Psychedelics and Environmental Virtues

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Abstract

The urgent need for solutions to critical environmental challenges is well attested, but often environmental problems are understood as fundamentally collective action problems. However, to solve to these problems, there is also a need to change individual behavior. Hence, there is a pressing need to inculcate in individuals the environmental virtues — virtues of character that relate to our environmental place in the world. We propose a way of meeting this need, by the judicious, safe, and controlled administration of "classic" psychedelic drugs as a way to catalyze the development of environmental virtues – a form of moral bio-enhancement. Recent evidence shows that psychedelics can be given safely in controlled environments, and can induce vivid experiences of unity and connectedness. These experiences, in turn, can durably increase feelings of nature-relatedness and pro-environmental behaviors. Therefore, we argue that responsible psychedelic use can reliably catalyze the development of a key environmental virtue known as *living in place*. This is a "master environmental virtue" that subsumes the qualities of respect for nature, proper humility, and aesthetic wonder and awe. Our account advances the environmental virtues debate by introducing a relevant practical proposal, and advances the psychedelic moral enhancement debate by providing a much-needed conceptual framework.

Keywords*:* Psychedelics, environmental virtues, moral enhancement, virtue ethics, environmental ethics, psilocybin

"It's extraordinary that the plant world might be offering us an antidote to the flight from nature. These plants call us back to nature, and nothing seems more valuable right now than something with that power."

- Michael Pollan

1. Introduction

It is widely recognized that there is an increasingly urgent need for solutions to critical environmental challenges. Often, such challenges are understood as essentially collective action problems; however, we ignore the role of individual behavior at our peril. In relation to collective actors such as corporations and states, the question seems to be one of environmental policy and regulation; but in relation to individuals, the motivation for taking environmental responsibility might best be promoted by the development of an environmental consciousness and ethics. If this is correct, then the question arises: how might this be done in a reliable, responsible, and philosophically sound manner?

In this paper we argue that there exists a safe and effective method for rapidly catalyzing the development of such an environmental consciousness and ethics in individuals: namely, the controlled and intentional administration of classic psychedelic substances such as LSD and psilocybin. Recent empirical evidence suggests that a single moderate-to-high dose psychedelic experience can durably elevate feelings of nature-relatedness, a strong predictor of pro-environmental behaviors. We offer an interpretation of this phenomenon in terms of the framework of environmental virtue ethics, and propose that transformative psychedelic experiences can facilitate the acquisition of a "master" environmental virtue known as *living in place* (Kirkham 2016). The intellectual pay-off of this argument is twofold: for those

working in the tradition of environmental virtue ethics, it draws attention to a uniquely relevant biotechnological intervention, and for those interested in the moral enhancement potential of psychedelics, it provides a conceptual framework for thinking about psychedelics' best-established effects on morally relevant attitudes and behaviors.

The structure of the paper is as follows. In section 2 we set out the case for moral bio-enhancement and environmental virtue ethics. In section 3 we review relevant evidence about the safety and transformative effects of psychedelics. In section 4 we argue that psychedelic experiences can catalyze the acquisition of the virtue of living in place. In section 5 we consider some possible objections to our account. Finally, in section 6 we summaries the discussion and comment briefly on policy implications.

2. Moral Bioenhancement and Environmental Virtues

The immediacy of the need for solutions to our most critical environmental challenges—climate change, plastic pollution, habitat destruction, and so on—is well attested. But often environmental problems are understood as essentially collective action problems. As such, they tend to be attributed either to the insufficiently regulated behavior of large-scale corporations or states (Mark et al. 2000, Ritchey 1990) or to some kind of practical or conceptual disconnection between humans and nature (Jordan and Kristjánsson 2017). Viewed in the first light, environmental problems tend to attract solutions that focus on co-operative transnational regulation, such as the creation and implementation of international treaties and protocols[2] or,

[2] The Montreal Protocol on Ozone Depleting Substances is the gold standard of this kind of approach: a transnational accord which was willingly signed by many of the nations of the world, and which was followed by timely and effective action to reduce the use of CFCs and put a stop to the depletion of the ozone layer. It is perhaps otiose to point out that an outcome like this has been the exception in international environmental agreements, and for good reason. The use of ozone depleting substances was limited to a bounded class of

more radically, the abolition of the free market altogether. Viewed in the second light, proposed solutions tend to involve an expansion of our ethical frameworks to include the natural world (Brennan 1984, Hursthouse 2006) or, more radically, some kind of cultural or ethical revolution (Taylor 1986).

Regardless of whether we endorse any or all of these proposed solutions, it is clear that a large number of environmental issues are caused, at least partly, by both corporations and individuals externalizing the environmental costs of their activities, while maximizing the benefits available from them. Thus, perhaps the most urgently needed intervention is some way of motivating both individuals and corporations to take responsibility for the environmental costs of their activities. In relation to corporations, the question seems to be one of environmental policy and regulation—but in relation to individuals, the motivation for taking environmental responsibility might best be promoted by the development of an environmental consciousness and ethics. There is empirical evidence for this contention, which we will revisit later in the paper: subjective feelings of relatedness to nature predict engagement in pro-environmental behaviors (Kettner et al. 2019). Developing an environmental consciousness and ethics can help to moderate individual choices and actions, which in turn plays an important role in our ability to get traction on environmental problems—from a harm-reduction perspective, by reducing demand for environmentally damaging goods and practices and supporting pro-environmental behaviors, and from a socio-political perspective, by encouraging political decisions that will facilitate greater action on environmental issues (Mark et al. 2000, Ritchey 1990).

industries and by the time the agreement was made, there had already been a move away from CFCs in those industries.

But promoting the development of environmental consciousness and ethics is not so simple. Our modern way of life presents particular challenges for humans, both cognitive and moral. Unprecedented advancements in technology, and social, political and environmental issues of global consequence, have created uniquely morally demanding circumstances for humans both individually and collectively (Ahlskog 2017, Earp, 2018, Ballesteros 2019, Brace 2020). Persson and Savulescu go so far as to suggest that our modern political and technological situation greatly increases the risk of some "Ultimate Harm" or existential threat to human life as we know it (2013, p. 127). The salient feature of purported existential threats to human life—climate change, antibiotic resistance, and so on—is that they tend to be intimately connected to collective action problems. Effectively countering existential threats requires motivating individuals to act in collectively beneficial ways, and perhaps broadening the notion of "collective good" beyond the human race (Jordan and Kristjánsson 2017, Pustovrh and McCollister Pirc 2016, Sandler 2007). But the prospect of existential threat creates unprecedented ethical demands that are difficult to respond to given our social, political, technological, and environmental circumstances. Our political institutions are not designed for complex, globalized collective action problems and the apparent intractability of these problems can leave individuals feeling disempowered and apathetic. Furthermore, for many people, our resource-intensive, highly urbanized modern lifestyles impede connection to the natural world and the environmental impacts of our day-to-day choices. It is very difficult to develop a sense of relatedness to nature, a sense of wonder at the beauty of the natural world, and an appreciation of the need for humility in the face of the vastness of the universe, when we cannot even see the stars in the night sky or find a place to plant a seed and watch it grow. The situation that demands the development of environmental consciousness and ethics is the very situation that impedes its development.

