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We Are the Earth and the Earth Is Us: How Palates Link Foodscapes, Landscapes, Heartscapes, and Thoughtscapes

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Humans are participating in the sixth mass extinction, and for the first time in 200,000 years, our species may be on the brink of extinction. We are facing the greatest challenges we have ever encountered, namely how to nourish eight billion people in the face of changing climates ecologically, diminish disparity between the haves and the have-nots economically, and ease xenophobia, fear, and hatred socially? Historically, our tribal nature served us well, but the costs of tribalism are now far too great for one people inhabiting one tiny orb. If we hope to survive, we must mend the divides that isolate us from one another and the communities we inhabit. While not doing so could be our undoing, doing so could transform our collective consciousness into one that respects, nourishes, and embraces our interdependence with life on Earth. At a basic level, we can cultivate life by using nature as a model for how to produce and consume food; by decreasing our dependence on fossil fuels for energy to grow, process, and transport food; and by transcending persistent battles over one-size-fits-all plant- or animal-based diets. If we learn to do so in ways that nourish life, we may awaken individually and collectively to the wisdom of the Maori proverb *Ko au te whenua. Ko te whenua Ko au: I am the land. The land is me*. In this paper, we use "scapes" —foodscapes, landscapes, heartscapes, and thoughtscapes—as unifying themes to discuss our linkages with communities. We begin by considering how palates link animals with foodscapes. Next, we address how palates link foodscapes with landscapes. We then consider how, through our reverence for life, heartscapes link palates with foodscapes and landscapes. We conclude with transformations of thoughtscapes needed to appreciate life on Earth as a community to which we belong, rather than as a commodity that belongs to us.

Keywords: vegetarian and non-vegetarian diets, plant diversity and abundance, animal welfare, climate change, fossil fuels, farming and wildlife, ecological economic benefits, transformation of consciousness and behavior

INTRODUCTION

For nearly 200,000 years, *Homo sapiens* gathered plants and hunted animals for nourishment. While our ancestors altered landscapes with fire and agriculture, modern hominids have changed landscapes in unprecedented ways. We have gone from a species reliant on nature for food, medicine, clothing, and shelter to one that scarcely knows nature exists outside of movies, local and national parks. Most people cannot identify the plants that grow in vegetable, herbal, or medicinal gardens, let alone the wild plants and animals in their communities, though their ancestors would have revered them and known their many roles in nourishing our species. In a vivid illustration of this mass delusion, some societies are now in the midst of convincing themselves that plant-based faux meat is better than the real thing and that nature is a feeble-minded nitwit compared to the "time-tested wisdom" of Silicon Valley technologies. People in "developed" societies have lost the wisdom that comes from living closely with nature.

Aldo Leopold began *A Sand County Almanac* with this statement (Leopold, 1949): "There are some who can live without wild things, and some who cannot. These essays are the delights and dilemmas of one who cannot." His book was a heart-felt account of how our growing detachment from nature was wreaking havoc on nature's communities. Yet, despite his eloquent pleas, the changes that fossil-fuel based human societies have fashioned since his death, nearly 75 years ago, are breath-taking. From the plundering of plants, animals, and Indigenous peoples during the era of nineteenth-century manifest destiny in the U.S. to current times, humans have participated in the extinction of many of the plants and animals that make this planet habitable (Kolbert, 2014). We are now being consumed by changes we wrought and consequences we did not foresee. Leopold concludes: "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."

Changing climates, massive declines in populations of plants and animals, economic and social inequities are all reminders of our lack of compassion for life on Earth. We can come to love and respect life by transforming our utilitarian views of plants and animals merely as sources of food to a reverence for their wide-ranging ecological, economic, and social meanings and values. In this paper, we use "scapes"—foodscapes, landscapes, heartscapes, and thoughtscapes—as unifying themes to discuss how palates link people with land. We begin by considering how palates link animals with foodscape; we then address the links between foodscapes and landscapes; next we consider how, through a reverence for life, heartscapes link palates with foodscapes and landscapes; we conclude with the transformations of thoughtscapes required to appreciate land as a community to which we belong, rather than as a commodity belonging to us.

We relate our reflections on "scapes" to the seven chakras or energy centers of the body (**Figure 1**). When foodscapes, landscapes, heartscapes, and thoughtscapes are linked and aligned, using the imagery of the chakras, so too is the human linked and aligned with the community of Earth. Life cannot exist without the nourishment of foodscapes (root chakra). Nor can life persist without reproducing itself (sacral chakra). To thrive, creatures create relationships with the landscapes they inhabit (which links the root, sacral, and solar plexus chakras). Our creative capacity to nurture plants, animals, and people depends on our ability to give and receive love (the heart chakra, which is the conduit from the root, sacral, and solar plexus to the throat, third eye, and crown chakras). When we are well-grounded in the other six chakras, we speak clearly and truthfully (throat chakra). That ability comes from awareness gained *via* the non-cognitive, intuitive, inclusive facets of being, as opposed to the cognitive, rational, analytical details of life (third eye chakra). Awareness that "I am" is naught, that all knowledge and being—including what I call "my" self—is illusory occurs when consciousness is liberated to its true state (crown chakra) prior to the time (our birth) when we each begin to identify with "my" self.

PALATES LINK ANIMALS WITH FOODSCAPES

Palates link animals with foodscapes—those parts of landscapes animals use to nourish and self-medicate—through three interrelated processes (Provenza et al., 2015, 2019; Provenza, 2018; **Figure 1**, root chakra). First, animals must have access to a variety of wholesome foods. The more they are restricted—for instance to a feedlot ration for livestock or ultra-processed foods for people—the less they can sustain health. Second, mother is a transgenerational link to foodscapes. Her knowledge—of what and what not to eat and where and where not to go to forage—is essential for helping her offspring get a start in life. Her influence begins in the womb (through flavors in her amniotic fluid), and continues at birth (through flavors in her milk) and when her offspring begin to forage (as a model for what and what not to eat). Third, liking for food is mediated by feedback from cells and organ systems, including the microbiome, in response to nutritional and medicinal needs that are met by nutrients (energy, protein, minerals, and vitamins) and the thousands of compounds plants produce (phenols, terpenes, and alkaloids).

Foodscapes with complex mixtures of grasses, forbs, shrubs, and trees are nutrition centers and pharmacies with vast arrays of phytochemicals (Provenza, 2018). Nothing is more important for health than foodscapes with a variety of foods for herbivores, omnivores, and carnivores. For herbivores, the bulk of any one meal is typically comprised of 3–5 plants, but they often eat small amounts of 50–75 plants during the day. Historically, we did not appreciate that the nutritional and pharmacological properties of these minor components of the diet—best eaten in small doses—enable health (Provenza, 2018). Compared with pastures that lack plant diversity or monotonous feedlot diets, animal welfare and well-being—including nutritional, physiological (blood parameters indicative of health), and immunological (immune function) status—all improve when livestock forage on diverse mixtures of phytochemically rich plants (Villalba et al., 2017, 2019; Beck and Gregorini, 2020; Lagrange et al., 2020; Redoy et al., 2020). That is why livestock foraging on phytochemically rich foodscapes do not require antiparasitic drugs or antibiotics and they also have low levels of morbidity and

