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ORIGINAL ARTICLE

Dark green humility: religious, psychological, and affective attributes of proenvironmental behaviors

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Abstract
Through a novel survey instrument, we examined traits and characteristics that various scholars and observers have averred promote or hinder proenvironmental behaviors. We found that those who hold anthropocentric and monotheistic religious views, and express low levels of environmental, religious, and cosmic humility, are less likely to engage in proenvironmental behaviors than those who maintain views, or express affinity with affective traits, values, and spiritual understandings, that are ecocentric, Organicist/Gaian, pantheistic, animistic, and that in general reflect humility about the human place in the world.

Keywords Environmental behavior · Religion · Humility · Affect · Environmental psychology · Environmental sociology · Environmental anthropology · Environmental history · Religion and nature · Sustainability

Overview

Through a novel survey instrument, we examined traits and characteristics that various scholars and observers have averred promote or hinder proenvironmental behaviors. Put most generally, based on extensive reviews of extant research including our own qualitative and quantitative studies, we hypothesized that those who hold anthropocentric and monotheistic religious views, and who express low levels of certain types of humility (per scales termed religious, cosmic, and environmental humility), would be less likely to report that they engage in proenvironmental behaviors. We further hypothesized that those who hold biocentric or ecocentric values, Organicist/Gaian/ecological understandings of interdependence, and/or pantheistic or animistic perceptions (per a new "dark green spirituality scale"), and express high levels of the previously mentioned types of humility, would be more likely to report that they engage in proenvironmental behaviors. We used three measures—those related to choices about food, transportation, and energy consumption—as proxies for proenvironmental behaviors. These measures also illuminate the quest for sustainable human economic and social systems. Herein therefore, when speaking of proenvironmental behaviors, we have in mind as well behaviors that seek to make human social systems environmentally and socially sustainable.

We shall proceed by reviewing the research that provided important background for our study, providing after this a section specifying in more detail than here our research hypothesis, a methodology section including discussion of the survey instrument and statistical analyses deployed, and our analysis and findings.

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Introduction

During the late Pleistocene (30,000–100,000 BP), *Homo Sapiens* began dramatically transforming Earth's environmental systems by figuring out how to use fire to increase

preferred vegetation for food and make hunting easier; these early humans also extirpated species from some habitats while driving others entirely to extinction.[1] With the Neolithic revolution, which began about 9500 BP, anthropogenic environmental change intensified as agricultural societies and their growing populations spread around the world. By 3000 BP, such societies had been established on all continents but Antarctica, domesticating plants and animals and precipitating more extinctions. As they expanded these agricultural civilizations, they not only replaced relatively diverse ecosystems with less diverse agro-ecosystems but also converted, displaced, or destroyed foraging and pastoral societies. In short, they precipitated both biological and cultural simplification, or as some scholars have aptly put it, biocultural homogenization. [2]

These processes intensified during the colonial period, which not only subjugated peoples and eroded or even supplanted their cultures but, by moving organisms from the habitats where they had evolved, and favoring some species (often the ones they were most familiar with) over others, endemic species were often extirpated while biologically diverse ecosystems were replaced by less-diverse agro-ecosystems (Crosby 1986; Mann 2005).

These processes intensified with the technological innovations accompanying the industrial revolution, and according to environmental historians, after 1945, led to a "great acceleration" of anthropogenic environmental change (McNeill and Engelke 2014). These changes have altered the climate system, which itself is precipitating yet more environmental changes, including by increasing the rate of anthropogenic extinctions (Kolbert 2014).

Anthropogenic climate change has become so profound and global that many now have advanced the still-controversial view that we should acknowledge this by changing epoch-nomenclature from Holocene to the Anthropocene (Crutzen 2002a, b). Others have illuminated the ways these changes can precipitate or exacerbate social instability and violence (Parenti 2011; Homer-Dixon and Blitt 1998).

Environmental studies as an interdisciplinary field arose in no small measure due to a recognition that the stakes are high when it comes to anthropogenic environmental change, and that a greater understanding of the cultural dynamics that lead to negative environmental change is needed if we are to construct environmentally sustainable lifeways and livelihoods. The present study both reflects this perspective and seeks to make a contribution to this needed understanding, especially with regard to the affective, religious, spiritual, and value dimensions of environmental behavior.

Study-based literature review

Much of the related ferment regarding what may hinder or promote proenvironmental behavior has focused on whether religious worldviews (also termed metaphysics or cosmovision), as well as specific perceptions and practices, hinder or promote proenvironmental behavior.

As part of the background needed for the current study, one of us wrote a detailed history of the cultural and scholarly ferment over the role of religion in environmental behaviors (Taylor 2016), while also orchestrating a comprehensive review of over 700 extant scientific studies investigating the role of religion in environmental behavior (Taylor et al. 2016). We cannot repeat these detailed analyses here nor cite all these sources but we can summarize three sorts of claims reviewed in them that have provided some of the impetus for this study.

The first is the claim that the monotheistic, Abrahamic religions—Judaism, Christianity, and Islam—promote environmentally destructive beliefs and behaviors. Although most such criticism has focused on Christianity given its greater prominence, the criticisms, generally speaking, inhere to all three of these traditions. The most common refrains among such critics, however, can be briefly put: monotheistic religions are deeply anthropocentric with their assumption that human beings have superior spiritual and moral value, and special earthly authority, because only humans are created in God's image. This leads, critics aver, to a scientifically unwarranted and ethically self-serving assumption God made the world, first and foremost, for humankind. Moreover, by placing fidelity to God as greatest commandment, these traditions have typically considered any culture that it understands as venerating or worshipping anything other than God—which usually means natural entities or organisms—as spiritually dangerous. Consequently, those adhering to Abrahamic religions have, generally speaking, viewed as inferior any culture they consider pagan and therefore, seek to convert its people or otherwise suppress their religious beliefs and practices.

Those articulating such critiques vary in the detail and nuance with which they express them, but they include a wide variety of scholars and environmental luminaries, including Ludwig Feuerbach, Ralph Waldo Emerson, Henry David Thoreau, John Muir (who was especially detailed, astute, and humorous in his critique), Edward Payson Evans (in Germany), Aldo Leopold (who evocatively offered an ecocentric value system as an moral alternative), and Rachel Carson (who added what we would now term an ecofeminist dimension to her critique). After 1960, historians weighing in included Clarence Glacken (1967), Roderick Nash (2001

[1] Boivin et al. 2016; Harari 2015; Martin 2005; Martin and Klein 1984; Diamond 1972; Diamond 1975; Dinerstein et al. 2017; Losos, Ricklefs, and MacArthur 2010; MacArthur and Wilson 2001; Meine, Soulé, and Reed 2006; Noss and Cooperrider 1994; Quammen 1996; Soulé 1986.

[2] Marsh 1970 [1864]; Ponting 1992; Lockwood and McKinney 2001; Harari 2015; Williams 2003.

[1967]), and Lynn White, Jr. (1967). White famously suggested that the spirituality of St. Francis could provide an ecologically friendly form of Christianity; a few years later, he added his perception that new forms of animism might also emerge and be ecologically salutary (White 1973). Arnold Toynbee (1972), in an equally provocative argument about the religious roots of the environmental crisis, advocated as an alternative a revitalization of Paganism.