Therefore, promoting the necessary pro-social and pro-environmental behaviors presents a particular challenge. Moreover, this is an urgent challenge, not one we can defer or allow to develop over time through increased awareness and moral education. In response to this pressing need for the development of environmental consciousness, and in light of the many advances in technologies such as embryo selection and germ-line genetic manipulation, the potential for *human enhancement* has attracted attention from bioethicists. Alongside discussions about the ethical status of cognitive enhancement, some philosophers have made a case for *moral* enhancement. This case is not especially complex: it seems almost truistic to argue that if people were better, then the world would be a better place, so if we want to make the world a better place, then we should support the moral enhancement of human beings. Given the moral challenges that we face as a species, if there were a way that we could safely and reliably enhance the human capacities to feel related to the natural world and to act responsibly toward it, there would *prima facie* be excellent reasons to do it. This raises the question: what would human moral enhancement look like, and how might it work?

The concept of moral enhancement has been understood in various ways, and no universal consensus has emerged. In an influential paper Douglas defines moral enhancements as enhancements that "expectably leave the enhanced person with morally better motives than she had previously" (2008, p. 228). However, in our view an exclusive focus on motives presupposes an overly narrow conception of the moral domain. Here we adopt, instead, the characterization of *agential moral neuroenhancement* (or equivalently, as he says, *agential moral bioenhancement*) formulated by Earp in his recent discussion of psychedelics:

> Any change in a moral agent – effected or facilitated in some significant way by the application of a neurotechnology [i.e., a technology that works directly on the CNS] –

> that results, or is reasonably expected to result, in the agent being a morally better (i.e., more moral) agent.
>
> (2018, p. 422).

We share Earp's general understanding of moral enhancement as enhancement to "the moral character of humanity" (*op. cit.*, p. 415). This broad characterization allows us to explore the possibility of moral enhancement within a virtue-ethical framework, rather than prematurely foreclosing the moral options available to the enhancement proponent.

In this light, the answer to our question above has two intimately related aspects. The first concerns the kind of moral framework that is best suited to respond to the complexity of the environmental challenges that we face. The second concerns the kinds of moral enhancements that might actually be feasible to induce in human beings. This is where virtue ethics and psychedelics come together.

Firstly, it is important to recognize that promoting pro-social and pro-environmental behavior through some kind of moral enhancement, is not merely (and, perhaps, not primarily) a matter of improving people's moral reasoning, awareness of ethical issues, or ability to undertake utility calculations. It also necessarily involves inculcating morally good psychological and behavioral orientations towards the environment or the natural world. Reflection on the particular challenges that we face in the interface between rapid technological advancement and growing environmental degradation suggests the need for a more holistic approach to the understanding of relevant ethical competencies. One framework that can make important contributions here, in our view, is *virtue ethics*. Virtue ethics is an approach to normative ethics that identifies the primary locus of moral evaluation as the individual and the development of

her character, rather than individual acts, act-types, or the consequences of acts. This approach has the potential to reframe our thinking about technological advancement and humans' relationship with their environment. Virtue ethics, with its focus on what sort of persons we should be and how we should live, brings together issues in environmental ethics and bioethics by attempting to determine the proper orientation that humans should have towards technology and the lifeworld (Jordan and Kristjánsson 2017). It also provides a rich framework for discussing human flourishing in the context of a complicated ecosystem, rather than simply prescribing right or wrong actions within human society narrowly conceived (Hursthouse 2012, Jordan and Kristjansson 2017). Thus, virtue ethics is, perhaps, the ideal moral framework in which to tackle ethical issues concerning environmental behavior and existential threat. Furthermore, virtue ethicists have recently turned their attention to virtues involved in human relationships to the environment, rather than in individuals' relationships to society. As such, there now exists a rich philosophical literature articulating and explicating the environmental virtues (Cafaro and Sandler 2005, Hursthouse 2006, Sandler 2007, Swanton 2010, Kirkham 2016).

Not only is virtue ethics a promising framework for thinking about environmental ethics, but it also seems to fit especially well with one of the most promising techniques of "moral bioenhancement": namely, the judicious, safe, and controlled application of psychedelics (Earp 2018). Any given virtue is standardly understood by virtue ethicists as being a "complex unity of dispositions to act and feel for certain sorts of reasons, and to see and respond to things in certain sorts of ways" (Hursthouse 2006, 160). These ways of seeing and responding must be ways that we *can* be, given the facts about human nature. The complex unity of characteristics and dispositions that constitutes a virtue must be something that we could recognize a preliminary version of in our children and, thus, develop, expand upon, and correct, as part of

their moral education. (*ibid*., p. 160). All of these general facts about how virtues are characterized and understood are consistent with the kinds of transformative changes in fundamental orientation and worldview that have been reported from scientific studies of psychedelic administration, to which we will turn shortly.

First, however, which specific environmental virtue might be a target for moral bio-enhancement using psychedelics? Here we draw on work in environmental virtue ethics by Kirkham (2016), who develops a characterization of a "master" environmental virtue that she calls *living in place*. Kirkham argues that in order to specify such an environmental and technological virtue, we must ask: what complex unity of characteristics and dispositions might dispose us to behave towards technology and the environment in a way characterized by humility and an appreciation of our place in the world? She argues that an understanding of the virtue of *humility* as it applies to the environment can form the basis for a master environmental virtue. Humility *qua* environmental virtue involves our accepting that humans have the responsibility to regulate our modifications of our environment and not to overestimate our capacity to reshape the world in any way we choose (Hursthouse 2006, p. 168). Environmental humility, then, can be characterized broadly as a proper degree of *self-knowledge*, or understanding of one's place in the world, including the limits to one's capacity for prediction and control through technological, or other, means. Drawing further on Hursthouse's discussion of "aesthetic wonder" and "respect for nature" as possible environmental virtues, Kirkham argues that if we can give a proper specification of what we mean by environmental and technological humility, it is likely to involve wonder and aesthetic appreciation, and certainly will entail something akin to "respect for nature" (Hursthouse 2006, Kirkham 2016). In this way, living in place *qua* environmental master virtue depends on our acknowledging that, as humans, we are fundamentally, and constantly, in an active and transformative

relationship to our environment, where we are responsible for regulating our modifications of the environment with a balanced estimation of our capacity to reshape the world, and our ability to predict the outcomes of our technological endeavors. So, living in place —the central virtue that relates to the relationship between humans and the environment—is a combination of the dispositions for environmental humility, aesthetic wonder, and respect for nature and, perhaps, some others – that is, essentially, it will be the virtue of being rightly disposed towards nature and technology. The environmentally virtuous person will be disposed to be properly related to nature through the experience of a sense of awe at its vastness and magnificence, wonder at its workings, respect for its living and non-living elements, and aesthetic appreciation of the diversity of its beauty.

Having argued for the relevance of virtue ethics to questions about moral enhancement and environmental ethics, we turn now to recent empirical evidence concerning the transformative effects of psychedelic drugs.

3. Transformative Effects of Psychedelics

The term "psychedelic" has been applied to many different drugs that reliably cause dramatic changes to conscious experience. Here we are concerned solely with the so-called "classic", serotonergic psychedelics, which alter consciousness primarily via their agonist action at the serotonin-2a (5-HT2A) receptor (Nichols 2016). The most common examples are LSD (lysergic acid diethylamide), mescaline, psilocybin, and DMT (N,N-dimethyltryptamine). In line with increasingly common scientific practice, we will use the term "psychedelic" exclusively for substances of this class.

Many psychedelics occur naturally in various plants, animals, and fungi, and have long histories of religious and medicinal use (Sessa 2012, Miller et al. 2019). Psychedelics first gained widespread attention in the Western world in the 1950s and 60s, following Albert Hoffman's discovery of the extremely potent semi-synthetic LSD (Hofmann 1980). Early researchers noted a similarity between some aspects of psychedelic experience and some symptoms of psychosis. This led to a research program studying these "psychotomimetic" substances, and their mechanisms of action, for clues about the biochemistry and genesis of mental illness (Osmond, 1957).

