Should Future Generations be content with Plastic Trees and Singing Electronic Birds?

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ABSTRACT: The aim of this paper is to determine whether the present generation should preserve non-human living things (plants, animals and other organisms) for future generations, even if in the future all the contributions these organisms currently make to human survival in decent conditions were performed by adequate technology. The paper argues it would be wrong to leave a world without non-human living plants, animals and other organisms to future generations, even if future people's preferences were satisfied, because such a world would fail to secure one of the conditions of future people's autonomy, that is, availability of adequate options. Building upon Joseph Raz's account of autonomy, the paper shows that the presence of non-human living organisms is part of an adequate range of options insofar as, to be adequate, options must meet a test of variety. According to Raz, options pass this test if they enable human agents to exercise a set of physical, affective, imaginative and cognitive capacities humans normally have an innate drive to exercise. The paper discusses empirical findings as well as psychological theories that provide support to the hypothesis that interactions with non-human living organisms enable human beings to develop and exercise these capacities by shaping them in a special way, different from the way interactions with other environments do.

KEYWORDS: intergenerational justice – open options – environmental preservation – Joseph Raz - autonomy

1. INTRODUCTION

Most accounts of sustainability and intergenerational justice require each generation to preserve a certain diversity of non-human species for future generations. Human beings, and future ones will probably not constitute an exception, obtain many types of benefits from a variety of existing plants, animals and other living organisms. These non-human living organisms are part of ecosystems, which provide humans with food, water, fuel, materials, and regulate temperatures, climate, floods, or diseases (UN Foundation 2005, Chapter 1, p. 28). Ecosystems thus currently secure human survival in decent conditions. But they also often believed to have value beyond this survival function. The aim of this paper is to discuss the value of the existence of non-human living organisms for human beings beyond the contributions they make to our survival from an intergenerational justice perspective (of course, the issue as such does not arise from the perspective of ethical theories which take a non-anthropocentric outlook on these issues[1]). The question this paper addresses is thus *whether it would be wrong to leave a world without non-human living things to the next generations,* even if next generations' survival was guaranteed by adequate technologies.[2]

This paper defends the thesis that it would be wrong to leave a world without non-human living plants, animals and other organisms to future generations, even if otherwise good living conditions were secured for them through technological means, because such a world would fail to secure one of the conditions of future people's autonomy, that is, availability of adequate options. The paper unfolds as follows. I will first state the problem by developing a thought experiment which appears in Brian Barry's writings on sustainability (Barry 1997, reis. 1999) (section 2). This thought experiment depicts a future world where non-human living things such as trees and birds have been extinguished and replaced by substitutes such as plastic trees and electronic birds. Future people, however, have formed preferences such that they are happy with them. Since a preference-based account of what should matter for future people cannot explain what, if anything, is wrong with this Plastic Trees World, we should investigate whether other criteria used to assess the value of intergenerational bequests could. Barry suggested "open options" but warned us that this criterion needs to be refined to make sense of the wrongness of the Plastic Trees World (section 3). In this paper, I will draw from Joseph Raz's prominent discussion of personal autonomy (Raz 1986) an account of "open options", or, in Raz's terms, "adequate options" (section 4). According to Raz, adequate options need not be numerous or preferred, but they must be varied, and options are varied if they enable human beings to exercise a range of capacities humans have an innate drive to exercise. I will then argue that interactions with non-human living animals, plants and other organisms may be necessary to develop and exercise these capacities to their fullest (section 5). I shall partly rely on findings and theories in psychology to support this claim. I will then draw some practical implications (section 6) and conclude (section 7).

Before going further, some prefatory clarifications are in order.

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[1] Note that those who wish to advance 'green' concerns in the public debate might still be interested in the intergenerational justice perspective for strategic reasons. It may be easier to persuade policy-makers and citizens that our descendants have (or will have) a legitimate claim over a decent environment than that animals and plants have a moral status.

[2] This paper restricts the scope of the discussion to *personal wrongs.* I shall bracket the question of whether a world deprived of animals and plants is wrong in an impersonal way. I also bracket the non-identity problem (Parfit 1984).

First, this paper focuses on the preservation of the natural environment as an issue of justice towards future, unborn, generation. It is thus not concerned with the potential ethical or aesthetic issues raised by the replacement of natural plants and animals by artificial, human-made, ones in our contemporary world, where the natural ones remain accessible.

Second, this paper is concerned with the value of the existence of non-human living things for present and future human beings, but it is not particularly concerned with the value of preserving non-human living things in the state they would have been had human beings not interacted with them. In other words, this paper is not especially about the value of the wild.

