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# Photosynthetics: a groundwork for being with the light

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## ABSTRACT

It has been suggested that we turn to solar geoengineering to counter global warming, which would consequently transform the relationship of terrestrial plant-life to the sun. This is an article not about geoengineering as such, but instead what is called *photosynthetics*, or, thinking about our moral relationship to the light – in particular, as it is mediated by plants. Working from within but then extending the idea of responsibility found in the work of Emmanuel Levinas, it is argued here that, since the plant cultivates the conditions of life on earth by photosynthesis, its relationship to the sun is then a relation of giving to others that is properly moral. The plant's existence is an exposure so out of kilter with human ways of understanding existence that it interrupts our own and brings us into a relation of responsibility. It is concluded that rather than redirecting the sun's radiation, we should turn to plants to reconsider how we live with the light on a heating planet. This first means separating moral responsibility from human vision so that we might encounter light on its own terms, and not simply as an element of rationality or sentiment or discipline.



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When it comes to mitigating global warming, the loudest voices would take us away from co-operation with natural entities – working with the trees to increase the canopies that offer shade or with the rocks to accelerate the weathering that sinks carbon – and towards geoengineering solutions that prioritise the demands of the wealthy (see Hill, 2022). A striking example of this is offered by solar geoengineering, whereby sunlight would be diverted back into space by altering the reflectivity of the earth. This would not only change the amount of light coming down to earth, aerosol particles injected into the stratosphere blocking some fraction of sunlight, it would also change the quality of light that reached the earth's surface, making it more diffuse. The effect, Holly Buck (2019) warns, would not only be a changing of the colour of the sky, but of how plants interact with the sun. If we rarely approach celestial bodies through an ethical lens (see Green, 2022), and if the technological transformation of the earth diminishes the partnership of plant and human at great existential risk to the plant world (Mumford, 1973), then this impact of geoengineering demands a serious moral response.

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This article introduces the concept of photosynethics, or, of thinking about ethics in conjunction with the relationships formed between plants and light and the human place amongst this. The first section surveys the influential ways that light has been figured in terms of human meaning, feeding then a cultural imaginary that prioritises the connection of light to reason or sentiment or discipline over encounters with light itself. The second section then makes the case that plants are the sorts of things that escape knowledge or power not as objects of sympathy but as entities encountered with a moral seriousness that demands they are approached with responsibility. The third section finally focuses on photosynthesis to show that the plant's relationship with the sun is not only best understood as a moral relationship marked by exposure to another, and by giving, but one that we ought to heed when thinking about the human relationship to the light. Taken together, the article presents a groundwork for thinking morally about our relationship to light and to plants before we cannot turn back from geoengineered solutions that might diminish this bond.

## Imaginarities of light

We have long associated light with rationality. As Nandita Badami (2021) points out, since we are overconfident about the good that comes of rational thought, we tend to be blindly optimistic about what can be achieved by harnessing the sun's light. She traces this intimacy between light and understanding to Plato's allegory of the cave. Here – and hereafter – she says, light becomes not so much a metaphorical device as a metaphysical one; light becomes the condition by which we know truth. Badami tracks this through history, noting how it evolves – for example, during the Enlightenment when humans themselves came to be seen as a source of rationalising light – but this narrative is essentially one of epistemology. Our story, with its focus instead on ethics, treads a similar path through western thinking, not to reproduce those identities or amplify those voices, but to suggest that their reproduction and amplification have concretised an idea of light that situates it within the human desire to grasp, and this in the sense both of comprehension and of extractive possession. It is a story that begins elsewhere in the *Republic* – not in the cave but with the Ring of Gyges.

In this passage of the dialogue, Plato's cousin Glaucon tells Socrates a story of a ring that grants its bearer invisibility (Plato, 1997, pp. 1000–1001). It is not clear how the ring works – whether it prevents the bearer from both reflecting and absorbing light or whether it refracts the light around him – but the effect is that whoever wears the ring is removed from sight. The ring is found by a shepherd, Gyges, who uses it to seduce the king's wife, kill the king, and then usurp his throne. Glaucon puts it to Socrates that both the just and the unjust person would act likewise, since no one would forgo desire if they were not compelled to do so, and since one of the ways that we are so compelled – reputational damage – is circumvented by being invisible. More than this, he suggests, 'someone who didn't want to do injustice, given this sort of opportunity, and who didn't touch other people's property would be thought wretched and stupid by everyone aware of the situation' (Plato, 1997, p. 1001). Socrates responds that no good could come of giving in to animal desire like this, that we cannot judge someone by seeing them but by their love of wisdom and how it takes them away from a wild nature, and that ultimately any pursuit of the good

consists not of appearances but of an attempt to encounter the forms as they truly are – which takes us back to the allegory of the cave (Plato, 1997, p. 1215). We have then, on the one hand, a social contract theory advanced by Glaucon that tethers light to reputation; and, on the other, an epistemological argument returned by Socrates that would bind the good to rationality as the light in which we see reality beyond everyday experience.