However, other investigators noted that some psychedelic experiences resembled mystical or religious experiences, rather than stereotypically psychotic episodes. Subjects administered high doses in supportive environments often reported dramatic insights and new perspectives, powerful emotional experiences, and feelings of union with the divine. Some reported positive behavioral changes or transformations of personality after a single experience. Observations of this kind prompted two further research programs: one studying these "mysticomimetic" substances for clues about the nature of religion and religious experience (Smith 1964), and another investigating their therapeutic potential in the treatment of psychiatric distress (Sandison and Spencer 1954, Grof 1975). Methodological problems were common in early clinical research on psychedelics. However, a recent meta-analysis of six randomized controlled trials from this era found that a single high-dose LSD treatment was effective in reducing symptoms of alcohol addiction (Krebs and Johansen 2012).

The heyday of psychedelic research was curtailed by developments stemming from the mysticomimetic paradigm. Intellectuals such as Aldous Huxley (1954) and Alan Watts (1960) argued that psychedelics could induce the same states of consciousness aimed at by Buddhist

and Hindu meditation practices. Following in their footsteps, Timothy Leary and Richard Alpert (later known as Ram Dass) promoted the use of LSD as a spiritual sacrament capable of fomenting a revolution of consciousness within the individual and a concomitant revolution of values within American society (Leary et al. 1964, Dyck, 2010). Amid the growing association of psychedelic use with anti-establishment activism, and ostensible safety concerns about uncontrolled use, psychedelics were prohibited. Scientific study of their effects on humans virtually ceased for some decades.

Since the 1990s, in a changed socio-political climate, human psychedelic research has slowly but steadily resumed. This "psychedelic renaissance" (Sessa 2012) has been aided by the many methodological, technological and theoretical developments that have occurred in the mind and brain sciences since the 1970s. The results to date are intriguing. First, and most importantly, it has been shown that controlled psychedelic administration has an excellent safety profile when strict guidelines are followed (Johnson et al. 2008). In the new wave of research, hundreds, if not thousands, of volunteers from various populations have been administered psilocybin, LSD, and DMT (sometimes as an ingredient of the South American beverage *ayahuasca*) without serious, lasting adverse effects (Ross et al. 2016, Aday et al. 2020). Several studies have also shown that members of religious groups who use psychedelics ceremonially have good physical and mental health relative to the broader population (e.g. Halpern et al. 2005, Barbosa et al. 2016, Ona et al., 2019).

Meanwhile, key tenets of the mysticomimetic and psychotherapeutic paradigms have received experimental vindication. In healthy volunteers and certain classes of psychiatric patients, psychedelics can induce *mystical-type experiences*, as defined by widely used psychometric questionnaires (MacLean et al. 2012, Barrett et al. 2015, Studerus et al. 2010). These

experiences feature feelings of unity, transcendence of time and space, and a "noetic" sense of gaining direct knowledge about ultimate reality. Phenomenologically, they seem to be indistinguishable from mystical experiences that occur spontaneously or as a result of spiritual practice (Griffiths et al. 2006, 2008, 2011, Liechti et al. 2017). Remarkably, one or two such experiences can have measurable psychological effects lasting for months or even years, including reductions in anxiety, depression, and addiction (Aday et al. 2020) and changes in personality dimensions such as "Openness to Experience" (MacLean et al. 2011).

It is this potential for lasting psychological change resulting from one or two discrete experiences that is most relevant to our concerns. As we noted earlier, psychedelics are used in ritual contexts by various religious groups, which suggests a role in regulating cognition and behavior. Positive psychological and behavioral changes resulting from psychedelic experience have been reported for decades. One obvious example would be the cessation or reduction of alcohol consumption by alcoholics following a single LSD session (Krebs and Johansen *op. cit.*). But other behavioral changes have been reported too, including increases in prosocial or altruistic behavior (Gandy 2019).

It is important to appreciate that psychedelics' effects on consciousness are highly variable: They depend not just on the dosage, but also on the psychological state of the individual and the environment in which they are administered ("set and setting"). Even in supportive clinical settings, mystical-type experiences do not always result. But when such experiences do occur, they can act as catalysts for profound psychological restructuring and behavioral changes. One hallmark of the mystical-type experience is the sense of *unity*, or connectedness. Subjects report profound feelings of connection to their bodies and senses, to forgotten aspects of their own personalities, to other people, to humanity at large, and—importantly—to the natural

world (Watts et al. 2017). In one study, healthy volunteers who underwent such an experience reported lasting increases in altruism and prosocial behavior, which were verified by community observers (Griffiths et al. 2011).

The corollary of the sense of connectedness is a temporary disintegration of the ordinary sense of self, which has been posited to have various possible benefits. Often subjects report an experience of boundless or universal love, which may or may not be interpreted in religious terms (Malone et al. 2018). Several studies have shown that psychedelic experiences can lead to lasting increases in "mindfulness-related capacities" for taking a flexible, open, non-reactive attentional stance toward one's own thoughts and feelings (Soler et al. 2016, 2018, Sampedro et al. 2017, Mian et al. 2019, Uthaug et al. 2019, 2020). These are some of the same capacities cultivated in mindfulness meditation, vindicating the basic intuitions of pioneers such as Huxley, Watts, and Leary (cf. Letheby forthcoming). Such capacities are traditionally held to play an essential role in supporting ethical behavior, which strengthens the case that careful psychedelic administration might play a role in "moral enhancement" interventions (Earp, 2018).

At the present, the case for psychedelic-assisted moral enhancement is largely circumstantial and awaits rigorous experimental test (Tennison 2012, Ahlskog 2017, Millière et al. 2018). One recent study found that psychedelic experiences were correlated with decreased narcissistic tendencies, which bolsters the circumstantial case (van Mulukom et al. 2020). However, the strongest, most direct evidence that we are aware of concerns the domain that interests us here: the sense of connection to the natural world and related behaviors towards it.

Since the early research of the 1960s, subjects have reported that transcendent psychedelic experiences had lasting positive effects on their relationship to the natural world (Masters and Houston 1966). Indeed, some have argued that widespread psychedelic use in the 60s contributed to the birth of the modern environmental movement (Luke 2013). More recently, Dr Gail Bradbrook, the founder of the influential Extinction Rebellion movement, has openly acknowledged that her decision to found this movement was influenced by psychedelic experiences (Mackintosh 2019). The capacity of psychedelics to durably increase feelings of connection to the natural world is attested by participants in recent clinical trials, even when the substances have been administered in an indoor setting with no explicit intention to increase such feelings. A small Swiss study examined the potential of LSD administration to alleviate anxiety in patients with a terminal illness. One patient commented:

> It was less about my illness. I was able to put it into perspective. … Not to see oneself with one's sickness as center… Your Inner Ego gets diminished, I believe, and you are looking at the whole … you are indeed starting to build relations with plants or with the entire living world around. You think less about yourself, you are thinking – across borders
>
> (Gasser et al. 2015, p. 62).

In a similar vein, a patient who participated in an ayahuasca retreat for the treatment of addiction reported:

> A week or two after [the retreat] I was just waking up every morning at like five, six in the morning and going outside and . . . I just sat and stared at the trees and the wind for like two hours, I would sit outside and it was just beautiful. I've never noticed it that

> much ever in my life. And after I had the ayahuasca it was just amazing, the connection with nature
>
> (Thomas et al. 2013, p. 38).