The second claim is that, contrary to the assertion of some scholars and others, anthropocentrism is also deeply embedded in religions originating in Asia. Moreover, these religions often also share ideas and practices common to Abrahamic religions, including that a deity or deities control environmental systems, and that to secure favorable environmental conditions and avoid unfavorable ones, divine beings must be appeased or worshipped in some specified way; often through sacrifices of some kind. Arguably, as importantly, religions originating in Asia, in their own ways, tend to view this world as penultimate, and even sometimes negatively, as a place of suffering, from which through proper religious and ethical practice one can ultimately be rescued.

The third claim is based on the growing scientific understanding that societies that have come to be labeled "indigenous" are typically less anthropocentric than the world's predominant religions—and therefore—they tend to be more respectful toward non-human organisms and aware of their needs and their value to the habitats upon which all life depends. Moreover, indigenous traditions have often evolved in ways in which their spiritual perceptions and practices have been integrated with ecological understandings, and have helped them to create socioecological systems that are sustainable and do not erode biodiversity. [3]

The overarching conclusion of these studies is that there are themes and practices within the world's predominant religions that tend to and often significantly hinder understanding of ecosystems and proenvironmental behavior.[4] In contrast and generally speaking, indigenous societies are more likely to have in-depth ecological knowledge, and spiritual and ethical traditions, that are environmentally sustainable, or at least, less destructive.

[3] Harris 1965; Harris 1966; Reichel-Dolmatoff 1971; Reichel-Dolmatoff 1976; Reichel-Dolmatoff 1996; Steward 1972 [1955]; Steward 1977; Lansing 1991; Lansing and Kremer 1995; Posey and Balée 1989; Posey 1999; Posey and Plenderleith 2002; Nelson 1999; Gadgil et al. 1993; Williams and Baines 1993; Ellen et al. 2000; Messer and Lambek 2001; Stepp et al. 2002; Laudine 2009; Kimmerer 2013; Whyte 2013; Whyte 2018; Nelson and Shilling 2018.

[4] Subsequent studies to the abovementioned comprehensive review even found that the proenvironmental exhortations by Pope Francis I have had little effect on Catholics (Li et al. 2016), and Christianity is not becoming more environmentally friendly despite the ardent environmentalism of the few (Konisky 2018); while Wexler (2016) examined a variety of religiously enjoined practices common in the world's predominant traditions that are environmentally harmful.

If the increasing weight of scholarly evidence supports these claims, then it may be that the processes that lead to *religious* homogenization may well reduce the affective and spiritual resources, and often the intimate knowledge of ecosystems that are needed to create sustainable societies. This begs these questions that have influenced this study: To what extent does the evidence underlying these claims hold up? And, what if any spiritual perceptions and practices, longstanding or newfound, might provide an affective basis for effective, proenvironmental mobilization? What other factors, unrelated to religious perceptions and practices, might be involved that influence environment-related behaviors?

There are, of course, many factors other than affective and religious ones that influence how people interact with their environments. We have also been mindful of research into these variables when constructing this research. These factors include humankind's geological and biological habitats, diverse social and economic systems, and more. Scholars from diverse disciplines have explored these variables and their reciprocal influences in an effort to better understand the ways humans impact, and are impacted on, by the world's environmental systems.

With others interested in sustainability, we are interested in understanding behaviors that promote or hinder the development and maintenance of ecologically and socially adaptive societies, and we understand that this demands the conservation of biologically diverse and resilient ecosystems. This means more than preserving a safe space for human civilization, as implied by the planetary boundaries approach (Steffen et al. 2015), which like many religion-related worldviews, has been critiqued for its anthropocentrism (Montoya et al. 2018), which inevitably gives human wellbeing priority over the wellbeing of other organisms and environmental systems that they do not need for their own flourishing. Instead, we assume that sustainability requires the conservation of biodiversity in the broad sense of preventing or minimizing anthropogenic reductions to Earth's genetic, species, and ecosystem variety, an approach some call "strong sustainability" (Ayres et al. 2001; Kuhlman and Farrington 2010). This approach has affinity with what some have called and defended as ecocentrism, in which all living things are viewed as having value apart from their usefulness to humankind (Washington et al. 2017). Such an understanding of strong sustainability has informed our research questions and methods in this article.

A wide variety of research on behavior change has also informed our research. Some studies suggest, for example, that a general approach for promoting sustainable behavior is information dissemination (Staats et al. 2004)—however, how that information is disseminated matters a great deal. For example, when that information is provided passively, in a way that fails to grab people's attention and/or affect them

emotionally, this often results in an only marginal effect of behavioral change (Cialdini et al. 1991; Fang and Sun 2016).

With regard to economic systems and ideologies, which certainly influences human behavior in scores of ways, it is important to ask what effects financial incentive interventions have on initial and sustained proenvironmental behaviors. Maki et al. (2016), for example, conducted a meta-analysis of 22 studies and found that incentive interventions generally had a small-to-medium effect on proenvironmental behaviors, both while the incentive was offered, and after it had been removed. The results also suggested that incentives may be most effective when targeting some behaviors, such as recycling, and less effective when trying to change others, such as conservation behaviors. Consequently, although economic incentives may be structured to promote some proenvironmental choices, there are other normative, psychological, and affective factors at play in decision-making that need investigation; this is a key goal of our survey research.

Other data about behavioral changes suggests that people conform to normative information about other people's current attitudes and behaviors. Sparkman and Walton (2017), for example, explored whether people conform to dynamic norms—i.e., information about how other people's behavior is changing over time—and found that dynamic norms about other people changing their meat consumption motivated change in their participants' behavior. They also found that this occurred despite prevailing static norms of meat consumption—specifically, such norms generated an increased interest in eating less meat and doubled meatless orders at a café. In addition, this shift in behavior generalized resulted in reduced laundry loads and water use over 3 weeks during a drought. They concluded that dynamic norms accomplish this because they are taken as a sign of what is to come, encouraging broader change, even in the face of a salient and socially entrenched current norm and related practices.

How people see themselves, their identities, also appears to be important. Carfora et al. (2017), for example, examined the role of proenvironmental self-identity in explaining intentions and proenvironmental behaviors. They found that proenvironmental self-identity significantly predicted both intentions and behaviors. What is more, it moderated the effect of perceived behavioral control (efficacy) on intentions and behaviors. This confirmed the importance of individuals' self-perception about proenvironmental concerns. An important aspect of self-perception is one's moral views of the natural world and non-human others. In this regard, Karpiak and Baril (2008) found that principled moral reasoning, as measured by the Defining Issues Test (DIT-2, Rest 1987), was positively correlated with ecocentrism (i.e., the belief in the intrinsic importance of nature), negatively correlated with environmental apathy, and was unrelated to anthropocentrism (i.e., the belief that nature is important because it is central to human wellbeing).