Third, although this paper will discuss the possibility of replacing living plants by plastic replicas and living animals by electronic toys, it is not for the purpose of addressing the value of authenticity and the issue of whether the original ought to be preferred to the replica. The paper mentions the option of replacing living plants by plastic ones just to flesh out the hypothesis that the future people's preferences could be satisfied by human-made substitutes.

2. THE PROBLEM: THERE IS NO NEED TO PRESERVE TREES AND BIRDS SINCE FUTURE PEOPLE COULD ADAPT THEIR PREFERENCES TO A TREELESS AND BIRDLESS WORLD

Many of us have a preference for preserving animals and plants, and one could think that the same should hold for future people. Hence intergenerational justice might require us to preserve living trees and birds so as to satisfy future people's environmental preferences. But preferences are malleable, and people may learn to appreciate plastic trees as much as they do appreciate real ones now. This point is made by Martin Krieger:

> *'What's wrong with plastic trees? My guess is that there is very little wrong with them. Much more can be done with plastic trees and the like to give most people the feeling that they are experiencing nature. We will have to realize that the way in which we experience nature is conditioned by our society-which more and more is seen to be receptive to responsible interventions.'*(Krieger 1973, p. 453)

Krieger's thesis is provocative, and has been interpreted either as the mere derivation of the full implications of preference utilitarianism, according to which what matters is that people's preferences are satisfied[3], or as the *reductio ad absurdum* of it (Katz 1997; Sagoff 1974).

Plastic trees and preferences reappear in Brian Barry's discussion of the "metric" of sustainability and intergenerational justice (Barry 1997, reis. 1999). The metric is the criterion we use to assess the value of the goods that could be saved for the future. As Barry puts it, the preference satisfaction metric leads to the unpalatable conclusion that, if current generations depleted natural resources and biodiversity and replaced them with technology, insofar as preferences are malleable, future people might still be content with what would be left to them, including plastic trees:

[3] Solow, for instance, endorses the preference satisfaction metric: "what we are obligated to leave behind is a general capacity to create well-being, not any particular thing or any particular natural resource" (Solow, 1991, p. 182).

> *'Perhaps people in the future might learn to find satisfaction in totally artificial landscapes, walking on the astroturf amid the plastic trees while the electronic birds sing overhead. But we cannot but believe that something horrible would have happened to human beings if they did not miss real grass, trees, and birds.'* (Barry 1997, p. 50; reis. 1999, p. 102)

Why would "something horrible" have happened here? What, if anything, is wrong without living trees and birds and other species? Let us specify the thought experiment Barry mentions in order to determine what is at stake here.

Suppose, then, that, in this hypothetical future world, plants and animals have been extinguished as a result of past generations' actions and behaviours (and not because of natural events such as a meteorite[4]). Since it is hardly thinkable to extinguish the sky, the soil, other planets, stars, clouds, seas and oceans, let us assume these would still be there. We will restrict our focus on non-human living things. Suppose also that, in this hypothetical world, future people are, materially speaking, at least as well off as present people are (that is, as Western higher and middle-class people are). Perhaps past generations destroyed the natural environment in order to bring more comfort and convenience to human beings (future generations included). In other words, past generations did not fail to secure decent living conditions for its descendants. But, for some reason, future people would be unable to regain living trees, birds, and other plants and animals. However, they would not have to worry about that: the survival functions plants and animals currently perform for us would have been replaced by adequate technologies, such as artificial soil stabilizers, carbon sinks, synthetic proteins, and so on. Furthermore, as suggested by Barry's vivid depiction, future people would still have sufficient material means to produce plastic trees, electronic birds, astroturfs, so as to recreate the enjoyable experiences their ancestors derived from interactions with living trees, birds and grass. Or, if plastic trees were too boring, future people could also enjoy computer simulations of fantastic worlds or decorate their mineral environment with artworks. They might even find ways to be content without having to bother to produce any tangible substitute for plants and animals. The important point is that, in this futuristic world, the degree of preference satisfaction would not be lower as a result of the absence of non-human living things.

The story assumes, as Krieger and Barry do, that preferences are adaptive to some extent. If future people are to live in the Plastic Trees World, their preferences will be shaped by their environment and they will be content with what they have. It is worth noting this assumption is challenged by some evolutionary theories. These theories suggest that, because the natural environment has been conducive to our survival before, we retain an innate positive attitude towards it. The biophilia hypothesis thus suggests that humans have an instinctive attraction for living creatures and systems.[5] Hence the human appreciation of nature might not be so malleable. However, so far available evidence tends to give more support to the *biophobia* hypothesis, the hypothesis that nature provokes negative, phobic responses – fear of animals and plants, than to the *biophilia* hypothesis (Hartig et al. 2011, p. 143). There is evidence that the preference for contacts with the natural environment is shaped by our culture and

[4] I make this specification because the kind of intergenerational obligation this paper is concerned with is whether the present generation should avoid undertaking actions that are likely to result in the extinction of animals or plants species. Whether the present generation might have, or not, to take specific dispositions to make sure that its descendants would be able to cope with meteorite falls, is a different question.