In *The Theory of Moral Sentiments* Adam Smith gives a response, of sorts, to Glaucon, not by appeal to rationality or philosophical activity, but to feeling. It is not just that we follow certain rules – prohibitions against theft or murder or treason, say – because we imagine being seen to break them but because we imagine what others would feel like seeing them broken or followed, and then align our own emotional disposition accordingly. This would prioritise virtue over rule following, and so no recourse to invisibility would circumvent good deed since the feeling would be borne in the heart. Smith works with an idea of sympathy that is imaginative, that is, that involves an act of projection to imagine what it would be like to experience suffering or witness unjust behaviour, including our own, from the vantagepoint of the other. For Smith (2009), people can be seen in an ‘odious light’ or an ‘amiable light’ (pp. 83, 85), but to be anonymous, like Gyges, would bring despondency rather than justifiable opportunity, since it would obscure him from ‘the day-light of honour and approbation’ (p. 63). Light plays a recurring figurative role in the development of this account, taking two broad forms throughout the text: first, that we imagine our actions seen by others as being *in the light of the other*; and second, that when we imagine the plight of the other we do so by seeing *the other in their own light*. Ultimately, being emotionally distant from others casts us in ‘the darkness of solitude’ whereas through moral sentiment we enter ‘the daylight of the world and of society’ (Smith, 2009, p. 177).

In *A Philosophical Enquiry* Edmund Burke (2008) describes sympathy as ‘a sort of substitution, by which we are put into the place of another man’, such that ‘we are moved as they are moved’, and so move to respond to their suffering, unable to remain still as ‘indifferent spectators’ (p. 41). For Burke (2008), sympathy in the face of the distress of the other generates feelings of both pain and pleasure: pain because we imagine ourselves in their position; and pleasure because when ‘we are formed by nature to any active purpose, the passion which animates us to it, is attended with delight’ (p. 42). Whilst Burke does not, like Smith, use figures of light to ground his idea of sympathy, he does unite both moral experience and light through his consideration of the sublime. A feeling of the sublime is brought about in confrontation with something of such magnitude that it short-circuits thinking, causing pain to the faculties but also the pleasure of attempting to contain in thought a quantity that exceeds it and thereby encountering the limit of human cognitive ability. The light of the sun, says Burke, is capable of evoking such a feeling, given its intensity on the eye that would overwhelm the senses. Darkness too evokes a sublime terror because we are overwhelmed by the feeling that we cannot discern, that we cannot perceive our environment, that we might at any moment stumble; our cognitive faculties are overwhelmed by the immensity of blackness that engulfs them (Burke, 2008, pp. 130–133). Justice and suffering, like light and darkness, take us to the limit of human reasoning, open us up to delight and terror, to pleasure and pain, and then open on to something beyond – an enthusiasm for an active purpose that takes us beyond ourselves.

Where light and darkness are often thought to stand for good and evil, an ambiguity has been introduced by Burke – and then extended by Michel Foucault. In *Discipline and Punish* Foucault (2020) argues that with the rise of panopticism – not only as a prison architecture but as an arrangement of the social for the exercise of power – darkness ceases to be an enveloping punishment:

The panoptic mechanism arranges spatial unities that make it possible to see constantly and to recognise immediately. In short, it reverses the principles of the dungeon; or rather of its three functions – to enclose, to deprive of light and to hide – it preserves only the first and eliminates the other two. Full lighting and the eye of a supervisor capture better than darkness, which ultimately protected. (p. 200)

To be visible to unknown entities is to be an ‘object of information, never a subject in communication’ (Foucault, 2020, p. 200). Reduced in such a way, the observed is not rendered anonymous by the dark but cast in ‘a sequestered and observed solitude’ by the light (Foucault, 2020, p. 201). Panopticism is a spatial arrangement by which we change or conform our behaviour, not sympathetically by the light of the other, but in accordance with the power that has bathed us in light, such that an excess of light would overwhelm any moral sense and contort the behaviour of the individual this way or that. ‘Visibility’, Foucault (2020) says, ‘is a trap’ (p. 200). We tend to think of power as a destructive force, perhaps a dark force, one that excludes and conceals and represses; as Foucault points out, power builds, it constructs, it creates reality. Whereas the light beyond Plato’s cave stood for truth, in Foucault’s panopticon it produces the appearances that power dictates.