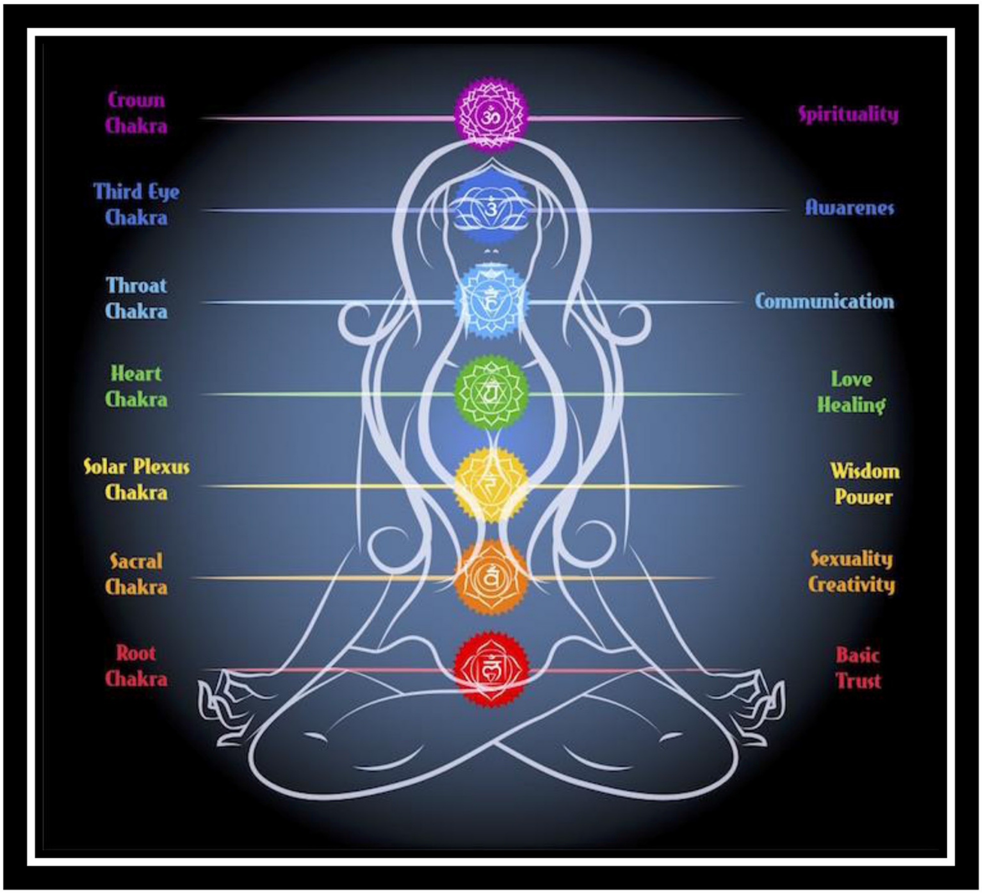

FIGURE 1 | We explore how palates link humans with foodscapes, landscapes, heartscapes, and thoughtscapes. Our reflections have parallels with the seven chakras or energy centers of the body. The root chakra is the foundation, akin to foodscapes nourishing humans. The sacral chakra, which governs sexual energy and creativity, links foodscapes with activities in landscapes. The solar plexus chakra, our ability to feel in control of our life, reflects our relationships with the landscapes we inhabit. The heart chakra is the bridge between the lower chakras (associated with physicality) and the upper chakras (associated with spirituality). This chakra reflects our ability to give and receive love, the basis for our capacity to nurture plants, animals, and people. The throat chakra gives voice to the heart chakra: when we are grounded in the other six chakras, we express ourselves clearly and truthfully. The third eye chakra is awareness gained through the non-cognitive, intuitive, inclusive facets of our being, as opposed simply to the cognitive, rational, analytical details of existence. The crown chakra is transcendent of "I am's" — and all illusions of duality. It is absolute awareness that "I am" is naught, all knowledge—including what I call "my" self—is liquidated and consciousness is liberated to its true state prior to any identification with physical form and function.

mortality compared with animals forced to forage on pastures with few plant species or in feedlots (Provenza et al., 2019).

In turn, human health is linked with the diets of livestock through the chemical features of the plants that livestock eat (Provenza et al., 2015; Gregorini et al., 2017). That includes not only energy, protein, minerals, and vitamins that plants contain, but the tens of thousands of other compounds that plants produce, collectively termed phytochemicals or the plant metabolome. This rich pool of compounds is increasingly recognized as responsible—as a complex whole—when trying to understand how plants promote health in herbivores or omnivorous humans who eat plants and meat (Nelson et al., 2017; Barabási et al., 2019). Through their many properties—that include anti-inflammatory, anti-microbial, anti-parasitic, and immunomodulatory effects—phytochemicals bolster health and protect livestock and humans against diseases and pathogens.

The benefits to humans of eating phytochemically/biochemically rich meat accrue as livestock assimilate some phytochemicals and convert others into metabolites that become muscle and fat, which become the phytochemicals/biochemicals that promote health (Provenza et al., 2019; Prache et al., 2020; van Vliet et al., 2021). That is similar to, but distinct from, the benefits realized by eating phytochemically rich herbs, spices, vegetables, and fruits (Tapsell et al., 2006). This expanded pool of compounds—phytochemicals and metabolites produced by animals from plants—should be considered in attempts to understand benefits to humans, such as damping oxidative stress and inflammation linked with cancer, cardiovascular disease, and metabolic syndrome.

The metabolic effects of eating meat from animals foraging on phytochemically rich diets are partially due to the ability of phytochemicals to curb inflammation (van Vliet et al., 2021). Eating meat from cattle raised on non-diverse pasture or grain-finished in feedlots does not have similar beneficial effects on inflammation (Arya et al., 2010; Gilmore et al., 2011). Low-grade systemic inflammation, characterized by elevated levels of cytokines (e.g., interleukin-6, tumor necrosis factor-alpha, and C-reactive protein), contributes to metabolic disease, type II diabetes, heart disease, cancer, and arthritis (Libby, 2007). Notably, cytokines respond within a meal (Holmer-Jensen et al., 2011), with increasing likelihood of developing diseases when meals that elevate inflammation become dietary habits (Esposito and Giugliano, 2006). Moderating inflammation through wholesome diets, however, can prevent or treat metabolic disease.

Most humans are omnivores who satisfy their needs for nourishment with a combination of animal and plant foods. While differences among individuals in form and function help to explain why some people can thrive on either animal- or plant-based diets (Williams, 1988), most people can best meet their needs with a combination of meat and plants. Animal and plant foods thus function symbiotically to nurture human health (van Vliet et al., 2021).

Compared with meat, plants more readily meet our needs for vitamin C and magnesium and plants are often higher than meats in folate, manganese, thiamin, potassium, and vitamin E (van Vliet et al., 2021). In addition to their many health-promoting properties, phytochemicals also antagonize deleterious effects of compounds found in cooked red meat, including heterocyclic amines, nitroso compounds, malondialdehyde, and advanced glycation end products (Provenza et al., 2019). These findings help explain why omnivorous diets rich in plants do not show links between red meat consumption and negative health outcomes often observed in population studies of people consuming a Standard American/Western Diet (Kappeler et al., 2013).

Relative to plants, meat provides all of the essential amino acids; minerals such as calcium, iron, selenium, zinc; vitamins A (retinol), B_{12} (adenosyl- and hydroxocobalamin), D (cholecalciferol), K2 (menaquinone-4); and long-chain polyunsaturated fatty acid including docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), which are most readily, or solely, obtained from meat (van Vliet et al., 2020, 2021). Eating a small amount (30 g) of dry beef can meet daily needs of a healthy 70-kg adult for taurine, carnosine, creatine, anserine, and 4-hydroxyproline, which improve metabolic, retinal, immunological, muscular, cartilage, neurological, and cardiovascular health (Wu, 2020). The value of meat for helping people meet various nutritional needs helps to explain why, even though vegetarians report a low desire to eat meat, their neural activity reveals a craving for meat (Giraldo et al., 2019). Their responses also highlight the discord between acquired beliefs about meat and inherent needs for nutrients contained in meat (Provenza, 2018).

Attempts to mimic meat with plant-based alternatives—using isolated plant proteins, fats, vitamins, and minerals—underestimate the nutritional complexity of whole foods, which contain tens of thousands of phytochemicals and biochemicals that promote health nutritionally and pharmacologically (Jacobs and Tapsell, 2007; Provenza, 2018; Barabási et al., 2019; van Vliet et al., 2021; https://foodb.ca/foods/FOOD00495). Moreover, while some proteins in plant-based meat alternatives have similar digestibilities to those in real meat, they are not converted as efficiently into muscle (van Vliet et al., 2015, 2018). Thus, compared with plants, people need to eat less meat to meet their needs for protein (Adesogan et al., 2019; van Vliet et al., 2021).

