Zygon®: Journal of RELIGION & SCIENCE

Bratton, Susan Power. 2026. "Religion and Ecology, Integral Ecology, and Scientific Ecology: Shared Worldviews, Constructive Cooperation, or Divergence?" *Zygon: Journal of Religion and Science* 61 (3): 922–48.
DOI: https://doi.org/10.16995/zygon.26086.

Open Library of Humanities

Religion and Ecology, Integral Ecology, and Scientific Ecology: Shared Worldviews, Constructive Cooperation, or Divergence?

Susan Power Bratton, Professor Emerita, Environmental Science, Baylor University, Waco, TX, susan_bratton@baylor.edu

Media applications of the term "ecology" have become increasingly cultural and conflated with "environment(al)." Analysis of the *World Religions and Ecology* series, edited by Mary Evelyn Tucker and John Grim, found engagement with ecological issues but limited participation by ecologists. Adopting Ken Wilber's objections to philosophical naturalism, the humanities-based integral ecology of Sam Mickey, Sean Kelly, and Adam Robbert critiques scientific ecology's materialistic models and crypto-reductionism. It classifies restoration ecology as Exterior-Individual-It, which is inconsistent with the communitarian and spiritual aspects of restoration practice. Focused on social ethics, the *Laudato Si'*-based integral ecology of Dennis O'Hara, Matthew Eaton, and Michael Eaton seeks intentional engagement with science and criticizes political attacks on climate change research while asserting that science and technology must develop a greater awareness of their human implications. Religious appropriation of ecology affects the scale and foci of environmental problem analysis. Religious scholarship could benefit from in-depth explorations of scientific ecological conceptualizations of scale, disturbance, systems, risk assessment, and health.

Zygon: Journal of Religion and Science is a peer-reviewed open access journal published by the Open Library of Humanities. © 2026 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See http://creativecommons.org/licenses/by/4.0/. Articles published by the Open Library of Humanities may also contain other CC-licensed material, or material used or reproduced under an exception or limitation to copyright. Such material is not subject to the article's license. It is either marked with its own license, or marked that it has been reproduced with permission or under fair-use.
OPEN ACCESS

Introduction

This inquiry arises from the observation that fields such as religion-and-ecology do not cover the same diversity of natural phenomena and environmental topics as scientific ecology and related disciplines, such as conservation biology and restoration ecology. I have identified possible sources of the perceived dissonance, such as religious research focusing on issues with press coverage (Bratton 2012, 2014). The purpose of this article is to investigate how religion-and-ecology, and integral ecology, perceive ecological science and whether they incorporate current scientific foci, findings, language, and environmental concerns. Following a brief overview of the origins of the term "ecology" and its diversification in meaning, the article reviews major trends in ecological science during the twentieth century. Although other means of gleaning an understanding of natural history are valid and useful, for this article, ecological science encompasses scholarly research, societies, and publications. It then investigates the participation of PhD-level ecological scientists and the applications of environmental science in the series *Religions of the World and Ecology* published by Harvard University Press and edited by Mary Evelyn Tucker and John Grim beginning in the 1990s, with the final volume published in 2004. It then compares two more recent multi-author volumes on integral ecology, Sam Mickey, Sean Kelly, and Adam Robbert (2017a), based on integral studies as influenced by Ken Wilber, and Dennis O'Hara, Matthew Eaton, and Michael Eaton (2020), based on *Laudato Si'*, and explores how they portray and engage ecological science.

Foundations and Trends in Scientific Ecology

While science often adopts vernacular vocabulary, the origin of the word ecology reflects the nineteenth-century naturalists' preference for classical languages. The zoologist, artist, and monist Ernest Haeckel coined the German word *Ökologie* from the Greek noun *oikos,* originally meaning a household or a shared economy. An enthusiastic Darwinian, Haeckel did idealize humanity and the natural order, as was typical of his generation of biologists. Humans crowned the evolutionary tree. Aside from publishing descriptive accounts of animal interactions with their environments, Haeckel was philosophically active as a founder of the Monist Society. Of interest to art historians, the combination of realism with abstract organic patterns in his biological illustrations contributed to the transition from nineteenth-century art to twentieth-century modernism (Voss 2023).

Initially, scientific ecology favored observational descriptive reports over experimental studies and focused on natural processes visible at human spatial and temporal scales. The models were deterministic and idealistic. In the early twentieth century, for example, the American Fredrick Clements developed a theory of plant succession following disturbance, where predictable species assemblages replaced one another until a burned or plowed site reached a relatively stable

climax. Responding to climatic zones and soil types, ecological communities had observable boundaries termed ecotones and functioned much like superorganisms. Natural processes like plant succession had predictable outcomes, terminating in ideal or maximally productive states, such as old-growth forests. At mid-century, Henry Gleason and Robert H. Whittaker challenged Clements's conceptualization and documented the individualistic responses of plant species to environmental gradients, such as elevation and moisture. In 1942, Raymond Lindeman's investigation of the trophic-dynamic aspects of ecology framed ecosystems in terms of energy transfer and nutrient cycling. In 1953, Eugene Odum published a best-selling university-level text centered on ecosystems. Odum pursued a holistic approach, constrained scientific reductionism, and conceptualized natural environments as composed of interacting biotic communities. Ecology gradually displaced subjective classifications and ideals based on cultural norms and teleological interpretations of evolution (Golley 1993).

From the 1960s into the 2000s, scientific ecology placed an ever-greater emphasis on experimentation and comparisons among systems with significant variables controlled. Leading laboratories increasingly applied statistics and developed predictive mathematical models, while new instrumentation enabled detailed study of molecular processes, particularly in chemical cycling, pollutant detection, and population genetics. These trends contributed to an expansion of spatial scales from microcosms and sandbox experiments to global models. Today's research extends beyond the seasonal and human lifespans, from the microsecond to deep time. New ecological specializations have emerged, such as disease ecology, landscape ecology, paleoecology, and global carbon modeling. Ecologists have analyzed hierarchies, flows, pathways, linkages, and intra- and interspecific relationships. Tracking biotic responses to natural and anthropogenic disturbances, they have found that many species are adapted to periodic burning, windfall, or flooding; thus, disturbances are often necessary to maintain ecosystem productivity and biodiversity. Natural and human disturbances interact, and many ecological communities long thought to represent the "climax," or "old growth" states, had histories of cultural burning. Disturbances at a locale produce multiple potential outcomes, and a single site can support multiple stable states. Abandoning older concepts of strongly bounded systems and processes, S. T. A. Pickett and Peter Sherwood White's (1985) edited collection of ideas concerning disturbance and succession is far more postmodern than Clements's linear, single-factor model.

The range of scales has been critical to concepts such as Gaia, which combines microbial ecology with atmospheric chemistry and physics. Ecologists have challenged the notion of harmony in nature and the concepts of "virgin" ecosystems and untouched wilderness. They have intentionally avoided idealistic interpretations and dichotomies resulting from culturally rooted categorizations, as these lead to incorrect assumptions about the structure and origins of ecological

communities. While becoming more holistic and systems-oriented, ecology has also become more experimental and deployed additional reductionistic chemical, molecular, and mathematical techniques. Applied ecology and conservation biology have striven to correct past and ongoing natural resource disasters, resulting from biased or insufficient scientific examination.

The Diversification of the Term Ecology

Since the mid-twentieth century, applications of the term ecology have multiplied, and increasingly incorporated social and economic implications not considered by Haeckel. Euro-American popular culture has adopted ecology as a descriptor for healthy human relationships with other species. The term has merged with environment(al). A commercial product that does not pollute or harm the environment is "ecologically friendly." One can purchase eco-soaps, eco-sandals, and eco-engines. In April 2025, this author conducted a search of shareware images available in Microsoft and Bing photo and illustration stock collections available for use with software such as Word and Powerpoint to determine how software designers supporting widely available writing or publication programs interpreted the terms ecology and environment(al). Frequent themes included sustainable technologies, such as photovoltaic cells and wind turbines. Rather than providing diverse images of living organisms at various scales, the collections favored compositions displaying a green planet in human hands or humans standing on a globe covered in vegetation. Popular usage thereby has promoted a "one Earth," "mother Earth," or "shared planet" theme, emphasizing the universality of life.

On September 25, 2025, an additional search of Microsoft images for "ecology" produced fifty selections, nine of which had unified-Earth themes; twenty-five (50 percent) of which concerned sustainable energy, particularly wind turbines and photovoltaic arrays; seven of which displayed sustainable products such as recyclable materials or electric automobiles; and six of which showed agricultural or garden landscapes. Of the nine images incorporating humans, five included children. Only two of the fifty photos were of living microcosms—a spider web and mushrooms in a moss mat, and there were no images of pollinators, predators, or other organisms with keystone ecological roles. Most of the outdoor photos displayed charming scenery, including wind turbines standing in fields of golden grain or crowning dramatic ridge tops. A search for "environmental" produced a much larger inventory. In the first 100 images, there were three unified-Earth selections, twenty-five close-ups of plants and eleven of animals, thirteen photos of oceans or lakes, then of forests, and seven of mountains. There were images of pollinators, predators, and endangered species, including such charismatic taxa as bees, hummingbirds, cranes, pandas, tigers, elephants, and gorillas. Ironically, from a scientific perspective, wind turbines and photovoltaics were absent. The Microsoft stock

largely reversed the scientific implications of the terms, equating ecology with sustainability while emphasizing the experiential, biotic, and lived-in aspects of environment(al). Although there is no easy way to check, the contents of the environmental inventory suggested political vetting. Only one photo of a crushed plastic bottle on a beach appeared in the first fifty images, and none captured petroleum spills or wastewater effluents. Photo libraries intended primarily for professional designers, such as Getty, recognize the duality of ecology and query whether the designer is seeking natural history or environmentally oriented images. These results verify the flexibility and merger of the terms ecology and environment(al) in popular usage, as well as the extent of media manipulation of their conceptual foundations.