Finally, a patient who received psilocybin with psychological support for treatment-resistant depression had this to say: "Before I enjoyed nature, now I feel part of it. Before I was looking at it as a thing, like TV or a painting. You're part of it, there's no separation or distinction, you *are* it." (Watts et al. 2017, p. 534; emphasis original). Interestingly, the researchers who reported this finding commented: "When describing their depression, the patients had not spontaneously referred to feeling disconnected from nature. It seems rather they had not realized that they were missing it/disconnected from it until reminded of its value during and after their experience with psilocybin." (*ibid.*)

The evidence that psychedelics can durably change individuals' attitudes and behavior toward the natural environment is not limited to qualitative reports. A small but suggestive set of quantitative findings speaks to this point too. In the patients who received psilocybin for treatment-resistant depression, a standard measure of nature-relatedness was significantly increased for 12 months after the psilocybin experience (Lyons and Carhart-Harris 2018). A cross-sectional survey study found that lifetime use of psychedelics, but not of other drugs, was associated with greater levels of nature-relatedness; moreover, the degree of nature-relatedness was positively correlated with the extent of "ego dissolution" during respondents' most intense psychedelic experience (Nour et al. 2017).

One might wonder whether high levels of nature-relatedness translate into behavioral outcomes. An affirmative answer is suggested by another cross-sectional survey study, in

which lifetime experience with psychedelics was positively correlated with self-reported environmental behaviors such as saving water and recycling; moreover, the relationship between psychedelic use and increases in these behaviors was "was statistically explained by people's degree of self-identification with nature" (Forstmann and Sagioglou 2017). Finally, in a prospective online survey study, Kettner et al. (2019) administered various psychometric measures to subjects who were independently planning to undergo a psychedelic experience. Subjects answered questionnaires one week before, and at various points up to two years after, their psychedelic experience. In line with other findings, lifetime psychedelic experience was positively correlated with respondents' degree of nature-relatedness at baseline (i.e. before their experience). Moreover, nature relatedness was significantly increased for two years after the psychedelic experience; the degree of increase correlated both with the extent of ego dissolution and with the perceived influence of natural surroundings during the psychedelic experience. While Kettner et al. did not administer measures of environmental behavior, they review evidence suggesting that nature relatedness is "a strong predictor of pro-environmental awareness, attitudes, and behavior… outperforming all other variables tested as a single construct" (*ibid.*, p. 65).

These findings clearly require replication. However, there is sufficient evidence, both quantitative and qualitative, to take seriously the idea that a single psychedelic experience could reliably and durably increase subjective feelings of connection and identification with the natural world, and thereby durably increase pro-environmental behaviors. This evidence is central to our argument in this paper.

4. Psychedelics can Promote Living in Place

Our central thesis, supported tentatively by the evidence reviewed above, is this: In conducive circumstances, psychedelics can reliably induce experiences which catalyze the development of key environmental virtues, such as Kirkham's (2016) *living in place*. Living in place subsumes the qualities of respect for nature, proper humility, and aesthetic wonder and awe, all of which have been discussed in the environmental virtue ethics literature (Taylor 1986, Hill 1983, Hursthouse 2006). Neither virtues nor their constituents can be defined precisely in terms of necessary and sufficient conditions, but Rosalind Hursthouse gives the following examples of behaviors that we might teach children by way of inculcating the virtue of respect for nature: "not to slash mindlessly at spiders' webs, to look at fossils carefully and try to understand their shape, to be glad rather than sorry that the Grand Canyon is not rimmed with machines dispensing Coca-Cola…" (2006, p. 167). We can see clear similarities with the construct of nature relatedness, which measures the extent to which people "take notice of wildlife wherever [they are]", "think about how [their] actions affect the environment", and "feel very connected to all living things and the Earth" (Nisbet and Zelenski 2013). As such, it seems plausible to us that a durable increase in nature-relatedness (of the kind that psychedelics catalyze) is partially constitutive of a durable increase in the virtue of respect for nature. This is exemplified by psychedelic experience reports of the following kind:

> 'The psychedelic experiences that I have had gave me a greater awareness that I am part of my environment in a type of symbiosis. That I am not separate.' …

> [Another participant] reported: 'I rediscovered the love for nature and how we are part of an extremely complex system, I regained curiosity on knowing how the physical world works and gained an understanding of the interconnectedness of everything.'…
>
> [Another participant] reported: 'Feeling connected with nature under an LSD trip has instilled a greater sense of personal responsibility toward the earth.'
> (Amada et al. 2020, p. 22).

Similar remarks apply to the other constituents of living in place: proper humility and aesthetic wonder and awe. Steven Vogel describes proper humility as the willingness and ability to recognize that in our dealings with the environment, "all our plans depend on nature and never escape from it" (Vogel 2003, p. 168)—that human beings can never fully control or dominate our environment, and never completely predict the consequences of our actions. In essence, proper humility involves both the recognition that our power over nature is limited and behaviors that proceed from that recognition. Again, the correspondence with nature-relatedness is clear: people high in nature-relatedness tend to disagree that humans "have the right to use natural resources any way we want", and that conservation is "unnecessary because nature is strong enough to recover from any human impact", and to agree that the "state of non-human species is an indicator of the future for humans" (Nisbet and Zelenski *op. cit.*). Something like this attitude is expressed by the Swiss chemist Albert Hofmann, who discovered LSD, in reflections on his own experiences with the drug:

> 'Through my LSD experience and my new picture of reality, I became aware of the wonder of creation, the magnificence of nature and of the animal and plant kingdom,'

> Dr. Hofmann told the psychiatrist Stanislav Grof during an interview in 1984. 'I became very sensitive to what will happen to all this and all of us.'
>
> (Smith 2008).

Interestingly, none of the items on the NR-6 corresponds directly to aesthetic wonder and awe (Nisbet and Zelenski *op. cit.*), so the case that psychedelic promotion of nature-relatedness incorporates this virtue constituent is circumstantial at this point. However, the circumstantial case is strong. Multiple studies have found that a single psychedelic experience can durably increase the personality trait Openness to Experience in healthy volunteers (Aday et al. 2020) and Openness incorporates propensities for aesthetic appreciation, including of the natural world (Silvia et al. 2015). Quantitative evidence shows that awe is a component of acute psychedelic experiences, and, indeed, predicts decreases in maladaptive narcissistic tendencies (van Mulukom et al. 2020). This finding is especially intriguing in light of a reported negative correlation between nature-relatedness and the "Dark Triad" personality traits of narcissism, psychopathy, and Machiavellianism (Fido et al. 2020). Finally, qualitative research shows that aesthetic wonder and awe in relation to nature are increased, in at least some cases, by psychedelic use:

> Yesterday was kinda cloudy and a little overcast, and I was driving home and there was this one small patch of clouds that was lit up bright by the sun, and it was all surrounded by these dark clouds. And I was like, 'that's amazing'… And then I caught that, because prior to the psilocybin I probably would never have noticed that. But, I'm always on the lookout for those kinds of things.
>
> (Noorani et al. 2018, p. 763).

Importantly, we are not making the implausible claim that a single psychedelic experience can leave immediately in its wake the full-blown possession of a complete virtue of living in place. Rather, our claim is that experiences of this kind tend often to catalyze a lengthy process in which the cognitive, affective, and behavioral constituents of this virtue begin to be developed and consolidated.

