

Commentary

# Larger Than Life: Injecting Hope into the Planetary Health Paradigm

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**Abstract:** The term planetary health, popularized in the 1980s and 1990s, was born out of necessity; although the term was used by many diverse groups, it was consistently used to underscore that human health is coupled to the health of natural systems within the Earth’s biosphere. The interrelated challenges of climate change, massive biodiversity losses, environmental degradation, grotesque socioeconomic inequalities, conflicts, and a crisis of non-communicable diseases are, mildly stated, daunting. Despite ‘doomsday’ scenarios, there is plenty of room for hope and optimism in planetary health. All over planet Earth, humans are making efforts at the macro, meso and micro scales to promote the health of civilization with the ingredients of hope—agency and pathway thinking; we propose that planetary health requires a greater commitment to understanding hope at the personal and collective levels. Prioritizing hope as an asset in planetary health necessitates deeper knowledge and discourse concerning the barriers to hope and the ways in which hope and the utopian impulse are corrupted; in particular, it requires examining the ways in which hope is leveraged by advantaged groups and political actors to maintain the status quo, or even promote retrograde visions completely at odds with planetary health. Viewing the Earth as a superorganism, with humans as the collective ‘nervous system’, may help with an understanding of the ways in which experience and emotions lead to behavioral responses that may, or may not be, in the best interest of planetary health. We argue that the success of planetary health solutions is predicated on a more sophisticated understanding of the psychology of prevention and intervention at all scales.

**Keywords:** hope; planetary health; climate change; optimism; meaning; purpose; nature relatedness; authoritarianism; social dominance; social justice; ecology; medical education; health policy; equity; health translation; non-communicable diseases (NDCs); biodiversity

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## 1. Introduction

“When it comes to Hope ... the journals are silent ... are we not now duty-bound to speak up as scientists, not about a new rocket ... but about this ancient but rediscovered truth, the validity of Hope in human development?”

Karl Menninger, MD, 1959 [1]

There is no escaping the simple fact that personal health, and indeed that of human civilization at large, is coupled to the health of natural systems within the Earth’s biosphere. Herein we can pause to contemplate the word health, and underscore that it is not simply the absence of disease. Rather, the World Health Organization considers health to be the fulfillment of human potential [2]; by extension, health of the biosphere and its natural systems (which allow for the fulfillment of human potential) must also be viewed from the vantage of flourishing and realization of promise.

Biodiversity represents promise. Recognition of the interconnectivity of personal and public health with thriving ecosystems, rich in biodiversity, is captured in the term ‘planetary health’.

At the same time, massive biodiversity losses, environmental degradation and human-provoked climate change are threatening the Earth’s natural systems. Threats to the health and stability of natural systems—through climate change, environmental degradation and grotesque biodiversity losses—are considered to be the grand challenges of our time. Moreover, the precarious situation of planetary ‘dis-ease’ is deeply intertwined with a growing crisis of non-communicable diseases (NCDs)—described by some as a modern pandemic [3]. For example, relationships between various aspects of biodiversity (including macro-level flora and micro-level bacteria), NCD prevention and the promotion of mental health have been noted by researchers [4–7]. On the other hand, the worldwide marketing, subsidization (at the commodity level) and distribution of ultra-processed foods, nutrient-poor/energy dense drinks, tobacco, and alcohol—that is, the drivers of NCDs [8–12]—have also been linked to environmental degradation, and greenhouse gas emissions [13–15].

The science is undeniable, and thus humans have good reason to be fearful about the threat posed by interconnected global problems. The details of how climate change and related threats will impact humans and the biosphere decades from now are imprecise, particularly because they are predicated on how we act in the here and now. However, a good portion of the available evidence allows for predictive ‘doomsday’ scenarios and media headlines such as ‘The Uninhabitable Earth’ [16]; expert scholars continue to evaluate the most effective ways to communicate the causes and consequences of climate change and its associated threats (and messaging with actionable steps) to various groups [17–19], and the important place of hope in climate change communications [20].

Undoubtedly, emotions in general, and hope in particular, are an important consideration in support of climate change policy [21,22]. However, our focus isn’t about climate change *per se*, nor its communication best practices. Planetary health also includes the (not unrelated) crises of non-communicable diseases (NCDs), environmental pollution (including excess light at night), health inequalities, social injustices, the spread of ultra-processed foods, incivility and other components of what we have previously described as ‘Anthropocene Syndrome’. Collectively, the topic of planetary health can provoke fear, anger and despair; we open up a discourse on the importance of hope in planetary health, underscoring that the ‘ingredients’ of hope are a psychological asset. We contemplate the essentiality of hope along the continuum from personal to planetary health.

While the available research can paint a disturbing picture of what the Earth might look like decades from now, a different set of available research on hope and positive psychology suggests that hope can provoke creative thinking and pro-social/environmental behaviors which can help fix what is broken. However, we need to look ‘upstream’ and examine how our values, attitudes, beliefs and malleable aspects of individual and societal ‘personalities’ take shape. Especially as these relate to the relationships humans form with nature. Discourse on hope necessitates discussions of trust and fear, and the ways in which the hope and the human utopian impulse can be co-opted by others; in the Anthropocene, delusions of hope are also an environmental toxin.

## 2. Roadmap to the Commentary

The purpose of our commentary is to bring the planetary health discourse ‘upstream’ from discussions of specific environmental threats (e.g., pollution) and/or individual policy solutions *per se*, and examine the need for a more advanced and practical understanding of the human psyche and behavior in this context. We urge an inter-disciplinary perspective on planetary health that keeps the role of the individual and collective psyche ‘in mind’. While technological advances and evidence-informed policy designs already provide hope for change, the application of these promissory notes are predicated on understanding ideology, motivations and inhibitory factors in human behavior.

First, we provide historical background on the term ‘planetary health’ as a framework for what has now become a professional multidisciplinary endeavor. In particular, we focus on the Report of The Rockefeller Foundation-Lancet Commission on Planetary Health [23]; this publication formally

united researchers with similar goals and provided hope for change. Since the Report defines planetary health as ‘the health of human civilization’, we briefly focus on the key word civilization; given its centrality in the definition of the new ‘field’, some level of discourse seems warranted.

Next, we examine positive psychology and, more specifically hope and optimism; volumes of international research highlight the value of hope as an asset in human health and well-being. In our view, the success of planetary health as a discipline (and the uptake of its pertinent findings) can be enhanced by a greater understanding of hope as an asset; however, there must also be an understanding of unrealistic optimism and false hope, and the ways in which human resonance with hopeful messages can be corrupted for political and corporate aims. The malignant use of hope and the contagion of pathological hope run counter to the interests of planetary health. We explore this at the end of the paper.

In between discussions of hope as an asset, and later, the ways in which it is cheapened, we explore the psychological underpinnings of the human connection with natural environments. We argue that greater knowledge of the psychological construct of nature-relatedness—personal or even societal-level connection to the natural world—is central to the success of planetary health. The hopeful messages and real-world application of the science-based fruits of its labor, including the more obvious pleas within the planetary health subtext—e.g., less materialism, less meat consumption—intersect with nature-relatedness. We state at the outset that our Commentary is slanted toward research generated in North America, Europe and Australia; as such it cannot be considered to be exhaustive in its coverage of universal social and psychological sciences. However, we also point out early on that human emotional relationships with nature, and engagement with nature, are linked with a variety of well-being measures across different cultures [24].