Since we are returned to the beginning of our story of light, it is worth, finally, considering the challenge posed to this imaginary by the work of Emmanuel Levinas. In *Totality and Infinity* Levinas (2007) observes that the fantasy of invisibility is the fantasy of a virile and closed individualism: ‘The myth of Gyges is the very myth of the I and interiority, which exist non-recognised’ (p. 61). We are – we must be – separate from others, but without a movement towards the other there is only solitude and ignorance. Levinas (2007) asks: ‘does not Gyges’ position involve the impunity of a being alone in the world, that is, a being for whom the world is a spectacle?’ (p. 90). Of course, Plato does not think that there could be sanction for those who used their anonymity to commit ill-deeds, but he takes a different road: for Plato, no good could come from irrationally giving in to a wild nature of desire; for Levinas, it is the very possibility of doing so that takes the human beyond the natural realm. ‘Gyges plays a double game’, writes Levinas (2007), ‘a presence to others and an absence, speaking to “others” and evading speech; Gyges is the very condition of man, the possibility of injustice and radical egoism, the possibility of accepting the rules of the game, but cheating’ (p. 173). This rests on an understanding of the state of nature that Levinas (2019) calls ‘Darwinian’: ‘The animal being is a struggle for life, a struggle for life without ethics. Is that not true? It is a question of might, no? Darwinian morality’ (p. 5). The human, by contrast, can break from this struggle of might and orient its existence towards the other and not against; not because the human is an inherently rational entity but because it can rise above ‘animal complacency in oneself’ (Levinas, 2007, p. 149).

Gyges does not. But Gyges’ noninteractive world, without intersubjectivity – all spectacle – is a ‘silent world’ (Levinas, 2007, p. 90). This is crucial: it is not seeing or being seen that makes the difference when it comes to moral responsibility but speech. Levinas

(2007) says that 'speech cuts across vision' (p. 195), which is to say that whilst looking at the other takes them in, assimilates them to the senses, allows for the individual to contain an image of the other in thought, the voice of the other interrupts this interiority, shatters the complacency of the one that thinks it can grasp the other. As such, Levinas (2007) writes, 'a being is not placed in the light of another but presents itself in the manifestation that should only announce it', and this announcement 'consists in a being telling itself to us independently of every position we would have taken in its regard, *expressing itself*' (p. 65). Contrary to Smith, then, responsibility does not hinge on imaginative sympathy, on imagining who the other is and what they experience, with its allusion to light and vision, but on responding to the call of the other. As Levinas (2008) explains in *Otherwise Than Being*, this call is not to be confused with mere sound; it is the way that in the encounter the other resists me, my intentions and perceptions, and so demands that I respond with responsibility given this asymmetry, given the limitation of my imagination which cannot encompass the other who stands across from me and never in my site, such that 'responsibility for another is precisely a saying prior to anything said' (p. 43). The other says, at bottom, 'thou shall not kill', not by articulating the words but by opposing my egoism pacifically, by eluding my cognition, by stepping away even as I step towards.

Levinas grounds responsibility in the distance that separates us. Smith accepted that those who were culturally distant would have different experiences but insisted that morality was the kind of thing that could bear no tolerance of injustice regardless of custom or tradition. This would essentially annihilate the distance. Burke held that such cultural distance would prevent the one from placing themselves in the shoes of the other, and so was sufficient to remove those others from moral responsibility (see Eagleton, 2009, pp. 62–82). This would then turn the distance into an alienation. For Levinas the otherness of the other cannot be gotten around. There is no vantage point from which the one can survey and know the other without reducing the other to an extension of one's own intentionality. As such, the only responsible encounter hinges on listening and not imagining, however forlorn it is to transmit and translate what is interior to the other. Cultural difference is a drop in the ocean – a cosmetic difference – compared to the chasm that separates one person from another. Levinas (2008) talks even of 'the stranger in the neighbour' (p. 123), recognising that distance is primarily – primordially – a question of existential separation rather than geography or custom.