The *World Religions and Ecology* Series, Edited by Mary Evelyn Tucker and John Grim

Religious responses to the negative impacts of industrialization, agriculture, and resource extraction, such as Christian stewardship, preceded the emergence of the environmental movement in the 1960s. After World War II, Christians, as the most prevalent voices in Euro-American universities, continued to dominate Western scholarly responses, such as the rise of ecotheology (Bratton 1983). Yet comparative and social-science-based religious environmental scholarship was becoming increasingly prevalent (Hargrove 1986). Although not the first to refer to religion-and-ecology, Mary Evelyn Tucker and John Grim founded and guided the project that provided the greatest boost to the emerging academic field. Former graduate students of the comparative religions scholar and Roman Catholic priest Thomas Berry, they organized a series of grant-funded meetings, each of which generated a volume focused on a faith tradition, published by the prestigious Harvard University Press. The selection of religions mirrored Western scholarly preferences for identifying "world religions" as those with a corpus of theological, philosophical, or spiritual texts or those associated with world powers, including Japan, China, and India (see Figure 1). Thus, the project dedicated a volume to Shinto, a Japanese religion (published by a Japanese press), and to Jainism, considered foundational to the evolution of Asian religions. Adherents of Jainism comprise 0.4 percent of the population of its natal region, India, or about five to six million people (Starr 2021). In 2020, 28 million people in sub-Saharan Africa alone, most of whom were traditionalists, identified with religions other than the "world religions" (Hackett et al. 2025), yet all Indigenous religions were amalgamated into a single volume (Grim 2001). Interestingly, the series did not systematically cover new religious movements, emerging religions, or modern alternative religions as categories. Nonetheless, the breadth, international representation, and scholarly quality of the project established religion-and-ecology as an essential subfield of comparative religions, environmental studies, and environmental humanities.

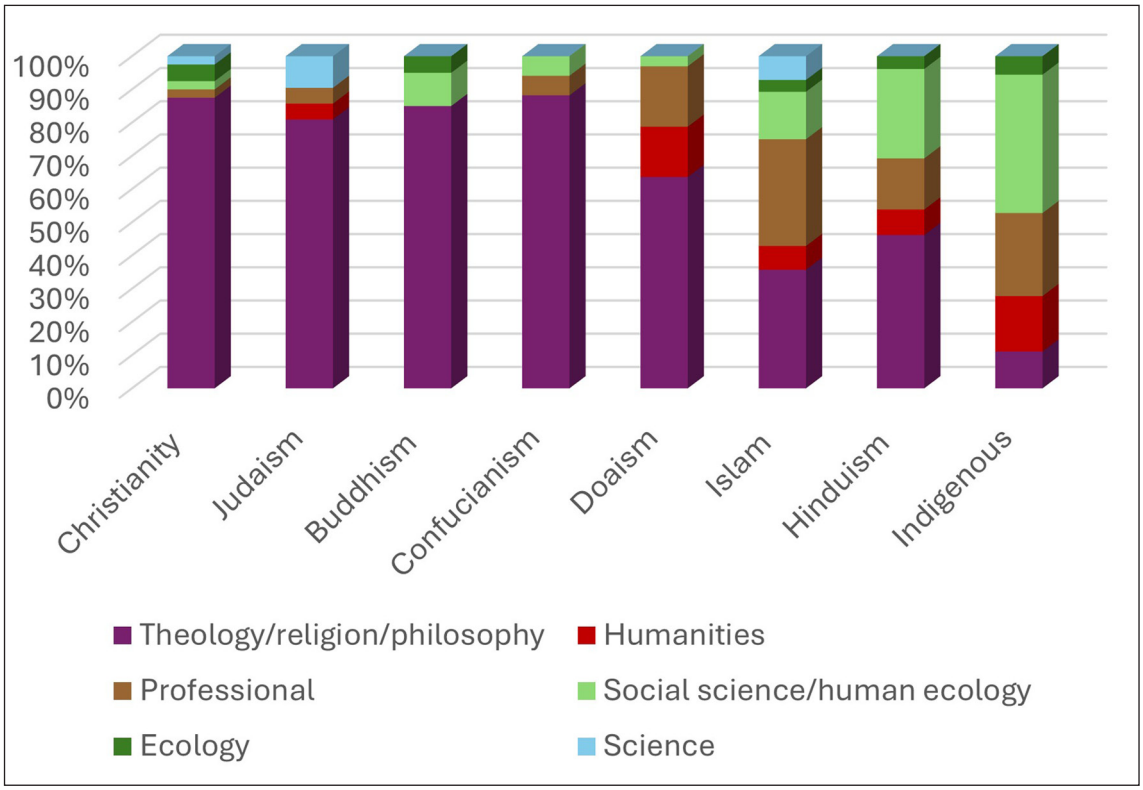

Figure 1: Fields of the authors and editors, Harvard University Press Series *Religions of the World and Ecology*. The graph partitions the educational and research backgrounds of the authors and editors from selected volumes in the series on ecology and religion edited by Mary Evelyn Tucker and John Grim. The comparison demonstrates the limited presence of scientists and the differentiation among the religions concerning the inclusion of the social sciences and the professions. The categories are all sciences (other than ecology), ecological science, social sciences and human ecology, the professions (including law, medicine, architecture), humanities such as languages and literature, and a combined category for theology, religious studies, ethics, and philosophy. The volumes are Hessel and Ruether (2000), Tirosh-Samuelson (2002), Tucker and Williams (1997), Tucker and Berthrong (1998), Girardot et al. (2001), Folz et al. (2003), Key-Chapple and Tucker (2000), and Grim (2001).

Considering the flexibility of the term ecology, a question arises about the goals of religion-and-ecology: Does it intentionally and insightfully incorporate ecological science? A helpful exercise is to analyze the academic training and roles of the editors and authors of the Harvard series. To this end, an ecological scientist is defined as having a PhD or research-based terminal degree in an ecological field and having published scholarly articles or books in scientific ecology or natural history. This analysis also identifies PhD-level scholars from other sciences, including other subfields of biology and a category titled "social science/human ecology," incorporating anthropology, sociology, and political

science. Due to academic overlaps between fields such as religion, theology, philosophy, and ethics, terminal degrees in these areas were combined into the "religion" category, while scholars in fields such as languages and fine arts fell into a combined "humanities" category. Individuals with a graduate degree or established as practitioners in applied fields, such as law, medicine, education, and urban planning, including expertise in acupuncture and feng shui, constituted a combined "professions" category. This classification prioritizes science when an individual holds two or more terminal degrees.

Figure 1 displays this classification for selected volumes and indicates that scientific ecology is weakly represented, with some volumes having no ecologists at all. Among the volumes on Christianity, Judaism, and Buddhism—three traditions covered in most comparative religions educational programs—only three contributors meet the ecologist's criteria: Stephanie Kaza, Calvin DeWitt, and Susan Bratton. Only one other scientist, physicist Ian Barbour, contributed to the Christian volume. Further, the ecologists did not necessarily contribute scientifically based commentaries (Tucker and Williams 1997; Hessel and Ruether 2000; Tirosh-Samuelson 2002). Bratton (2000), for example, responded to a contribution on prophecy, as requested by the editors, and discussed the potential for Christian eco-deacons. Other scientists with interdisciplinary interests, such as the conservation biologists Michael Soule (Buddhist) and David Ehrenfeld (Jewish), were potentially available but did not participate.

Among the unexpected findings, some editorial teams drew more chapters from the professions than others. The Islamic volume rightly recognizes the importance of professions such as architecture to environmental management (Folz et al. 2003). The volumes on regional religions, including Daoism and Indigenous religions, also had greater representation of the professions (Girardot et al. 2001; Grim 2001). The highest percentage of social science and human ecology representation concerned Indigenous religions, yet Hinduism also had greater representation from social science, particularly anthropology, than Christianity or Judaism (Key-Chapple and Tucker 2000). Reflecting Western academic history, an analysis of the religious specialties indicated that the contributors to the volumes on Christianity and Judaism were more likely to be specifically trained in theology, religious philosophy, or religious ethics, or serving in a theology department. Contributors to the volumes on Asian or Indigenous religions were more likely to be associated with religious studies or comparative religions programs. Although recent movements, such as eco-feminism, appeared in multiple contexts, and Rosemary Radford Ruether co-edited the Christian volume, the scientific roots of the Gaia hypothesis received sparse attention. There was little engagement with economics or law, despite their importance to environmental justice and international development. Nonetheless, Tucker and Grim were sensitive to the importance of having scholars from non-Western and Indigenous faith traditions serve as editors and

senior authors. These contributors were, on average, more concerned about sustainable development and environmental policy formation.