[5] E.g. Kellert and Wilson (1995).

our education.[6] *Actual* preferences do not necessarily coincide with the preferences the biophilia hypothesis assumes human beings should have.

3. CAN AN "OPEN OPTIONS" METRIC ADDRESS THE ADAPTIVE PREFERENCES PROBLEM?

The satisfaction of future generations' preferences cannot provide a solid justification for preserving real trees and birds whenever it is possible to extinguish them without threatening the future society's capacity to produce whatever is needed to satisfy its members' preferences. But, then, which metric of sustainability and intergenerational justice could make sense of Barry's intuition that the presence of plants and animals matters, even when people do not have a preference for them? Let us follow again Barry here. As Barry puts it, if the implications of the use of a preference satisfaction metric are unpalatable, the natural move is (i) to replace the subjective preference criterion by a more objective "good life" criterion and (ii) to rely more on present people's value judgments than future people's (adapted) ones. Hence we would have to preserve future people's "chance to live a good life as we conceive it" (Barry 1997, p. 52, reis. 1999, p. 103).[7] Instead of bequeathing the resources needed to maintain future people's capacity to satisfy their preferences (preferences that would actually be shaped by the very resources we would leave behind), the present generation would determine the conception of the good life that should be guaranteed in the future and bequeath the resources needed to maintain future people's ability to live according to this conception of the good life. But this alternative to the preference satisfaction criterion raises two issues, Barry warns us. First, we (as present people) do not always agree on what a good life consists in (and the extent to which the existence of other species is essential to it). Second, even if a consensus could be reached on some aspects of the good life that would be worthy of preservation for future people, according to Barry "it would be presumptuous – and unfair – to pre-empt [future people's] choices in the future" (Barry 1997, p. 52, reis. 1999, p. 104). Why would this be "presumptuous" and "unfair"? If we only left the resources needed to live according to one given conception of the good life, we would fail to express respect for future people's rational capacities, that is, the capacities involved in the choice, the examination and the revision of a conception of the good life.[8] Henceforth the resources left to future generations should be such that they do not presuppose that future people will choose a pre-selected conception of the good life. Barry thus suggests that we should rather

[6] E.g. Buijs et al. (2009); Krieger (1973); Sagoff (1974).

[7] Nussbaum's capability approach might be an illustration of this family of approaches. Nussbaum derives a list of Central Human Capabilities from a neo-Aristotelian, account of a life worthy of human dignity. One of these Central Human Capabilities is the "Other Species" capability, that is, "being able to live with concern for and in relation to animals, plants, and the world of nature" (Nussbaum 2011). On the application of the capability approach to intergenerational justice, see: Page (2007); Watene (2013) On the capability approach and sustainable development, see: Voget-Kleschin (2014)

[8] Barry's worry shares important characteristics with the liberal worry that the State might express disrespect to its citizens if it imposed a specific conception of the good life. Note that the "imposition" can take two forms. The first one consists in the inculcation of values, the second one in the exclusive provision of the means needed to live according to one conception. An intergenerational setting where generations do not overlap is only concerned with the second form of imposition. Note, however, that if leaving a certain kind of resource to future people biases them towards the adoption of the conception of the good this kind of resource supports, in most cases it cannot coerce them into adopting it (churches, for instance, can be transformed into libraries). The fact that the function of many resources can diverted may thus render liberal requirements less stringent in the intergenerational setting. On liberal neutrality in intergenerational contexts, see also: Gosseries (2004, p. 252, n.19).

"provide future generations with the opportunity to live good lives according to *their* conception of what constitutes a good life" (Barry 1997, p. 52, reis. 1999, p. 104). We should thus "leave other options open to them". In the intergenerational justice literature, the criterion of opportunities, or open options (I shall use the terms "options" and "opportunities" interchangeably), has also been proposed by Edith Brown Weiss, who argues for "an intergenerational principle of options, or conservation of options." (Brown Weiss 1992).

Now, the question is whether the criterion of opportunities, or open options, can explain what would be wrong with a "Plastic Trees world", or more exactly with a world without non-human living things. This world obviously closes the option of having access to trees, plants and animals. But one could imagine that the resources that were not spent on the preservation of non-human species could have been spent on something else, medical research or technological advances, for instance, thereby opening *other*, new options for future generations. Imagine a world where future people would not have access to golden-cheeked warblers any more, but to vaccination against rhinopharyngitis instead. In what sense does this world "close" options for future generations? We thus need to specify the concepts of open options and opportunities further.