How does this work? The transformative mechanisms of psychedelic experience are incompletely understood, but we can make some informed conjectures. Clinicians and researchers agree on the importance of the post-session "integration" phase, in which insights and realizations from the experience are revisited and processed by the subject (Richards 2017). Recent theoretical work suggests that psychedelics induce a transient period of heightened neural and cognitive plasticity, and simultaneously expose subjects to new and different ways of modelling the self and its world (Carhart-Harris and Friston 2019, Letheby and Gerrans 2017). The resultant process has been likened to a kind of "inverse PTSD [post-traumatic stress disorder]" (Garcia-Romeu et al. 2014) in which a discrete, emotionally intense episode prompts repeated recollection, leading to profound psychological restructuring—in this case, for the better. This is essentially what we think occurs with the environmental virtue of living in place. During the psychedelic state, subjects experience a different way of understanding and experiencing their own existence in relation to the natural world, and the overwhelming intensity and positive valence of this experience leads them repeatedly to revisit these new ways of seeing, causing durable changes in perception, cognition, and behavior. (Notably, this is highly consistent with classical philosophical accounts of virtue cultivation.) The evidence reviewed above suggests that increased *identification* with nature resulting from a temporary weakening of ego boundaries is the most important psychological factor, though more research on this point is required.

In sum, our claim, which results from interpreting recent empirical evidence through the conceptual framework of environmental virtue ethics, is as follows: careful, controlled psychedelic administration can reliably induce experiences involving a profound sense of connectedness to the natural world, thereby catalyzing a process of developing the "master environmental virtue" of living in place, whose constituents include respect for nature, proper humility, and aesthetic wonder and awe.

5. Objections and Replies

In this section we consider some possible objections to our account. First, it might be questioned whether this kind of approach to our pressing environmental challenges is a high priority. As mentioned above, many would argue that what is more urgently needed is transnational cooperation and legislation on matters like climate change and pollution—in short, that the necessary solutions to the accelerating ecological crisis are regulatory and systemic, not individual and psychological.

In response, it is important to emphasize that we are not proposing psychedelic-facilitated environmental virtue cultivation as a panacea, but as one part of a multi-pronged solution. Further, the literature on collective action problems such as climate change recognizes that changes to individual attitudes and behavior are essential in facilitating broad-based responses to problems of this kind (Schwenkenbecher 2014). It is well established that to facilitate significant social and ethical change in attitudes and behaviors, the existence of "norm entrepreneurs" (Sunstein 1996, p. 909) can be pivotal. This suggests that one should not underestimate the potential macro-level effects of powerful psychological, behavioral, and

above all ethical interventions at the individual level. This principle is illustrated by Gail Bradbrook, founder of the enormously influential Extinction Rebellion movement, who, as we mentioned, attributes her decision to found the movement to her own psychedelic experiences, *inter alia* (Mackintosh 2019). As we argued in the first section of the paper, interventions at the individual level, *in addition to* more macroscopic and systemic change, are necessary if we as a species are to confront the rapidly accelerating ecological crisis effectively.

A second worry is that perhaps our argument presupposes the correctness of virtue ethics as a moral theory, and thus is of limited relevance to anyone but convinced virtue ethicists. Is there anything here that consequentialists, deontologists, and others ought to care about? One response is that one need not think that character is the sole locus of moral evaluation in order to think that the development of virtues is important. Those who develop good character are more likely, *ceteris paribus*, to promote good outcomes and treat others (including non-human others) as ends in themselves (Jamieson 2007). Our claim that psychedelic experiences can promote environmental virtues, which constitutively include propensities for pro-environmental behaviors, ought to be of interest to anyone who is concerned with environmental ethics, and, in particular, with the role that individual psychological and behavioral interventions have to play in collective action problems.

A third objection is familiar from existing discussions of pharmacological enhancement: it alleges that improving moral character or well-being with drugs carries some intrinsic disvalue; bluntly, that becoming more ethical by taking drugs is cheating. Klerman has argued that objections of this kind are often rooted in *pharmacological Calvinism*: a view that involves "a general distrust of drugs used for nontherapeutic purposes and a conviction that if a drug 'makes you feel good, it must be morally bad'" (Klerman 1972, p. 3). While we do not promote

indiscriminate use of psychoactive substances, and recognize that their use raises ethical and safety issues, we reject pharmacological Calvinism: in our view, there is no compelling reason for thinking that non-therapeutic drug use invariably and *as such* carries some ethical disvalue. Indeed, evidence concerning the long history of ritualized medicinal and sacramental drug use, and concerning the salutary effects of psychedelics when used with appropriate safeguards, significantly undermines the pharmacological Calvinist outlook.

We also suspect that this objection rests, in part, on an empirically false conception of the mechanism whereby psychedelic administration can transform personality and behavior. A 2003 report published by the President's Council on Bioethics expresses a concern about non-therapeutic drug use that is similar in spirit to the pharmacological Calvinist worry, but is founded on a specific mechanistic-cum-phenomenological picture of how such use actually operates:

> …biotechnical interventions act directly on the human body and mind to bring about their effects on a passive subject, who plays little or no role at all. He can at best *feel* their effects without *understanding their meaning in human terms*. Thus, a drug that brightened our mood would alter us without our understanding how and why it did so…'
>
> (President's Council on Bioethics 2003, p. 290; our emphasis).

Letheby (2015) has argued that, while this picture *may* characterize the mood- and personality-altering action of drugs such as selective serotonin reuptake inhibitors (SSRIs), it is not an accurate picture of how psychedelics cause lasting psychological benefits (cf. Earp et al. 2018). Far from "re-wiring" personality from the outside via experience-independent neurobiological

pathways, psychedelics act as catalysts for a variety of altered states of consciousness; in these states and their aftermath, subjects engage in a meaningful process of learning and personal growth (Richards 2017). This picture is supported by ample qualitative research on the therapeutic use of psychedelics suggesting that patients conceptualize psychedelic-assisted therapy as a profoundly meaningful and conscious process of transformation (Breeksema et al. 2020). This understanding of the mechanism whereby psychedelic experiences produce changes in behavior over a longer period is consistent with the virtue-ethical picture of the development of character and the cultivation of virtues.

A fourth objection is one that was used to motivate the widespread prohibition of psychedelics in the 1960s: that these drugs are simply too dangerous to be administered safely. While we acknowledge that careless and uncontrolled use of psychedelics can carry significant psychological risks, we emphasize that our argument solely concerns the careful use of these substances in controlled environments such as clinical trials and tried-and-tested religious ceremonies. When it comes to the safety profile of responsible psychedelic administration in modern clinical conditions, the track record of the recent wave of research speaks volumes: since the 1990s, over 2000 doses of psilocybin have been administered to carefully screened and prepared volunteers from multiple populations without any significant, lasting adverse effects (Ross et al. 2016, p. 1176). According to an important review of safety guidelines, psychedelics

> possess relatively low physiological toxicity, and have not been shown to result in organ damage or neuropsychological deficits… there is no evidence of… potential neurotoxic effects with the prototypical classical hallucinogens…

> Participants and review committees may be concerned that LSD or other hallucinogens are associated with chromosomal damage. These concerns stem from an anti-LSD media campaign by the USA government in the late 1960s… However, many follow-up investigations soon squarely refuted the hypothesis that LSD use in humans was a significant risk for chromosomal damage or carcinogenic, mutagenic or teratogenic effects…
>
> (Johnson et al. 2008, pp. 606-607).

Meanwhile, an oft-cited multicriteria decision analysis ranked psychedelics among the least harmful of 20 commonly used recreational drugs, taking into account multiple types of harm to the individual, to the others, and to society (Nutt et al. 2010).

A fifth and final worry is that the extant evidence is insufficient to justify our claim that psychedelic experiences can catalyze environmental virtue development. In response, we acknowledge that the existing evidence does not establish our thesis definitively. However, this evidence is highly suggestive; in our view, it warrants tentative acceptance, and further empirical investigation, of our hypothesis. The hypothesis certainly coheres well with the increasingly large body of evidence showing that psychedelics can produce durable positive psychological changes of myriad kinds in both healthy subjects and psychiatric patients—specifically by inducing experiences of ego dissolution and interconnectedness.