Some researchers have examined the role that experiences in natural environments may have in influencing psychological dispositions and environment-related perceptions and behaviors. Scannell and Gifford (2010, 2017), for example, deduced that 13 psychological categories, including feelings of belonging, entertainment, personal growth, freedom, comfort-security, relaxation, and aesthetics, exist and influence perceptions of place attachment and protective intentions; moreover, they found that these places are sometimes considered sacred (2017, 2010). Moreover, other psychological studies have concluded that where places are considered sacred, there is much stronger attachment to them (Mazumdar and Mazumdar 1993; Mazumdar and Mazumdar 2004). Rantanen (2009), in a somewhat similar finding, concluded that experiencing a deep connection to nature leads to a healthier psychological and emotional life and can inspire people to act in proenvironmental ways. Ecopsychologist Peter White, who utilizes and facilitates mindfulness techniques (MAPIN: Mindful-Affective-Perception-Imagination-in-Nature) with group participants in Sydney, Australia, in another similar finding, concluded that guided experiences in nature lead to an increased appreciation of it. The experiences of participants included awakening with an increased sense of wonder and joy and an increased sense of connection to the natural world, including for some, a recognition of sentience and value of non-human organisms (White 2012). Another qualitative study from Australia suggested that "significant and powerful experiences in nature can lead to long-term changes in psychological well-being and environmental behavior" (Snell and Simmonds 2012: 331).

One particularly relevant psychological disposition, as explored in a study led by Jen Wright (Wright et al. 2018), is humility, an "epistemically and ethically aligned state of awareness" (2018: 94) through which people feel they are a small part of a "bigger picture," a vast universe and an interconnected web of a host of beings who deserve moral consideration. So conceived, humility can be operationalized and measured along the dual dimensions of low self-focus, which assesses people's awareness of themselves in relation to the "bigger picture"—e.g., God/spirit, the cosmos, the natural world—and high other-focus, which measures people's state of awareness of themselves in relation to morally relevant living beings. According to Wright et al. (2018), humility expresses itself in several contexts, the most important of which for our purposes here is in people's relationship to the natural world and to other living species—i.e., environmental humility (as expressed in strong sentiments such as "I often feel in awe of the natural splendor of the world" and "Humans have to learn to share the Earth with other species"). It is also measurable in terms of people's relationship to God, spirit, or higher power (religious humility, e.g., "I accept my total dependence upon the grace of God") and in terms of people's relationship, the larger surrounding universe (cosmic humility,

e.g., "I frequently think about how much bigger the universe is than our power to comprehend").

Similarly, a study led by Garfield that focused on "spiritual oneness beliefs," which "emphasize connections among people, other living beings, and the nonliving environment," hypothesized and found that such beliefs were positively "associated with positive attitudes and behavior toward the natural world" (Garfield et al. 2014: 357, cf. 361). These researchers asserted, "Spiritual oneness appears to be the first religiousness/spirituality construct shown to positively predict observable proenvironmental behavior" such as donating to proenvironmental organizations (2014: 369). Still other research concluded that "biospheric" values—namely, values that reflect concern for all life in the biosphere—are strongly associated with proenvironmental intentions and behaviors (de Groot and Steg 2008, 2010); and that individuals who experience "deep interconnection with all forms of life" typically hold that "human beings should not harm nature because we are a part of nature and all species have a right to exist" (Arnocky et al. 2007: 256-57).

Two additional studies authored or orchestrated by Annick Hedlund-de Witt (Hedlund-de Witt 2013; Hedlund-de Witt et al. 2014), which focused broadly on people's worldviews, found that certain worldview types positively affect environmental attitudes and behaviors. Specifically, they found that belief in "inner growth," "contemporary spirituality," "connectedness with nature," and "willingness to change" predicted proenvironmental behaviors (e.g., reducing or eliminating meat consumption while increasing consumption of in-season and organic food products, while a "focus on money," "secular materialism," and "instrumentalism" predicted significantly lower sustainable food choices). They also found that more intrinsically oriented worldviews correlate with proenvironmental attitudes and lifestyles, while more extrinsically oriented worldviews correlate with less environmental attitudes and lifestyles.

Much of the above-cited research on affect, humility, felt connections to nature, worldviews, and their influence on environmental behavior provides evidence for Bron Taylor's historically and ethnographically derived argument about *Dark Green Religion* (2010), which provided a second, important line of enquiry for the current research. Such religion, as Taylor constructed the notion and argued, is characterized by "spiritualities of belonging and connection to nature" (Taylor 2001a, 2001b) and corresponding beliefs that the world is "sacred, imbued with intrinsic value, and worthy of reverent care" (Taylor 2010: ix). Such religion coheres with (at least) or directly draws on scientific understandings of ecological interdependence and biological kinship, based on an evolutionary understanding that life evolved from a common ancestor (Taylor 2017). Such perceptions lead, in turn, to humility about the human place in the world (which is informed by scientific understandings of how tiny and what latecomers humans are in the universe's history) and a corresponding critique of human moral superiority. Such dark green spirituality also often involves animistic perceptions about the possibility of relationships with natural entities, forces, and non-human organisms, as well as ecological understandings of interdependence and holistic, Gaian (also known as Organicist) metaphysics.[5] Taylor (2010) further argued that these sorts of dark green perceptions, spiritualities, and values typically lead to proenvironmental intentions and behaviors. Moreover, he contended, they have significant cultural traction around the world, in no small measure, because they are being expressed and promoted by diverse social actors including scientists and environmental philosophers, environmental activists, historians, artists, musicians, filmmakers, nature writers, literary critics, and museum and aquarium curators. Following up on these assertions, Garrett Boudinot and Todd Levasseur (2016) subsequently found that such "dark green" and biocentric values animate the sustainability-envisioning Transition Town in Totnes, UK.

Obviously, some of the previously mentioned research, including that which suggests environmental humility as a wellspring of environmental action, has affinities with findings and arguments advanced in *Dark Green Religion*. Such research begs further questions, including, whether and how influential, and how extensive geographically and influential politically, are such perceptions, spiritualities, and beliefs. The current research, summarized below, springboards from the previous, just-summarized qualitative and quantitative research to illuminate the role of such worldview elements in environmental behaviors.

Research hypotheses

Informed by this briefly characterized research, we developed four hypotheses regarding the relationships between proenvironmental intentions and behaviors and traits that we shall label environmental humility, on the one hand, and dark green religion, on the other. Specifically, we hypothesized that:

[5] Today, Animism "commonly refers to perceptions that natural entities, forces, and nonhuman life-forms have one or more of the following: a soul or vital lifeforce or spirit, personhood (an affective life and personal intentions), and consciousness, often but not always including special spiritual intelligence or powers" and it often "enjoins respect if not reverence for and veneration of such intelligences and forces and promotes a felt kinship with them" (Taylor 2010, 15). Despite great diversity and generally speaking, cultures commonly called "indigenous" have such perceptions and values (Taylor et al. 2016). See also Harvey (2006, 2013).

Organicism "understands the biosphere (universe or cosmos) to be alive or conscious, or at least by metaphor and analogy to resemble organisms with their many interdependent parts," and often, "this energetic, interdependent, living system is understood to be the fundamental thing to understand and venerate" (Taylor 2010, 16).

