”, *Cambridge Journal of Economics* 29(2): 207-222, 2005.

²See for example: Garver, G., “The Rule of Ecological Law: the Legal Complement to Degrowth Economics,” *Sustainability* 5(1): 316-337, 2013.

³Mill, J.S., *On Liberty*, Longman, Roberts & Green, London, 1869.

the long flight to the sub-arctic only to find the insects on which her life depends have already hatched and departed. Can we possibly justify our winter vacation on the beach in Mexico when it takes life from man and beast alike as its price? Could “liberty” possibly mean that those whose cup runneth over can justly take from those with no cup at all? How is “responsible” liberty to be defined, and where is it to be found? This is likely to be the most profound challenge that democratic theory and practice have ever faced.

Recognizing this, a grounding of law and governance with contemporary science must start with the recognition that in the Anthropocene “liberty” lives in a modest room in the mansion of justice.

A New Ethics for the Age of Humans

Ethics and political philosophy in the 20th century, at least in the Anglophone countries, largely focused on whether to emphasize human rights or utility. Yet, neither tradition has been firmly grounded in contemporary understandings of human subjectivity and social and ecological interdependencies. In the early 20th century, scholars such as Bergson, Schweitzer, Whitehead and others began an “organic” counter movement that began to articulate an integrated understanding of the relationship between the human self and the world. This inspiring counter-perspective has come back to life as thinkers like Leopold, Callicott, Jamieson, Berry, Elliott, and Brown have explicitly sought to connect ethics to science.⁴

Indeed, contemporary science supports and situates understandings of the self and world that are contained in many of the world’s ethical and religious belief systems, and in the work of philosophers such as Spinoza. The insights of neuroscience in particular help to understand how humanity can access and experience fundamental connections to a creative Universe, and undergird the construction of new narratives of humanity’s place in it, including its responsibility to future generations of life. This work outlines a need to advance the dialogue between moral philosophy and the insights from contemporary neuroscience, evolutionary biology, cosmology, and complexity theory.

What is clear from comparing the current evolutionary creation narrative to that found in the Judeo-Christian-Muslim traditions and their theological additions is that many of the assumptions of Western civilization find no support from current science. Gone are a chosen species and a chosen people. There is no prospect of an exogenous rescue, as in the second coming of Christ; no grounding for believing that women are derivative from men, nor their property; no *ex cathedra* moral systems as in the Ten Commandments; no virgin birth and no personal immortality; and no human dominion over the Earth and its myriad life forms. Without these theological premises the whole project of Earth domination which underlies much of higher education collapses.

As a result of our fresh understanding of ourselves, our circumstances and our declining prospects, conceptions of economics, finance, and, above all, democratic governance

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must rest on at least three straightforward, interconnected premises. First, that persons are fundamentally interdependent members of communities that include humans and other life, which all depend on the Earth’s biogeochemical processes that obey the laws of the Universe. Second, there is a fundamental duty to care for where we and our communities live. And third, that care for life requires the respectful use of what makes life possible. We call these, respectively, membership, householding, and entropic thrift. Living in keeping with these three truths may be summarized as living in right relationship with life and the world.

Membership recognizes that we share heritage and destiny with all other people and all other life on this planet, and therefore must expand the moral community to include all persons and all life. Humans are essentially relational, and individualism must give way to holism. We are members of, not masters over, life’s commonwealth. All persons in all cultures have equal moral claims to flourishing, constrained and enhanced by the claims of other species for their place in the sun. We are not the chosen species or the chosen people. This, if you like, is a new emancipation – it is an emancipation from false claims of privilege.

With house-holding, humans see themselves intrinsically as members of communities, then care for those communities is simply an expression of who we are and what we do. The world is not a collection of sources for satisfying our desires and a place to dispose of the waste stream inevitably created by those satisfactions. Rather, it should be considered a commonwealth where all species interact with each other and the planet’s biophysical systems in a manner that facilitates the thriving of life. Ultimately, we are obligated to enable, within our limited capacities, this thriving to continue on its journey into novelty. The idea of the Earth as a collection of resources and waste receptacles

⁴For a full review, see: Brown, Peter G., “Ethics for Economics in the Anthropocene,” Teilhard Series No. 64, American Teilhard Association, Woodbridge, CT, 2012.

must give way to that of the Earth as life's household (oikos).