A second way to examine the authors' engagement with scientific ecology is to investigate their coverage of different scientific topics. In reading the indices of the volumes, ecological terms such as nutrient cycling, succession, zoonoses, and carbon sequestration are largely absent. Major ecological environmental foci, including atmospheric change and biodiversity loss, appear throughout the series. However, the chapters offer little to no discussion of more specific scientific subjects, including those that pose serious ethical questions, such as endocrine disruptors, habitat fragmentation, and ocean acidification. The volumes focus on broad-scale ecosystem classifications, agriculture, and vertebrate fauna. For example, Evan Eisenberg (2002) provides an insightful overview of the historical impacts of agriculture and deforestation on Israel, including soil salinization and nutrient loss. However, despite internationally recognized Israeli scholarship on the restoration of degraded lands and water conservation and the many Jewish-heritage scientists conducting marine, aquatic, or atmospheric research (including Lynn Margulis of Gaia systems theory), the volume on Judaism offers only a few pages on climate change and contemporary water management. Thanks to the Indigenous and anthropological authors, Grim (2001) covers the widest variety of biomes in the series, repeatedly addresses biocultural diversity, uses terms such as endemic and exotic, and mentions multiple species (primarily megafauna and economically important plants). However, while covering climate change, fires in tropical forests, and nuclear waste, it does not delve into a full range of global processes critical to Indigenous cultural survival, such as sea-level rise and the long-distance transport of pollutants via marine food chains.

A significant number of contributors to the *World Religions and Ecology* series have interdisciplinary backgrounds or dual degrees, and another investigator may have categorized them differently. However, crediting every bachelor's degree in biology would not greatly increase the scientific presence or properly identify individuals with credentials as ecological professionals or researchers. The inclusion of scientific ecology was sporadic at best, and, with a few exceptions, limited to the overview level. The paucity of other environmental sciences, such as toxicology and atmospheric chemistry, further limited dialogue with scientific ecology. This suggests that religious scholars have appropriated the term ecology and the implication of a more profound understanding of biotic diversity and natural processes it conveys, or that they have adopted the popular rather than the scientific definition.

Integral Ecology's Origins

Before addressing the question of whether this appropriation is problematic, it is helpful to explore an additional interdisciplinary term that emerged about the same time as the Tucker and Grim project but has more recently gained

traction as a distinct theological or philosophical approach: internal ecology. The definitions and practices of integral ecology vary relative to the religious backgrounds of its advocates. The Christian conceptualization is anchored in the thought of late twentieth-century Catholic theologians, particularly Thomas Berry and Leonardo Boff, as articulated in *Laudato Si'* under the guidance of Pope Francis. Boff originally used the language of "holism" and "holistic ecology." Tucker et al. (2019, 147) credit Berry with first using the term integral ecology in 1995. Roman Catholic theologians and community leaders have widely adopted integral ecology as a concept that merges Catholic spirituality and social ethics with environmental problem-solving. A second cadre is more closely related to the assemblage of alternative religious pathways arising from Western explorations of Asian religions and contemplative spirituality. For example, Ken Wilber (2011, 2017), one of the most cited leaders of "integral studies," proposes elevating humanity to a second-tier cosmic consciousness. His program has elements of New Age cosmology, including a linear and deterministic hierarchy of spiritual states identified by colors, a division of human scholarship into four quadrants, and claims that integral transformative practice can prevent the impending demise of humanity. Focusing on human consciousness, Wilber (1995) adopts the idea of an "integral-perspectival mind" from Jean Gebser's (1985) *The Ever-Present Origin,* initially published in German in 1953 (*Ursprung und Gegenwart*). Wilber (2011, 2017) aligns "integral transformation" with the applied academic fields of politics, governance, medicine, business, education, and, of course, integral ecology. Yet a third cadre of progressive scholars, predominantly from the humanities rather than a denominational framework, has also adopted integral ecology as a basis for freeing diverse cultural constructions of nature from the constraints of the materialism and reductionism that support ongoing environmental degradation. Including philosophers and religious scholars, such as Michael Zimmerman and Sam Mickey, these integral ecologists often cite Wilber and adopt his models.

Figure 2 compares the academic backgrounds of the editors and contributors to a Roman Catholic-focused collection of essays by O'Hara et al. (2020), *Integral Ecology for a More Sustainable World: Dialogues with Laudato Si'*, and those in *The Variety of Integral Ecologies: Nature, Culture, and Knowledge in the Planetary Era* by Mickey et al. (2017a), which is anchored in humanities scholarship. The profile of O'Hara et al. (2020) is very similar to that of the Harvard volume on Christianity, with theology and religious ethics strongly dominant. Although several contributors have secondary credentials in fields such as business, health, and agroecology, only one scientist authored a chapter—Brother Guy Consolmagno, a physicist who has served as director of the Vatican Observatory. He addresses critiques, going back to the Galileo debacle, that the church and the pope should not be engaged in science. The works in Mickey et al. (2017a) are primarily a combination of philosophical and religious studies and social science, with no scientists serving as authors.

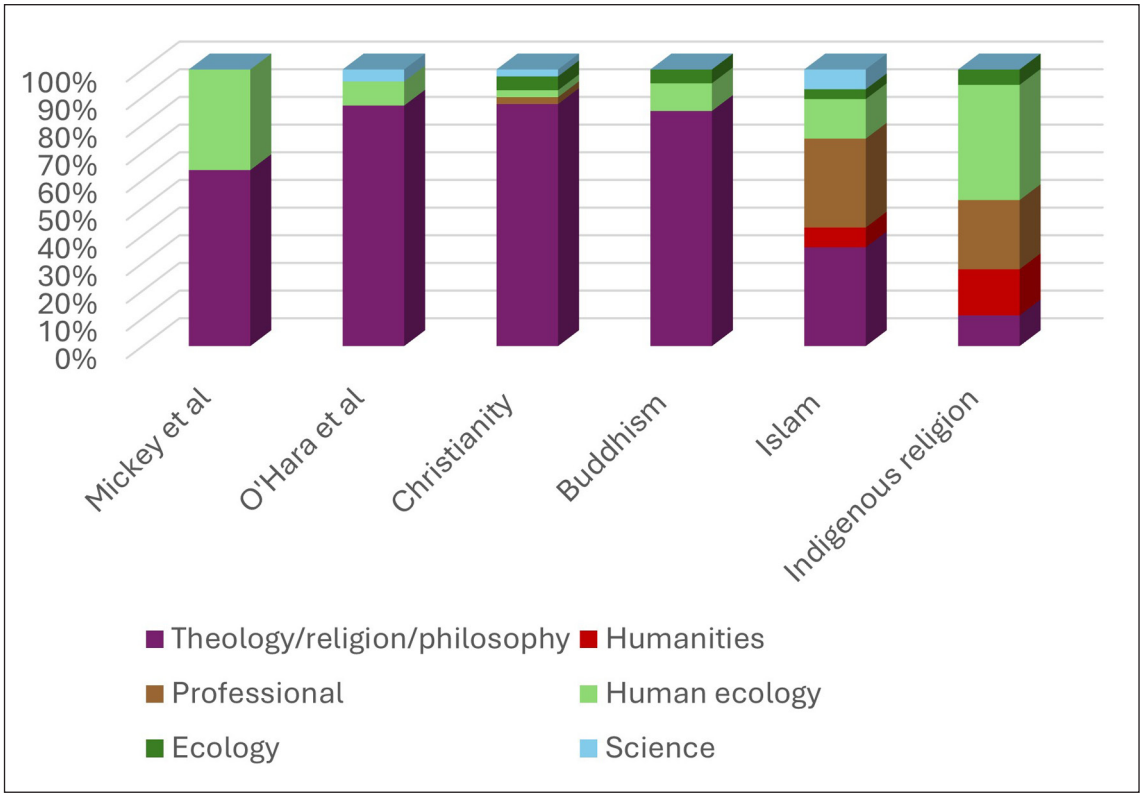

Figure 2: Fields of the authors and editors, two *Integral Ecology* volumes compared to the Harvard Series. The graph partitions the educational and research backgrounds of the authors and editors from two volumes on integral ecology and selected volumes in the series on ecology and religion edited by Mary Evelyn Tucker and John Grim. The comparison demonstrates the integral ecology volumes incorporate no contributions by scientific ecologists. The author background of the integral ecology volume by Roman Catholic contributors (O'Hara et al. 2020) is similar to that of the Harvard series volume on Christianity (Hessel and Ruether 2000). The categories are all sciences (other than ecology), ecological science, social sciences and human ecology, the professions (including law, medicine, and architecture), humanities such as languages and literature, and a combined category for theology, religious studies, ethics, and philosophy. The volumes are Mickey et al. (2017), O'Hara et al. (2020), Hessel and Ruether (2000), Tucker and Williams (1997), Folz et al. (2003), and Grim (2001).

Integral Ecology's Evaluation of Scientific Ecology, Ken Wilber, and Mickey et al. (2017a)

Before investigating Mickey et al. (2017a) in more detail, a review of Wilber's tenets is helpful in distinguishing Mickey et al.'s conceptualization of integral ecology from that of Pope Francis. Wilber is immediately problematic, as his discussions of science are brief, dated, and bereft of contemporary scientific theory. In *A Theory of Everything* (Wilber 2011, x–xi), for example, he incorporates a two-page description of string theory from physics without exploring other

scientific cosmological models. Primarily informed by concepts of social and psychological development, Wilber's use of the term "evolution" is not in the sense an evolutionary biologist would use it. As Lisa Sideris (2018) summarizes: "An important feature of both [Michael] Zimmerman's and Wilber's theories is the idea of hierarchical stages of cultural evolution, and tiers of consciousness, that are understood to have universal relevance and applicability for human history. Wilber and many who follow him hold that most people have not attained these higher stages of consciousness." Wilber's evolutionary cosmic consciousness shares features of social Darwinism, such as an ever-ascendant humanity, and elements of apocalyptic prophecy that most life science researchers diligently avoid.