Finally, we conclude with a call for greater input (into the new planetary health paradigm) from experts in the behavioral sciences. In particular, the subspecialties of psychology—prefixes including social-, environmental-, positive-, evolutionary-, and lest we forget, eco-psychology, have much to offer. Indeed, the latter discipline has taken the point position of planetary health for decades; as stated almost 30 years ago, “*the goal of ecopsychology is to bridge our culture’s long-standing, historical gulf between the psychological and the ecological, to see the needs of the planet and the person as a continuum*” [25].

### 3. What Is Planetary Health, Really?

It is important to point out that planetary health isn’t a 21st century neologism, and its primary concept is neither unique or novel; indeed, journal articles dating back decades—particularly those emphasizing holistic approaches to human wellbeing—used the term planetary health to underscore that human health and the health of the Earth’s natural systems cannot be uncoupled [26,27]. This history is important because popularization of the term ‘planetary health’ emerges from environmental activism [28], holistic (traditional, culturally-rooted) health advocates [29], and intellectual input from clinicians, academics, community groups, schools (teachers and children!) and progressive thinkers; below we cite several examples to illustrate that although the term planetary health has been used by many groups with differing backgrounds, the essence of the term in reference to current academic pursuits is consistent.

In 1980, the environmental group Friends of the Earth expanded the WHO person-centric definition of health with the following statement:

“Friends of the Earth therefore believes that health is a state of complete physical, mental, social and ecological well-being and not merely the absence of disease—that personal health involves planetary health.” [30]

In the Foreword to ‘The Biocultural Basis of Health: Expanding Views of Medical Anthropology’ (1980), Jonas Salk underscored that environmental degradation “*threatens human and planetary health. The latter must also be added to the consideration of biological and sociocultural influences on health throughout the human life span*” [31]. In 1988, scientist James Lovelock—famous for the ‘Gaia Hypothesis’ which

proposed that the Earth is a super-organism—opined that there was a “*need for a new profession: planetary medicine, a general practice for the diagnosis and treatment of planetary ailments*” [32]. Physician and philosopher William Stewart expanded the conversation in 1991: “*As a journey of a thousand miles begins with one step, so, too, must our practice of planetary medicine begin with the creation of human health in the fullest sense. Health creation includes not only treating diseased states but also establishing physical, mental, emotional, spiritual, and societal well-being*” [33].

Also, in 1991, leading marine biologist Sylvia A. Earle reminded colleagues of the importance of thinking beyond a single glamorous species and, instead, to visualize in terms of planetary health: “*To maintain a species, it is necessary to maintain a system, and by maintaining a system, many species are saved—not just the ones in the spotlight. Increasingly, the importance of entire systems is becoming recognized, not just to maintain biological diversity but as a way to help ensure stability and planetary health*” [34]. Legal scholars such as Edith Brown Weiss were also far out in front of the planetary health movement, underscoring that planetary health is a matter of basic rights and equality, including the rights bestowed upon the next generation. As stated by Brown Weiss in 1990: “*Intergenerational equity calls for equality among generations in the sense that each generation is entitled to inherit a robust planet that on balance is at least as good as that of previous generations. This means that all generations are entitled to at least the planetary health that the first generation had*” [35]. Psychologists Judith Green and Robert Shellenberger also underscored that in the context of global biopsychosocial medicine, “*planetary health is not separate from our own*” [36].

However, the term planetary health wasn’t trademarked for use by academics and clinicians; rather, it was employed in the thoughts, words and actions of many diverse groups. For example, in 1990 the Pluralistic School No 1, an elementary school in Santa Monica, encouraged children to be ecologically minded and become actively involved in local communities. This included an understanding of the plight of the disadvantaged; children joined adults on a regular basis to personally deliver food to a local community center for homeless persons. According to the Los Angeles Times, the school encouraged thinking which linked ‘personal and planetary health’ [37]. The efforts of this school were entered into the United States Congressional Record [38]. Early advocates of plant-based “macrobiotic” diets (described here [39]), now hybridized into a Mediterranean-Macrobiotic diet [40,41], maintained that such dietary choices—moving away from meat—were part of a commitment to ‘planetary health’ [42]. Furthermore, as highlighted by scholars Annie Booth and Harvey Jacobs in 1988, the idea that “*human health and planetary health are the same thing*”, that “*to harm the Earth is to harm the self*”, have been expressed by indigenous cultures for centuries [43].

Obviously, these are merely a few examples among many which make clear that ‘planetary health’ isn’t a protected term; within academic sciences, consolidated and overlapping movements which have since solidified into several professional ‘disciplines’—these include, but are not limited to, ‘One Health’, ‘EcoHealth’, ‘Global Health’ and our focus here, ‘Planetary Health’ [44,45]. We use the term discipline or field only for convenience. As pointed out by physician ecologist Frederick Sargent II, MD, in 1972:

“These problems are adisciplinary. That is, they relate at once to no particular discipline, yet involve many, perhaps all disciplines. The major problems of the sciences concerned with environment make meaningless the traditional boundaries that have separated [human] compartmentalization . . . apparently, some scientists are ready to leave their feudal baronies and join in innovative configurations specifically focused on solving definitive problems, however complex they may be”. [46]

However, Sargent went on to make clear that if any discipline should take the lead in bringing voices together, it should be public health; 45 years after his call, with aims toward expanding academic and practice-oriented public health in the interest of, as Sargent called it, “*proper and adequate functioning of the planetary life-support system*”, The Lancet Commission on Planetary Health Report was published [23]. This important document (which has spawned a professional journal,

Lancet Planetary Health) built upon the Millennium Ecosystem Assessment, an earlier effort which underscored the notion of ecosystem services. Collectively, these are the many benefits humans obtain directly and indirectly from the Earth's ecosystems, ranging from healthy food, clean water, and forest products, to meaningful cultural 'goods and services' such as recreational opportunities, aesthetic appreciation, sense of place and spiritual meaning [47]. The Lancet Commission on Planetary Health Report highlights that political, economic and social systems—the policies and practices which define modernity—intersect with all life on planet Earth; germinating from the seed of public health, planetary health has been formally defined in this context as “*the health of human civilization and the state of the natural systems on which it depends*”, and one of the primary goals of the new professional discipline is to find ‘*solutions to health risks posed by our poor stewardship of our planet*’ [23] (See Box 1).

#### 4. Hope in Planetary Health

The need for greater awareness of the seriousness of interconnected global challenges is urgent, but despondency and despair (from the Latin *de* (away from) *sperare* (hope); i.e., hopeless) concerning the current crises will only encourage guilt, apathy and surrender to the status quo. Hope, as we will discuss, is a prerequisite to the combination of motivation and creative thinking which is required as societies take on the challenges of planetary health; however, hope cannot be reduced to a slogan or bumper sticker. It is a health-related ‘variable’, one that requires further study, analysis and assimilation into planetary health.