It is important to note that our hypothesis is not that moderate-to-high-dose psychedelic administration, in conducive contexts, leads inevitably to mystical-type experiences that catalyse virtue cultivation. Even under the most favourable conditions, not all subjects who undergo controlled psychedelic sessions report experiences of this kind. Clearly this needs to

be factored into any rigorous cost-benefit analysis of the putative enhancement practice under discussion. (We return to policy implications shortly.) However, there are a couple of points worth noting. The first is that recent research, building in some cases on longstanding indigenous traditions, has identified multiple aspects of set and setting that tend to promote beneficial and transformative experiences (Haijen et al. 2018). The second is that, when it comes to environmental virtues specifically, at least some evidence points in the direction of further factors such as the perceived influence of natural surroundings during the experience (Kettner et al. 2019). Future research into such factors may introduce greater predictability into the proposed use of psychedelics to promote pro-environmental attitudes and behaviours.

Finally, with respect to psychedelics' potential as *moral enhancement* agents, we emphasize that the most compelling evidence to date concerns nature-relatedness and pro-environmental behaviors. As yet, to our knowledge, there has not been a prospective experimental study designed specifically to test psychedelics' abilities to increase pro-environmental attitudes and behaviors in healthy subjects under controlled conditions. One major implication of our argument is that such research ought to be undertaken and might have non-trivial payoffs with respect to pressing practical problems of the present day[3].

6. Conclusion and Implications

We have argued that psychedelics, when used responsibly under controlled conditions, can reliably catalyze the development of a key environmental virtue, *living in place*, whose constituents include respect for nature, proper humility, and aesthetic wonder and awe. If this

[3] Recent work by Meyer et al. (2021) on the operationalization of epistemic vice provides a paradigm for the empirical investigation of virtue-theoretic constructs.

conclusion is correct, there are at least three significant implications. First, the potential role of psychedelics in catalyzing moral development has implications for the burgeoning literature about moral enhancement. Earp (2018) has argued that psychedelics represent the most promising and realistic biotechnological intervention for moral enhancement that we know of. However, a conceptual framework is needed for thinking about *how* psychedelics might improve moral character and ethical behavior. Our arguments suggest that virtue ethics is a promising framework, given the fit between (i) current theoretical understandings of psychedelics' transformative mechanisms and (ii) traditional philosophical accounts of the virtues and how they can be cultivated by human agents[4].

The second implication is focused on the environmental virtue ethics literature. While much of the discussion to date has focused on how to conceptualize new virtues, or re-conceptualize old ones, it is also widely acknowledged by environmental virtue ethicists that inculcating these complex psychological and behavioral traits poses a challenge. This challenge is especially acute given the increasing urgency of the ecological crisis, and the overwhelming urbanization of the population, which brings with it a widespread isolation and alienation from natural environments. While the perceived influence of natural surroundings plays a role in promoting nature-relatedness in the context of uncontrolled use, other studies show that nature-relatedness and pro-environmental behaviors are increased even when psychedelics are taken indoors in highly artificial-seeming environments. On the whole, this suggests that psychedelic-assisted interventions might represent a uniquely promising approach to catalyzing the development of the environmental virtues given our current sociocultural situation.

[4] See Kähönen (2020) for another conceptual framework that is not necessarily inconsistent with that developed here.

The third and final implication pertains to policy. If our hypothesis is confirmed by further research, then it seems to us that there is a straightforward ethical imperative to make these transformative experiences available to a wider (non-psychiatric) public in safe, legal, low-risk, and socially acceptable contexts of use. This connects with Thomas Metzinger's arguments for the importance of a *Bewussteinskultur*, or "consciousness culture", which involves "exploring the space of altered states of consciousness in ways from which we all can profit" (2009, p. 239) and removing ethically unjustifiable barriers to individuals' cultivation of profitable conscious states (cf. Walsh 2016). Obviously the devil is in the details, and determining precisely how to bring this about will be no trivial matter. However, many societies throughout human history have integrated psychedelic-induced states of consciousness into culturally sanctioned practices and rituals. The increasing evidence that such states can lead to salutary psychological, behavioral, and perhaps even ecological consequences behooves us to consider this course of action seriously.

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References

Aday, J.S., Mitzkovitz, C.M., Bloesch, E.K., Davoli, C.C. and Davis, A.K. 2020. Long-term effects of psychedelic drugs: A systematic review. *Neuroscience & Biobehavioral Reviews*, *113*, 179-189.

Ahlskog, R. 2017. Moral enhancement should target self-interest and cognitive capacity. *Neuroethics*, *10*(3), 363-373.

Amada, N., Lea, T., Letheby, C. and Shane, J. 2020. Psychedelic experience and the narrative self: An exploratory qualitative study. *Journal of Consciousness Studies*, *27*(9-10), 6-33.

Ballesteros, V. 2019. Applied mysticism: A drug-enabled visionary experience against moral blindness. *Zygon®*, *54*(3), 731-755.

Barbosa, P.C.R., Strassman, R.J., da Silveira, D.X., Areco, K., Hoy, R., Pommy, J., Thoma, R. and Bogenschutz, M. 2016. Psychological and neuropsychological assessment of regular hoasca users. *Comprehensive Psychiatry*, *71*, 95-105.

Barrett, F.S., Johnson, M.W. and Griffiths, R.R. 2015. Validation of the revised mystical experience questionnaire in experimental sessions with psilocybin. *Journal of Psychopharmacology*, *29*(11), 1182-1190.

Brace, P. 2020. Altered states of consciousness: Natural gateway to an ecological civilization?. *Journal of Theoretical and Philosophical Psychology*, *40*(2), 69.

Breeksema, J.J., Niemeijer, A.R., Krediet, E., Vermetten, E. and Schoevers, R.A. 2020. Psychedelic treatments for psychiatric disorders: a systematic review and thematic synthesis of patient experiences in qualitative studies. *CNS drugs*, 34, 925-946.

Brennan, A. 1984. 'The moral standing of natural objects', reprinted in Brennan, A. (ed.) 1995. *The ethics of the environment*, Aldershot: Dartmouth, 35–56.

Cafaro, P. & Sandler, R. (eds.) 2005. *Environmental virtue ethics*, New York and Oxford: Rowman & Littlefield.

Carhart-Harris, R.L. and Friston, K.J., 2019. REBUS and the anarchic brain: toward a unified model of the brain action of psychedelics. *Pharmacological Reviews*, *71*(3), 316-344.

Douglas, T. 2008. Moral enhancement. *Journal of Applied Philosophy*, *25*(3), 228-245.

Dyck, E. 2010. *Psychedelic psychiatry: LSD from clinic to campus*. Johns Hopkins University Press.

Earp, B.D. 2018. Psychedelic moral enhancement. *Royal Institute of Philosophy Supplements*, *83*, 415-439.

Earp, B. D., Douglas, T., & Savulescu, J. (2017). Moral neuroenhancement. In S. Johnson & K. Rommelfanger (eds.) *Routledge Handbook of Neuroethics*, 166-184. Abingdon and New York: Routledge.

Fido, D., Rees, A., Clarke, P., Petronzi, D. and Richardson, M. 2020. Examining the connection between nature connectedness and dark personality. *Journal of Environmental Psychology*, *72*, 101499.

Forstmann, M. and Sagioglou, C. 2017. Lifetime experience with (classic) psychedelics predicts pro-environmental behavior through an increase in nature relatedness. *Journal of Psychopharmacology*, *31*(8), 975-988.

Gandy, S. 2019. Psychedelics and potential benefits in "healthy normals": A review of the literature. *Journal of Psychedelic Studies*, *3*(3), 280-287.