As Barry puts it, "there are two natural approaches to the measurement of opportunities" (Barry 1997, p. 52, reis. 1999, p. 104). The first approach consists in counting opportunities, or options. The more options, the better. The problem with this "counting approach" is that it is blind to both the quality and the diversity of the options. For these reasons the "counting approach" cannot explain what, if anything, is wrong with a world without non-human plants and animals, as long as technological advances provide a sufficiently high number of "options" to replace the experiences or services they would have otherwise provided to human beings. The "counting approach" raises additional issues Barry does not bring about in this paper. Trivial options, such as brushing one's teeth before taking a shower rather than after, would count as important as choices of career or religion. Furthermore, the counting approach's blindness to the value of options leads to highly counterintuitive conclusions, as Amartya Sen puts it:

> *'A three-some set of alternatives that a person sees, respectively, as "bad", "terrible", and "disastrously terrible" must, then, be accepted by her to be giving her just as much freedom or opportunity as another three-some set that consists of alternatives that she sees as "good", "excellent" and "incomparably excellent"'*(Sen 2004, p. 689)

Finally it is not always better for the agent to increase the number of options in her choice set, since adding another option may modify the original choice situation in a way that is detrimental to the agent (Dworkin 1982).

The second approach consists in equating the value of the option set with the value of the option the agent prefer. But, then, why should our generation *also* strive to secure other, non-preferred options, for future generations? If the value of an option set is equivalent to the value of its preferred alternative, adding other options to the set does not increase the value of the set.[9] With the preference-sensitive approach, the option/opportunity metric collapses into the preference satisfaction metric.

However, one could point out that this line of criticism may not hold in the intergenerational context, because future people's preferences are unknown. Securing more than one option is thus more prudent because, the more options, the higher the chances future people will be able to satisfy their preferences. Open options is thus a way to secure future preference satisfaction in an intergenerational context characterized by uncertainty about

[9] The presence of other options might even decrease the degree of satisfaction by increasing opportunity costs.

preferences. Difficulties arise, however, when we reintroduce the adaptability of human preferences in the picture. The prudential "preference-sensitive" open options approach treats future preferences as if they were shaped independently from whatever resources would have been left to future people. But it might well be the case that, even if we left few or no options but one to future people, they would still be satisfied.[10] Why, then, other things being equal, would it be better for future generations to have access to open options rather than to have their preferences shaped so as to be fit to the only available option? To answer this question, we must go beyond the preference-sensitive account, and even beyond its prudential version, and elaborate an account of options, or opportunity sets, based on the reasons we have for choosing it as a metric of intergenerational justice. "More work, as they say, needs to be done" (Barry 1997, p. 54, reis. 1999, p. 105).

4. AN AUTONOMY-BASED ACCOUNT OF ADEQUATE OPTIONS

In what follows, I will attempt to elaborate an alternative account of the open options metric, which may better capture the normative rationale behind this metric. I suggest this normative rationale is the assumption that human autonomy is valuable. This alternative account is grounded on the idea that access to open options is a condition for being autonomous, or at least favour the exercise of autonomy. A crucial insight of this autonomy-based account is that, by contrast with the preference satisfaction account, it does attach value to the history of preference formation, that is, to the way people's preferences are formed. What matters for the autonomy-based account is not, or not only, that future people's preferences will be satisfied by the state of affairs or the range of state of affairs our intergenerational savings policy will make possible. What matters is that our intergenerational saving policies secures the conditions for future people to form their preferences in an autonomous way. Open options would be part of these conditions, or perhaps a way to describe these external conditions. Now, it is of course not self-evident that if future people lived in a world without non-human living organisms, they would be non-autonomous, or less autonomous than they would have been in a world with trees, birds, etc. The remainder of the paper is thus devoted to explicate the potential connection between human autonomy, option sets and the presence of non-human plants and animals in the future range of options.

The connection between options sets and the ideal of personal autonomy has been elaborated in details by Joseph Raz (Raz 1986). What is personal autonomy? According to Raz, autonomy characterizes both a certain relationship between a person and her own life and the conditions needed for a person to have this relationship with her life. The relationship an autonomous person has with her life is characterized in terms of "authorship", "self-creation" and "free choice" (Raz 1986, pp. 370–371). The conditions for a person to be autonomous include both "internal" capacities and features of the external environment, and are described by Raz as follows (Raz 1986, pp. 372–373). To be autonomous, that is, to have the capacity for autonomy, a person must:

(1) possess certain mental abilities and capacities, "the mental abilities to form intentions of a sufficiently complex kind, and plan their execution. These include minimum rationality, the ability to comprehend the means required to realize [her] goals, the mental faculties necessary to plan actions, etc" (Raz 1986, pp. 372–373);

[10] And even if future preferences were not entirely shaped by the available option(s), the present generation could still actively increase the chances future people will be satisfied by cultivating a taste for the narrower range of options that corresponds to the Plastic Trees World.