Amid the discussions of environmental degradation and species losses, there are bright spots, too; for example, there are encouraging signs that green space in the world's mega-cities (that is, those with populations greater than 10 million) has been increasing rather than decreasing [48]. Some of this expansion is likely because someone, somewhere, cared enough to join with others in an effort to work around whatever barriers to green space expansion (e.g., from commercial, industrial developers) there might be. Researchers are actively working toward the reintroduction of species in careful, evidence-informed ways (a process called rewilding) to benefit entire ecosystems; this includes reintroduction of large apex predators and possibly even microbiota [49,50].

Consider the threat to the health of bees and other insects. While this needs to be addressed by limiting pesticide and other chemical exposure (which means staring up at the large barrier of corporate influence and political ideology [51]), some creative researchers are going around that blockade; Canadian and Italian researchers have found that the application of beneficial microbes enhances resistance against insecticide-associated disease, and promotes colony development in bees [52,53]. Consider also the petrified notion that for-profit corporate board members have only one responsibility—maximizing shareholder wealth. Forward thinking groups (benefit organizations such as B Corp Labs) are working around this barrier by creating new hybrid “for-benefit” organizations; in this way, companies can provide some level of evidence that they are an asset to the public “good” while still “doing well” financially. Briefly, the independent non-profit B Corp Lab establishes criteria for standard practices (including sustainability and environmental stewardship); the corporate applicant is audited to ensure the delivery of services is ultimately of benefit to both public and planet. Already, legal language in various states has been constructed to accommodate the “for-benefit” corporate model [54].

These are a molecular-level sampling of what is being done around the world in the interest of planetary health. Shortly we will discuss the scientific definition of hope, and it will be plain to see how these examples—with clear motivation to solve a local/global problem and the bypassing of a barrier—illuminate the essence of hope. As we have described elsewhere [55], witnessing hope and transformation in the shadow of planetary pathology—even in small doses—may be considered a vaccine against pessimism, cynicism and despair.

## 5. What Kind of Civilization?

Since planetary health is now defined with a focus on ‘the health of civilization’, it might be helpful to focus briefly on the word civilization. From the perspective of anthropology, civilization is described as “the cumulative world-wide development of scientific knowledge and technique, originating with the emergence of state-level societies; that group of world cultures associated with state-level societies characterized by social stratification, urbanism, literacy, codified traditions and extensive trade” [56]. Writing in ‘An Analytical Dictionary of the English Language’ (1830), scholar David Booth describes the slippery problem of defining human civilization:

“When we leave its general, or abstract, signification, we find that it shows itself under an innumerable variety of shades: for almost every man has his own idea of Civilization, and would willingly impose it on his neighbors. “If a prince”, says (Jonathan) Swift “sends forces into a nation where the people are poor and ignorant, he may lawfully put half of them to death, and make slaves of the rest, in order to ‘civilize’ and reduce them from their barbarous ways”. [57]

Thus, the fundamental question for planetary health is ‘what *kind* of civilization do we want’; the answer to that question has enormous implications as to what, as Booth noted, should be ‘imposed on our neighbors’. Since civilization is generally marked by the development of scientific knowledge, it is worth pointing out that (given public funding constraints) the decisions to pursue one line of scientific inquiry on behalf of the public—and not another—are decided upon by a small band of experts with personalities, values and mental outlooks that may, or may not, reflect society at-large. Of course, a small band of global philanthropists also directly determine preferred lines of scientific inquiry based on their own values [58]. Famed French-American microbiologist and environmentalist Rene Dubos (1901–1982) described it thus:

“Despite our pathetic attempt at objectivity, we as scientists are in fact highly subjective in the selection of our activities, and we have goals in mind when we plan our work. We make a priori decisions concerning the kind of facts worth looking for; we arrange these facts according to certain patterns of thought that we find congenial ... a more disturbing aspect of modern science is that the specialist himself commonly loses contact with the aspect of reality which was his primary concern, whether it was matter, life or man ... science and the technologies derived from it now often function as forces independent of human goals ... all too often, knowledge and technology pursue a course which is not guided by pre-determined social philosophy”. [59]

At its heart, planetary health concerns civility and good citizenship on ‘Spaceship Earth’ [60]; in his writings, Dubos reminded readers that the original usage of the word ‘civilization’ (first by Marquis de Mirabeau in 1756) during the Enlightenment encompassed a universal humanity which emphasized moderation, self-regulation, humane laws, a high level of purpose, decency in conduct, and limitations on war [61,62]. We argue that tackling the ‘health of human civilization’—the primary task of planetary health—necessitates the acknowledgment that such a task is, in fact, a study of attitudes, intentions, emotions, ideals, values, and especially, behaviors. Such study is not exclusive to the individual; rather, the health of civilizations is dependent upon an understanding of how groups and their leaders—including those who profess to prioritize public and planetary health—operate in the cognitive, emotional and behavioral planes. In other words, there needs to be a scientific understanding of how dominant groups and influential organizations (or in-groups) selectively use science, and its monies, in the public square [9,63–69]; as these references demonstrate, public health is replete with examples of initiatives which look good from far, but are far from good. Trust is deeply intertwined with hope [70], and each time science is selectively used for specific agendas (as references [63–69] clearly highlight), public trust, and thus hope, is undermined.

Among his many scientific and lay press articles, Dubos maintained an ongoing column in the *American Scholar* for nearly a decade. He entitled his regular contributions “The Despairing Optimist”,

signifying that despite the obvious issues with planetary ill-health, he maintained his optimism in the creative nature of humanity. Dubos had no difficulties articulating drastic environmental problems, but *“his optimism, which circles every Dubos thought like a satellite in close orbit, is based on the conviction that as in earlier eras, the 20th century citizen is not helpless against threatening trends”* [71]. Dubos reminded his readers that the wellspring of his own optimism was rooted in the countless historical examples in which hope was leveraged to provide creative solutions in the most dire predicaments—summed up in his adage that ‘trend is not destiny’ [72,73].

Finally, it is worth pointing out that the term ‘westernization’ in the context of contemporary civilization may be considered a surrogate marker for neoliberalism; for the last half-century neoliberal ideology has pushed short-term economic interests and driven materialism around the globe. It places emphasis on possessive individualism, acquisition, competition and ‘ownership’ into social, cultural, political, and scientific arenas. In practice, neoliberalism is maintained through dynamics of power associated with affluence, militarism, and coercive relations [74]. Neoliberalism manifests as an abundance of consumer choices—including the ultra-processed foods, beverages, tobacco, etc., that act as drivers of NCDs—and at the same time provides the personal “freedom” of allowing the individual to be the primary holder of preventive strategies (i.e., solely responsible for lifestyle) for one’s own health. Moreover, the ideology provides the commercially available (often globally patented) remedies which one (and at the larger scale, society) might purchase in the hopes of offsetting the commercial drivers of NCDs [55]. The consequences of neoliberalism to the Earth’s resources and its threat to the wellbeing of all species, not only humans, as has been described in detail by experts in the field [74,75].