Eating meat from animals who eat phytochemically rich diets nourishes and satiates. In *Life in the Rocky Mountains*, Warren Angus Ferris recounts his adventures in the headwaters of the Missouri, Columbia, and Colorado Rivers from 1830 to 1835 (Ferris, 2012). Back then, roughly 60,000 bison fed on diverse mixes of plants and Ferris' crew fed on bison, as Indigenous people had done for ages. He notes bison in poor flesh were the worst diet imaginable, but as they became fat, no other meat could compare. "With it we require no seasoning; we boil, roast, or fry it, as we please, and live upon it solely, without bread or vegetables of any kind, and what seems most singular, we never tire of or disrelish it, which would be the case with almost any other meat."

Earth's health depends on diverse mixes of plants, which can be enhanced by managing grazing (IPCC, 2019). While many ways exist to do that (Teague et al., 2013), at the highest level of sophistication, a skilled herder is a "chef" who designs daily meal courses to improve the health of livestock and ecosystems (Meuret and Provenza, 2014, 2015). A flock in the hands of an "ecological doctor" can create healthy soil, plants, animals, and food for people in ways that enhance biodiversity, mitigate fires, and sustain local cultures—benefits not considered in life cycle analyses (Pilling et al., 2020). Those benefits matter as two-thirds of Earth's land mass, unsuitable for crops, is home to two billion people who depend on livestock for their livelihood (White, 2015). They can reduce the economic and social costs of livestock production, while boosting the quantity and quality of the foods they produce, through low-cost, non-fossil-fuel-intensive practices that include managing grazing, raising locally adapted animals, and eating meat and milk products (Provenza, 2008; Eisler et al., 2014; Varijakshapanicker et al., 2019).

Like skilled herders and their flocks, we humans can link our palates with foodscapes to engender human and environmental health. When the projected population increase to 10 billion people is combined with an increase of 32% in per person emissions from global shifts to ultra-processed diets high in refined carbohydrates, the net effect is an 80% increase by 2050 in greenhouse gas emissions (GHGE) from food production and consumption (Tilman and Clark, 2014). Studies in Japan and Australia support the contention that ultra-processed foods are major contributors to GHGE (Kanemoto et al., 2019; Ridoutt et al., 2020). Alternatively, diets of wholesome foods would not increase GHGE. Such diets could be any combination of fruits, vegetables, grains, seafood, eggs, dairy, poultry, pork, lamb, and beef.

The global shift away from eating wholesome diets to ultra-processed foods high in refined carbohydrates encouraged 2.1 billion people to over-eat and become overweight or obese (Schatzker, 2015; Ludwig, 2020). This was illustrated in a study where people offered ultra-processed foods (e.g., white bread, sugary cereals, reconstituted meats) ate an extra 500 calories a day compared with people offered wholesome foods (e.g., fresh fruits and vegetables, whole grains, unprocessed meat), even though the two diets were matched for energy, protein, sugar, fat, sodium, and fiber (Hall et al., 2019). Compared with wholesome foods, ultra-processed foods do little to induce satiation (physical and biochemical processes that bring a meal to an end) or satiety (processes that inhibit eating between meals). Thus, people overeat and gain weight.

Steadily embedding ultra-processed foods into our diets over the past 50 years has been an experiment of sorts for humans (Schatzker, 2015; Scrinis, 2020). Replicate this study over a few generations—in the womb, childhood, teen, and adult years—and we now have an epidemic of chronic diet-related diseases (Archer, 2014; Mennella, 2014; Provenza et al., 2015; Costa et al., 2018). Given modern dietary trends, it is foolish to think that introducing more ultra-processed foods (e.g., plant-based meat alternatives) into our diet will reverse the burden of diet-related diseases. Indeed, our experiences of the recent past provide a good idea of the likely outcome: a continued rise in diet-related diseases. Ironically, champions of ultra-processed plant-based meat alternatives purport to address issues of human and environmental health, created in part by industrial agriculture, with more ultra-processed foods and industrial agriculture.

In the end, the challenges of feeding eight billion people are not as simple as advocates on either side of the plants vs. meat debate suggest. Food systems are far too contingent on local socioeconomic and environmental conditions to enable one-size-fits-all policies (Halpern et al., 2019). Indeed, an omnivorous diet, rich in whole plant and animal foods, has the greatest potential to feed human populations globally (Peters et al., 2016; van Vliet et al., 2020, 2021).

PALATES LINK FOODSCAPES WITH LANDSCAPES

Palates link foodscapes with landscapes (**Figure 1**, sacral and solar plexus chakras), but neither the general public nor scientists can easily navigate that terrain. We get whiplash from the ever-changing advice given by authorities who rarely agree (Leroy et al., 2018). No wonder issues of diet rise to levels of religious fervor with salvation and damnation as common themes (Simoons, 1994). Nowadays, plant-based diets are in vogue and meat is under assault ethically (animal welfare), nutritionally (human health), and environmentally (land use practices and GHGE).

Global food systems, agricultural practices, and land uses are responsible for roughly a quarter of GHGE. Most emissions come from land use (especially deforestation), methane (mostly from cattle), and nitrous oxide (mainly from overuse of fertilizer and manure; Project Drawdown, 2020). Cattle, buffalo, goats, sheep, pigs, and poultry add 14.5% to GHGE (IPCC, 2019). Of that, 9.5% is producing feed (mainly for livestock in feedlots), processing and transporting meat, milk, and eggs. The other 5% of GHGE from livestock is methane from rumen fermentation and manure. Scientists come to different conclusions about how palates affect these GHGE figures.

To enhance human health and cool a warming climate, many groups contend that we must increase intake of vegetables, fruits, nuts, and legumes, and all but eliminate red meat from our diets (Lucas and Horton, 2019; Willett et al., 2019; Project Drawdown, 2020; WBCSD, 2020). Yet, limiting intake of red meat and processed meats for human health is not backed by rigorous scientific evidence (Zeraatkar et al., 2019; Zagmutt et al., 2020), nor do scientists agree that plant-based diets are the only way to cool a warming climate (van Vliet et al., 2020). Compared to plant-based foods, livestock require more land to produce a unit of food, so curbing the amount of meat in our diets could reduce the impacts of agriculture (Godfray et al., 2018; Project Drawdown, 2020). However, while plant-based diets can have lower GHGE than meat-based diets (Poore and Nemecek, 2018), when their impacts are calculated to consider nutrients, the footprints of animal and plant foods are similar because animal tissues better meet our needs for many nutrients, including all of the essential amino acids (Drewnowski et al., 2015; Tessari et al., 2016; van Vliet et al., 2021). Forsaking an omnivorous diet in favor of a plant-based diet would also mean growing more commodity crops, which due to high levels of soil erosion, could add more than livestock to GHGE (Teague et al., 2016), especially considering projected increases in soil erosion from farming (O'Neal et al., 2005).

With regard to grazing, some contend that animals on pastures have more adverse impacts than animals in feedlots, when considering both land use and GHGE. Grazing practices increase land use and GHGE when they require deforestation, synthetic fertilizers, and water to produce feed for livestock on pastures (Project Drawdown, 2020). Moreover, animals on pasture typically grow more slowly than animals in feedlots and so they take longer (18–24 months) to reach slaughter weight than animals in feedlots (12–16 months) (Swain et al., 2018). The increased time to slaughter adds to GHGE as well as the cost of meat for consumers.