(2) have access to *adequate options* to choose from;.

(3) be able to choose independently from coercion and manipulation by others.

Insofar as securing future people's capacity for autonomy involves securing the external and internal conditions for them to be autonomous, as defined by Raz, leaving "options", in the form of "adequate options", to future generations, should be part of this endeavour. Now, the questions are: what makes a range of options *adequate*? And is the presence of non-human living organisms necessarily part of adequate options?

Let us have a closer look at each of the Razian conditions of autonomy I have outlined above. The open options metric is related to the criteria of adequacy for a range of options. Raz starts his discussion of adequacy of options with two fictive examples, the Man in the Pit and the Hounded Woman (Raz 1986, pp. 373–377). A man fell down in a pit and cannot escape. He is condemned to live there for the rest of his life. But he knows there is enough food, water and shelter in the pit for him to survive there the rest of his life. Yet the only life choices that remain available to him in these conditions are too trivial to enable him to develop and exercise his autonomy. Whilst the hounded woman lives on a small island she shares with a dangerous animal, which wants to eat her. Since each of her choices can have deadly consequences, her choice-making capacities are too exhausted for her to enjoy her autonomy. An adequate range of options must be a sort of middle ground between these two extremes.

According to Raz, the option a person has access to are *adequate* if (Raz 1986, pp. 374–376) :[11]

(i) They include a well-distributed selection of options with long-term, middle-term and short-term consequences, so that the person can control significant as well as trivial aspects of her life (Raz 1986, p. 374) (This explains why the Man in the Pit's options are not adequate).

(ii) There is a *variety* of options available to the person (Raz 1986, p. 375).

(iii) The choice is determined by "the need to protect the life one has". "A choice is dominated by that need if all options except one will make the continuation of the life one has rather unlikely." (Raz 1986, p. 376) (This explains why the Hounded Woman's options are not adequate). Protecting "the life one has" includes protecting one's survival, but also the important projects and relationships that render this person's life worthwhile (Raz 1986, pp. 152–153).

Living trees and birds are not directly related to condition (i). And since the thought experiment excludes situations where future people's survival is at stake, the discussion is not concerned with the "survival" aspect of condition (iii). But we can also leave the "worthwhile life" aspect aside. Although, nowadays, many people need living trees and birds to live according to their most cherished values (think about animists or bird-watchers), future people will probably develop other life plans if they have to live with plastic trees or other substitutes for living trees. It would put an unreasonable demand on each generation to secure any possible way of life, include those which were only valued in the past.

This leaves us with condition (ii). Call this the Variety Condition. Variety is not the same thing as quantity. The number of options does not matter as such (which allows Raz's account to escape the objections raised against the "counting approach" (cf. supra)). *Variety* is about the degree to which options differ from each other. And Raz specifies the notion of variety even further. A range of options is adequate if it passes a "test of variety" (Raz 1986, p. 375). The test of variety is not culture-bound (Raz 1986, p. 375). Different cultures and civilizations provide opportunities for human beings to train, exercise and channel these capacities. The test of variety, writes Raz,

[11] Note that this list of conditions is not meant by Raz to be "a general doctrine of the adequacy of options" (Raz 1986, p. 373). The list is thus not closed.

"points to a way in which the options available in different cultures can be evaluated and compared" (Raz 1986, p. 375). If we transpose the test of variety to the intergenerational context, it could also allow us to compare the extent to which the conditions of autonomy are met at different times and for different generations. A range of options passes the test of variety if it meets the following condition:

> *'To be autonomous and to have an autonomous life, a person must have options which enable him to sustain throughout his life activities which, taken together, exercise all the capacities human beings have an innate drive to exercise, as well as to decline to develop any of them.'*(Raz 1986, p. 375)

The capacities human beings have an innate drive to exercise are the following ones: moving around, exercising our body, stimulating our senses, engaging our imagination and our affection, occupying our mind. Call these the *human capacities*. Now, the question becomes whether non-human living plants, animals and other organisms contribute to enabling humans to exercise the capacities aforementioned, and whether they contribute in a way that cannot be replaced by human-made artefacts, techniques or technologies.