## 6. Positive Psychology, Symbiotopia

In their fountainhead paper on positive psychology, Seligman and Csikszentmihalyi state the following:

‘The field of positive psychology at the subjective level is about valued subjective experiences: well-being, contentment, and satisfaction (in the past); hope and optimism (for the future); and flow and happiness (in the present). At the individual level, it is about positive individual traits: the capacity for love and vocation, courage, interpersonal skill, aesthetic sensibility, perseverance, forgiveness, originality, future mindedness, spirituality, high talent, and wisdom. At the group level, it is about the civic virtues and the institutions that move individuals toward better citizenship: responsibility, nurturance, altruism, civility, moderation, tolerance, and work ethic’. [76]

In a way, positive psychology is about individuals and social groups hoping for, and working toward, Mirabeau’s (and Enlightenment contemporaries) view of civilization, or universal humanity. It is easy to see how the bulk of the positive psychology descriptive (above) could be cut and pasted into the cornerstone messages of planetary health. Understanding hope, perseverance, moderation, nurturance, future-mindedness, tolerance, love, et al., would seem essential to the aims of planetary health as it pursues science and motivates individuals and groups around barriers to progress.

While our focus will be on hope, we also point out that the historical record of humankind shows that dreams of a better, or idealized, environment and society have been part of the human imagination for as long as there have been societies. History also shows that imagined possible worlds have been the kickstarter for engagement in social change. Put simply, utopian thinking is not only common in daily life, it has been leveraged for important social changes that are now valued in the 21st century, or at least establishing the bar to which universal social and economic rights can be measured [77–79]; as stated by sociologist and reformer Robert A. Woods in 1913, *“at no stage in human evolution has it seemed possible to organize the higher life of society without utopia”* [80].

The derogatory or pejorative use of the word utopia (utopian) has often been directed at those who have fought for social change; in the 1800s, for example, physicians advocating for improving

the conditions in mental asylums were dismissed as ‘utopians’ [81]. Viewed superficially, the entire Report of The Rockefeller Foundation-Lancet Commission on Planetary Health could be labeled ‘utopian’. However, cynics and anti-utopian skeptics conflate a 500-year-old piece of literature (Thomas More’s book *Utopia* (1516) and dystopian visions), with utopia the psychological and social asset; to do so misses the potential value of utopia as a method to help fulfill the aims of personal, public and planetary health [82]. The value of utopian thinking in the 21st century is built on large doses of hope, not fear; it is built on ideas that visualize equality, synergy and sustainable symbiosis for all of society, including minorities and the marginalized. History bears witness to the dystopian results when fascists and authoritarians hijack the human desire for a ‘better’ world and sell visions that are designed to appeal to the perceived threats and fears of a particular segment of society. We will discuss this in more detail later.

Positive psychology as idealized by Seligman and Csikszentmihalyi (and certainly in their quote above) could be written off by skeptics as ‘utopian’. However, it is essential precisely because it provides a utopian benchmark of what the ‘health of civilization’ might look like. The challenge, however, is application at scales that promote planetary health. Writing in the *American Psychologist* (1985), Dennis R. Fox states: “*utopian speculation on the part of social scientists would enhance the possibility of seeking, and perhaps finding, more effective solutions to complex problems. Without the goal of a synergistic ecological utopia, we are likely to continue floundering . . . keeping utopia in mind can prevent our settling for minor reforms when more significant change might be possible*” [83].

While engaging in self-regulated utopian thoughts may be important to personal resiliency over the life-course [84], emerging research from social psychology demonstrates the potential value of utopian thinking to planetary health; researchers have found that higher scores on utopianism scales are linked with greater desire to perform activities to change society (citizenship behaviors), and when primed for utopian thinking, study subjects were also more likely to engage in citizenship behaviors. In addition, thinking about one’s utopia and switching to thoughts concerning current society increased motivation to engage in citizenship behaviors [85]. While preliminary, this important research suggests that utopian thinking can be a critical spark in energizing transformative behaviors on large scales.

In their fountainhead work *Environment and Utopia: A Synthesis* (1977), scholars Moos and Brownstein remind the reader that utopian thinking criticizes, then transforms the political-social-economic organizations that sustain the status quo; the functional models proposed in utopian thinking may, or may not, work, but utopias are about changing, not replicating ongoing modes of social systems [86]. Viewed from the planetary health perspective, utopia is really symbiotopia. From its Greek origins (*u* = no; *topia* = place) utopia translates as *no* place; yet, planetary health is about a *known* place, whether it be the local environments of individuals and communities, and outward to entire the planet. Whatever shape the visions of ‘a better life’ in planetary health might take, the mandatory component will require a place of symbiosis (Greek: *syn/m* = together; way of living together); a place where global mutualism ensures each person can achieve their fullest potential, and that such efforts are prioritized in the context of supporting the biodiversity upon which that mutualism is reliant. Hence, forward-thinking on the health of civilization requires that we seek creativity, research and dialogue on symbiotopia. Understanding that hope is intricately connected with utopian thinking [87], we turn now to hope in human health.

## 7. Hope as an Asset in Human Health

Over the millennia, philosophers, poets and pundits have filled up entire books attempting to pin down definitions and decipherments of hope; from the scientific perspective, hope begins with the motivation to pursue a well-defined goal (in psychological jargon, this dedication is termed *agency*) and incorporates the use of practical avenues through which to approach the goal, including ‘side streets’ which can carry the individual around barriers which would otherwise block pathways to goal attainment. This capacity to generate strategy toward goals and work around obstacles is known as pathway. Thus, in its simplest scientific equation, hope is agency thoughts x pathway thoughts [88].

In the last few decades, the study of hope as an important construct in health psychology has rapidly moved from non-existence (exemplified in Menninger's quote above) to robust scientific inquiry. While there is still much to be learned, it is becoming increasingly clear that hope is an important asset in human health—at once it may act as a vaccine for resiliency [89,90] and bolster physical and mental health [91–94]. Hope is associated with healthy lifestyle behaviors, including physical activity, avoidance of tobacco, healthy dietary habits (including greater consumption of fruits and vegetables, healthy portion control and avoidance of unhealthy foods), and adherence to medications [95–99]. Consider that among individuals who survived a smoking-related cancer (yet continue to smoke), hopelessness has been identified as a key barrier to smoking cessation [100]. Thus, scientists look at both the presence and the absence of hope. Importantly, it may be the combination of hope with knowledge and/or perceived importance of lifestyle variables (rather than education, perceived importance or hope alone) that becomes the major catalyst for behavioral change [101].

Optimism is a related psychological asset; it is generally defined as possessing positive outcome expectancy for future events across life domains. In daily life, optimism manifests as confident persistence, but hope is more specifically concerned with self-initiated actions and personal capabilities for securing the positive outcomes [102,103]. Although optimism is viewed distinctly from hope, there are obvious similarities and, unsurprisingly, similar associations with good physical and mental health; optimism has been linked to lower all-cause mortality [104], chronic disease [105], lower body mass index [106], lower inflammatory cytokine levels and C-reactive protein [107], and lower inflammatory response to experimental stress [108]. Although there are genetic links to optimism (in the range of 25% heritable), and positive associations with socioeconomic advantage [109], there is evidence that it is also malleable [110].