1. Dark green religion (henceforth DGR) and humility—in particular, environmental humility (henceforth EH)—would be positively correlated with one another.
2. Both DGR and EH would be positively correlated with proenvironmental, pro-sustainability intentions and behaviors (henceforth EB, shorthand for environmental behaviors)
3. Participants who had already displayed an interest in environmental issues would

a) display higher levels of DGR and EH
b) would show a stronger relationship between both DGR and EH, and EB.

4. Anthropocentric and monotheistic perceptions (subsets of Humility) would be negatively related to EB, while Organicist/Gaian/pantheistic and animistic perceptions (subsets of DGR) would be positively associated with EH and EB.

Methodology

To explore these hypotheses, we developed and tested a survey instrument with scales to test all three of the abovementioned variables, DGR (a religious set), EH (a psychological set), and EB (a behavioral practice set), which explored respondent choices regarding (1) food consumption, (2) transportation utilization, and (3) energy use. An overview of each of the three scales precedes discussion of our sampling and statistical methods. The survey also concluded with basic questions about demographics: sex, ethnicity, age, geographic location, and annual household income, regarding their political ideology (on a continuum from extremely conservative to extremely liberal) as well as whether respondents were raised religious, and if so, within which tradition. Respondents were also asked if they were currently religious, and if so, with which tradition they affiliate, and also, about the relative strength of their current religious disposition, and about the hours they spend monthly volunteering with a charity, political organization, or non-profit organization. For more details, see key questions of the survey instrument, which are provided in the Appendix.

As will be apparent from this Appendix, we posed propositions to which survey respondents were to answer using a Likert scale ranging from "strongly agree" to "strongly disagree." We took two types of precautions to prevent participants from developing automatic response patterns: we varied the Likert scales in different survey sections from either 1 to 5 or 1 to 7; and we sometimes reversed the scale from "very important" to "not very important," or with regard to behavioral statements, from "as often as I get the chance" to "never." Respondents were also provided a comment box into which they could write additional feedback. Information about subject groups, sampling methods, and statistical analysis follows our discussion of the survey's three main scales.

The Behavioral Practice Scale

Because we are most interested in understanding correlations between affect, values, and religious or spiritual perceptions and how these may interact in ways that promote proenvironmental behaviors, we focused on three key domains of possible daily behavioral practices that can either contribute to or hinder sustainability. These were choices related to (1) food, (2) transportation, and (3) energy use.[6] These three domains were picked for their base quotidian impact: every human must eat, move, and use energy.

The first-choice category we focused on was food and diet. For this, we assumed (based on consensus scientific evidence) that a plant-based diet is the most sustainable choice for the majority of humans, especially when compared with industrial animal agriculture (Food and Agriculture Organization 2006; Koneswaran and Nierenberg 2008). This is not to say that agriculture itself is sustainable (Jackson 2011), or that industrial-scale plant-based agriculture is either. Clearly there are a variety of nuances in this category (as there are in any category of behaviors) which we cannot tease out in this research. Rather, we will use basic approaches to dietary choices as a proxy for sustainable behavioral choice.

The second category of individual behavior we researched is related to how humans transport themselves around the world. These choices may be on a continuum from less to more sustainable (e.g., from individual automobiles powered by nonrenewable fossil fuels, to carpooling, to public transit, to biking and walking). We recognize that non-human animals provide a source of transit for many parts of the world, but this is no longer a significant mode of transport in the industrialized society where our research occurred. More so, most households in the USA own at least one automobile and many drive multiple miles per day. Because the USA is the main region in which this research was conducted, in this article, we created questions that reflected this dominant mode of transport.

The third domain of individual choice we focused on is levels and sources of energy consumption. Consistent with scientific understandings, especially with regard to anthropogenic climate change, we accept that the current, heavy use of fossil fuel/nonrenewables as a source of energy is disrupting the climate system and is highly unsustainable. We further assume, again, based on widely accepted scientific evidence, that renewable sources such as wind, solar, tidal, geothermal, and (sometimes)

[6] For more on these three domains of individual action and how they relate to sustainability/unsustainability, see Hawken (2017). For a focus-group-based study undertaken in the UK on pro-sustainable behavior choice, see Axon (2017).

hydroelectric power generation is more sustainable. We further recognize that improving energy efficiency is an important way to making energy systems more sustainable.

The behavioral choices we will use as indicators of relatively sustainable behaviors do not, of course, occur in a vacuum: such choices occur in a social context informed and shaped by religious, economic, and political factors. Our research includes questions related to these variables. The behavior-focused survey questions are then used to help see if such variables are associated with certain religious and psychological dispositions that promote or hinder proenvironmental behavioral choices. In our judgement, to transition toward sustainable societies, we need to better understand what may motivate proenvironmental behaviors, and thus, the resilience of environmental and social systems (Redman 2014).

The "Dual Dimension" Environmental Humility Scale

The second scale we deployed has been theorized, developed, and defended at length elsewhere by Jen Wright and others (Nadelhoffer & Wright 2017; Nadelhoffer et al 2017; Wright et al 2017; Wright et al 2018). According to them, one way to understand humility is as a corrective to our natural "centeredness." All humans stand, phenomenologically speaking, at the center of the universe. This "centered-ness" naturally biases our experience—we feel our own needs, desires, interests, beliefs, goals, and values as being more immediate and urgent than those of others', which manifests as a natural self-orientation and absorption, leading us to privilege, prioritize, and favor ourselves. Humility is a state of awareness in which these distortions are (even if only temporarily) eliminated, a state of awareness free of the epistemic and ethical biases generated by our natural centered-ness.

Humility helps to orient us toward reality, enabling us to understand and experience ourselves—and all to which we stand in relation—objectively. It is the experience of ourselves within the context of our full existence, generating a clear and accurate sense of ourselves as finite, fragile, and imperfect beings, contingent and relationally constituted—and yet, part of a vast, complex, and interconnected universe of living beings. This can be experienced spiritually, as a connection to the Divine or some higher force or power, but it can also be experienced more secularly, through an awareness of one's place in, and connection to, the larger natural/cosmic order. It also helps to orient us toward others, enabling us to truly understand and experience the "all else"—e.g., the vast web of interconnected beings whose needs and interests are as morally relevant, as worthy of attention and concern, as our own. This increases compassion, along with a greater appreciation for the value of others and a greater acceptance of their beliefs, values, and ideas, even when different from one's own. It is experienced as the expansion, not the contraction, of the force and scope of our own needs and interests, as they become interwoven with the needs and interests of others, and as such are no longer experienced as separate, in conflict, and/or in competition, but rather, as inextricably and necessarily connected and shared. We experience ourselves as grounded by and embedded in, supporting and supported by, the larger living world. Separate fates become shared fates.

The development of the dual-dimension humility scale incorporates both dimensions, and anchors part of the research summarized in this article. Specifically, it was designed to gauge people's state of awareness of themselves in relation to the "bigger picture" (God/spirit, cosmos, nature—i.e., low self-focus) and to others (i.e., high other-focus), as well as to gauge people's attitudes about humility indirectly. This resulted in the identification of five sub-scales, four of which were particularly relevant for our purposes: religious humility, cosmic humility, environmental humility, and high other-focus. The first three measures people's sense of connection to God (i.e., the sacred), the surrounding universe, and the natural world. The last one measures people's sense of connection to other morally relevant beings. The humility scale, including the environmental humility subscale, was developed before conducting this study. The scale, including the subscale, has been fully tested, validated, and published, and this article includes the first ever use of the unique environmental humility subscale.