5. ARE LIVING TREES AND BIRDS NECESSARY FOR FUTURE OPTIONS TO MEET THE TEST OF VARIETY?

Drawing upon our everyday experience, we see that the natural environment gives us many occasions to exercise the capacities listed above. We move around when we wander in the woods. We exercise our body when we climb trees. We stimulate our senses when we watch reddening autumn leaves or enjoy hearing the birds singing. Our aesthetic or religious appreciation of trees engages our imagination and our affectivity. We occupy our mind when we try to understand how trees grow, how they photosynthesize, where and when birds migrate, and so on. But our daily life also shows us that the artificial, human-made, world give us very satisfying opportunities to exercise our capacities. In a human-made world, one can move around with cars and planes, exercise her body with sophisticated gym equipment, stimulate her senses with exciting computer games, engage her imagination with hermetic contemporary artwork and occupy her mind with mathematics. Of course, the question of whether human-made objects could perform the same function (that is, enabling us to develop and exercise the human capacities) for us as natural ones is largely an empirical question (Gosseries 2001, p. 342). But we can anticipate that a treeless world such as the Plastic Trees World could be sufficiently varied and thus adequate for future people to be autonomous. The autonomy-based account of open options seems thus also unable to explain what could be wrong with a world deprived of non-human living plants, animals and other organisms. However, before settling for this disappointing conclusion, let us reexamine Raz's account of *variety* in order to determine whether living animals and plants could really be absent from an adequate range of options.

5.1. Developing human capacities to a sufficient extent vs developing human capacities to their fullest extent

Raz's *The Morality of Freedom* only aims to examine some of the criteria of adequacy for available options. It does not aim to provide a general doctrine of the adequacy of options (Raz 1986, p. 373). But we need this general doctrine to evaluate the Plastic Trees World. The purpose of this section is to complete the Razian account of a

discussion of the concrete implications of the criterion of variety. Adequate options are options that *enable the agent to sustain throughout her life activities which, taken together, exercise all the human capacities.* This definition specifies that an adequate set of options should provide the agent with the opportunity to exercise *all* these capacities. A set of options that does not enable us to engage our imagination, for example, is not adequate, even if it enables us to exercise all the other capacities. But this definition does not specify the *degree to which* an adequate set of options should enable us to develop these capacities. There could actually be at least two possible interpretations of the test of variety.

> **The sufficient development interpretation of the test of variety:** an adequate range of options should be varied so as to enable the agent to develop and exercise the human capacities *to a sufficient degree*. (the Sufficient Interpretation, for short)
>
> **The full development interpretation of the test of variety:** an adequate range of options should be varied so as to enable the agent to develop and exercise the human capacities *to a full degree*. (the Full Interpretation, for short)

Raz's test of variety allows both interpretation. But Raz's discussion of the difference between autonomy and self-realization (which does not coincide with the difference between the two interpretations of variety) sheds some light on the interpretation he could favour. Self-realization *is* the *development to their full extent* of the human capacities (Raz 1986, p. 375). The ideal of self-realization requires public institutions to make sure individual actually develop and exercise the human capacities to their fullest. Raz does not endorse the ideal of self-realization. An autonomous agent should have the choice to develop, or not, all or some of her capacities. The agent should be free not to realize herself. Yet Raz's ideal of autonomy requires the agent to be able to choose a life of self-realization, if she wants to (Raz 1986, p. 376). A life of self-realization involves the development of all the human capacities to a full extent. Therefore the general doctrine of adequacy should rather opt for the Full Interpretation.[12]

5.2. Is the presence of non-human living plants, animals and other organisms necessary to develop human capacities to their fullest?

A set of options is adequate if it enables the agent to develop each of her capacities to its fullest, if she wants to. Would an otherwise autonomous agent be prevented to do so if she did not have access to non-human living things, but perhaps only to equally preferable substitutes such as plastic trees and electronic birds?

In this section, I provide arguments that could tip the balance in favour of the thesis that experiencing the natural environment is needed to develop and exercise the human capacities listed above to their fullest.

Let us first look at the existing empirical literature on the benefits of nature experience. Experience of nature brings about at least three types of beneficial psychological effects: the satisfaction of environmental *preferences*, mental and physical *restoration*, *learning* and *personal development* (Hartig et al. 2011). Are these benefits related to the

[12] The reader might worry that the Full Interpretation may involve policies of intergenerational savings that would be too costly or burdening for the present generation. This issue requires a complete theory of intergenerational justice to be fully addressed. This theory would not only determine how we should assess the value of intergenerational savings (the so-called "metric" issue, which is this paper's focus) but also how these valuable savings should be distributed among generations (the "pattern" issue). For discussions of intergenerational justice patterns, see: Gosseries (2001, 2008); Meyer (2008).

development and exercise of the capacities humans are driven to exercise? And is nature an irreplaceable source of benefits of this type?

With respect to *environmental preferences*, the discussion of the Plastic Trees thought experiment has given reasons to doubt that preferences for experiences of natural object would subsist should these natural objects disappear. We must investigate other types of benefits to validate the claim that natural things are part of adequate options.