In the context of planetary health and global problems, the robust relationships between hope and meaning in life are worth brief discussion. Meaning in life is an important psychological asset which involves comprehension (to makes sense of life events and patterns), purpose (valued goals provide direction and motivation), and significance (an individual's existence matters) [111]. Much like hope and optimism, research demonstrates that measurable meaning in life (and one of its central features, purpose [112]) is linked to various positive health outcomes [113]. Both cross-sectional and longitudinal research demonstrates that hope and meaning are close partners (strong correlations, share large variance in outcomes of mental health); encouragingly, hope-therapy intervention studies show that participants increase their sense of life meaning [114].

At the larger scale, it is possible to theorize how hope (and positive psychology in general), could be a tremendous asset to the threatened health of civilization; the challenge for planetary health is to move toward assessment of positive psychology and hope, and ask how its benefits at the personal level might generalize at population levels. In particular, an understanding of hope and hopeful thinking could improve the communication and messaging surrounding planetary health and its aims—such that they resonate at the community and organizational levels. Hope and optimism may literally change how we see the world around us [115]. Using eye-tracking technology during the presentation of emotional images, researchers have found that individuals with higher levels of hope and optimism spend less time attending to dysphoric and threatening images. Moreover, higher levels of optimism are associated with increased time spent attending to positive information [116]. Important in this context is emerging research demonstrating that aspects of mood and an individual's emotional state can spread through social contacts [117,118]; even experimenter-manipulated presentation of either negative or positive information in social media newsfeeds has been shown to lead to massive-scale emotional contagion through the social networks [119].

Personal psychological connections between humans and the natural environment (something we will discuss in detail shortly) can be cultivated through experience; hope and meaning in life may be a critical component which bridges nature connections, personal wellbeing, and more broadly, the actions which are conducive to a healthier civilization. In the context of public health promotion, positive psychology focuses on positive relationships among groups (rather than the disease-based

model, which only focuses on public health pathology) [120]; we add *planetary* health promotion to the positive psychology equation. In order to contextualize the promise of these positive relationships at the collective level, we next discuss the view that planet Earth is, at least metaphorically, a superorganism.

#### Box 1. Quality of Planetary Life in the Anthropocene.

The goals of planetary health include climate stability, preservation of biodiversity, productive agriculture and sustainable foods for a growing population, habitable lands, adequate quantity and quality of water, socioeconomic equity, reduction of disease and the promotion of human health and wellbeing, safeguarding of human rights, ends to war and aggression, preserving and restoring positive emotional connections to nature and place, and respecting personal and community spiritual values.

## 8. Moving Upstream—The Psyche of Planetary Health

From our perspective, the fulfillment of planetary health's potential as an interdisciplinary enterprise will hinge upon the assimilation of existing research (and support of its development) on the emotional relationships between humans and 'the land'. This includes the individual and community connections to the local places, but also includes, more broadly, relationships to all life within the biosphere. Human relationships with land, place and non-human life have always invoked a full gamut of emotions—joy and pleasure, fear and despair [121–123]; planetary health must commit to understanding the psychological underpinnings of civilization's relationship to all life within the ecological theatre, not only because the emotional despair of witnessing environmental degradation may itself be a 'psycho-terratic dis-ease' [124], but also because the positive emotions related to nature connections—awe and joy—may be leveraged for the health of civilization. In this section, we will outline what is known concerning some of the psychological connections to nature, and how they may inspire hope in the context of planetary health.

Historical perspectives, including the 'land ethic' of Aldo Leopold (1887–1948) provide valuable context; critical interpretations of Leopold's work in conservation promotes the idea that humans and the 'land communities'—interdependent organisms, abiotic components and energy—are collectively valued. Viewed this way, Leopold was promoting the idea of species interdependence which is the essence of planetary health. Mindful awareness of this relationship provides an ethical basis for conservation policy [125].

In Lovelock's original Gaia hypothesis, it was proposed that humans were standing on a single super-organism; the Earth (biota, climate, geology) was theorized to maintain a large-scale, self-regulating geo-physiology conducive to life [31]. However, Lovelock wasn't the first to use the term 'super-organism' in reference to the collective of natural systems; others had visualized and described the collective life on Earth as a super-organism. Indeed, in 1939, philosopher (and personal friend of Albert Einstein) Oliver L. Reiser suggested that within the super-organism made up of all plant and animal life, humans had become the 'nervous system' (and each human, a neuron) of the planet as single living system [126,127].

Given the unfathomable influence of human emotions and behaviors over the fate of both plant and animal kingdoms (sustainability of biodiversity), it would seem that discussing all life on Earth as a super-organism—where humans function as the nervous system—is more than metaphor; the nervous system responds to the total environment; by extension it would seem reasonable to consider the ways in which the 'nervous system of the super-organism' is conditioned by experience and learning. After all, if humans are the de facto nervous system operating on behalf of the super-organism—and the task of a nervous system is to respond to the environment in the interest of survival—it would seem necessary to figure out how we feel, think and respond to the natural world. In Edward O. Wilson's landmark book *Biodiversity* (1988), Lovelock wrote "*To exploit such a world (super-organism of planet Earth) on the scale we do is as foolish as it would be to consider our brains supreme and the cells of other organs expendable. Would we mine our livers for nutrients for some short-term gain?*" [31].

Given the nearly 3 million years our genus has spent in natural environments, it is hardly surprising that ancestral experiences still resonate in the neuronal activity, cognitions and behaviors of contemporary humans. Evolutionary psychology is filled examples, and while some of this is fear-based—such as perceptual bias directed toward reptiles (responses noted in infancy) [128,129]—it is reasonable to conclude our ancestors experience of positive moods and emotions (such as awe) while in natural environments would have been an evolutionary advantage [130]. Contemporary experiences in natural settings may promote mental health and lower the burden of stress physiology [131,132]; even residential proximity to nature may be an asset to mental health [133].

Since individuals have different attitudes toward nature, it is important to learn everything we can from individuals who are especially responsive to nature. For example, the measurable psychological construct of nature relatedness (see also nature connectivity, nature connectedness) captures to what extent an individual has an awareness of, and fascination with, the natural world; nature relatedness also assesses the degree to which an individual has an interest in making contact with nature. Since nature relatedness has been linked with health and wellbeing, it is considered a psychological asset [134,135]. However, it may also be a planetary health asset because emerging research shows that nature relatedness is positively associated with empathy, pro-environmental attitudes and humanitarianism (and negatively with materialism) [136–138].

Available evidence suggests that life course experience with (and early perceptions of) nature can shape nature relatedness and pro-environmental attitudes/behaviors; researchers are looking more closely to determine how and in what environments nature relatedness and other ‘planetary health’ attitudes are shaped and how they subsequently determine interactions with nature [139–144]. Emerging research shows that understanding specific types of human-nature relationships may help predict pro-environmental behaviors [145] and the messaging that might resonate with specific groups (for example, on reducing meat consumption, one of planetary health’s already-stated goals) [146]. An urgent question for planetary health researchers is how experience and affiliation with the natural environment mitigates the compassion fade (that is, routinely observed decreases in helping behavior—or diminished support for it—over time and with increasing numbers of targets who need to be assisted); available research suggests that emotional connection to, or personal identification with the natural environment, might buffer against compassion fade. Put another way, emotional disconnect from the natural environment may compromise the willingness to protect non-human animal and plant life [147].