The "Dark Green Religion" scale

Like many scholars who use historical and ethnographic methods to explore social phenomena, observing people and social settings for long periods, talking extensively with people in them, and supplementing these data with the published observations of historians, journalists, and social scientists, can lead one to having strong hunches about the relative importance of many variables and dynamics. As is not uncommon, those with such hunches would like to test them through quantitative research. Taylor developed a "dark green religion" scale toward this end, and this collaborative research represents the first time it has been tested and deployed.

The main characteristics of dark green religion were summarized in the literature review and more can be understood about these traits by examining the specific propositions in the dark green religion scale. For the present purpose, the only additional thing that should be mentioned is that the operational definition of "religion" in the construct "dark green religion" is very broad, and it includes those who are conventionally religions, perceiving or believing in immaterial divine beings, spirits or forces of some kind, and those who find meaning and a sense of the sacred in nature but are entirely naturalistic (for example, scientific, atheistic, agnostic, or secular) in their self-construal. So, for example, one can perceive the earth and its systems to be a part of God or otherwise Divine (as in pantheism) or a complex interrelated system that is not divine in a conventional sense, but so very special that it can be valuable and compelling to use religious terminology

Table 1 Groups targeted for distributing survey

Group Targeted (money offered: Y/N)	Reason for approaching	Answer: Y =distributed N = declined to respond or distribute
Center for Biological Diversity (Y)	US leader in legally protecting wildlife and wildplaces via the Endangered Species Act	N
Earth First! Journal (Y)	Leading radical environmentalist journal in the US	Y--they sent the survey link out on their social media platforms
Cornwall Alliance (Y)	Leading US Christian fundamentalist think tank that lobbies against climate change policies and is dominionist in their approach	N
Hazon (Y)	Leading US Jewish environmental group	N
Interfaith Power and Light (Y)	Leading US interfaith environmental group	N
Tikkun (Y)	Leading progressive US Jewish publication	N
Michael Dowd (Y)	Leading "evolutionary evangelist"	N
William "Bill" Jordan, III (N)	Leading ecological restorationist and founder of Environmental Prospect	Y
Clayton-Thomas Muller (Y)	Leader of 350.org in Canada, works with Idle No More	Y--sent to his networks in Canada
Asante Riverwind (N)	Nature-based artist and musician with 30+ year radical environmentalist background	Y-shared on his Facebook page
Guy McPherson (Y)	Founder of blog "Nature Bats Last," advocate of scientific reality of "near term extinction"	Y-posted link to his blog
Deep Green Resistance (Y)	Leading radical environmentalist group based in US that calls for decisive ecological warfare	N
GreenFaith (Y)	Leading US interfaith environmental group	Y
Earthworks Farm (Y)	Organic urban farm located outside of Los Angeles	Y
Academic colleagues located in Australia and Finland, respectively (N)	Snowball sampling via their active international sustainability networks and connections (educational, public, and private connections)	Y--both sent survey link to networks via email and posted on their Facebook pages
International Society for the Study of Religion, Nature and Culture (N)	Leading international professional organization for the academic study of religion and nature issues	Y-posted link on their Facebook page
International Society for Environmental Ethics (N)	Leading international, professional organization for the academic study of environmental ethics	Y-link was sent to their active listserve members
Association for Environmental Studies and Sciences (N)	Leading international, professional organization for the academic study of environmental studies and sciences	Y-link was sent to their active listserve members
GreenSchool listserve (N)	Listserve for members (professional, private, and academic) and supporters of the Association for the Advancement of Sustainability in Higher Education, the leading US professional organization for sustainability in higher education	Y-link was sent to their active listserve members

to describe its value (such as, it is "sacred") or metaphors for it, such as the earth system as Gaia (after the ancient Greek Goddess of the Earth). Also very common is the integration into "dark green" worldviews of scientific understandings of the origin and evolution of the universe, biosphere, and the diversity of life on earth. By bearing this in mind, it will be clearer the extent to which "dark green" worldviews might have growing cultural traction among Earth's relatively well-educated human populations.

Research sample and data gathering

After receiving research funds and IRB approval (code IRB-2016-044) from the College of Charleston, the above questions were input into an online survey, hosted by Amazon Mechanical Turk. They were also included in printed-out surveys that were distributed to Earthaven ecovillage members at Earthaven (located outside of Asheville, NC) and a permaculture class that was meeting at Earthaven in June, 2016. Three hundred seven people in the control group[7] filled out an online survey on Amazon Mechanical Turk. Of this, 47% were male and 53% female, while 77% were Caucasian, 7% of African heritage, 7% of Asian heritage, and 3% Hispanic/Latin-American heritage.

Participation was also incentivized by offering targeted groups $50.00 for assistance distributing the survey through

[7] We use the description "control group" here lightly. As should be clear, this was not an experimental design. We use it simply to convey that we targeted two groups of people: (1) those we had reason to believe were actively interested and involved in sustainability related initiatives and endeavors and (2) ordinary people who we had no reason to think were particularly interested or involved (though they certainly might have been).

their listserve. Monies were also used to incentivize completing the on-line MTurk survey by our control group, where participants logged on to the MTurk site and completed the survey. Here readers should recognize that the MTurk respondents were anonymous, but the audience was of English-speaking participants with access to a computer and who, if only through this process, knew about MTurk as a testing domain.

Individuals affiliated with a variety of groups and who participate in their group's listserves were approached and asked to complete the survey (Table 1, below). Some of those approached represent groups we assumed to be a valuable data set for measuring dark green religious humility: they were active educators of sustainability, environmental ethics, religion and nature, and/or environmental studies and sciences. Such a targeted audience represents highly educated people who are aware of pressing sustainability issues, and who may also be scholar-activists. Other groups targeted included leading radical environmentalist groups, leading religious environmentalist groups, and practitioners of sustainable activities such as building ecovillages[8] and those engaging in permaculture and engaged in environmental activism. Based on research already conducted and reviewed previously, we assumed that those in this group were most likely to be ecocentric in their ethics and possibly to reflect pantheist/Gaian, animist, and other dark green views. Authors also approached the Cornwall Alliance, a leading fundamentalist Christian climate change denying/anti-environmentalist group in the USA. They did not respond to our request, so this targeted audience was not surveyed. Unfortunately, we did not succeed in getting cooperation from any theologically conservative Christian group. We did, however, through our religion-related demographic variables, survey many self-identified Christians.

One of the strategies we employed in the survey was to randomize the order in which the survey was presented to the respondents, to protect against order effects. We also occasionally reverse the values on the Likert scale questions (e.g., 1-strongly agree/5-strongly disagree to 1-strongly disagree/5-strongly agree). This was done to protect against survey fatigue, where participants fall into an automatic response pattern. However, some respondents stated in comment boxes that they found this to be confusing and they wondered why the shift occurred. It is possible that some respondents did not notice the shift and therefore the answers in this section may reflect this, though we did not see any obvious evidence of this.