Garcia-Romeu, A., R Griffiths, R. and W Johnson, M. 2014. Psilocybin-occasioned mystical experiences in the treatment of tobacco addiction. *Current drug abuse reviews*, *7*(3), 157-164.

Gasser, P., Kirchner, K. and Passie, T. 2015. LSD-assisted psychotherapy for anxiety associated with a life-threatening disease: a qualitative study of acute and sustained subjective effects. *Journal of Psychopharmacology*, *29*(1), 57-68.

Griffiths, R.R., Richards, W.A., McCann, U. and Jesse, R. 2006. Psilocybin can occasion mystical-type experiences having substantial and sustained personal meaning and spiritual significance. *Psychopharmacology*, *187*(3), 268-283.

Griffiths, R.R., Richards, W.A., Johnson, M.W., McCann, U.D. and Jesse, R. 2008. Mystical-type experiences occasioned by psilocybin mediate the attribution of personal meaning and spiritual significance 14 months later. *Journal of psychopharmacology*, *22*(6), 621-632.

Griffiths, R.R., Johnson, M.W., Richards, W.A., Richards, B.D., McCann, U. and Jesse, R. 2011. Psilocybin occasioned mystical-type experiences: immediate and persisting dose-related effects. *Psychopharmacology*, *218*(4), 649-665.

Grof, S. 1975. *Realms of the human unconscious: Observations from LSD psychotherapy*. New York: Viking.

Haijen, E.C., Kaelen, M., Roseman, L., Timmermann, C., Kettner, H., Russ, S., Nutt, D., Daws, R.E., Hampshire, A.D., Lorenz, R. and Carhart-Harris, R.L. 2018. Predicting responses to psychedelics: a prospective study. *Frontiers in pharmacology*, 897.

Halpern, J.H., Sherwood, A.R., Hudson, J.I., Yurgelun-Todd, D. and Pope Jr, H.G. 2005. Psychological and cognitive effects of long-term peyote use among Native Americans. *Biological psychiatry*, *58*(8), 624-631.

Hill, T.E. 1983. Ideals of human excellence and preserving natural environments. *Environmental Ethics*, *5*(3), 211-224.

Hofmann, A. 1980. *LSD: My problem child*. 1979. Trans. Jonathan Ott. New York: McGraw.

Hursthouse, R. 2006. Environmental virtue ethics. In Ivanhoe, P. J., and. Walker, Rebecca L., eds., *Working Virtue*, 157. New York: Oxford University Press.

Hursthouse, R. 2012. Human nature and Aristotelian virtue ethics. *Royal Institute of Philosophy Supplement, 70*, 169-188

Huxley, A. 1954. *The Doors of Perception.* Reprint, New York: HarperCollins, 2009.

Jamieson, D. 2007. When utilitarians should be virtue theorists. *Utilitas* 19(2): 1-24.

Johnson, M.W., Richards, W.A. and Griffiths, R.R. 2008. Human hallucinogen research: guidelines for safety. *Journal of Psychopharmacology*, *22*(6), 603-620.

Jordan, K., and Kristjánsson, K. 2017. Sustainability, virtue ethics, and the virtue of harmony with nature. *Environmental Education Research*, 23 (9), 1205-29.

Kähönen, J. 2020. Psychedelic unselfing and moral perception: A philosophical account of the change of values induced by psychedelic experiences. Master's thesis, University of Helsinki. https://helda.helsinki.fi/bitstream/handle/10138/315556/Kahonen_Kaytannollinen_Filosofia.pdf.

Kirkham, N. 2016. Recognizing our place in the world. *Environmental Ethics*, *38*(1), 97-119.

Klerman, G.L. 1972. Psychotropic hedonism vs. pharmacological Calvinism. *Hastings Center Report*, 1-3.

Krebs, T.S. and Johansen, P.Ø. 2012. Lysergic acid diethylamide (LSD) for alcoholism: meta-analysis of randomized controlled trials. *Journal of Psychopharmacology*, *26*(7), 994-1002.

Leary, T., Alpert, R., and Metzner, R.,1964. *The psychedelic experience: a manual based on the Tibetan book of the dead*. New York: Citadel Press.

Letheby, C. 2015. The philosophy of psychedelic transformation. *Journal of Consciousness Studies*, *22*(9-10), 170-193.

Letheby, C. forthcoming. Psychedelics and meditation: a neurophilosophical perspective. In Repetti, R., ed., *The Routledge Handbook of the Philosophy of Meditation*. Routledge.

Letheby, C. and Gerrans, P. 2017. Self unbound: ego dissolution in psychedelic experience. *Neuroscience of Consciousness*, *2017*(1), nix016.

Liechti, M.E., Dolder, P.C. and Schmid, Y. 2017. Alterations of consciousness and mystical-type experiences after acute LSD in humans. *Psychopharmacology*, *234*(9-10), 1499-1510.

Luke, D. 2013. Ecopsychology and the psychedelic experience. *European Journal of Ecopsychology*, *4*(1), 1-8.

Lyons, T. and Carhart-Harris, R.L. 2018. Increased nature relatedness and decreased authoritarian political views after psilocybin for treatment-resistant depression. *Journal of Psychopharmacology*, *32*(7), 811-819.

Mackintosh, E. 2019. A psychedelic journey, a radical strategy and perfect timing. How the world's fastest-growing climate movement was made. <https://edition.cnn.com/2019/12/25/uk/extinction-rebellion-gail-bradbrook-gbr-intl/index.html>.

MacLean, K.A., Johnson, M.W. and Griffiths, R.R. 2011. Mystical experiences occasioned by the hallucinogen psilocybin lead to increases in the personality domain of openness. *Journal of Psychopharmacology*, *25*(11), 1453-1461.

MacLean, K.A., Leoutsakos, J.M.S., Johnson, M.W. and Griffiths, R.R. 2012. Factor analysis of the mystical experience questionnaire: A study of experiences occasioned by the hallucinogen psilocybin. *Journal for the Scientific Study of Religion*, *51*(4), 721-737.

Masters, R. and Houston, J. 1966. *The varieties of psychedelic experience*. Reprint, Rochester: Park Street Press, 2000.

Metzinger, T. 2009. *The ego tunnel: The science of the mind and the myth of the self*. Basic Books.

Meyer, M., Alfano, M., and de Bruin, B The development and validation of the epistemic vice scale. *Review of Philosophy and Psychology*.

Mian, M.N., Altman, B.R. and Earleywine, M. 2020. Ayahuasca's antidepressant effects covary with behavioral activation as well as mindfulness. *Journal of Psychoactive Drugs*, *52*(2), 130-137.

Miller, M.J., Albarracin-Jordan, J., Moore, C. and Capriles, J.M. 2019. Chemical evidence for the use of multiple psychotropic plants in a 1,000-year-old ritual bundle from South America. *Proceedings of the National Academy of Sciences*, *116*(23), 11207-11212.

Millière, R., Carhart-Harris, R.L., Roseman, L., Trautwein, F.M. and Berkovich-Ohana, A. 2018. Psychedelics, meditation, and self-consciousness. *Frontiers in Psychology*, *9*, 1475.

Nichols, D.E. 2016. Psychedelics. *Pharmacological reviews*, *68*(2), 264-355.

Nisbet, E.K. and Zelenski, J.M. 2013. The NR-6: a new brief measure of nature relatedness. *Frontiers in Psychology*, *4*, 813.

Noorani, T., Garcia-Romeu, A., Swift, T.C., Griffiths, R.R. and Johnson, M.W. 2018. Psychedelic therapy for smoking cessation: qualitative analysis of participant accounts. *Journal of Psychopharmacology*, *32*(7), 756-769.