Acknowledging his revision of the Great Chain of Being, Wilber (2011, 66) presents a nested hierarchy encompassing the universe and human existence in levels, where the physiosphere is below the biosphere, which is below the noosphere incorporating human consciousness and the apex theosphere. For Wilber (2011, 98), the noosphere "transcends and includes the biosphere. The biosphere is a crucial component of the noosphere, but not vice versa." He argues that "eco-philosophers, who abhor hierarchies that place humans on top of the evolutionary scale . . . value the biosphere above particular organisms, such as man," implying those who focus on the biosphere fall short of second-tier consciousness, which requires a concern for all humanity (Wilber 2011, 38). As Sideris (2018) concludes: "Integral ecology in a Wilberian vein adopts a multi-perspectival, comprehensive approach to reality that is indebted to a framework devised by Wilber called the AQAL (all-quadrant, all-level). The AQAL model acts as a metatheory that assumes there are (at least) four irreducible perspectives, or quadrants, that must be addressed in order to understand and deal with environmental problems: objective, interobjective, subjective, and intersubjective perspectives." Wilber (2011, 98) extends his critique of "ecotheorists" who treat nature or the biosphere as the ultimate reality to identify the biosphere as "only *half* the story." The biosphere is "only a small slice of the Bigger Pie . . . that includes the biosphere, noosphere, and theosphere," and de facto all four of Wilber's quadrants. From a scientific ecological perspective, the biosphere is not a cosmic model. The term is used to convey the interconnectivity of Earth's living organisms and ecosystems. Wilber changes its definition, demotes it, and makes it subject to controversial religious principles. While Wilber (2000, 470–71) rarely comments on specific environmental issues, he critiques the "Eco-camp" for its abuse of reason and attempt to embrace nature rather than accomplish "transcendence from the biosphere to the noosphere." He is equally dismissive of systems theory from all fields for its "subtle reductionism" and "limited worldview," and for being an "exterior approach" (Wilber 2000, 117–47).

Wilber's (2011, 8–11) passion for nested hierarchies presents a barrier to developing environmental strategies incorporating a diversity of religious

perspectives, because he hierarchically arranges spirituality as memes, beginning with the first-tier stages of survival sense (beige), evolving to kin spirits (purple), followed by power gods (red), truth force (blue), strive drive (orange), human bond (green), flex flow (yellow), and the two superior stages distinguishing second-tier thinking—whole view (turquoise) and integral-holonic (coral). Magical or animistic religions are purple, while tribal religions with heroic narratives and mythic spirits are red. Religions based on an omnipotent other and emphasizing the law are blue, landing the Abrahamic faiths in the middle of the first tier. Although Wilber (2011, 2017) places the theosphere at the apex of his nested hierarchy, he provides almost no information on what defines or characterizes it. Interestingly, Wilber (2000, 521) prophetically announces "the coming of the Over-Soul that is the World Soul" but does not discuss it, while extensively describing the marriage of spirit and soul (Wilber 2011). As understanding the theosphere is actualized via personal transformation, his theos emerges as a form of fill-in-the blank god.

Meanwhile, Wilber's models denigrate Indigenous religions as spiritually primitive and treat Roman Catholicism as the archaic blue meme. Wilber (2011) is particularly intent on superseding "boomeritis" and identifies the boomers committed to social justice and cultural pluralism as the green meme. They are nearing, but three stages below, the ethical ideal. He observes that cultural and religious pluralisms accept inadequate worldviews; thus, his spiritual consciousness should replace these faulty forms of egalitarianism. Interestingly, Wilber's definition of boomeritis could cast Boff and Pope Francis and their emphasis on care for the poor as archetypes of the green meme. Wilber's repeated justification for demoting science, the civil rights movement, environmentalism, and premodern religions is that they have not been effective at solving all humanity's problems. He thus sets an impossible standard and offers an abstract, even magical, key to attaining it. Sideris (2018) observes that Zimmerman has criticized "the pope's failure to think along lines of cosmic evolutionary (hierarchical) development," thereby deeming *Laudato Si'* and Francis's version of integral ecology inadequate. Clearly, integral ecology is not one school of thought. Wilber is not well-versed in scientific ecology, nor is he an environmental writer, considering his infrequent and superficial attention to specific environmental issues.

Mickey et al. (2017b, 1) open their introductory chapter with the premise that defining ecology in biotic terms is insufficient and that scientific ecology does not provide adequate knowledge or interdisciplinarity to understand the "Earth community." Notably, they begin at the global scale, asserting:

> Ecology is typically defined as the study of relationships between organisms and their environments. Although this definition is correct, it does not tell the whole story. More specifically, it does not account for what can be described as integral ecologies—a variety of emerging approaches to ecology that cross

> disciplinary boundaries in efforts to deeply understand and creatively respond to complex matters, meanings, and mysteries of relationships that constitute the whole of the Earth community.

Mickey et al. (2017b, 1–2) then treat ecological science as relatively complete and dismiss the need for scientific updates. They claim sweeping authority in announcing: "The aim of this book is not to present a comprehensive account of ecology (much of which has already been written), but to introduce and explore the diversity of integral ecologies . . . Learning about integral ecologies cultivates a comprehensive understanding of ecology, which facilitates collaboration and communication amid a full spectrum of ecologies."

A notable feature of Mickey et al. (2017a) is that the editors and some contributors articulate a suspicion of ecological science and portray it as culturally isolated, narrowly focused, or socially biased. Interestingly, Mickey et al. (2017b) utilize two founders of ecology, Ernest Haeckel and Eugene Odum, as archetypes of scientific ecological thinkers. Their critique treats Haeckel as locked in mechanistic and materialistic models—a complaint that can be directed at science in general. Mickey et al. (2017b, 3) posit that "while Haeckel's ecology enlarged the scope of biology, it was only able to account for ecological phenomena mechanistically (i.e., as 'the necessary results of mechanical causes'), excluding as 'unscientific' any accounts of a divine plan or transcendent agency in the natural world." Citing Carolyn Merchant (2007, 178), Mickey et al. (2017b, 4) then decry Haeckel's monism for its basis in mechanistic explanations and for attributing varieties of moral and religious consciousness to the same mechanistic processes. They reject his pantheism, radical for its time, for related faults, in concluding: "Although Haeckel includes inquiries into divinity and consciousness in his ecology, he includes them in a way that fails to honor the depth and mystery of such topics . . . His pantheism is a mechanistic materialism." Mickey et al. (2017b) rightly condemn Haeckel's contributions to social Darwinism and, after his death, Nazi ideology's exploitation of his ideas. However, they offer no evidence that social Darwinism and its justification of racism are continuing failures of contemporary scientific ecology.

In turning to Odum, who had retired by the 1980s, Mickey et al. (2017b, 5) backdate scientific ecology's leadership by half a century. They again invoke the limitations of science in general when they observe that "Odum's integrative approach to ecology supports efforts to overcome reductionism and work toward the mutual benefit of science and society. However, his ecology still contains aspects of the reductionism it claims to avoid. He does not address the spiritual or religious dimensions of ecology at all, nor does he include the humanities within his holistic thinking" (Mickey et al. 2017b, 5). Citing Donato Bergandi (2000, 16), Mikey et al. (2017b, 5) suggest that "one could describe Odum's 'holistic' ecology' as 'cryptoreductionistic' or as 'reductionistic holism.'" Mickey

et al. (2017b, 5) further propose that "Odum's integrative ecology would have been more holistic if it included perspectives from the humanities, including disciplines such as cultural anthropology, religious studies, philosophy, literary theory and poetics, the latter two fields bringing together the humanities with the fine arts." However, Odum acknowledges that his own ecological thinking was strongly influenced by his sociologist father, Howard Washington Odum, a professor at the University of North Carolina, from whom he also acquired a commitment to social justice (Craige 2001, 114). Further, Odum was an early advocate for Aldo Leopold's land ethics, personally presented on the topic, and was interested in whether ecosystem science could provide further insights applicable to environmental ethics (Craige 2001, 107–14). During Odum's tenure, the Institute of Ecology he founded at the University of Georgia included faculty from the humanities and aesthetic fields and served as a platform for guest humanities speakers, such as Holmes Ralston and Merchant. Eugene Odum's spouse, Martha Ann Huff Odum, who majored in design at the University of Illinois and expressed her love of wilderness and nature through painting, helped to instill art in the Institute of Ecology's scholarly culture. The institute building was designed with display space and hosted art shows with receptions and lectures (Craige 2001, 19–20).