It is likely that nature relatedness is intertwined with generalized concern for future consequences. Various studies have shown that higher scores on concern for future consequences is associated with positive mood, lower aggression, interpersonal wellbeing, higher life satisfaction, compliance with preventive care, and most relevant to our current discussion, optimism [148]. Interestingly, images of nature and/or spending time in natural environments can increase concern for future consequences, promote optimism, reduce impulsivity [149–151] and promote cooperative, altruistic and sustainable behaviour [152–154]. Studies suggest that childhood nature experience increases awareness of biodiversity, desire to conserve nature, and to coexist with biodiversity [155–157]; indeed, childhood connections to nature may be the wellspring of adult commitment to nature conservation because this early experience magnifies a sense of meaning and purpose [158]. Moreover, childhood nature experience has been linked with mental health in adulthood [159]. Thus, we need further insight into links between the cultivation of nature relatedness, motivations and actual (beyond merely intended) behaviours.

In an increasingly urbanized world, positive relationships with nature may also have a place in encouraging unification rather than polarization. For example, in studies involving healthy adults, exposure to nature images (vs. urban) reduces aggression after experimenter-induced psychological stress [160,161]. At the neighborhood level, green space and tree canopy (or remediation with nature in mind) has also been linked to decreased crime, violence and aggressive

behavior [162–166]. Moreover, on the larger scale of long-standing conflict, nature conservation efforts have united otherwise polarized groups for common cause; from the planetary health perspective, deeply-held connections to nature can be leveraged toward healing the wounds of war [167], and peace building for resolution and prevention [168]. Bringing polarized groups together is a key step toward undoing ideologies and social dominance orientation that otherwise fosters prejudice and discrimination [169]. It is noteworthy that in nature-intervention research (2 weeks of mindful awareness of nature vs. mindful awareness of built environment components vs. control), attention to nature increases not only connectedness to nature, but also other people and to life as a whole [170].

Sustainable consumer behavior is a complex process that takes place in a large theatre which requires a multilevel perspective inclusive of interacting social and situational factors such as cultural norms and availability of ‘product’ [171]. However, cross-cultural research indicates that the majority of humans support environmental protection and identify with the value of ‘looking after the environment’; thus, the question for researchers is how such support and values are developed [172]. Obviously, the research on nature relatedness is vital when viewed through the lens of think global, act local. Given the connections between nature relatedness (and experience in natural environments) with meaning in life [173,174] (hence the primary elements of hope), we suggest that the hope of planetary health is to be found in the experiences and early-life education. That is, the sort of education and experience which shapes the values and attitudes conducive to the health of civilization.

Scientists will need to explore the relationships between nature relatedness at individual and community levels; indeed, there may be untold connections between nature relatedness and commitments to politics and policy that favor public health. For example, preliminary evidence suggests that nature relatedness and orientation toward political authoritarianism run in opposite directions [175]; on the other hand, time spent indoors consuming screen-based media may shape attitudes. For example, greater time spent watching television is positively associated with authoritarianism [176]. The importance of further investigating the relationships between nature relatedness, public health, politics and policy (from the planetary health perspective) is discussed in more detail below.

## 9. Dangers of Hope as Universal Nostrum

Thus, far, we may unwittingly give the impression that hope (and positive psychology in general) is inherently and exclusively a ‘good’ to the progress of civilization and stewardship of planetary resources. However, we underscore that the impetus to study hope and the psyche-at-large in the context of planetary health is also predicated on the harms that can be induced by unbridled hope and unrealistic optimism. We have already mentioned the importance of trust, but it is also important to highlight that the study of planetary health vis à vis hope necessitates the study of fear.

In the history of civilization—as well as the limbic system of political candidates, policy makers and those who follow or are governed by them—hope and fear are the combined metals in a strong alloy. Fear, of course, generates hope, including the unrealistic sort which is acted upon in many corners of civilization, including the aisles of the pharmacy, health food store, and far more importantly, in the voting booth. In *Mental and Moral Science: A Compendium of Psychology and Ethics* (1868), Alexander Bain writes the following:

“In the view of Epicurus, the chief miseries of life arose, not from bodily pains, but partly from delusions of hope, and exaggerated aspirations for wealth, honors, power etc. (and) from delusions of fear.” [177]

For example, perceived fear of immigrants and diversity generates hope in authoritarian political candidates and the retrograde visions they espouse [178,179]; promises of a ‘better world’ are painted for certain sections of society (not all-of-society) by hearkening back to a romanticized time, an idyllic ‘topia’ where inconvenient truths such as greenhouse gases do not ‘exist’ and heavy sheet metal tailfins on automobiles make sense. Recent elections in the United States and Europe underscore

the detrimental public health (and we would add, planetary health) consequences of political authoritarianism [180,181]. Elections and ideology have gross environmental consequences [182,183]. So, too, do aggression, militarism, war and conflict contribute to environmental degradation [184–186]; what should otherwise be a highly-cited landmark paper on the role of public health in the prevention of war—one which underscores environmental degradation and the mechanisms by which militarism insinuates itself into education and university-associated “research and development”—has been cited a paltry 28 times (Google Scholar, as of February 2018, since its 2014 publication in the *American Journal of Public Health*) [187].

Remarkably, though, public health as a discipline remains structurally distinct from the infrastructure of political science. The progression of public health from evidence-based intelligence-gathering to advocacy and policy applications will be stymied without the integration of political knowledge (including that concerning the methods of political operatives) into teaching programs [188]. Corporations, particularly those involved in endocrine-disrupting chemical production, have long-since sharpened their skills on the three-legged stool of engagement with science, engagement with the public, and engagement with politics [189]. Planetary health needs to do the same. The study of environmental degradation is therefore, by extension, also a study of the worldviews, values, attitudes and mental outlook of political leaders and their administrations—not to mention the donors and marketing experts who put them in place with messages of unrealistic optimism.

## 10. Chalice of Technology

Among its key messages, the planetary health movement promotes harnessing the power of technology for change [46]. Undoubtedly, technology—whether applied to agriculture, food science, transportation and elsewhere—will be a key part of transforming health at all scales. Ancient human history is filled with examples of technological creativity—the use of fire, fermentation, food storage techniques, tools etc.—which have promoted health and wellbeing; the last century alone has witnessed unimaginable technological advances that have enhanced human health, albeit in unevenly distributed ways. Our evolutionary past is one filled with technological hope.

However, the annals of science and medicine are filled with examples of technology applied without consideration of unintended consequences. The road to compromised personal, public and planetary health has been paved with highly-profitable intentions [190]. Indeed, the very existence of planetary health as a discipline was brought about by technological applications which operated (and still operate) without concern for natural systems.

Given the challenges of planetary health, especially the need to feed an estimated 3 billion more people (by 2050) in sustainable ways, the pressure to source biochemical and technological ‘solutions’ is strong. Hope in innovation and scientific progress should prevail. However, development and application may proceed at an increasingly rapid pace without the safety net of the precautionary principle. On the one hand, the discipline of planetary health should engage in science communication which helps to quell unnecessary health fears (thus, instill hope) concerning agricultural and other technologies. However, it cannot minimize or escape discourse concerning the environmental implications of agricultural chemicals; scientists are only now beginning to appreciate the threats to biodiversity via common chemicals, including those chemicals which were presented as ‘safer’ than others [191–193].