Life-cycle analyses (LCA) reveal smaller carbon footprints for plant-based meat alternatives (Beyond Burger^{R} and Impossible^{TM} Burger) compared with cattle finished in feedlots (+3.2 and +3.5 kg CO_2-eq emissions/per kg product, respectively; Heller and Keoleian, 2018; Quantis International, 2019a). Values for feedlots (+10.2 to +48.5 kg CO_2-eq per kg product) depend on the geographical location where cattle are raised and GHGE potential of retail, distribution, restaurant or at home use, and end-of-life stages (Stanley et al., 2018; Asem-Hiablie et al., 2019; Rotz et al., 2019). Of note, the same company that showed a +3.5 CO_2-eq emissions/per kg product in the LCA of the Impossible Burger^{TM} (Quantis International, 2019a) also showed a −3.5 CO_2-eq emissions/per kg beef with managed grazing (Quantis International, 2019b).

How grazing is managed and the forages livestock eat influence the time to slaughter and GHGE. Due to greater soil carbon sequestration, multi-species rotational grazing can reduce net GHGE by 86%, resulting in a footprint 74% less than feedlots (Rowntree et al., 2020), and 30% less than monotonous pastures of ryegrass or alfalfa (Beck, 2020). Pasture-based livestock production that boosts diet variety improves animal welfare and production while sequestering at least as much GHG as it emits, even considering all facets of production, while enhancing ecosystem diversity and function in ways not possible with monoculture crops or pastures (Allard et al., 2007; Teague et al., 2016; Stanley et al., 2018; Viglizzo et al., 2019; Beck and Gregorini, 2020; Rowntree et al., 2020). Compared with grazing a monoculture of grass or alfalfa, when cattle or sheep eat diverse mixes of grasses, forbs, and tannin-containing legumes, they gain weight more efficiently and reach finish body condition nearly as quickly as animals in feedlots and with less GHGE (Hristov et al., 2013; Villalba et al., 2019; Beck, 2020; Thompson and Rowntree, 2020).

Alas, while livestock can be raised with fewer GHGE, and in some cases in ways that sequester more GHG than they emit, that is not so for the vast majority of the world's animal agriculture (Project Drawdown, 2020). While some studies show high sequestration rates for managed grazing, that is not consistent across all grazing operations due to factors that include soil texture, the mix of plant species, grazing intensity, and rainfall (Conant et al., 2017; Stanley et al., 2018; Paustian et al., 2019). Rainfall (water) is essential for photosynthesis, and water availability is expected to become more uncertain with climate change. Lack of water, nitrogen, and other nutrients such as phosphorus may thus constrain the size of agricultural carbon sinks (Lal, 2016).

Carbon dioxide (CO_2) absorbed through photosynthesis can be stored in grasses, forbs, shrubs, and trees, and as organic matter in soil. Depending on the form, this carbon can be stored for a season, several years, multiple decades, or several centuries. Eventually, though, carbon returns to the atmosphere *via* decomposition processes and management practices alter that outcome. Regenerative agriculture stresses improved annual cropping systems, crop-livestock integration, and managed grazing, while the benefits of silvopasture that integrate trees into working landscapes are often ignored. Yet, tree intercropping is more common than regenerative annual cropping, and silvopasture is practiced more widely than managed grazing (Project Drawdown, 2020). These practices have much higher sequestration rates than regenerative annual cropping or managed grazing, with much greater scientific certainty about their benefits (Lal et al., 2018; Project Drawdown, 2020). Where suitable, the opportunity is thus to convert pastures to silvopasture, increasing sequestration rates as well as the sale of livestock and wood products.

Predicting levels of CO_2 is difficult (IPCC, 2019). Even if we knew what would happen to man-made emissions—which depend on international policies, technological and agricultural advances—Earth's network of sources and sinks is vast, interlinked, and dynamic. To further complicate matters, climate change is projected to transform many landscapes from carbon sinks to sources due to increasing droughts, fires, and other disturbances that release carbon from soils and plants. Past IPCC estimates range from as high as 2,000 ppm by 2250 (temperature rise of 9°C) to 700 ppm by 2080 (rise of >3°C). The most optimistic scenario is one where emissions peak now and begin to decline, as we remove more carbon from the air than we produce by 2070, and CO_2 dips below 400 ppm between 2100 and 2200 (increase <1°C).

Methane (CH_4) is a greenhouse gas with 28 times the global warming potential of carbon dioxide. Methane emissions have fluctuated during the past 12,000 years (Smith et al., 2016). They were reduced by the mass extinction of wild mammals at the end of the Pleistocene Epoch 12,000 years ago. They also declined with the extirpation of bison in North America (1860's) and the rinderpest epizootic that wiped out animal populations in Africa (1890's). Methane produced by ruminants today is equivalent to that of wild mammals prior to the Pleistocene extinctions.

Nearly one third of the CH_4 emitted by human activities is from producing and transporting coal, natural gas, and oil (31%). In addition, other human activities—landfills with organic material that rots (16%), livestock (5%), and rice paddies (3%)—have also helped methane-belching microbes proliferate. Methane is produced by methanogenic bacteria in wetlands and oceans as well as in stomachs of termites and ruminants such as cattle, sheep, and goats. Enteric CH_4 emissions from ruminants can be reduced by restoring degraded farmlands, pastures, and rangelands, by managing grazing, and by increasing the nutritive quality and digestibility of forages, including planting tannin-containing forbs, shrubs, and trees in landscapes (Thornton and Herrero, 2010; Wang et al., 2014, 2015; Herrero et al., 2016; Singh and Gupta, 2016; Villalba et al., 2019).

While CH_4 is a potent GHG, it is also a temporary one. It lasts a decade before it breaks down. On the other hand, once we put CO_2 in the atmosphere, it persists for centuries. Carbon dioxide levels, now at 415 ppm, are greater than humans have ever experienced. The last time Earth's atmosphere sustained that amount of CO_2–during the Pliocene Epoch 5.3 to 2.6 million years ago—Antarctica was a plant-covered oasis, sea levels were an estimated 10 to 20 m higher and global temperatures were an average of 2–3°C warmer.

Nitrous oxide (N_2O) emissions occur *via* the circulation of nitrogen among microorganisms that live in the soil and water, plants and animals, and the atmosphere. Application of nitrogen fertilizer to soil accounts for most agricultural emissions of N_2O, which can be reduced by managing soil in ways that decrease the need for nitrogen fertilizer, applying fertilizers more efficiently, modifying manure management practices, and integrating livestock back into farming systems (Project Drawdown, 2020). Manure left on pastures is a large source of N_2O emissions. Providing livestock with tannin-containing forages decreases nitrogen in urine and increases nitrogen in manure, which reduces N_2O emissions and builds soil organic matter (Clemensen et al., 2020). The presence of plants, instead of bare soil, reduces N_2O emissions (de Klein et al., 2020). Well-managed pastures also emit less N_2O than degraded pastures (Chirinda et al., 2019), an effect that if it occurs widely, is an under-appreciated impact of managed grazing.

Grasslands absorb and release CO_2, emit CH_4 from livestock, and emit N_2O from soils. Carbon sinks are located mainly in natural and sparsely grazed grasslands, whereas emissions of CO_2, CH_4, and N_2O predominate in managed grasslands (Chang et al., 2021). From 1750 to 2012, substantial increases in livestock numbers enhanced warming due to emissions of CH_4 and N_2O that were partially offset by reduced numbers of wild herbivores. Concurrently, conversion of forests to pastures and grasslands to croplands caused net warming. Notably, the cooling effect of carbon sinks in natural and sparsely grazed grasslands has nearly canceled warming from managed grasslands. Managed grazing, pasture improvement, and restoration of degraded pastures can all help to prevent further warming from managed grasslands.

During the past century, agriculture declared fossil-fuel-based warfare on land mechanically (plowing soil), chemically (herbicides and pesticides), and biologically (GMO technology). By separating rearing livestock from growing crops, we decoupled bio- and geo-chemical cycling of carbon, water, nitrogen, phosphorus, and sulfur, and increased emissions of methane and nitrous oxide, as well as eutrophication and contamination of water sources (Lal, 2020). Agriculture can reverse ecological damage—from excess irrigation, tillage, fertilizers, herbicides, and pesticides used to grow and protect crops in monocultures—by integrating multiple species of livestock back into landscapes with different crops to build organic matter, fertility, and water-holding capacity of soil (Berry, 1977; Gosnell et al., 2020; Rowntree et al., 2020).