Rather than give Odum credit as a founder of the field of environmental studies who labored to legitimize environmental policy and ethics courses in curricula and provide ecological science textbooks suitable for baccalaureate students from nonscience fields, Mickey et al. (2017b) cast him as a "lab rat" in disguise. This points to two issues. The first is that the invocation of strongly compartmentalized models of the relationships among academic fields, such as those of Wilber, does not accommodate the scholarly contributions of highly interdisciplinary scientists, such as Odum, Leopold, and Rachel Carson, or the integrative nature of their explorations, such as system ecologist and mathematical modeler H. H. Shugart's (2014) *Foundations of the Earth: Global Ecological Change and the Book of Job*. Mickey et al. (2017b) adopt a stereotype of scientific ecologists as confined by materialism (the "It"), and thereby disinterested in the aesthetic, spiritual, or communitarian. The second issue is that integral ecology and scientific ecology differ in their concepts of holism and do not have the same scope or standards for validating their models. Scientific ecology is about living, and thereby material systems and the tangible and observable processes that generate and maintain them. The environmental and ecological sciences incorporate reductionist studies—such as LD_{50} experiments, mapping mercury or DDE in sediments, and quantifying carbon sequestration by plant species—that both inform constructive environmental action as they stand and contribute to the development of systems models. Their validity rests in their replicability, accuracy, and precision and whether repeated application proves their predictions about how biotic systems behave. In contrast, Wilber

claims holism by placing a theosphere atop a cosmic hierarchy, yet does not fully describe or characterize *theos*. Mickey et al. (2017a) forward the artificially bounded AQAL model.

Mickey et al.'s (2017b, 10) integral ecology tracks its lineage to theologians, particularly Thomas Berry and Leonardo Boff, whom they favorably compare with German Romantics like Johann Wolfgang von Goethe, as they all "viewed natural phenomena in terms of a natural process that cannot be captured by mechanistic explanations." However, Mickey et al. (2017b) do not center their conceptualization around Boff's focus on the poor and disenfranchised. They frequently cite integral theorist Wilber's (1995) *Sex, Ecology, Spirituality: The Spirit of Evolution* as a model for countering the weaknesses of contemporary philosophical naturalism and the environmentally damaging, mechanistic, materialist worldview they believe it forwards. Sean Kelly's (2017, 189) chapter, "Five Principles of Integral Ecology," credits ecological science for contributing "to a more holistic, and in this sense, more integral understanding of the natural world." However, Kelly expresses concern about academic specialization and fragmentation and depicts the sciences, including ecology, as more guilty of these sins than the humanities. Kelly (2017, 202) claims that while "Standard Gaia theory and Earth system science already represent significant challenges to the dominant trend in late modern science toward increasing specialization and disciplinary fragmentation. The sciences of ecology, for their part, are generally following the dominant trend." Kelly (2017) provides no historical evidence, however, to support either statement or the implied comparison. Informed by Basarab Nicolescu (2002), Kelly (2017, 202) concludes: "It is worth remembering that the disciplinary mind of modern science—which as we have seen, extends to standard ecology as well." From a scientific ecologist's perspective, environmental concerns have fueled the consolidation of several ecological subfields and spurred ecological applications of molecular genetics, analytical chemistry, and quantitative stochastic modeling. Attempting to solve wicked environmental problems has favored specialization but also encouraged transdisciplinary research projects.

Kelly (2017, 208) articulates the integral ecologists' worry that ecology as a branch of modern science "was schooled within the wider cultural process of what sociologist Max Weber called the 'disenchantment (*Entzauberung*) of the world.'" Kelly presents re(enchantment) as a transformative process and establishes it as one of the five principles that define integral ecology, along with evolutionary, planetary, transdisciplinary, and engaged. From an environmental problem-solving perspective, these are qualities, values, or even communitarian virtues that can be applied across any relevant academic field. Concerned about disenchantment and the scientific limitations of what ecology explores, Mickey et al. (2017a, 12) invoke a Wilber (1995)-inspired integral ecology that "overcomes dualisms of objectivity/subjectivity and matter/spirit." This ideally conceptualizes "nature and

culture as mutually constitutive, not mutually exclusive" (Mickey et al. 2017a, 12). As Esbjörn-Hargens and Zimmerman (2011, 276) propose, this helps to "avoid a nature-versus-culture stance." To this end, they classify scientific ecology with the "It" portion rather than the "We." Sean Esbjörn and Michael Zimmerman (2017) organize ecologies and their parallel academic fields, providing four categories from Wilber's AQAL model: Exterior-Individual-It versus Interior-Individual-I; and Exterior-Collective-Its versus Interior-Collective-We. In their scheme, Exterior-Individual-It is the terrain of behaviors, including such disparate fields as chemical ecology, physiological ecology, cognitive ecology, restoration ecology, environmental psychology, molecular ecology, theoretical "pure" ecology, and ecological modeling. This category mixes applied research with theoretical and purely conceptual modeling, and analytic and heavily instrumented studies with research that is primarily descriptive or experiential. From the perspective of scientific ecology, the AQAL model is binary, defined by absolute boundaries, and non-integrative.

The Maturing Conversations Prompted by *Laudato Si'*

The integral ecology of O'Hara et al. (2020) is far more concrete in its approach to social ethics and infuses more environmental economics, policy, and science into its analyses than that of Wilber or Mickey et al. (2017a). Two chapters engage climate change, one examines nuclear energy, and four explore the technocratic paradigm. Matthew Whelan (2020, 100), who has worked in field as an agroecologist, presents "an agroecological reading of *Laudato Si'*," where he constructively draws on work of scientific ecologists, such as John Vandermeer, and argues that agroecology should replace industrial agriculture, because a distinguishing characteristic of industrial agriculture is "its failure to defer to and to learn from the wisdom of the earthly and natural order given by God." Expressing the Catholic integral ecologists' concern that economic and political interests can suppress science, Stephen B. Scharper (2020, 50) comments that: "Climate change science has emerged in the last three decades as one of the most vexed and contentious areas of contemporary scientific endeavor. From the muzzling of environmental scientists and the closing of ecological research centers in Canada to the censorship of leading climate researchers in the United States, such as NASA climate scientist James Hansen, politics has tinctured, tethered, and at times eclipsed scientific data on one of the most crucial issues of our times." Overall, the integral approach of O'Hara et al. (2020) seeks a participatory balance, where the environmental sciences work constructively with Catholic social ethics to overcome the problems generated by the ideals of unlimited economic growth and consumerism, and scientists understand that "science and technology must develop with an awareness of its ethical and human implications" (Consolmagno 2020, 191). Just as Pope Francis consulted scientists in drafting *Laudato Si'*, O'Hara et al. (2020) acknowledge the necessity and value of tapping ecological knowledge

and wisdom. However, a concern evident in several chapters and shared with Wilber is that scientific ecologists pursue preservationist goals that protect the biota at the expense of humans.

Appropriation of the Term "Ecology"

Appropriation is a complex topic because the term "ecology" is applied in different ways. On the one hand, as religion often guides political and social responses to environmental change and degradation, using ecology as a banner or call to action is well-meaning and invites civic engagement. The public understands ecology as the pursuit of healthy living systems and sustainable economies. On the other hand, the word ecology suggests a knowledge and appreciation of the Earth's biotic communities, which may or may not be present in the practice of religion-and-ecology. The selection of authors and editors for the Harvard series and the integral ecologists' association of scientific ecology with the inadequacies of contemporary natural philosophy are not just responses to trends in popular ecology but contribute to the detachment of the term ecology from its scientific roots. Although several authors in the Harvard series incorporate life science in their chapters, the series favors universal scales and splicing ecology with sustainability. While *Laudato Si'* has a more intentional program for fostering constructive participation with scientific ecology, its application of integral ecology is primarily cultural.

Wilber appropriates ecology, evolution, and Teilhard de Chardin's noosphere in constructing and legitimating his cosmological models. The appropriation of scientific language is also evident in the coinage of new terms related to ecology and religion and affects the field's approaches to spatial and temporal scales. For example, Thomas Berry's emerging "Ecozoic" age borrows from the geological identification of the planet's great evolutionary eras, such as the Paleozoic and Mesozoic. The original geological divisions are "zoic" as they are based on radical changes in fossil assemblages of animal remains. In contrast, Berry's Ecozoic compresses the time frame and places it on a human scale, which ignores the massive geophysical and biological changes that initiated the Paleozoic. Further, from a scientific perspective, all eras (sometimes called ages) are equally ecological. As "ologies," the words ecology and geology claim a superior understanding of Earth systems and thereby assert scholarly authority. Tucker identifies Berry as a geologian—a hybrid between a geologist and a theologian. Although borrowing the authority of science to create banners and goals for religious environmental activism is neither unethical nor ineffective, it can result in dissonance with scientific language and understanding. It becomes concerning if it disconnects or displaces ecology and other sciences rather than draws on their knowledge and wisdom, or causes scientists to dismiss religious ideas as inconsistent with scientific models.

Among the three perspectives investigated, Tucker and Grim's project is respectful of ecological science, yet it did not explore contemporary ecological

theory or delve into its ideas of environmental systems change in space and time. Wilber and Mickey et al. (2017a) portray ecology as flawed due to materialism and reductionism. While Kelly's (2017) identification of integral ecology as evolutionary bolsters its claim of authority, his application of the term evolution relative to scientific usage is indefinite. Mickey et al.'s (2017b) arguments that scientific ecology fails in holism, interdisciplinarity, and social accountability allow humanities scholars to claim high ground in academic leadership. Unfortunately, the assumption that much of what scientific ecology has to offer is already available inhibits exploration of current applied ecological research and a host of concerns centered on living systems. O'Hara et al. (2020) are the most intentional in synthesizing environmental science with social ethics and reflect *Laudato Si's* effort to consult scientists. Nonetheless, the trajectory overall has been to increasingly treat ecology as a general cultural understanding of nature rather than the practice of science or natural history per se.