In total, 382 people responded from these groups (coded as "Environmental Listserve group"). Of these, 48% were male and 52% female, while 87% were Caucasian, 1% of African heritage, 2% Asian of heritage, and 2% Hispanic/Latin-American heritage. One note about our samples: Although we did get a broad spectrum of responses on the liberal-conservative spectrum, we nonetheless had more people self-reporting as liberals (N = 428) than either moderates (N = 189) or conservatives (N = 54). There were also a wide range of religions represented in our participants, though the dominant one (not surprisingly) was Christianity. Importantly, these were spread across the political spectrum. And though we took efforts to get as wide and diverse a sample of participants as possible, the sampling methodology was not randomized. Nonetheless, it was consistent with the methodology commonly employed in survey collection in the political and psychological sciences.

Analysis and findings

For the purposes of our analyses, we created summary DGR and humility variables (averaging across the each set of survey questions), as well as subscales for environmental and cosmic humility. For the sustainability-related behaviors, we averaged the survey questions into two different sets of summary variables. We used Pearson's correlation to find correlations among and make inferences about the variables and the perceptions of the respondents and the larger populations to which they belong. This analysis confirmed all of our hypotheses. We will go through these one at a time. (All of the findings that were statistically significant have been marked with $^{**}p < .001$, $^{*}p < .05$.)[9]

[8] For a qualitative psychological study on motivating factors for residents living at Ecovillage Ithaca in NY and how such residency allows for the practice of sustainable behaviors, see Kirby (2003).

[9] With inferential statistics, researchers use a small sample population to make inferences about larger populations to which the sample groups belong. Statistical analysis known as the Pearson correlation examines whether two variables are correlated: in other words, it examines whether two variables tend to change together in either the same or opposite way. (In our study, we are examining whether there are positive or negative correlations between the scales we developed for our survey instrument.) A positive correlation of 1, for example, means that for every single (1) unit increase in variable A, there is a single (1) unit increase in variable B, whereas, a negative correlation of − 1 means that for every 1 unit increase in variable A, there is a 1 unit decrease in variable B. The likelihood, or probability, that the identified correlation will reflect the larger population, which for practical reasons could not be sampled, is reflected in a "p" or probability score; when relationship found in smaller samples to be highly or very highly likely to reflect the larger populations that the study seeks to illuminate, then it is deemed "statistically significant." "Statistical significance," put differently, refers to the level of confidence researchers have that the relationships they have found in their sample populations will reflect the larger populations. This level of confidence, or "probability" the findings are accurate and not due to chance variability or some unknown confounding variable, is expressed in "p" scores: specifically, $p < 0.001$ means the researcher is 99% confident, or if $p < 0.0005$, 95% confident, that the correlation found would apply to the larger populations which the sample was used as a basis for making such inferences.

Of course, the aphorism "correlation does not equal causation" applies here and no causative claims are being made herein.

Hypothesis #1: Dark green religion (henceforth DGR) and humility—in particular, environmental humility (henceforth EH)—would be positively correlated with one another.

We found that DGR and humility were strongly positively correlated with each other (r = .45**) and that DGR was most strongly correlated with the subscales of Environmental Humility (r = .64**) and Cosmic Humility (r = .52**). In other words, the stronger a respondent's affinity with dark green religion, the greater was their humility as identified by the survey scales, both in general (overall) and with regard to environmental and cosmic humility.

DGR		rs
Humility	.45**	
Env Humility	.64**	
Cosmic Humility	.52**	

Hypothesis #2: Both DGR and EH would be positively correlated with proenvironmental, pro-sustainability intentions and behaviors (henceforth EB, shorthand for environmental behaviors)

We found that DGR was strongly positively correlated with positive attitudes about ecological diversity (r = .40**), pro veg/vegan dietary attitudes (r = .50**), and sustainability-related behaviors, sets 1 and 2 (rs = .53 and .62**). Put differently, the stronger a respondent's affinity with dark green religion, the more positive were their attitudes about ecological diversity, being vegetarian/vegan, and the more frequently they reported that they engage in sustainability-related behaviors.

Humility was similarly positively correlated with positive attitudes about ecological diversity (r = .43**), but this was a modestly weaker relationship when it came to pro veg/vegan dietary attitudes (r = .17**), and sustainability-related behaviors, sets 1 and 2 (rs = .26 and .32**), respectively. In other words, the greater a respondent's overall humility as identified by our survey instrument, the more positive were their attitudes about ecological diversity and (to a lesser but still significant extent) about being vegetarian/vegan, and the more frequently they reported sustainability-related behaviors.

Interestingly, *Environmental* Humility, specifically, was more strongly positively correlated with pro veg/vegan dietary attitudes (r = .42**) and with sustainability-related behaviors, sets 1 and 2 (rs = .44 and .49**), but somewhat less so with positive attitudes toward ecological diversity (r = .20**). Put differently, the greater a respondent's environmental humility, the more positive were their attitudes about being vegetarian/vegan, and the more frequently they engaged in sustainability-related behaviors, but this relationship was modestly less positive with regard to their attitudes about ecological diversity.

Not surprisingly, participants' pro veg/vegan dietary attitudes were strongly correlated with sustainability-related behaviors, sets 1 and 2 (rs = .54 and .60**). The more positive their pro veg/vegan dietary attitudes, the more frequently they reported engaging in sustainability-related behaviors.

		DGR	Humility
	Positive attitudes about ecological diversity	.40**	.43**
	Pro veg/vegan dietary attitudes	.50**	.17**
	Sustainability-related behaviors, set 1	.53**	.26**
	Sustainability-related behaviors, set 2	.62**	.32**
Pro veg/vegan dietary attitudes	Positive attitudes about ecological diversity		
	Sustainability-related behaviors, set 1	.54**	
Sustainability-related behaviors, set 2		.60**	

Hypothesis #3: Participants who had already displayed an interest in environmental issues would

a) display higher levels of DGR and EH
b) would show a stronger relationship between both DGR and EH, and EB.