Of 80 ways to mitigate climate change assessed in Project Drawdown (Hawken, 2017), food and agriculture rank high: reducing food waste (ranked 2), eating plant-rich diets (4), sustaining tropical forests (5), silvopasture that combines forestry and grazing (9), regenerative agriculture (11), sustaining temperate forests (12), conservation agriculture (16), tree intercropping that combines growing trees with annual crops (17), and managed grazing (19). To reduce GHGE and sequester GHG, farmers and ranchers can combine practices—e.g., cover crops, compost applications, perennial crops, silvopasture, managed multi-species grazing—to produce food in ways that generate soil health, enhance plant and animal diversity, and provide ecosystem services including carbon sequestration (Lal, 2016, 2020; Gregorini et al., 2017; IPCC, 2019; Project Drawdown, 2020). In the process, we can grow phytochemically rich vegetables, fruits, and crops to feed ourselves and the animals in our care. We can also reduce livestock in feedlots, eat less meat in industrial nations, and increase animals grazing diverse mixtures of phytochemically rich forages to provide meat that is phytochemically and biochemically richer and arguably more nourishing for people and environments (Provenza et al., 2019; van Vliet et al., 2021).

While some individuals and organizations claim regenerative agriculture alone can halt climate change, that is not the case, and questions remain about how much emissions can be sequestered (Project Drawdown, 2020). Enthusiasm and hubris often blind us to the limits of our ability to foresee the unintended consequences of our actions. People who initiated the Green Revolution, out of the best of intentions, did not anticipate adverse outcomes, any more than John D. Rockefeller foresaw the fallout from the fossil fuels that now sustain industrial agriculture. Life is an endless series of unintended outcomes that emerge surprisingly from our best intentions. Conceding our limits with humble hearts can help keep our eyes open (Senge, 1994; Provenza, 2018). Though the Green Revolution fed billions of people, unintended costs include: (1) social changes from loss of land, massive displacement, and poverty for countless small farmers; (2) loss of biodiversity and food quality; (3) land degradation from soil erosion and loss of minerals, (4) adverse effects of synthetic fertilizers on soil organisms, (5) pollution from fertilizers, herbicides, and pesticides; (6) salinity from irrigation; and (7) fossil-fuel dependence.

The current focus on the role of agriculture in greenhouse gas emissions and sequestration neglects this fundamental issue: the ecological, economic, and social costs of our utter dependence on fossil fuels are unsustainable (Hagens, 2020). Ironically, contemporary economic models—built upon land, labor, and capital—do not reflect the singular importance to society of inexpensive energy derived from fossil fuels. To produce a calorie of food, modern industrial agriculture requires a minimum of two calories of fossil fuels for machinery to plant, irrigate, and harvest crops; for fertilizers, herbicides, and insecticides to grow and protect plants in monocultures; for antibiotics and anthelmintics to maintain the health of livestock; and for nutrition supplements and pharmaceuticals to sustain the health of livestock and humans. We use another 8–12 calories of fossil fuels to process, package, deliver, store, and cook modern food. No wild species can survive expending far more energy than it consumes.

Our reliance on fossil fuels to produce food will of necessity decline during the first half of the twenty-first century due to increasing economic and environmental costs of extracting fossil fuels and their adverse effects on people, environments, and climate. This seeming catastrophe will create opportunities for societies to produce foods locally in ways that nurture relationships among soil, water, plants, herbivores, farmers/ranchers, and consumers. Agriculture will be at the heart of communities, but from soils and plants to livestock and humans, we will need to learn what it means to *co-evolve* with nature's complex creative communities, endlessly transforming due to ever-changing relationships among organisms and environments. As part of that co-evolutionary process, plants will become important as nutrition centers and pharmacies—their phytochemicals essential in the health of plants, livestock, and people—and we will need to co-create plant and animal communities that can thrive in the absence of fossil fuel inputs (Provenza, 2008). According to Darwinian theory, plant and animal species *adapt* as genes with survival value are passed from one generation to the next. That view fosters rather rigid notions of evolution that disregard how plants and animals *create relationships* with what they deem to be relevant facets of the biophysical environments they inhabit (Lewontin, 2000; Provenza, 2018). Organisms are not machines and genes are not destiny. Rather, individuals are *involved* in the world, which allows them to *evolve* with the world (Provenza et al., 2013; Laland and Chiu, 2021). This view recognizes that the success of co-evolution depends not only on "the right combination of genes" in plants and animals but on how those genes are expressed epigenetically in the environments where people and the plants and animals in their care are co-evolving. Co-evolution also involves learned behaviors, passed from one animal generation to the next, in which mother and extended families are transgenerational linkages to landscapes.

HEARTSCAPES LINK PALATES WITH FOODSCAPES AND LANDSCAPES

The heart chakra, which is the conduit from the root, sacral, and soler plexus to throat, third eye, and crown chakras, reflects our ability to give and receive love, the basis for our capacity to nurture plants, animals, and people. Creating ecologically sustainable foodscapes is a challenge for the industrial ways we produce, market, and consume food, which do little to promote and nourish diverse communities of life below and above ground. That includes both conventional and regenerative agricultural practices when they do not address the social inequities and structural racism at the heart of agriculture by enhancing the diversity of people who produce food locally in ways that enhance food security (Gregorini and Maxwell, 2020; Wozniacka, 2021). Such systems do not encourage socio-economically inclusive relationships that link heartscapes with foodscapes and landscapes. All of these interrelated factors influence what people want to eat. For example, when we think about how the different foods that we eat may affect changing climates, biodiversity, human and animal well-being, and then feel compassion for the collective consequences, some people lose their appetite for eating animals.

Based on data from the United Nations FAO (2020), more than 72 billion cows, sheep, goats, pigs, and chickens are killed annually to help feed 7.8 billion humans worldwide. While people in government and industry focus on how much meat is produced and consumed, farming is also about the lives of plants and animals—and the quality of their lives. While the inner life of a farmed animal depends on the species—each has its own nature and each one his or her own life—the scientific literature on everyone from chickens to cows leads to one conclusion: farmed animals are beings who possess many of the emotional and mental traits of humans (Marino, 2019). Because most people lack intimate relationships with raising the plants and animals they consume, we lack awareness of their sentience—their capacity to feel, perceive, and experience life subjectively. And though the poor quality of life and violent death suffered by factory-farmed animals is well-documented, many people ignore this evidence in favor of beliefs that meat is merely a commodity we purchase from the grocer (Leroy and Praet, 2017).

In the U.S., only 4% of calves spend their entire lives on pastures and rangelands eating phytochemically rich plants. The other 96% of calves are weaned at 7–8 months of age and moved to feedlots or monotonous pastures to be fattened. In many cases, these conditions violate the five freedoms of animal welfare: freedom from fear, distress, discomfort, pain, injury, and disease (Manteca et al., 2008; Mellor, 2016; Villalba and Manteca, 2019). Calves are moved from familiar (mother, peers, home pastures) to unfamiliar (feedlots) haunts, which causes fear and distress. Though individuals differ in preferences due to experiences *in utero* and early in life (Atwood et al., 2001; Wiedmeier et al., 2012; Beck, 2020), they have no chance to self-select their own diets, which violates their freedom to express normal behavior, maintain health, and avert disease. Like us, they dislike any food eaten too often or in excess, which causes stress and food aversions (Catanese et al., 2013). Yet, daily they are fed the same feedlot ration, or pastures of ryegrass or alfalfa, so monotonous and high in grain or nitrogen they experience nausea, causing discomfort and distress (Provenza et al., 1994; Beck and Gregorini, 2020).