The academic trends bring up an additional question: Can religion harm or fuel disregard for scientific ecology? A thought-provoking feature of Mickey et al.'s (2017a) precepts is the degree to which they share conservative religionists' distrust of contemporary science, including ecology, and their apprehension that ecological science ignores, supersedes, or disempowers the divine and enchanted. Both Mickey et al. (2017a) and religious conservatives portray life and physical science as unresponsive to sociocultural contexts and are wary of science's potential to support undemocratic and oppressive social hierarchies. Some (not all) Christian Evangelicals may reject scientific findings as superseding divine authority, especially when the science predicts environmental degradation or disasters (Veldman 2019). As Naomi Oreskes and Erik Conway (2010) have documented, industrial lobbyists have fueled Christian conservative suspicions that contemporary science is untrustworthy and that scientists are secular, self-motivated, and materialistic, thereby encouraging climate change skepticism. By supporting environmental causes, the integral ecologists certainly diverge from Christian conservatives. However, in reference to controversial applications of integral ecology, such as Michael Zimmerman (2009), Sideris (2018) expresses the concern that, in adopting ecomodernism, with its technological solutions and free markets, and apparently Wilber, to question whether the scientific consensus on climate is sufficiently inclusive of alternative and skeptical perspectives." For religious conservatives and Neo-liberals contesting environmental research, the purpose is often a rejection of science's support for governmental regulation of business and industry. The contributors to Mickey et al. (2017a), in contrast, are more concerned that science can treat nature as mere material and reduce the diversity and richness of cultural and spiritual expression.

Marking a division among the schools of integral ecology, O'Hara et al. (2020) meld ecological science into their problem analyses and understand economically driven climate change denial as divisive. Additionally, *Laudato*

Si' places a much greater emphasis on the centrality of service and resisting economic sins in mitigating environmental degradation than Wilber's stages of cosmic consciousness model does. Scharper (2020) argues that *Laudato Si'*s calls for "compassionate science." Scientific objectification is not a deficiency. Yet, integral science arises from caring and compassionate goals, relationships, and applications. The flexibility of the term ecology camouflages the differences in cosmology, eschatology, and spiritual practice among integral ecologists.

Interdisciplinarity and Validating Models—the Case of Restoration Ecology

An additional means of examining the relationship between religion-and-ecology, integral ecologies, and scientific ecology is to determine if the religious and philosophical models are true, robust, and sufficient, and whether religion is weighing and absorbing concepts from contemporary scientific ecology, and vice versa. A division from the scientific ecologist's perspective is religion and ecology's tendency to universalize, elevate, or compress scales and underestimate the importance of microscales and phenomena such as patchiness in natural systems. While the "one-planet" or cosmic approach is friendly to considering relationships between anthropogenic and natural disturbances, the elevated scale precludes cultivating a nuanced understanding of how to plan for wildfires, storms, and atmospheric change-induced weather alterations. Damning the mechanistic approach devalues mathematical modeling and the instrumentation utilized for DNA sequencing and tracing chemical pollutants. In contrast, I have identified religious ecodimensionality as an essential characteristic of many effective religiously based strategies for environmental management, including their applications to resource-harvesting technologies, thereby integrating a scientific conceptualization of scales and cycles (Bratton 2018). For example, Indigenous fisheries management often conveys traditional ecological knowledge (TEK) via religious ritual, art, and narratives, thereby adapting harvest times and amounts to reproductive cycles, migrations, and population fluctuations.

All the contributing fields have, in one way or another, worked to eliminate simplistic dualisms. Yet, for the Wilber-informed integral ecologists, bifurcation of academic fields into those based on I/We or It implies that the We fields are the superior platform for action. The proposed classification is only useful if it accurately characterizes ecology and its subfields. A test is to examine an applied subfield, in this case restoration ecology with its social and civic components, to determine if its classification as Exterior-Individual-It is plausible and useful, and whether the scientists and professionals practicing ecological restoration dismiss the spiritual and aesthetic in favor of the mechanistic and material. In addition, ecological restoration innately engages careful applications of scale and combinations of anthropogenic and natural disturbances.

The science educator William Jordan III (2003, 2) has defined ecological restoration as "the attempt, sometimes spectacularly successful, sometimes less so, to make nature whole—that is, to deploy the technologies of agriculture, informed by history and the sciences of ecology and conservation biology—to return a landscape, whether a tract of land in Illinois, a mountain slope in Colorado or a coral reef in the Philippines, to some clearly defined historic ecological condition." In this conceptualization, human management may not just be necessary but healthy and positive for both the biota and the human community. Jordan has also proposed that restoration involves performance and potentially ritual. Regarding prescribed fire in native prairie restoration in the American Midwest, Jordan (1994) observes that "[t]he burns are really the quintessential or emblematic act of prairie restoration. They have even become a rite of spring, eagerly anticipated by the growing number of 'prairie people' involved in restoration efforts in the Midwest, and are often surrounded by a festive, joyful, atmosphere." Agreeing with poet and literary scholar Fredrick Turner (1988), Jordan (1994) "the need for prairie fire dramatizes *its* dependence on *us*, and so liberates us from our position as naturalists or observers of the community into a role of real citizenship." Gretel van Wieren (2008) points out that in the practice of restoration, "humans are in important ways restored to land," and the reconnection is effective "in a spiritual-moral sense." She concludes that "restoration performs sacred work and serves as a form of public witness; and it can engender spiritual-moral experiences within participants." These models treat well-planned and well-executed ecological restoration as an actualization of "We" rather than "I" or the more distant and material "It" in terms of the human community, the ecological community, and their integration. Fields such as restoration ecology and conservation biology incorporate culture and its components in their very definition.

In "A Night Burn on the Prairie: Ecological Restoration as Performance, Ritual, and Ceremony," Jordan et al. (2026) argue that scientifically informed restoration practice can still emerge as an intricately organized cultural construction and a spiritual or religious experience. Spirituality, in turn, fosters enthusiasm, caretaking, and love of nature. They ask if the burns are performance, ritual, or ceremony, whether the fire, flora, and fauna are actors or celebrants. Assuming the practice of ecological restoration incorporates the Exterior and the Interior, Jordan et al. (2026) concur with van Wieren (2008) that restoration is an emerging form of public spiritual practice and thus a component of civil religion. Van Wieren (2013) documents the sisters of Holy Wisdom Benedictine Monastery in Wisconsin's participation in native prairie and woodland restoration as a form of sacramentality. Benedictine spirituality rests in the routine and mundane as framed by sacred time. The hours mark intervals for labor, study, contemplation, worship services, shared meals, and recreation. The community becomes "more aware of God's presence in

ordinary activities and in the larger world" (van Wieren 2013, 153). Restoration counts as strenuous work, including such physically or attention-demanding chores as seed collecting, pulling weeds, tilling, and transplanting. The sisters utilize the restored sites as educational venues for schoolchildren, and they have installed pleasant nature trails that serve as welcoming locales for absorbing the wonder of creation, engaging in prayer, and renewing the inner spirit (van Wieren 2013, 153–54).

The innovative Benedictines are practicing a form of integral ecology in their synthesis of science, engaged knowledge, addressing human community needs, caring for creation, nurturing spiritual practice, and welcoming the divine. However, their project was underway prior to the dissemination of *Laudato Si'*. Van Wieren (2013, 168) mentions in a footnote that "[e]arly on, Thomas Berry claimed a bioregional social philosophy as integral to an earth-based spirituality and ethic," but does not directly identify the Holy Wisdom project as integral. In this case, the venerable Benedictine concepts of the sacred nature of the biota (the material), time, and work have served the community in good stead. Additionally, examining how science and religion reached this juncture of flexible compatibility credits the ecologists with initiating the foundational restoration experiments, providing regional educational programs, and assisting private landowners, schools, and non-profits in getting involved. Holy Wisdom Monastery is near the University of Wisconsin-Madison Arboretum, which has a decades-long record of conserving representative examples of native plant communities, testing methods for conducting ecological restoration programs, developing conduits for communication among professionals, and prioritizing imaginative educational outreach. Prior to his retirement, William Jordan III was the arboretum's publications and outreach manager. Critical to this constructive outcome are scientific respect for religion, cultural diversity, and organizations with non-scientific missions, and religious respect for the needs of the greater community and the labors of the ecologists and scientific professionals. Although educational programs that promote healthy communication more often originate with scientific stakeholders, nourishing receptive cultures and civic frameworks is necessary to ensure the viability and duration of ecological restoration's endeavors. The management structure is inherently "We" and participatory. The normative "It" of scientific publication does not encompass the complex "We" of the wellsprings of ecological scientific imagination and process. Citing a study by Sara Pike (2023), Jordan et al. (2026) identify alternative and post-industrial religious engagement in ecological restoration as "a means of building relationships."