Once in place, profit-generating applications become difficult to extricate, even with solid evidence demonstrating how harmful that once-heralded ‘solution’ might be. For example, organophosphate pesticides help ‘feed the world’ by improving crop yields; but volumes of research demonstrate detrimental effects on health, including interference with normal brain development—these and other endocrine disrupting chemicals ultimately cost society hundreds of billions of dollars [194]. However, when clear evidence indicates that a particular pesticide should be removed from agricultural use, politics and profits stand in the way; scientists who speak up are subsequently labeled as ‘pseudoscientists’ and ‘anti-technologists’ [195]. As mentioned earlier, planetary health isn’t a new

construct; its earliest pioneers (Rachel Carson and Rene Dubos as two examples among many) were also smeared by industry-vested scientists and the multi-national technological machine (see Box 2). The hope inherent in the 21st century planetary health movement is that its compass will be away from rigid technological ideology (what Dubos referred to as ‘tunnel-vision’ optimism) and corporate rhetoric.

**Box 2.** Attempts at Marginalization.

There are many historical articles cataloguing the swift and harsh reaction to Rachel Carson by industry scientists and their associates in institutional academia [196,197]. Labels directed at Carson were no different than those directed at scientists and advocates who speak up today—pseudoscience, anti-science and, in the case of women, “hysterical” [198]. Attacks on Carson’s credibility by scientists with deep industry ties—especially Robert White-Stevens and Thomas H. Jukes—have been well documented. Speaking with dominant authority in the paternal language of scientific rhetoric, White-Stevens stated: “if man were to faithfully follow the teachings of Miss Carson we would return to the dark ages, and insects and diseases and vermin would once again inherit the Earth” [199]. Baseless fear instilled into the American public; Jukes, a veteran scientist who had been employed by the American Cyanamid Company for two decades, referred to Rachel Carson’s *Silent Spring* not as something that researchers should more closely examine, but as a “bone-chilling science-fiction story book ... holy writ to the new cult of environmentalism” [200]. Jukes further stated: “Those so-called harmless nuts who go around eating seaweed and wheat germ have become a dangerously dominant force in our society” [201].

Said Dubos on smear attempts: “One of the easiest and cheapest ways to appear socially sophisticated these days is to dismiss the advocates of environmental control as ‘eco-freaks’ or ‘anti-technologists’ [which Dubos was labeled] ... one of the most remarkable achievements of the campaigns conducted by those who have been castigated as eco-freaks or anti-technologists is that the opportunity to live a good environment is coming to be regarded as our “unalienable” rights ... in contrast, the tunnel-vision optimists are the unimaginative architects of disaster. By visualizing the future as a mere extrapolation of present trends; with more and more of the same only bigger and faster, they encourage society to follow a suicidal course” [202].

In line with earlier discussions, leveraging hope and optimism with an aim toward ‘selling’ the bioeconomy (as inherently good and virtuous), runs the risk of shifting publicly funded resources away from important behavioral and social research, as well as costly efforts to adopt policy initiatives that are already sound [203]. Neoliberalism privileges the solutions of high technology rather than those that might now exist through philosophical insights and greater attention to socio-political ideologies [74]. Moreover, the emergence of scientific findings on hope and positive psychology are inappropriately leveraged to ‘sell’ the goods and services of the neoliberal ‘personal responsibility’ industry. Specifically, neoliberal policies and practices affirm that a healthy lifestyle based on individual choices is the sole path to WHO-defined health. This deflects responsibility away from the sales and marketing that otherwise drives obesity and NCDs (that is, ultra-processed foods, tobacco, alcohol, et al.) in modern ‘civilization’ and elevates the hope in the ‘right’ sorts of choices which are positioned to undo NCDs (e.g., pharmaceuticals, supplements) [190]. With biological clandestineness which only shows up over time, ultra-processed products et al. provide us with NCDs, while other products (cloaked in the rhetoric of hope) promise to take them away.

Caveats concerning optimism and hope in human health and well-being have been noted by researchers in behavioral sciences. The study of false hope and excessive optimism is no less important from the perspective of planetary health. For example, excessive optimism has been linked to risk taking in gambling [204]; thus, in the realm of planetary health, excessive optimism at the individual and/or institutional level could cloud the ability to see that resources are being lost, and hamper disengagement when losses suggest the wise thing to do is to step away. Interestingly, in the realm of business—a central part of the application of planetary health science—lower levels of optimism among entrepreneurs (involved in new ventures) predict greater revenue and employment growth [205]. Might such findings be extended in terms of the planetary health’s stated goal of finding ‘solutions to health risks posed by our poor stewardship of our planet’? Experts are beginning to examine the cognitive differences—the motivations, attitudes and values—among business entrepreneurs who

adopt sustainable activities [206]. Much like knowledge in the area of nature relatedness, we consider the expansion of such work to be vital in the context of planetary health.

### 11. Academic Planetary Health, Expanding the Discourse

As a new professional construct, planetary health has written a promissory note which stipulates that it will support the health of human civilization and work toward finding solutions to the chronic, low-grade inflammation endured by planet Earth. The unification of various disciplines under the planetary health banner is itself a hopeful act; it immediately demonstrates motivation, agency and pathway thinking. It underscores that holding the grains of knowledge within isolated silos of science—including medicine, politics, economics, sociology, ecology and countless others—is not sustainable in the face of humanity's grand, multi-factorial challenges.

However, as much as the Rockefeller Lancet Planetary Health report should be commended for the expansive multi-disciplinary ground which it covers, no doubt a remarkable document, there are notable omissions, too. For example, there is brief 2-paragraph (p. 1996) mention of the effects of environmental change *on* mental health within the 47 page Report (minus references); while understanding how environmental degradation influences mental health is important, there is no discussion of the upstream research which demonstrates how values and mental attitudes concerning nature (especially through early life education and experience with nature) might shape environmental change. For perspective, variants on the word technology (e.g., technological, technologies) appear, on average, at least once per page in the Report. Moreover, the sole reference used to support links between natural environments and positive mental health was a dated systematic review which only pooled studies through 2008 (that is, seven years before the 2015 Report was published!) [207].

The Report, in our opinion, suffers from absence of a bold call for greater knowledge on understanding the ways in which psychological connections to natural systems influence the very aims of planetary health—sustainability, conservation, equity. Again, this is distinct from mentioning the negative mental health impacts of climate change. In discussions of education and behavior, there is no mention of educating the affluent to understand what it 'feels' like to be in poverty [208–210]; this is an upstream step that *might* incentivize policy makers to more viscerally understand how neoliberal 'behaviors' influence the status quo. Moreover, the term living wage (or even the word 'wage' makes no appearance)—which seems odd given its connection to positive mental health and the healthy behaviors, (including healthy dietary patterns and opportunity for recreation) which planetary health is attempting to promote [211–218]. Affluent populations might have more true leisure time, and tend to spend more time outside and enjoying nature, because they can afford to [219]. How can an individual establish an emotional connection to nature while working extended hours (or two much-less-than-living-wage jobs!) in poverty or precariousness? Moreover, there is a need to understand the psychology of the political opposition to equity; this, we posit, is an essential 'behavioral' feature of planetary health.