Collectively, these practices cause animals in feedlots to suffer various maladies, including liver abscesses, chronic acidosis, oxidative and physiological stress, and other metabolic diseases similar to people with metabolic syndrome, characterized by muscle mitochondrial dysfunction, oxidative stress, and elevated levels of blood glucose, insulin, and cortisol (Carrillo et al., 2016; Beck and Gregorini, 2020; van Vliet et al., 2021). In contrast, the greater mitochondrial oxidative enzyme levels in animals eating phytochemically rich diets are analogous to those in healthy athletes (Apaoblaza et al., 2020). To counter the effects of phytochemically poor diets on morbidity and mortality (Maday, 2016), animals are sustained on antibiotics, whose overuse in feedlots helped create antibiotic resistance. Increasing intake of meat from livestock reared on phytochemically rich foodscapes, while reducing intake of meat from feedlots, could improve animal welfare, reduce excessive intake of meat, and increase intake of phytochemically and biochemically rich meat of better quality (Provenza et al., 2019; van Vliet et al., 2021).

Because most people do not raise the animals and plants they eat, many believe farm animals and cultivated plants lack intelligence, awareness, or concern about the quality of their lives. That view goes back to Aristotle, who assumed animals differ from people because people can reason. He credited animals, but not plants, with perception—awareness gained through senses. Fast-forward 2,400 years and plant physiologists and molecular biologists are presenting compelling evidence that plants possess states of perception and awareness—gained through as many as 20 senses—far beyond what the ancient Greeks knew (Chamovitz, 2012; Trewavas, 2014). If we consider consciousness and sentience to be part of awareness and perception, then some contend that plants are conscious and sentient (Mancuso, 2018). Moreover, learning and memory are vital as roots, stems, leaves, and flowers address environmental challenges.

Vines and roots know when they "touch" their own shoots and roots or those of other plants. Roots interact with fungi and bacteria, collectively known as the plant microbiome, as they "forage" for water and nutrients: roots transfer energy from leaves to fungi and bacteria and they transfer nutrients from fungi and bacteria back to the host plant. Root exudates contain primary and secondary metabolites that can attract, deter, or kill belowground insect herbivores, nematodes, and microbes, and inhibit competing plants (van Dam and Bouwmeester, 2016).

Plants "see" different wavelengths of light, which they capture in photosynthesis. As part of that process, they "breathe" through stomata on the surface of leaves and stems. They open their stomates to inhale carbon dioxide—which they use to fashion rich arrays of phytochemicals—and they exhale oxygen, processes that are metabolic counterparts in animals and humans.

Plants can "smell" and "taste" compounds in the air and on their tissues; they can "hear" and respond to the sound of a caterpillar chomping on a neighboring plant; they "smell" and "taste" and "talk" and "listen" in a biochemical language using phytochemicals (Karban, 2015). Volatile compounds produced by one plant can alert its neighbors to danger; harken insect predators to protect them from would-be insect foragers; recruit animals to perform vital services such as pollination and seed dispersal; and deter herbivores from eating too much of their tissues.

What should we think, then, about the multidimensional interrelationships that plants create with soil organisms, other plants, and animals? What kind of intelligence is being manifest? When organic chemists synthesize compounds in labs, we consider that an act of high intelligence, as any student who has taken a class an organic chemistry will attest. Yet, plants routinely outmaneuver clever chemists, agri-business, and farm folks who attempt to eradicate them with chemicals, as over 500 herbicide-resistant weeds worldwide can attest (Heap, 2020).

Nobody knows how a plant or an animal or another person experiences life, but the fact that we share many attributes presents humans with a conundrum that lies at the heart of a mystery: for any being to live, other beings must die. While eating a plant-based diet or plant-based meat does not directly involve killing animals, indirectly it does. Crops are grown in monocultures where life below and aboveground is destroyed by tillage, pesticides, and fertilizers (Fischer and Lamey, 2018). Along with numerous other species (Kolbert, 2014), a striking example is grassland birds whose numbers declined by over 50% in the last 50 years due to industrial agriculture (Rosenberg et al., 2019). Conversely, regenerative practices that integrate livestock with farming can nurture life below and above ground in ways not possible with fossil-fuel intensive industrial agriculture (Horrigan et al., 2002). Though not a panacea for saving the planet, such practices could be a vital step in the right direction (Smith, 2014; Massy, 2017; Brown, 2018; Godde et al., 2020), but that will require transforming fossil-fuel dependent industrial agriculture into ecological agriculture.

While most people do not own farms or ranches, anyone who owns a plot of land can become a farmer and a rancher, nurturing biodiversity by creating homes for plant and animal species on their land. We can grow lawns "infested" with clover and dandelions, so we don't have to fertilize with nitrogen or use herbicides. Better yet, we can encourage native plant species that thrive in our landscapes to diversify life below and aboveground in our neighborhoods. We can grow vegetable, herbal, and medicinal gardens and raise bees and chickens. We can plant native shrubs and trees that sequester carbon and provide flowers and berries for bees and birds. In so doing, we reduce our need for water, the lifeblood of this planet, and fossil fuels to grow, fertilize, weed, and mow lawns. Just as meaningfully, growing plants and animals that become food for our bodies will help us appreciate that all life—plant and animal alike—is sacred, a gift from Nature's bounty that can be shared with our community, who in turn return the favor.

Nearly 75 years ago in *A Sand County Almanac*, Aldo Leopold warned of the dangers of breaking our linkages with the plants and animals and ecosystems that nurture and sustain us: "There are two spiritual dangers in not owning a farm. One is the danger of supposing that breakfast comes from the grocery, and the other that heat comes from the furnace. To avoid the first danger, one should plant a garden, preferably where there is no grocer to confuse the issue. To avoid the second, he should lay a split of good oak on the andirons, preferable where there is no furnace, and let it warm his shins while a February blizzard tosses the trees outside."

Becoming involved in the natural world would change our relationships—socially, ecologically, and economically—with the communities we inhabit. Economics is decision-making in the face of scarcity based on commodification of goods and services. Scarcity is requisite for capitalist economies to function and they are designed to create scarcity where it does not exist (Hagens, 2020; Kimmerer, 2020). To our collective detriment, monetized systems do not link people with one another and mother Earth out of gratitude and reciprocity for one another and nature's bounty as members of her community. These currencies of a gift economy multiply with each exchange as their life-giving energies ripple outward from person to person.

"Gratitude is the thread that connects us in a deep relationship," notes Robin Wall Kimmerer, "simultaneously physical and spiritual, as our bodies are fed and spirits nourished by the sense of belonging, which is the most vital of foods. Gratitude creates a sense of abundance, the knowing that you have what you need. In that climate of sufficiency, our hunger for more abates and we take only what we need, in respect for the generosity of the giver." If our first response is gratitude in a gift economy, then our next response is reciprocity to the giver and our mother.

Kimmerer concludes: "Continued fealty to economies based on competition for manufactured scarcity, rather than cooperation around natural abundance, is now causing us to face the danger of producing real scarcity, evident in growing shortages of food and clean water, breathable air, and fertile soil. Climate change is a product of this extractive economy and is forcing us to confront the inevitable outcome of our consumptive lifestyle, genuine scarcity for which the market has no remedy… Regenerative economies which cherish and reciprocate the gift are the only path forward. To replenish the possibility of mutual flourishing…, we need an economy that shares the gifts of the Earth, following the lead of our oldest teachers, the plants."

Modern *Homo sapiens* have made an art form of dining, but we tabled the larger questions concerning our relationships with the heartscapes we inhabit socially, ecologically, and economically. Eating is participating in endless transformation. As I eat, energy and matter in someone—plants and animals alike—becomes this entity I call me, which will, in the flicker of a cosmic eye, become soil, plants, and animals again. In pondering this mystery, we may realize that all life is sacred (**Figure 1**, heart chakra). The well-being of the plants and animals we eat to nourish our bodies determines our health and that of the communities that sustain life on Earth.