In inquiring whether religion can damage or suppress science, the question should also be posed: Can ecological science harm religions? Inadequate scientific modeling and invalid results have bolstered regulatory practices such as banning Indigenous cultural burning, which is part of a complex

of ceremonies and rituals. For example, misguided forestry planning has contributed to the decline of longleaf pine (*Pinus palustris*) and its unique floral communities by suppressing frequent low-intensity cultural fires (McGuire et al. 2023). Conversely, ecological restoration can serve as a means of recovering religious traditions, healing the land, and forwarding sovereignty for Native Americans, such as the Lumbee and Waccamaw Sioux, who incorporate the longleaf and sacred fire in their religious symbolism, rituals, and cosmologies. Cooperation with scientifically informed state agencies and conservation organizations, such as the Nature Conservancy, can accelerate ecosystem and cultural restoration (NC Botanical Garden 2024; Jordan et al. 2026). Kelly's (2017) five principles, including re-enchantment, are compatible with the social initiatives that restore longleaf and renew its interdependencies with human cultures. Both scientific restoration ecology's and religion-and-ecology's growing concordance with TEK as a historic means of retaining, dispersing, and processing inventories of biota and observations of biotic processes and relationships with the physical environment refine applications of scale and managed disturbance to site-specific planning (Nelson and Shilling 2018).

Discussion

In widespread usage, the meaning of ecology has diversified and become more culturally oriented. The scientific definition of ecology is, in comparison, relatively stable and remains biologically anchored. Religion-and-ecology, as well as integral ecology, primarily invoke ecology as a cultural phenomenon or value. Given this vocabulary tangle, religious scholars should identify scientific ecology as such when drawing on its models and knowledge. They should also consider how their audiences understand ecology and which form of religion-and-ecology they are investigating or advocating. Researchers should distinguish among popular themes, biased stereotypes, and vetted science. In addition, the applications of religion-and-ecology should strategically consider how best to further engage scientific ecologists, human ecologists, and environmental professionals with religious communities. Religious appropriation of ecology affects the scale and foci of environmental problem analysis. This can be beneficial when it enhances the understanding of social factors but a liability when it compresses scales, constrains research designs, devalues the biota, or dismisses complex phenomena, such as climate change.

Models such as Wilber's AQAL are so general and top-down that the inclusion of almost any religious activity in environmental problem-solving can be considered integral. For example, Sean Esbjörn-Hargens and Zimmerman (2011) provide case histories to validate the effectiveness of integral ecology. However, they include environmental conflicts in which integral ecology was neither the most influential religious contributor nor invoked by the primary

decision-makers. Darcy Riddell (2011) identifies integral ecology as contributing to the evolution of more culturally inclusive and environmentally conscious planning for British Columbia's rainforests. Riddell reports that she and other activists used Wilber's principles, including contemplative practice, to keep them focused on the campaign for forest conservation and overcome fatigue and despair—a worthy application. However, when she identifies First Nations' (Indigenous) religious contributions as consistent with the AQAL model, she then also treats them as a contribution of integral ecology. Environmental historians and policy analysts, however, credit the First Nations, rather than Wilberian integral ecology, with firmly defending their spiritual valuation of the landscape and cultural trees and championing an understanding of hydrologic change called "blue ecology." Further, government agencies and ecological professionals have been deploying contemporary planning strategies, such as adaptive management, that forward cultural values and contributions (Blackstock 2013; Takeda 2015). While Riddell's account is honest and heartfelt, to claim victory for a very Western, cosmic consciousness model, which conflicts with and displaces First Nations cosmology, is a form of appropriation that the First Nations rightly resist. Adherents of alternative religions and spiritualities have variously supported, protested, or attempted to usurp the leadership and religious values of the First Nations in resolving environmental conflicts (Coté 2010; Bratton 2021, 1–5, 23–47).

Analysis at universal and elevated scales is legitimate but insufficient to address environmental problem-solving at local and regional levels. The application of Wilber's concepts to classifying environmentally responsive sciences, such as restoration ecology, is too linear and dichotomous to fully evaluate the scientific fields' social structures and relationships with the human and nonhuman. As Benedictine sacramentality and Native American religions are anchored in lived-in landscapes and for centuries have supported thoughtful land care and the sacred essence of day-to-day work, they accommodate the scaling and interactivity of scientifically informed ecological restoration. A conscious effort by all restoration participants to draw on traditional ecological knowledge as well as university-generated scientific findings, and to cultivate the engaged knowledge generated by restoration practice, improves the viability and longevity of projects. Restoration in practice has the advantages of shared goals and bioregional frameworks, expediting consilience. However, in academic applications, the gaps in scale alone can constrict ecology-and-religion's repertoire of environmental concerns. The dismissal of scientific specializations and mechanistic research methodologies also depletes the inventory. Conversely, further religious examination of scientific ecology's investments in topics such as the fragmentation of ecological communities, human modification of disturbance regimes, species adaptation to physical environmental change, and the fate of pollutants in ecosystems will assist

in prioritizing issues for environmental action and identifying barriers to successful problem-solving.

Religion-and-ecology and integral ecology have already contributed to constructing robust and beneficial communication pathways. There are cases, such as the scientific professionals' potential for preempting TEK and Native American sovereignty, where scientists need to improve their understanding of the values and cultural contributions of religion. Conversely, devaluing scientific ecological knowledge because it's specialized, mathematical, or tracking carbon sequestration using sophisticated instrumentation is a nonstarter. Better options include encouraging shared knowledge, wisdom, contributions, and respect, as is evident in many restoration projects and in movements like blue ecology, which practice interdisciplinarity by promoting conversation and shared action among representatives of several fields or sources of expertise, including TEK (Blackstock 2013).

Wilber and the Roman Catholic integral ecologists share the perception that ecological science often sides with the biosphere against humankind. While scientific ecologists do develop protective relationships with the organisms and habitats they study, commercial and industrial anti-regulatory interests promote the stereotype of ecologists as anti-people. Further, many of the disasters caused by supposedly scientifically informed natural resources management arose from attempts to use ecological models to optimize production. The lack of ecological language and concepts, the demand for abstract holism, and the limited repertoire of ecological topics in the sources examined suggest that scholars with religious backgrounds may not be fully accessing scientific literature on specifically human topics such as environmental health and environmental risk. The experiment with Microsoft, where the "environmental" photo search produced more images of charismatic megafauna and splendid natural landscapes than of oil spills, microplastics, and wildfires, is evidence that the media selects for positive images and exciting wildlife rather than burned homes, drought-stressed farms, and Parkinson's disease patients. Ironically, much research specifically on human health or economic liabilities requires advanced skills in statistics, biochemistry, microbiology, or other "reductionist" fields to read and is less likely to appear in publications for general audiences. A possible corrective is to develop deep-dive projects or conversations to further open ecological and environmental science knowledge to religious leaders to provide new avenues for the social application of scientific findings. Pope Francis's integral ecology, for example, can provide a robust platform for shared religious and scientific ecological explorations of scale and disturbance, such as the fragmentation of vegetation in Amazonia, and applications of systems theory, such as the impacts of atmospheric change. Concerns for human welfare should prioritize ecological risk modeling and environmental health.

Competing Interests

The author declares that they have no competing interests.

References

Bergandi, Donato. 2000. "'Reductionistic Holism': An Oxymoron or a Philosophical Chimera of Eugene Odum's Systems Ecology?" In *The Philosophy of Ecology: From Science to Synthesis*, edited by D. R. Keller and Frank B. Golley, 204–17. Athens, GA: University of Georgia Press.

Blackstock, Michael. 2013. "Blue-Ecology: A Cross-Cultural Ecological Vision for Freshwater." In *Aboriginal Peoples and Forest Lands in Canada*, edited by D. B. Tindall, Ronald Trosper, and Pamela Perreault, 180–204. Vancouver: University of British Columbia.

Bratton, Susan P. 1983. "The Ecotheology of James Watt." *Environmental Ethics* 5:28–40.

———. 2000. "The Church Should Call Not Just Prophets but Environmental Deacons!" In *Christianity and Ecology,* edited by Dieter Hessel and R. R. Ruether, 429–38. Cambridge, MA: Harvard University Press.

———. 2012. "Religion and the Ecosphere: Is Religion Ecofriendly?" In *Science and the World's Religions, Vol. 3: Religions and Controversies*, edited by Patrick McNamara and Wesley J. Wildman, 221–51. Westport, CT: Greenwood Press.

———. 2014. "Tradition as Benefit or Barrier: The Case of US Christian Religion in the Formation of Environmental Ethics." In *Linking Ecology and Ethics for a Changing World: Values, Philosophy, and Action*, 14th Cary Conference, edited by Riccardo Rozzi, S. T. A. Pickett, Clare Palmer, Juan J. Armesto, and J. Baird Callicott, 71–84. New York: Springer.

———. 2018. "Ecodimensionality as a Religious Foundation for Sustainability." *Sustainability* 10 (4): 1021. https://doi.org/10.3390/su10041021.

———. 2021. *Religion and the Environment: An Introduction*. Abingdon, UK: Routledge.

Consolmagno, Guy. 2020. "From Galileo to *Laudato Si'*." In *Integral Ecology for a More Sustainable World: Dialogues with Laudato Si'*, edited by Dennis O'Hara, Matthew Eaton, and Michael Eaton, 179–94. Lanham, MD: Lexington Books.

Coté, Charlotte. 2010. *Spirits of Our Whaling Ancestors: Revitalizing Makah and Nau-chah-nulth Traditions*. Seattle: University of Washington Press.

Craige, Betty Jean. 2001. *Eugene Odum: Ecosystem Ecologist & Environmentalist.* Athens, GA: University of Georgia Press.

Eisenberg, Evan. 2002. "The Ecology of Eden." In *Judaism and Ecology: Created World and Revealed Word*, edited by Hava Tirosh-Samuelson, 27–59. Cambridge, MA: Harvard University Press.