What about *restoration*? Restoration refers to processes through which people recover their physical and psychological resources (Hartig et al. 2011, p. 148). Physical and psychological resources include the ability to mobilize a high level of physical and mental energy, the ability to concentrate or the mental disposition to help others. People exhaust these resources in trying to meet everyday demands and thus need to restore them. The restorative effects of nature are assessed by measuring cardiovascular activity, testing cognitive performances, or just asking people about how they feel. For instance, existing evidence suggests that experiencing nature can have a restorative effect on the ability to direct attention (Hartig et al. 1991; Herzog et al. 1997; Kaplan 1995; Tennessen and Cimprich 1995; Ulrich 1999). A study showed that students' average proofreading performance was better after spending time in a nature reserve than in urban environments or in relaxation conditions in human-made environments (Hartig et al. 1991). We can reasonably suppose that maintaining our ability to direct attention can help us to better develop and exercise our capacities, at least the affective, imaginative and cognitive ones. The question, however, is whether we could not design artificial environments that could reproduce the restorative properties of nature. The answer will depend on the specific factor that explains why natural environments have such a restorative effect, and whether this factor may be reproduced.[13] Another question is whether the restorative effects of nature depend on the existence of environmental preferences. If they do, then we are driven back to the problem of adaptive preferences. Hence the support the restorative effects of nature provides to the claim that non-human living things should be preserved for future people is somehow uncertain.

The *learning* and *personal development* benefits humans derive from the experience of nature may be more promising in this respect. The core hypothesis that underlies the description of this type of benefits is that the kind of "feedback" people receive as a result of their interactions with natural environments is different from the feedback they receive as a result of interactions with other environments (Hartig et al. 2011, p. 154). Hence nature experiences contribute in a distinctive, specific way to a person's learning and personal development. The benefits nature experience provides consist in improvements in problem-solving abilities, self-reliance, self-esteem and sense of control (Hartig et al. 2011, p. 154). These benefits could indeed contribute to the development of the human capacities listed by Raz in his discussion of the test of variety.

What could be so special about the experience of nature with respect to learning and personal development? Researchers have singled out different ways in which nature experience as such shapes human knowledge and skills (e.g. Hartig et al. 2011, p. 155; Knopf 1987). First, in natural environments, *the distinction between what is in one's control and what is not is more clear-cut than in human-made environments* (e.g. Newman 1980). We know that we cannot control the weather, and we know that it is in our power to, say, walk from A to B. Human-made environments are more ambiguous to this respect. For example, it is difficult to determine the extent to which getting a job is within the job-seeker's control. For many people this is understandably stressful. Nature experience,

[13] For an overview of the current hypotheses defended in the literature, see: Hartig et al. 2011, pp. 152–154.

by helping people to explain their successes and failures in a more accurate way, enables them to develop a sense of competence and thus improves their self-esteem. Insofar as low self-esteem may hamper the development and exercise of one's physical, affective, imaginative and cognitive capacities and abilities, this aspect of nature experience can be a good reason to believe that opportunities to experiences with natural, non-human, living things, should be part of a world where options are adequate. Second, natural environments are *neutral*. They are not judgemental and do not give negative or ambiguous feedback. This, again, may be important for people to build self-esteem and a sense of control. Third, interactions with natural environments and their components (plants and animals) are *challenging in their own way*[14] *and give many opportunities to develop various capacities and abilities*. Limited empirical evidence and theoretical hypothesising suggest that a direct experience of nature could have a significant impact on the cognitive development, affective maturation and evaluative development of children (Kellert 2002). The extraordinary variety of the natural world gives rich opportunities for identifying, naming, classifying, analysing and understanding facts. The experience of nature may facilitate the development of children's thinking and problem-solving skills. The diversity of the natural world also stimulates a large range of emotions, wonder, joy but also fear and a sense of uncertainty, thus possibly contributing to affective maturation. All of this gives us reasons to think that nature experience directly contributes to the development and exercise of our capacities, and thus a reason to think that opportunities to experience the presence of non-human living organisms should be part of a world where options are adequate.

One could perhaps object that this hypothesis leads to a slightly counterintuitive implication, which is that the capacities of the people who live in environments that are richer in plants and animals should be more developed than the capacities of the people who, say, live in highly urbanized environments where trees, birds, etc, are scarce. Insofar as people living in rural areas have more opportunities to experience nature, the thesis seems false, since educational attainments are generally lower in rural areas than in urban ones (e.g. World Bank 2007, p. 84). The objection assumes that educational attainments are a reliable proxy to measure the level of development of a person's capacities. But the sheer existence of autodidacts casts doubts on this. Moreover, the capacities educational attainments measure are mainly the cognitive ones. But there is *a priori* no reason to think that people with lower educational attainments fare less well with respect to other capacities. Now, even if we granted the assumption that educational attainments effectively measure human capacities, claiming that nature experience contributes to the development of human capacities in a special and perhaps irreplaceable way is not the same thing as claiming that nature experiences provide the only significant opportunities for developing human capacities.