FROM FOODSCAPES, LANDSCAPES, AND HEARTSCAPES TO TRANSFORMATIONS OF THOUGHTSCAPES

Thoughtscapes refers to the topography of mind-body consciousness, the awareness of the thinker and knower of our spatial and temporal interdependence and at-one-ness with foodscapes, landscapes, heartscapes, and communities (Gregorini and Maxwell, 2020; **Figure 1**, third eye and crown chakras). If we identify solely with "my" self, we create an impermeable wall of perceptions, beliefs, and judgments that block our relationships with one another and the communities we inhabit. As Tolle (1999) puts it: "It is the screen of thought that creates the illusion of separateness, the illusion that there is you and a totally separate "other." You then forget the essential fact that, underneath the level of physical appearances and separate forms, you are one with all that is. By "forget," I mean that you can no longer *feel* this oneness as self-evident reality. You may *believe* it to be true, but you no longer *know* it to be true."

When foodscapes, landscapes, heartscapes, and thoughtscapes are allied, we *feel* connected and aligned with one another and nature's communities. "The word enlightenment conjures up the idea of some super-human accomplishment," as Tolle notes, "and the ego likes to keep it that way, but it is simply your natural state of *felt* oneness with Being. It is a state of connectedness with something immeasurable and indestructible, something that, almost paradoxically, is essentially you and yet it is much greater than you. It is finding your true nature beyond name and form. The inability to feel this connectedness gives rise to the illusion of separation from yourself and the world around you. You then perceive yourself, consciously and unconsciously, as an isolated fragment. Fear arises, and conflict within and without becomes the norm."

Historically, the quest by many human populations to dominate nature was a core civilizing force and a natural impulse when humanity was exposed and vulnerable to the elements (**Figure 1**, root, sacral, and solar plexus chakras). Nature, as we know, is often unkind. Through our desire to protect ourselves from the harshness of Earth's vagaries and to feed, clothe, and house ourselves, we came together in extended families, formed tribes, cities, states, nations, and civilizations. This impetus was further enabled and driven by a hierarchical structure that placed our God or the Gods, depending on one's mythology, at the top with humans within "our group" next, followed by "other" humans not within "our tribe," then came animals (valued for how they supported human efforts to overcome nature) and plants (as a way to feed livestock and humans).

As our technological and industrial systems developed, and we forgot our dependence on nature, we began to think ourselves more powerful than her, and if anything, came to see technology as superior to nature. Our status on top of the fossil-fuel reliant technological pyramid caused us to believe that we had "mastered nature" solely for our purposes. She is reminding us—as droughts, fires, and floods ravage the globe, warming climates cause sea levels to rise, and the coronavirus wreaks havoc on peoples and economies globally—that she is the final arbiter. These threats know no boundaries—ecologically (climate change), economically (global recession), or socially (coronavirus pandemic)—only interdependencies: our collective fates are intertwined.

Our species is now participating in the sixth mass extinction (Kolbert, 2014), facing the greatest challenges we have ever encountered: nearly eight billion people trying to deal with changing climates ecologically; disparity between haves and the have-nots economically; and xenophobic fear and hatred socially. Historically, the intersection of social, economic, and ecological issues emerged as part of the conservation movement in the land of immigrants (America) when the first national park was founded, ironically in part to "protect" land from Mexicans and Native Americans (Cagle, 2019). Eco-xenophobia resurfaced in the 1970's as overpopulation and resource depletion became issues (Ehrlich, 1968). Population growth and resource depletion were conflated with immigration growth, and both were blamed for the looming collapse of Spaceship Earth, a worldview that inspired eco-nativists and nationalists. The worsening climate crisis could easily become a bludgeon for more anti-immigration and nationalist activists.

Today, people worldwide are as polarized as they have ever been. We have forgotten the unmanifest (unity) that underlies the manifest (duality). We have forgotten that creativity comes from the union of "pairs of opposites." We are stuck in "is not" and can't recall "neither is nor is not." Ironically, some people who ascribe to world mythologies that should unite us—love your enemies—instead choose to antagonize, polarize, and isolate us from one another and our mother, as manifest through a lack of empathy and sympathy for other inhabitants on Earth. We will see if mythologies—based on loving kindness and compassion—are more than just words.

Eckhardt Tolle asks: "How is it possible that humans killed in excess of 100 million fellow humans in the twentieth century alone? Humans inflicting pain of such magnitude on one another is beyond anything you can imagine. And that's not taking into account the mental, emotional and physical violence, the torture, pain and cruelty they continue to inflict on each other as well as on other sentient beings on a daily basis. Do they act in this way because they are in touch with their natural state, the joy of life within? Of course not. Only people who are in a deeply negative state, who feel very bad indeed, would create such a reality as a reflection of how they feel. Now they are engaged in destroying nature and the planet that sustains them. Unbelievable but true. Humans are a dangerously insane and very sick species. That's not a judgement. It's a fact. It is also a fact that sanity is there underneath the madness."

The trials we now face could transform consciousness in ways that recreate our relationships with one another and life on Earth. Indeed, insufferable trials are likely the only way humanity will change. If we survive, we may be re-born in ways echoed in the Maori proverb *Ko au te whenua. Ko te whenua Koau: I am the land. The land is me.* We may come to appreciate that all political and economic prowess comes from our mother. We are the Earth, and the Earth is us. While death can transform—and near-death experiences cause some to return to Earth when they realize heaven is a state not a place (Eadie, 1994; Alexander, 2012; Moorjani, 2012)—we need not die to transform. Ordeals such as depression, cancer, divorce, and covid-19 can increase our appreciation for others and our place in the cosmos (Tolle, 1999; Bronson, 2002). Either way—dying and coming back or dying to past worldviews—trials transform.

People in rural areas worldwide are experiencing unprecedented rates of depression and suicide due to the lack of belonging that links communities socially, economically, and ecologically. Fundamental changes can occur through personal transformations of consciousness (Gosnell et al., 2019). In *Call of the Reed Warbler*, Massy (2017) discusses transformations that caused people to change agricultural practices when conventional ways no longer worked to the point that farmers were broke economically, bankrupt ecologically, and depressed socially. They first had to understand how landscapes function ecologically and how they are linked economically and socially: nothing functions in isolation. They next had to get out of the way to let these functions regenerate naturally. Finally, they had to develop the humility to "listen to the land" and embrace change while simultaneously continuing to learn with childlike openness.

Just as trials can transform our individual consciousness, global trials could transform the collective consciousness of humanity from ethnocentric and xenophobic to one that respects, nourishes, and embraces all life on Earth. Historically, our tribal nature served us well, but we are now a mutually interdependent global population inhabiting a tiny orb in the vastness of time and space. By nature, we learn early in life to identify with our family, then our community, our culture, our religion, our politics, our job, our country, and so forth—all of the "I am's." But that is an illusion inflected locally in time and space. Change the time and place, and the "I am's" change. Transcend the "I am's" and we come to the unmanifest *I am* (infinite being), which is manifest in the here-and-now as energy and matter transforming endlessly and experienced as a fleeting visit to Earth (Dunn, 1985; Tolle, 1999; **Figure 1**, third eye and crown chakras).

In a similar vein, Albert Einstein mused, "A human being is a part of the whole, called by us 'Universe,' a part limited in time and space. He experiences himself, his thoughts and feelings as something separate from the rest—a kind of optical delusion of his consciousness. The striving to free oneself from this delusion is the one issue of true religion. Not to nourish it but to try to overcome it is the way to reach the attainable measure of peace of mind." (Calaprice, 2005). Or, as Confucius taught, the task before us is to free ourselves from this prison by expanding our circle of compassion to embrace all of humanity and the whole of nature in its wonders (Smith, 1991). Transcend all of the "I am's" and we come to *I am* as an enlightened being.