Entropic thrift then requires low entropy stocks and flows, and the sinks for high entropy waste, be used judiciously and with respect. Like all other far-from-equilibrium systems, our lives depend on low entropy, a fundamental good that underlies all other "goods." Low entropy is a key feature of the Earth's capacity to support flourishing human and natural communities – it makes all life possible. It enables the far-from-equilibrium, autocatalytic living organisms like us to exist and thrive. Wasting that which makes life itself possible is a fundamental moral wrong. The Earth's limited capacity to construct and maintain far-from-equilibrium systems implies strong moral limits to human appropriation of low entropy energy and material and of sinks for human waste. There are both intergenerational and interspecies limits to the just use of Earth's sources and sinks.

TOWARD AN EDUCATION FOR THE ANTHROPOCENE

Courses and curricula in normative disciplines such as economics, finance, law, and ethics promote a worldview that is at odds with the state and fate of the human-Earth relationship. Economics, in particular, as the self-proclaimed "queen of the social sciences" undergirds political science and theory, business and engineering programs, and increasingly fields such as natural resource planning and conservation biology through expanding the boundaries and influence of cost-benefit analysis to include all earth systems. Principles of economics courses are among the most prescribed on college campuses worldwide; economics and political science majors are the curricula of choice for pre-law students and most public policy professionals and politicians; and masters programs in business administration graduate more advanced degrees than any other field of study.

The way forward is not acceptance of fundamental difference, but instead to evaluate which normative stances hold up to scientific scrutiny. Efforts to reconcile normative disciplines with the findings of contemporary science provides a foundation from which to equip and charge higher education for the challenges of the Anthropocene. Our purpose is not to urge the reduction of the normative orphans to the sciences, but to use the powerful and still emerging insights of contemporary science to join these inquiries in building a common edifice of understanding.

An education born from the realities of the Anthropocene would provide a new map for students; directions on how to navigate the unprecedented challenges of a human-dominated planet. Institutions of governance, business, civil society, and education would work together to reform economics, law, and ethics to inform life-affirming, scientifically credible, and, ultimately, moral choices. A reconciliation agenda would then outright refuse cooperation with ways of thinking and being that facilitate and legitimate the decline in life's prospects.

Here is what we propose as urgently needed reforms. *First*, reject the narcissism that characterizes the orphan disciplines – for it is here that we study, not the world, but

our own thought systems about the world. Note that in Waterhouse's painting of Echo and Narcissus at the front of this article, he is so taken with his own image that he does not even see the woman who is courting him. In some versions of the Narcissus story his distractions prove fatal—as ours are proving to be. But he only imperiled his own life—we are putting all of life's prospects at risk. *Second*, take on fully the way in which the picture of the human in these thought systems permeates, and contaminates, vast swathes of the curriculum in such seemingly distant hallowed halls as engineering and animal science. *Third*, take on the moral culpability of having legitimated and facilitated unprecedented planetary crises of the Anthropocene. *Fourth*, return to the original *raison d'être* for universities—which is to study the Universe and the human place in it. *Fifth*, acknowledge that the tasks ahead are to seek to bring order to the house of knowledge – what E.O. Wilson calls "consilience," a "jumping together" of what we know.

This agenda requires bold moral actions to rectify not only what we teach and study, but to show the great work ahead to salvage life's prospects. We will not step up to the challenge by timid efforts to inoculate lethal approaches with interdisciplinary initiatives, or a course here or there on "sustainability." The door opened, only so far ajar, by emerging paradigms such as ecological economics or big history are examples of such openings. It is essential to create incentives for far bolder actions of reform. For example, government agencies, foundations, and loyal alumni need to condition their giving on a demonstration of prompt, vigorous, and thorough reform. It is simply and profoundly wrong to continue to teach economics as if the economy is not connected to Earth's life support systems; finance as if it is simply lubricant for exchange; and law as if humans are the rightful owners of Earth and all its life. Let's put these thought systems on the dusty shelves of history and get on with meeting the increasingly grave challenges of our age.

We are just at the beginning of discovering our place in the cosmos and its implications for ourselves and the rest of life with which we share heritage and destiny. The findings will be revolutionary, frightening, unsettling, and full of opportunity. This is the challenge that the Anthropocene offers higher education: to cast off the cobwebs that entangle us and promise little more than a continuation of the journey we have charted for ourselves into oblivion. A path through the thicket is before us.

ACKNOWLEDGMENT

This call for action is an outgrowth of the Economics for the Anthropocene Partnership (<http://e4a-net.org>), with support from the Social Sciences and Humanities Research Council of Canada.

The authors thank Suzanne Moore, Debra Rowe, and David Korten for critical reviews of earlier drafts.

BALANCE



ARCoR

The Romanian Association
for the Club of Rome

ISSUE
No.2

www.clubofrome.ro

April 2016

CLUB OF ROME MAGAZINE
The Romanian Association

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