Esbjörn-Hargens, Sean, and Michael E. Zimmerman. 2011. *Integral Ecology: Uniting Multiple Perspectives on the Natural World.* Boston: Integral Books.

———. 2017. "An Overview of Integral Ecology: A Comprehensive Approach to Today's Complex Planetary Issues." In *The Variety of Integral Ecologies: Nature, Culture, and Knowledge in the Planetary Era,* edited by Sam Mickey, Sean Kelly, and Adam Robbert, 55–80. Albany, NY: State University of New York Press.

Folz, Richard C., Fredrick M. Denny, and Azizan Baharuddin, eds. 2003. *Islam and Ecology: A Bestowed Trust.* Cambridge, MA: Harvard University Press.

Gebser, Jean. 1985. *The Ever-Present Origin*. Athens, OH: Ohio University Press.

Girardot, N. J, James Miller, and Liu Xiaogan. 2001. *Daoism and Ecology: Ways within a Cosmic Landscape.* Cambridge, MA: Harvard University Press.

Golley, Frank B. 1993. *A History of the Ecosystem Concept in Ecology: More Than the Sum of Its Parts.* New Haven, CT: Yale University Press.

Grim, John A., ed. 2001. *Indigenous Traditions and Ecology: The Interbeing of Cosmology and Community.* Cambridge, MA: Harvard University Press.

Hackett, Conrad, Marcin Stonawski, Yunping Tong, Stephanie Kramer, Anne Shi, and Dalia Fahmey. 2025. "Religion in Sub-Saharan Africa." In *How the Global Religious Landscape Changed From 2010 to 2020*. Washington, DC. Pew Research Center. https://doi.org/10.58094/fj71-ny11.

Hargrove, Eugene, ed. 1986. *Religion and Environmental Crisis*. Athens, GA: University of Georgia Press.

Hessel, Dieter, and Rosemary Radford Ruether, eds. 2000. *Christianity and Ecology: Seeking the Well-Being of Earth and Humans*. Cambridge, MA: Harvard University Press.

Jordan, William R., III. 1994. "'Sunflower Forest': Ecological Restoration as the Basis for a New Environmental Paradigm." In *Beyond Preservation: Restoring and Inventing Landscapes*, edited by A. Dwight Baldwin, Judith de Luce, and Carl Pletsch, 17–34. Minneapolis: University of Minnesota Press.

———. 2003. *The Sunflower Forest: Ecological Restoration and the New Communion with Nature*. Oakland, CA: University of California Press.

Jordan, William R., III, Susan P. Bratton, and Thomas Simpson. 2026. "A Night Burn on the Prairie: Ecological Restoration as Performance, Ritual, and Ceremony." In *The Handbook of Religion and the Environment*, edited by Susan P. Bratton, Stephanie C. Boddie, and Ibrahim Özdemir, 258–70. Cheltenham, UK: Edward Elgar Publishing.

Kelly, Sean. 2017. "Integral Ecology and Edgar Morin's Paradigm of Complexity." In *The Variety of Integral Ecologies: Nature, Culture, and Knowledge in the Planetary Era,* edited by Sam Mickey, Sean Kelly, and Adam Robbert, 81–103. Albany, NY: State University of New York Press.

Key-Chapple, Christopher, and Mary Evelyn Tucker, eds. 2000. *Hinduism and Ecology: The Intersection of Earth, Sky, and Water*. Cambridge, MA: Harvard University Press.

McGuire, John, Carol Denhof, and Byron Levan. 2023. *The Forest That Fire Made: An Introduction to the Longleaf Pine Forest*. Athens, GA: University of Georgia Press.

Merchant, Carolyn. 2007. *American Environmental History: An Introduction*. New York: Cambridge University Press.

Mickey, Sam, Sean Kelly, and Adam Robbert, eds. 2017a. *The Variety of Integral Ecologies: Nature, Culture, and Knowledge in the Planetary Era*. Albany, NY: State University of New York Press.

———. 2017b. "Introduction: The History and Future of Integral Ecologies." In *The Variety of Integral Ecologies: Nature, Culture, and Knowledge in the Planetary Era,* edited by Sam Mickey, Sean Kelly, and Adam Robbert, 1–27. Albany, NY: State University of New York Press.

NC Botanical Garden. 2024. "Hooheh (Longleaf Pine) Reforestation and Cultural Burn Program." *YouTube video*, 55:14. March 18, 2024. https://youtu.be/i80q3ylgFgg?si=GuwKq61Hyyk-G2GN.

Nelson, Melissa K., and Dan Shilling, eds. 2018. *Traditional Ecological Knowledge: Learning from Indigenous Practices for Environmental Sustainability*. Cambridge, UK: Cambridge University Press.

Nicolescu, Basarab. 2002. *Manifesto of Transdisciplinarity*. Albany, NY: State University of New York Press.

O'Hara, Dennis, Matthew Eaton, and Michael Eaton, eds. 2020. *Integral Ecology for a More Sustainable World: Dialogues with Laudato Si'*. Lanham, MD: Lexington Books.

Oreskes, Naomi, and Erik Conway. 2010. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. New York: Bloomsbury Press.

Pickett, S. T. A., and Peter Sherwood White, eds. 1985. *The Ecology of Natural Disturbance and Patch Dynamics*. Amsterdam: Elsevier Academic Press.

Pike, Sarah. 2023. "'There's Divinity in Everything Here': Ritualizing Ecological Practice at Pagan Nature Sanctuaries." *Journal for the Study of Religion, Nature and Culture* 17 (3): 376–403.

Riddell, Darcy. 2011. "Evolving Approaches to Conservation: Integral Ecology and Canada's Great Bear Rainforest." In *Integral Ecology: Uniting Multiple Perspectives on the Natural World,* edited by Sean Esbjörn-Hargens and Michael E. Zimmerman, loc. 8788–8190. Boston: Integral Books.

Scharper, Stephen B. 2020. "A Compassionate Science: Pope Francis, Climate Change, and the Fate of Creation." In *Integral Ecology for a More Sustainable World: Dialogues with Laudato Si'*, edited by Dennis O'Hara, Matthew Eaton, and Michael Eaton, 29–38. Lanham, MD: Lexington Books.

Shugart, H. H. 2014. *Foundations of the Earth: Global Ecological Change and the Book of Job.* New York: Columbia University Press.

Sideris, Lisa H. 2018. "Techno-science, Integral Thought, and the Reality of Limits in *Laudato Si'*." *The Trumpter* 34 (1): 14–35. ISSN 0832-6193.

Starr, Kelsey Jo. 2021. "6 Facts about Jains in India." *Short Reads*, Pew Research Center, August 17, 2021. www.pewresearch.org/short-reads/2021/08/17/6-facts-about-jains-in-india/.

Takeda, Louise. 2015. *Iland's Spirits Rising: Reclaiming the Forests of Haida Gwaii.* Vancouver: University of British Columbia Press.

Tirosh-Samuelson, Hava, ed. 2002. *Judaism and Ecology: Created World and Revealed Word.* Cambridge, MA: Harvard University Press.

Tucker, Mary Evelyn, and Duncan Ryuken Williams, eds. 1997. *Buddhism and Ecology: The Interconnectedness of Dharma and Deeds.* Cambridge, MA: Harvard University Press.

Tucker, Mary Evelyn, and John Berthrong, eds. 1998. *Confucianism and Ecology: The Interrelation of Heaven, Earth, and Humans.* Cambridge, MA: Harvard University Press.

Tucker, Mary Evelyn, John Grim, and Andrew Angyai. 2019. *Thomas Berry: A Biography.* New York: Columbia University Press.

Turner, Fredrick. 1988. "A Field Guide to the Synthetic Landscape: Toward a New Environmental Ethic." *Harper's Magazine* 276 (April): 49–55.

Van Wieren, Gretel. 2008. "Ecological Restoration as Public Spiritual Practice." *Worldviews* 12:237–54.

———. 2013. *Restored to the Earth: Christianity, Environmental Ethics, and Ecological Restoration.* Washington, DC: Georgetown University Press.

Veldman, Robyn Globus. 2019. *The Gospel of Climate Skepticism: Why Evangelical Christians Oppose Action on Climate Change.* Oakland, CA: University of California Press.

Voss, Julia. 2023. "Ernst Haekel and the Evolution of Modern Art." In *The Art and Science of Ernst Haeckel,* edited by Benedikt Taschen, 44–69. Cologne: Taschen.

Whelan, Matthew P. 2020. "The Peril and the Promise of Agriculture: An Agroecological Reading of *Laudato Si'*." In *Integral Ecology for a More Sustainable World: Dialogues with Laudato Si'*, edited by Dennis O'Hara, Matthew Eaton, and Michael Eaton, 91–108. Lanham, MD: Lexington Books.

Wilber, Ken. 1995. *Sex, Ecology, and Spirituality: The Spirit of Evolution.* 1st ed. Boston, MA: Shambhala Press.

———. 2000. *Sex, Ecology, and Spirituality: The Spirit of Evolution.* 2nd ed. Boston: Shambhala Press.

———. 2011. *A Theory of Everything: An Integral Vision for Business, Politics, Science, and Spirituality.* Boston: Shambhala.

———. 2017. *A Brief History of Everything.* 2nd ed. Boston: Shambhala.

Zimmerman, Michael. 2009. "Including and Differentiating among Perspectives: An Integral Approach to Climate Change." *Journal of Integral Theory & Practice* 4 (4): 1–26.