Koestler (1978) coined the term "holon" to describe the interconnectedness of all things—from subatomic particles and atoms to cells and organ systems to social and biophysical landscapes to planets, solar systems, stars, and galaxies—literally worlds within worlds within worlds, each unique. He stressed that each holon has two conflicting propensities: one is integrative (to function as part of the larger whole) and the other is self-assertive (to safeguard individual autonomy). At any level of organization, each holon must affirm its individuality, but it must also yield to the demands of the larger whole for the system to function co-evolutionarily. While these two tendencies appear to be opposites, they can be harmonious and complementary. Indeed, a healthy system—cell, individual, society, and ecosystem—maintains a balanced yet dynamic interplay between integration and self-assertion that keeps a system flexible and open to change. Flexibility is lost when any holon—from cells (cancer) to individuals (political parties) to societies (nation states) to ecosystems (population explosions)—comes to dominate.

Ecologists who attempt to understand interrelationships among soil, plants, and animals are participating in an endeavor that began during the seventeenth century. Prior to that time, the predominant worldview was one of a spiritual, organic, living universe that was mysterious and, in some ways, frighteningly unpredictable. That view changed in the seventeenth century to one in which nature, though complex, was thought to be knowable and predictable, provided we could just discover the rules. The machine became the model and the clock the metaphor for this worldview, but the more we learn about the workings of the clock, the more intricate, complex, and mysterious the "machine" becomes. We can understand the rules of nature's game, but the flexibility of the processes enables life to evolve with ever-changing conditions (Provenza, 2018). Rather than machine-like, fixed, and rigid, genes are expressed epigenetically, which enables plants and animals to change morphologically (form), physiologically (function), and behaviorally as social and biophysical environments change.

The ability to perceive the world differently is far more important than any scientific knowledge we appear to gain about the workings of soils, plants, animals, people, and the environments we inhabit. Each time we look more deeply at any "essential thing" it turns out to have some other feature of appearances, such that in the manifest we will never reach a "final essence" which is not also the appearance of something more. Manifold manifestations arise from the transcendent (**Figure 1**, Crown Chakra). As visionary physicist David Bohm put it (Horgan, 2018): "Anything known has to be determined by its limits. And that's not just quantitative but qualitative. The theory is this and not that. Now it's consistent to propose that there is the unlimited. You have to notice that if you say there is the unlimited, it cannot be different, because then the unlimited will limit the limited, by saying that the limited is not the unlimited, right? The unlimited must include the limited. We have to say, from the unlimited the limited arises, in a creative process."

We are thus coming to view science, not as a predictive oracle, but rather as a way to understand creative processes of nature and to monitor and assess policies implemented through consensus. Playing nature's game is about flexibility in the face of ever-changing environments. Flexibility is about taking small steps and keeping our eyes open. Consensus helps us choose where to walk. Science helps our eyes to open and focus. In that sense, the challenge is to understand principles, processes, and interrelationships. The opportunity is to meld science with the local knowledge of people making their livings on landscapes that are uniquely regenerating in time and space.

What will become of *Homo sapiens*? No one knows the answer to that question: an individual, a species, a universe—all are ever changing verses in the language of *I am*. But at this moment on this planet the question is not if life on Earth will continue. The question is if *Homo sapiens* can learn to live with respect for one another and the other inhabitants of this planet.

Human civilizations typically last 10 generations, roughly 250 years, as they evolve through five stages: pioneers, commerce, affluence, intellect, and decadence (Ophuls, 2012). Civilizations collapse due to combinations of factors that include exceeding biophysical limits, excessive complexity, and human errors that involve practical failures and moral decay. Historically, the consequences of a failed civilization were catastrophic for a particular society, but they were not fatal to *Homo sapiens* as a species. We now live in an interdependent, global civilization, in which the destinies of all peoples are intertwined socially economically, and ecologically.

The Maori term *Taiao* speaks to our linkages with the natural environment that surrounds us, encompassing the world and her offspring. Because we are born of the Earth, we have an eternal connection to *Taiao*, which is about forging nourishing relationships with one another and our mother as we find our way forward (Morishige et al., 2018). We are members of nature's community. What we do to them, we do to ourselves. By nurturing them, we nurture ourselves.

We nurture by declaring love—not war—on one another and the communities we inhabit. Yet, human societies declare war on anything that threatens constancy, from diseases and invasive species, to one another. As Campbell (1972) noted: "It is for an obvious reason far easier to name examples of mythologies of war than mythologies of peace; for not only has conflict between groups been normal to human experience, but there is also the cruel fact to be recognized that killing is the precondition of all living whatsoever: life lives on life, eats life, and would otherwise not exist. To some this terrible necessity is fundamentally unacceptable, and such people have, at times, brought forth mythologies of a way to perpetual peace. However, those have not been the people generally who have survived in what Darwin termed the universal struggle for existence. Rather, it has been those who have been reconciled to the nature of life on this earth. Plainly and simply: it has been the nations, tribes, and peoples bred to mythologies of war that have survived to communicate their life-supporting mythic lore to descendants."

That quest created nations that now inhabit this blue orb, floating in the eternal silence of space, as astronaut Rusty Schweickart expressed so poignantly (Senge, 1994, p. 368-371): "You look down there and you can't imagine how many borders and boundaries you crossed again and again and again. And you don't even see 'em. At that wake-up scene—the Mideast—you know there are hundreds of people killing each other over some imaginary line that you can't see. From where you see it, the thing is whole, and it's so beautiful. And you wish you could take one from each side in hand and say, 'Look at it from this perspective. Look at that. What's important?'... The size of it, the significance of it—it becomes both things, it becomes so small and so fragile, and such a precious little spot in the universe… and you realize that on that small spot, that little blue and white thing is everything that means anything to you. All of history and music, and poetry and art and war and death and birth and love, tears, joy, games, all of it is on that little spot out there…" (https://www.youtube.com/watch?reload=9&v=zmHrnKY6crE).

On the one hand, we miss the point if we believe that Eden comes after we die. Eden is right here, right now. Heaven and hell and all the gods are in us, not somewhere out in the cosmos (Campbell and Moyers, 1988; Moorjani, 2012). If we value this dimension of Eden, we must nurture this Garden, treat this dwelling and its inhabitants with love and respect. But if our love of money, power, and dominion continue to trump the power of love for one another and our mother (Reich, 2015; Mayer, 2017; Kimmerer, 2020), we will be expelled from the Garden. We will continue to plunder one another and our mother as long as our contrived views of socio-economic and ecological systems are based on scarcity, selfishness, greed, and competition, rather than abundance, selflessness, sharing, and cooperation. If we appreciate that we are the children of Earth, we may learn to thrive with one another and all life in the Garden.

On the other hand, as Smith (1991) reminds us with regard to Hindu beliefs: "All talk of social progress, of cleaning up the world, of creating the kingdom of heaven on Earth—in short all dreams of utopia—are not just doomed to disappointment; they misjudge the world's purpose, which is not to rival paradise but to provide a training ground for the human spirit." Likewise, as Campbell and Moyers (1988) put it succinctly: "When we talk about settling the world's problems, we're barking up the wrong tree. The world is perfect. It's a mess. It has always been a mess. We are not going to change it. Our job is to straighten out our own lives."

So, we must each make a choice: an eye for an eye, a tooth for a tooth or love your enemies. Do we want blind, toothless inhabitants of Earth or do we want to nurture one another and life on Earth? Do we want lives motivated merely by the needs and wants of the root, sacral, and solar plexus or do we seek as well a transformation at the heart chakra to loving kindness, awareness, and enlightenment? These issues have little to do with ecological and economic matters *per se*. Rather, the issue is transcending the "I am's" to heal divides that polarize and isolate us. The irony is if we work together to transcend the boundaries we create, we will address "the really big issues" by nurturing the creativity and diversity needed to overcome the challenges we now face. And though we could continue to declare war on life, as we have done, we could instead declare love on one another through the foodscapes, landscapes, heartscapes, and thoughtscapes we choose to inhabit. Time will tell which alternative we choose and how the choices we make will emerge as we participate in co-creating with (or without) one another and our mother.

AUTHOR CONTRIBUTIONS

FP wrote the manuscript. CA and PG contributed valuable input throughout the process. All authors contributed to the article and approved the submitted version.

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