Nour, M.M., Evans, L. and Carhart-Harris, R.L. 2017. Psychedelics, personality and political perspectives. *Journal of Psychoactive Drugs*, *49*(3), 182-191.

Nutt, D.J., King, L.A. and Phillips, L.D. 2010. Drug harms in the UK: a multicriteria decision analysis. *The Lancet*, *376*(9752), 1558-1565.

Ona, G., Kohek, M., Massaguer, T., Gomariz, A., Jiménez, D.F., Dos Santos, R.G., Hallak, J.E., Alcázar-Córcoles, M.Á. and Bouso, J.C. 2019. Ayahuasca and public health: health status, psychosocial well-being, lifestyle, and coping strategies in a large sample of ritual ayahuasca users. *Journal of Psychoactive Drugs*, *51*(2), 135-145.

Osmond, H. 1957. A review of the clinical effects of psychotomimetic agents. *Annals of the New York Academy of Sciences*, *66*(3), 418-434.

Persson, I. and Savulescu, J. 2013. Getting moral enhancement right: the desirability of moral bioenhancement. *Bioethics*, *27*(3), 124-131.

President's Council on Bioethics, The, 2003. Beyond Therapy: Biotechnology and the Pursuit of Happiness. https://bioethicsarchive.georgetown.edu/pcbe/reports/beyondtherapy/index.html. 13 August 2021.

Pustovrh, T., and McCollister Pirc, M. 2016. Moral enhancement by technological means: possible, permissible, a duty?. *Interdisciplinary Description of Complex Systems,* 14 (4), 344-52.

Richards, W.A. 2017. Psychedelic psychotherapy: Insights from 25 years of research. *Journal of Humanistic Psychology*, *57*(4), 323-337.

Ritchey, D. 1990. Taking the heat: corporations, individuals must take responsibility for the environment. *Arkansas Business, 7*(15), 38.

Ross, S., Bossis, A., Guss, J., Agin-Liebes, G., Malone, T., Cohen, B., Mennenga, S.E., Belser, A., Kalliontzi, K., Babb, J. and Su, Z. 2016. Rapid and sustained symptom reduction following psilocybin treatment for anxiety and depression in patients with life-threatening cancer: a randomized controlled trial. *Journal of Psychopharmacology, 30*(12), 1165-1180.

Sampedro, F., de la Fuente Revenga, M., Valle, M., Roberto, N., Domínguez-Clavé, E., Elices, M., Luna, L.E., Crippa, J.A.S., Hallak, J.E., De Araujo, D.B. and Friedlander, P. 2017. Assessing the psychedelic "after-glow" in ayahuasca users: post-acute neurometabolic and functional connectivity changes are associated with enhanced mindfulness capacities. *International Journal of Neuropsychopharmacology*, *20*(9), 698-711.

Sandler, R. L. 2007. *Character and Environment: A Virtue-Oriented Approach to Environmental Ethics,* New York: Columbia University Press.

Sandison, R.A., Spencer, A.M. and Whitelaw, J.D.A. 1954. The therapeutic value of lysergic acid diethylamide in mental illness. *Journal of Mental Science*, *100*(419), 491-507.

Schwenkenbecher, A. 2014. Is there an obligation to reduce one's individual carbon footprint? *Critical review of international social and political philosophy*, Vol.17 (2), 168–188.

Sessa, B. 2012. *The psychedelic renaissance: Reassessing the role of psychedelic drugs in 21st century psychiatry and society*. Muswell Hill Press.

Silvia, P.J., Fayn, K., Nusbaum, E.C. and Beaty, R.E. 2015. Openness to experience and awe in response to nature and music: personality and profound aesthetic experiences. *Psychology of Aesthetics, Creativity, and the Arts*, *9*(4), 376.

Smith, C. 2008. Albert Hofmann, the father of LSD, dies at 102. *New York Times*, April 30th 2008. https://www.nytimes.com/2008/04/30/world/europe/30hofmann.html

Smith, H. 1964. Do drugs have religious import?. *The Journal of Philosophy*, *61*(18), 517-530.

Soler, J., Elices, M., Franquesa, A., Barker, S., Friedlander, P., Feilding, A., Pascual, J.C. and Riba, J. 2016. Exploring the therapeutic potential of Ayahuasca: acute intake increases mindfulness-related capacities. *Psychopharmacology*, *233*(5), 823-829.

Soler, J., Elices, M., Dominguez-Clavé, E., Pascual, J.C., Feilding, A., Navarro-Gil, M., García-Campayo, J. and Riba, J. 2018. Four weekly ayahuasca sessions lead to increases in "acceptance" capacities: a comparison study with a standard 8-week mindfulness training program. *Frontiers in pharmacology*, *9*, 224.

Spalding, M., Calvillo, A.G., Ganster, P. and Luna, C. 2000. Environmental Priorities and Responsibilities: Governments, Corporations, and Individuals. *T. Jefferson L. Rev.*, *23*(1), 57.

Studerus, E., Gamma, A. and Vollenweider, F.X. 2010. Psychometric evaluation of the altered states of consciousness rating scale (OAV). *PloS One*, *5*(8), e12412.

Sunstein, C. 1996. Social norms and social roles. *Columbia Law Review*, 96(4) 903–968.

Swanton, C. 2010. Heideggerian environmental ethics. *Journal of Agricultural and Environmental Ethics*, 23 (1), 145–166.

Taylor, P. 1986. *Respect for nature: A theory of environmental ethics*. Princeton: Princeton University Press.

Tennison, M.N. 2012. Moral transhumanism: the next step. *Journal of Medicine and Philosophy*, *37*(4), 405-416.

Thomas, G., Lucas, P., Capler, N.R., Tupper, K.W. and Martin, G. 2013. Ayahuasca-assisted therapy for addiction: results from a preliminary observational study in Canada. *Current Drug Abuse Reviews*, *6*(1), 30-42.

Uthaug, M.V., Lancelotta, R., van Oorsouw, K., Kuypers, K.P.C., Mason, N., Rak, J., Šuláková, A., Jurok, R., Maryška, M., Kuchař, M. and Páleníček, T. 2019. A single inhalation of vapor from dried toad secretion containing 5-methoxy-N, N-dimethyltryptamine (5-MeO-DMT) in a naturalistic setting is related to sustained enhancement of satisfaction with life, mindfulness-related capacities, and a decrement of psychopathological symptoms. *Psychopharmacology*, *236*(9), 2653-2666.

Uthaug, M.V., Lancelotta, R., Szabo, A., Davis, A.K., Riba, J. and Ramaekers, J.G. 2020. Prospective examination of synthetic 5-methoxy-N, N-dimethyltryptamine inhalation: effects

on salivary IL-6, cortisol levels, affect, and non-judgment. *Psychopharmacology*, *237*(3), 773-785.

van Mulukom, V., Patterson, R.E. and van Elk, M. 2020. Broadening your mind to include others: The relationship between serotonergic psychedelic experiences and maladaptive narcissism. *Psychopharmacology*, *237*(9), 2725-2737.

Vogel, S. 2003. The nature of artifacts. *Environmental Ethics*, *25*(2), 149-168.

Walsh, C. 2016. Psychedelics and cognitive liberty: Reimagining drug policy through the prism of human rights. *International Journal of Drug Policy*, *29*, 80-87.

Watts, A.W. 1960. The new alchemy. In *This is It, and Other Essays on Zen and Spiritual Experience*, 127-153. New York: Pantheon.

Watts, R., Day, C., Krzanowski, J., Nutt, D. and Carhart-Harris, R. 2017. Patients' accounts of increased "connectedness" and "acceptance" after psilocybin for treatment-resistant depression. *Journal of Humanistic Psychology*, *57*(5), 520-564.