Put bluntly, planetary health do well to closely examine the words and actions of McDonald's founder Ray Kroc who vigorously lobbied in opposition to minimum wage increases [220] (and contributed massive sums to Richard Nixon who vetoed even minor increases in minimum wage) [221]. Commenting in *Time* magazine (1973) when queried about his massive fortune, Kroc said the following: "I expect money like you walk into a room and turn on a light switch or a faucet, it is not enough" [222]. This single sentence highlights the need to understand the motivations and values of powerful individuals (known colloquially in the softer language of 'stakeholders') who might be considered the myelin sheath around the nervous system of the super-organism.

The planetary health discipline, it would seem, got off the starter blocks by privileging technology and minimizing (or leaving out entirely) the discourse on the upstream drivers of behaviors, volumes of research on natural environments vs. human cognition/behavior, psychological constructs such as nature relatedness, and psychology in general. While certainly unintentional, these 'optics' do not look good. Moreover, it is noteworthy that the senior author of the Lancet Planetary Health

*Report*—a one-time senior executive of one of the planet’s largest soft drink manufacturers—has since moved to lead a lucrative project with planetary tobacco giant Phillip Morris International [63,69]. Still, original research [223,224] and commentaries [225] in the new Lancet Planetary Health journal are, encouragingly, prioritizing and emphasizing the mental health value of nature.

As mentioned earlier, planetary health isn’t a new ‘job’ title; it has a deep history of intellectual thought and action within clinical, academic, activist and community traditions. In its earliest days, the term planetary health and its primary messages were co-opted by shysters hawking dubious products from the fringes of alternative medicine [226]. Today, it runs the risk of being co-opted by purveyors of tobacco, pesticides, ‘patent-pending’ seeds, ultra-processed foods, soft drinks, or any other kind of planetary company wishing to be seen to be green. As stated by scholar David Harvey in 1993, “control over the resources of others, in the name of planetary health, sustainability of preventing environmental degradation, is never too far from the surface of many western proposals for global environmental management” [227]. Hope in a new planetary health might be found in the words of Jonas Salk on the day the polio vaccine success was announced (1955); when queried on who or what entity maintained patent ownership of the vaccine that would transform planetary health, he responded: “Well, the people I would say. There is no patent. Could you patent the sun? [smiles and laughs]” [228] (See Figure 1). In order to change the status quo, we must reconsider the neoliberal-stoked scientific possessiveness and ‘ownership’ of planetary health technology. Salk’s quote may seem quaint, from a bygone era, but the processes which drive the unequal distribution of technology, and the ways in which intellectual ‘property’ blocks pathways to universal cures, needs to be a central part of planetary health discourse [229,230].



**Figure 1.** Immunization for Planetary Health: In addition to developing infectious disease vaccines, the Anthropocene requires that we expand the definition of ‘protecting the herd’. How can early-life experiences shape the attitudes, values and ‘personality’ at scales which profoundly influences the health of civilization? To what degree is the entire herd (biodiversity on Earth) protected by understanding emotional connections to the natural environment, each other, and other life forms?

We remain hopeful that as the nascent field matures, it will consider upstream priorities, including those that determine, as Dubos said, the allocation of funds toward the kind of facts worth looking for. If planetary health is without a voice from leaders in ecopsychology (and insert prefix for other environmental/ecological/sociologically-rooted branches of psychology) then ‘the facts worth looking for’ will be grotesquely biased. Privileging technology, rather than an understanding of how technology influences humankind’s relationship to the natural world, was a primary concern of Dubos:

*“developing counter technologies to correct new kinds of damage constantly being created by technological innovations is a policy of despair . . . we must try to imagine the kind of surroundings and of life we want, lest we end up with a jumble of technologies that will eventually smother body and soul” [60].*

## 12. Conclusions

With a rich history of use, the term ‘planetary health’ is beginning to find a professional home in public health. The Report of The Rockefeller Foundation-Lancet Commission on Planetary Health (already cited several hundred times on Google Scholar since its 2015 publication) is an instrument of hope. It provides motivation and outlines pathways around some of the barriers which keep us stuck in the Anthropocene. Despite ‘doomsday’ scenarios, there is plenty of room for hope and optimism in planetary health. All over planet Earth, humans are making efforts at the macro, meso and micro scales to promote the health of civilization. These efforts should be celebrated because they often involve the ingredients of hope—agency and pathway thinking; witnessing progress resultant from hopeful thinking can provide inspiration for further creative thinking.

Progress toward the goals of planetary health will undoubtedly require the application of emerging (and yet-to-be-invented) technologies. However, as much as planetary health needs to look forward to the evidence-informed adoption of technologies (with precautionary principle in place and considerations of unintended consequences mapped out), the ability to visualize symbiotopia (i.e., a place where mutual benefits to all members of society and biodiversity are prioritized) also requires looking at the collective ‘personality’ which brought us deep into the Anthropocene. As pointed out in the Report of The Rockefeller Foundation-Lancet Commission on Planetary Health, the present systems of governance are inadequate to address the threats directed at planetary health.

Hope in correcting dysfunctional governance is, in our view, to be found in deeper investments in understanding the functioning of the ‘nervous system of the super-organism’. Beyond the metaphor, this requires a greater comprehension of the neurobehavioral pathways by which ‘we’ arrived at a place where the term planetary health was entered into the lexicon by necessity; it means greater understanding of how hope can mitigate the dominance of fear in individuals and groups [231]. It means the study of the system-justifications employed by dominant groups and the endorsement of ideologies that keep the unsustainable status quo in place. Systems justification seeks to understand social dominance orientation, authoritarianism and why individuals and groups are motivated to justify gross socioeconomic inequalities and the political arrangements that keep them in place [232]. The importance of hope in planetary health is as much a study about what facilitates its contagion, as it is what hinders its usefulness in the Anthropocene. Moreover, it is also an exercise in understanding how hope can be manipulated and corrupted for ‘gains’ which run counter to the very aims of planetary health.

Planetary health needs new strategies which seek to develop ‘vaccines’ against conflict and aggression, and to further understand the cognitive and behavioral underpinnings of political ideologies that either block or facilitate the adoption (or at least the testing of) proposed solutions. In an era where the health of the Earth’s biodiversity is on the line, where climate change is destined to shake civilization from its slumber, the term ‘fitness for office’ in politics takes on entirely new meaning. In our view, hope and its prerequisite, trust, can be strengthened by a far deeper ‘vetting’ of leaders who take prized government positions.

At its deepest level, planetary health is about understanding the human relationship with the natural environment, its ancestral past and its evolutionary resonance in modernity; it is about the transfer of ‘best of intentions’ into behaviors, or what we broadly refer to as ‘lifestyle’. In our view, in between the technological approaches and politics, planetary health sits on support beams which require a more sophisticated understanding of the psychology of prevention and intervention at all scales. As the collective nervous system of the planetary super-organism, ‘we are duty-bound’ to be responsive to our rapidly changing environment, and speak up for the ‘this ancient but rediscovered truth, the validity of Hope’ for our future, and the wellbeing of all species.

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