DGR and humility were both *stronger* for people from various environmental/sustainability-related listserves (n = 308) than for the control group (Mturkers, n = 328):

- DGR, *Mean score* = 6.0 (listserve) vs 5.1 (control)
- Cosmic Humility, *Mean score* = 5.8 vs 5.1
- Environmental Humility, *Mean score* = 6.3 vs 5.3[10]

Proenvironmental attitudes and sustainability behaviors (sets 1 and 2) were *stronger* for people from the listserves than for the control group:

- Pro veg/vegan dietary attitudes, *Mean score* = 4.0 (listserve) vs 2.6 (control)
- Sustainability-related behaviors, set 1, *Mean score* = 3.5 vs 2.5
- Sustainability-related behaviors, set 2, *Mean score* = 4.1 vs 3.4

Importantly, the relationship between DGR and pro-attitudes and behaviors was also *stronger* for people from the listserves than for the control group, suggesting that the

[10] Independent-samples t tests, which compare the difference in the data variability between the two groups, were run to show that these means were significantly different from each other.

relationship between people's DGR, proenvironmental attitudes, and sustainability behaviors becomes reinforced and strengthened as the latter increase:

- DGR and Positive attitudes about ecological diversity (r = .53 vs .27, significantly different z = 3.9**)[11]
- DGR and Sustainability-related behaviors, set 1 (r = .46 vs .31, significantly different z = 2.2*)
- DGR and Sustainability-related behaviors, set 2 (r = .59 vs .36, significantly different z = 3.1**)
- DGR and pro veg/vegan dietary attitudes (r = .35 vs .33)

Similarly, the relationship between humility and pro-attitudes and behaviors was also *stronger* for people from the listserves than for the control group, suggesting the same reinforcing relationship:

- Humility and Positive attitudes about ecological diversity (r = .55 vs .41, significantly different z = 2.4*)
- Humility and Sustainability-related behaviors, set 1 (r = .34 vs .21, significantly different z = 1.9*)
- Humility and Sustainability-related behaviors, set 2 (r = .48 vs .26, significantly different z = 3.1*)
- Humility and pro veg/vegan dietary attitudes (r = .24 vs .09, significantly different z = 2.0*)

	Mean scores Listserve	Mturk
DGR	6.0	6.1
Env Humility	6.3	5.3
Cosmic Humility	5.8	5.1
Pro veg/vegan dietary attitudes	4.0	2.6
Sustainability-related behaviors, set 1	3.5	2.5
Sustainability-related behaviors, set 2	4.1	3.4
DGR and Positive attitudes about ecological diversity	0.53	0.27
DGR and Sustainability-related behaviors, set 1	0.46	0.31
DGR and Sustainability-related behaviors, set 2	0.59	0.36
DGR and pro veg/vegan dietary attitudes	0.35	0.33
Humility and Positive attitudes about ecological diversity	0.55	0.41
Humility and Sustainability-related behaviors, set 1	0.34	0.21
Humility and Sustainability-related behaviors, set 2	0.48	0.26
Humility and pro veg/vegan dietary attitudes	0.24	0.09

[11] A z-score test was conducted to determine whether the two correlations are significantly different, in the sense that one was significantly greater than the other.

When tested for regressions, both DGR and humility independently predicted people's sustainability-related behaviors, even after controlling for (i.e., removing the influence of) people's dietary choices and their attitudes about ecological diversity. This was true for both the environmental listserve and the MTurk control groups.

Hypothesis #4: Anthropocentric and monotheistic perceptions (subsets of Humility) would be negatively related to EB, while Organicist/Gaian/pantheistic/animistic perceptions (subsets of DGR) would be positively associated EB.

- Organicist/Gaian/pantheistic/animistic perceptions were indeed positively correlated with sustainability-related behaviors, set 1 (r = .47**) and sustainability-related behaviors, set 2 (r = .54**). In other words, the stronger their organicist/Gaian/pantheistic/animistic perceptions, the more frequently people engaged in sustainability-related behaviors.
- Anthropocentric and monotheistic perceptions were indeed negatively correlated with sustainability-related behaviors, set 1 (r = − .21**) and sustainability-related behaviors, set 2 (r = − .17**). In other words, the stronger their anthropocentric and monotheistic perceptions, the less frequently people engaged in sustainability-related behaviors.

		Listserve	Mturk
Organicist/Gaian/pantheistic/animistic perceptions	Sustainability-related behaviors, set 1	.47**	.54**
	Sustainability-related behaviors, set 2	− .21**	− .17**

Discussion and conclusion

In his classic work of environmental philosophy and spirituality, the great twentieth century ecologist Aldo Leopold averred that environmental ethics depend on the ability of humankind to empathize with, respect, admire, love, and value, the entire ecological community; feelings that flow naturally when people are alert to the delights and wonders of nature, and who understand ecological interdependence and biological kinship. Leopold derived such kinship ethics from Darwin's insight that all organisms share a common ancestor (Taylor 2017). Such experiences and understandings, Leopold thought, should lead people to reject notions of human supremacy and instead, to cultivate identities as "plain" members of the biotic community; in other words, adopt an ethics and thus behaviors of humility about the human place in the

world. Taken together, such feelings and experiences led Leopold to expand the moral community to all life, and to his now-famous "Land Ethic": "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" (Leopold 1970 [1949]: 262). Leopold also argued, much like Lynn White, Jr. did decades later, that "Conservation is getting nowhere because it is incompatible with our Abrahamic concept of land. We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect" (Leopold 1970 [1949]: xviii-xix).

Leopold's views have been widely shared by environmental thinkers and activists, and social scientists have begun to test empirically these and other perceptions about the role of religion in environmental behaviors. Our research builds on this growing body of research while providing unique insights into experiences, perceptions, and beliefs that are positively associated with the most ardently proenvironmental actors. Specifically, we have reinforced previous research that found that monotheistic religious beliefs and anthropocentric values are not associated with (and probably hinder) proenvironmental attitudes and behaviors, at least as tested among the demographic groups (which were primarily US-based and Caucasian) who responded to our unique survey.

More importantly, we have provided significant evidence that those surveyed who expressed high levels of humility about the human place in the world, and who have affinity with "dark green" spiritual perceptions and beliefs, not only express ecocentric values but are also more likely to act in proenvironmental ways. In their own ways, our findings reinforce previous findings that associated worldviews with biospheric and ecocentric values with profound commitments to environmental causes and pro-environmental behaviors.

Our unique contribution has been in identifying in more detail than previous studies specific experiences, perceptions, and beliefs that are associated with (and likely promote) ecocentric values and behaviors. These include "dark green" experiences such as awe, wonder, and delight in nature, as well as feelings of belonging to and loving nature; understandings that all species share a common ancestor and are biologically related kin, which leads to humility about the human place in the world and overturn notions of human supremacy; convictions that non-human organisms are persons with whom we can and should be in respectful, and possibly even communicative relationships; beliefs that the interconnections among organisms and ecosystems are so important that they can and should be considered sacred; and our ethical obligations to other organisms and the web of life itself are so important that they are not only worthy of respect, but reverence. The level of depth provided by our survey on the above is further strengthened by correlating these views with those of cosmic, religious, and environmental humility. Such merging of domains has never been tested before, and the environmental humility questions themselves were employed for the first time, globally, with our survey.

To summarize the above, those survey respondents who expressed affinity with the kind of emotions and perceptions we have called environmental humility and dark green spirituality are more likely to engage in proenvironmental behaviors.

We have already explained that our study, while valuable, is limited in a number of ways that it is important to underscore. Most generally, although we received more than enough responses to find our hypotheses validated as significant through statistical analysis, we were constrained by limited resources from generating a larger and more diverse set of respondents. This means that our findings could possibly be specific to the demographics of our sample—i.e., dominantly liberal, Caucasian, and Christian. We plan to rectify this in the future through larger and more randomized methodologies, and hopefully, also with the ability to oversample demographic groups that are too small in proportion to the sampled population to enable statistical comparisons. For example, self-identifying pagans would likely need to be oversampled, as would certain subsets of other religious, scientific, or environmental groups. Furthermore, our aim is to translate the survey into other languages so that it can be deployed in other geographic regions, including regions where Christianity is not a dominant religious demographic.