The aforementioned studies emphasise the potential, distinctive psychological benefits nature experience provides. But, as they are conducted in our world, where nature experience is always accessible (whilst it would not be any more in the treeless, birdless world Barry describes), they mainly focus on the comparison between a life with very few nature experiences and a life with frequent nature experiences. They may help us to decide whether people, children or adults, who live in highly urbanized environments should go hiking more often, for instance, or whether big cities should invest more in the construction of urban parks (like Central Park). But, to decide whether there would be something wrong with a world without non-human living organisms, we must imagine what it would be like to live in a world where nature experience would not be accessible any more, and try to tackle what humans

[14] The challenging character of nature experience is a major theme in various novels and movies, such as *Into the Wild* or *Deliverance.*

would miss, be they fond of hiking and urban parks or not. Perhaps one could speculate that, insofar as they are at the same time complex entities and entities that are not human-made, or at least not entirely human-made (since humans shape domesticated animals and plants to a significant extent), living animals and plants could stimulate the development and exercise of human capacities and abilities in a rather unique way. Being confronted to the existence of a large range of organisms that have not been designed by other humans might make a unique contribution to the development of our affective, imaginative and cognitive capacities, by the very fact that these organisms are not human-made. Not having access to nature would limit future people's experience of complexity to human-made reality. Contacts with a reality that is not human-made would be limited to contacts with the mineral world.

6. PRACTICAL IMPLICATIONS

The natural environment is thus likely to be part of an adequate range of options because, first, it provides exceptionally rich opportunities to develop and exercise the human capacities and, second, access to a complex reality that works apart from human control and projects may stimulate the development of the human capacities in a way that human-made reality does not. Therefore the metric of open options, once clarified, gives a reason to preserve living trees and birds for future people. It also enables us to specify the aspects of nature that should be preserved.

Environmental preservation pursues at least three distinctive goals: first, the preservation of a healthy, not polluted environment; second, the preservation of a natural environment; third, the preservation of biodiversity (Gosseries 1998). There is little doubt that the first goal is required for the well-being of future generations. The present article has attempted to justify the two other goals from the perspective of intergenerational justice. Now, let me briefly mention some aspects of nature and diversity an adequate range of options might include. First, for a range of options to be adequate, it must enable the agent to survive. There is no obligation to maintain aspects of the natural world that threaten humans (such as the AIDS virus, locust invasions or storms). Second, a world that functions out of human control does not need to be a totally wild world. Even a pot plant functions apart of its owner's projects, to some extent. However, if we only preserved pot plants for future generations, these would become rather boring and one could doubt there would be much occasions left for them to develop their human capacities.

A last issue regarding the definition of an "option" remains to be tackled. If non-human living organisms are to be preserved *as an option*, how should we secure their availability? Given the fact that preserving real trees (and especially many different species of real trees) incurs costs on the present generation, we might wonder whether a sensible solution might not be to cut trees so as to make room for a growing population, and still keep seeds in seed banks, so that future generations could still plant trees so as to develop and exercise their capacities to their fullest.

Perhaps preserving seed banks *only*, instead of living trees, would be deficient from the perspective of the open options view for the following reason. The *concrete experience* of an option also shapes our choices. It is not the same thing to choose to experience nature when trees are already there and to choose to plant seeds in order to experience a natural world one has never encountered. The concrete experience of the option thus modifies the option itself from the agent's perspective. A possible access to real trees will not have the same impact on future people's choices than the physical presence of trees. The range of options one has when she has access to tree

seeds without having experienced real trees is not larger than the range of options one has when trees are physically present. It is different. A person who has never seen trees might be less willing to spend resources and effort to plant some even if seeds are available. Therefore, by allowing future generations to choose not to plant trees, we might (paradoxically) diminish rather than increase their autonomy.

7. CONCLUSION

This paper had two aims: clarifying the open options account of intergenerational justice and determining whether and to what extent non-human living things should be part of open options. I have reframed open options in terms of adequate options. An adequate range of options is one of the conditions of autonomy. An adequate range of options does not have to contain a high number of options. But it must, first, secure our physical and ethical survival and, second, meet a test of variety. A range of options is varied if it enables the agent to develop and exercise a set of capacities human beings have an innate drive to develop and exercise, which I have called human capacities. Having thus clarified the idea of open options, I have provided support for the hypothesis that access to the natural environment ought to be one of the components of an adequate range of options for future generations. First, the existing empirical literature suggests that the experience of nature provides exceptionally rich opportunities to learn, develop and exercise the human capacities. Second, access to a reality that functions apart from human control and projects might stimulate the human capacities in a way that human-made reality cannot.

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