Our findings may well have practical implications for those trying to mobilize human beings to respond to our self-made predicaments. It seems to us, however, that given our findings of close associations between certain experiences, perceptions, and beliefs, that it would make sense for environmentally concerned individuals and groups—educators, religious leaders, environmentalists, and others—to offer similar experiences in nature and educational experiences, and that it is reasonable to think (given some of the research also cited in the literature review) that this has led those who have developed environmental humility and dark green spiritual and moral sentiments to their perspectives and proenvironmental commitments. Bron Taylor's discussion of dark green religion (2010), for example, and subsequent book on the motion picture Avatar (Taylor 2013) shows the incredibly diverse ways people arrive at, express, and promote ecocentric worldviews and values. Indeed, a host of grassroot actors have, based on their own experiences and views about how to bring people to their own points of view, are acting accordingly. More research could be designed to understand which experiences, as well as pedagogical, artistic, communicative, and other means, are effective in bringing individuals and groups into deeper environmental understandings and value commitments. It would also be helpful to find out if there is a correlation between those with these views and if they are politically

active, as political will must be mobilized to avert a widespread collapse of Earth's biocultural systems. Some of our survey questions do provide evidence that suggests those with high environmental humility and DGR views are politically active and willing to contribute financial resources to proenvironmental causes.

We are aware, this said, that this research is an early stage of development and that, though we took efforts to get a wide and diverse sample of participants, the sampling methodology was not fully randomized. Caution in interpretation of our findings is therefore warranted. Our research also does not clarify many other relevant questions, such as, which is more significant in shaping people's behavioral choices, worldview formation, which then determines behaviors; or if in contrast, changing behaviors then leads to a change in worldview; or perhaps more likely, that these variables are reciprocally influential. Future research based on focus-groups might well illuminate such questions, especially because it is difficult to tease out such nuances from survey research.

Despite such limitations, we think the findings are intriguing and even tantalizing. This study is the first utilizing the DGR and DDHS, and we have demonstrated their reliability and found valuable associations, as hypothesized. A goal for future research is to expand upon these findings with additional studies, larger samples, more countries, and fully randomized methodologies. Such studies would likely increase our understanding of the role of affect, religious and spiritual perceptions, psychological dispositions, and ethical values, in hindering or promoting proenvironmental behavior.

Appendix

Table 2 Survey questions related to behavioral choices

Recycling paper, plastic, and/or aluminum products.

Installing water saving devices in your home.

Setting air conditioner and/or heater to conserve energy.

Installing solar panels for part of your residential electricity consumption.

Installing residential energy efficient appliances.

Purchasing sustainable agricultural products.

Purchasing local agricultural products.

Growing your own food.

Purchasing sustainable animal products (meat, dairy, eggs).

Purchasing local animal products (meat, dairy, eggs).

Being a vegetarian (not eating meat or fish).

Being a vegan (not consuming animal products).

Using and supporting public transit as much as possible (bus, light rail, heavyrail).

Paying more taxes when they are earmarked to protect the environment.

Making consumer choices that do not harm (or do significantly less harm to) the natural environment.

Purchasing carbon offsets for travel by car or plane.

Table 3 Survey questions related specifically to dietary and transit choices

Get produce directly from a local farm or CSA (community supported agriculture farm)

Eat organic foods

Shop at a farmer's market

Walk or bike instead of drive

Carpool (automobile ride-sharing)

Use public transit (bus, light rail, heavy rail)

Table 4 Survey questions related to active behaviors related to political activism and self-education

Support environmentally concerned candidates by campaigning for them or donating money to their campaigns, where the candidate has a clear platform of environmental protection and advocacy.

Donate time or money to environmental groups

Participate in protests such as marches or boycotts or letter writing campaigns against environmentally destructive policies or practices

Read articles on sustainability and environment-related issues

Table 5 Survey questions related to how respondents would spend a hypothetical amount of money

Go on vacation, traveling more than 500 miles
Go on vacation, traveling less than 500 miles
Pay off debt (student loan, credit card, mortgage)
Invest the money (in stock market or money market account)
Use it as a down payment on a house
Install solar panels or other energy saving household systems/appliances
Buy a fuel-efficient (electric, hybrid, or gas with high MPG) car
Donate to an environmental charity
Donate to a religious organization
Bringing your clothing up to current fashion standards

Table 6 Survey questions related to species diversity

"we need this diversity to survive."
"God said to preserve it."
"this diversity is not important and valuable."
"this diversity is important as a form of planetary purity."
"it is wrong to harm this diversity."

Table 7 Survey questions related to consuming animal products

It is a moral/ethical issue- it is wrong to mass produce/consume animals and their products.

It is a health issue- it is better for our health to not mass produce/consume animals and their products.

It is an environmental issue - it is better for the environment to not mass produce/consume animals and their products.

Table 8 Survey questions related to dark green religion

1. The biosphere is like a living being, with many parts needed for its health and survival.
2. All living things are sacred.
3. All living things should be treated with respect and reverence.
4. All living things are interconnected.
5. Human beings are kin, they are related, to all other living things.
6. Humans should not cause other species to go extinct.
7. All living things have intrinsic (or inherent) moral value.
8. All species share a common ancestor and have come into existence through the same processes.
9. Nature is full of spirits or spiritual intelligences.
10. Animals have emotions that resemble our own.
11. Sometimes, human beings can understand what animals are thinking or feeling.
12. Sometimes, human beings can communicate with animals.
13. Sometimes, human beings can communicate with trees or other plants.
14. I feel awe and wonder when pondering the world and universe.
15. I am fearful when pondering the world and universe.
16. I feel humble when pondering the world and universe.
17. I feel like I belong to nature.
18. I feel love toward nature.
19. Protecting the environment is a highly important moral obligation.
20. If people recognized their connection to nature they would do more to protect it.
21. People should strive to understand and trust in nature.
22. People should cultivate a sense of humility about their place in the grand scheme of things

Table 9 Survey questions related to various types of humility

1. I often feel humble when I think of a Higher Power.
2. God requires us to be humble.
3. Ultimately, there is a Supreme Being who gets all of the credit and glory for our individual accomplishments.
4. My Creator works through me in all my good actions.
5. I accept my total dependence upon the grace of God.
6. I often find myself pondering my smallness in the face of the vastness of the universe.
7. I often think about the fragility of existence.
8. I frequently think about how much bigger the universe is than our power to comprehend.
9. When I look out at the stars at night, I am often deeply humbled.
10. I feel awe towards the mysteries and complexities of life.
11. Humans have to learn to share the Earth with other species.
12. We should always try to be in harmony with Mother Nature.
13. I often feel in touch with Mother Nature.
14. It's important from time to time to commune with nature.
15. Caring for humanity requires us to care about the environment.
16. I often place the interests of others over my own interests.
17. My friends would say I focus more on others than I do myself.
18. I always find myself making sacrifices for others.
19. My actions are often aimed towards the wellbeing of others.
20. I care about the welfare others, at times more than my own welfare.

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