This separation is not bridged by the enjoyment of a duty or purpose, as for Burke; responsibility is not enjoyment but instead giving. As Levinas (2008) argues, you must enjoy what you give but not the giving itself, which 'has meaning only as a tearing from oneself despite oneself', such as, 'the tearing away of the mouthful of bread from the mouth that tastes in full enjoyment' (p. 74). And not just bread but really an openness to the other, a complete and uncompromising hospitality for the other. Burke's admixture of pleasure and pain placed the encounter with suffering in the category of experience of the sublime, like an excess of light or an engulfment in darkness, that overwhelms thought and opens on to an idea of justice. For Levinas, the enthusiasm for the other experienced in the encounter with the other, whose unassimilable otherness resists my grasp, opens on to an infinite relation of giving.

Whereas light has often been seen as a mechanism for recognising the other's plight, substituting oneself then for them, for Levinas this image granted to vision is a mere

shadow of the other. Levinas (2006) argues that image neutralises its subject, translating it into a sensation to be enjoyed, and so removing it from the moral universe. The image merely resembles the other, an entity who resembles themselves, of course, but who is more than this resemblance because the spontaneity of their existence cannot be set. 'An image', Levinas (2006) says, 'is an allegory of being' (p. 6). Without this animating force of spontaneity, the image is simply a plastic form, always a statue, whatever the medium, stuck in time. No encounter with another is forthcoming because the other cannot come forth to interrupt my enjoyment. Take a photograph: its smiling subject is really a non-subject because its smile will never broaden, because its mouth will never open to speak, because it does not move and so does not move me. We are back, like Gyges, in silent spectacle – an evasion of the fullness of another being and not an encounter. To capture the image of the other is to remove them to a prison of light, to make them an object of information and not a subject of communication, but a prison that operates not like Foucault's panopticon – by suffusing space with light – and instead by dislocating the other from time, where time is understood as a movement towards the other, where moral responsibility is a movement together into the future, an embrace of the unknown, an embrace of the other.

But the ambiguity of light captured in Burke and in Foucault is extended by Levinas. Light understood as a service to vision, of human cognition or power, would reduce the boundless other to mere sense data. At the same time, Levinas (2007) ascribes a boundlessness to light itself, as an elemental force that contains but cannot be contained, that can be put to work to serve human interest but that can never be captured at its source. Are we then responsible to light as a moral element in the same way that we are to the other person since it is the way the other escapes me that demands my responsibility? Not for Levinas, in whose work elements are not the kind of thing that conceal an entity to be encountered; they are an existence without an existent and so cannot interrupt my existing. Whereas our lot in a world of others is to be dislocated by the suffering of the other, he says, our relationship with the natural world is one of 'enjoyment and agreeableness of life' (Levinas, 2007, p. 149). We are at home in the elemental, but never sure of our place when in an encounter with the other. We live *from* the 'good soup' provided by the natural world (Levinas, 2007, p. 110), but we live *for* other people. Welcoming the other would mean opening our home, giving our soup, but we cannot give to what we give. Light then plays a vital part in our moral existence, possesses a status more elevated than mere things that can be had *in toto*, is more than just the medium by which we know or feel or discipline, but for Levinas is not something with which we form a moral relationship.

## Being a plant

The argument to be made is that plants do in fact form moral relationships with light and that we can learn from the plant how to be with the light if we accept that plants themselves are morally serious entities. It is made difficult, should we want to understand responsibility in Levinasian terms, given that Levinas situates the plant in the violent state of nature. This is perhaps unintuitive, given that the plant is usually thought of as a peaceably impassive sort of thing, but then for Levinas violence is not so much an agentic action as it is an existence unchecked by the existence of another. In rejecting



obliviousness to the fate of the other, Levinas (1997) warns of ‘invading reality like a wild vegetation that absorbs or breaks or pushes back everything around it’ (p. 9). Occupying the world without regard for how that occupation affects others is, Levinas says, something a plant would do. To be moral is not only to live non-violently but also unnaturally, to put others above our own growth or need or survival; selfishness and violence would instead reduce the human to the status of a ‘man-plant’ (Levinas, 1997, p. 100). At the heart of this is the argument that the human being exists in separation but that this existence is only given its animation in its separateness *from* others; without the other there is no coherent self and so the existence of the individual is put in motion, in time, by its going over to the other, its *being for* others. Without this latter movement there is only ever a solitary being, maximally free, vigorous in power, no doubt, but held in an atrophying stasis. Levinas (1997) asks:

What is an individual, a solitary individual, if not a tree that grows without regard for everything it suppresses and breaks, grabbing all the nourishment, air and sun, a being that is fully justified in its nature and its being? (p. 9)

Gyges is one answer. Attention to others snaps us out of this supposedly plant-like existence, where we justify our own selfishness by reference to our nature, and instead turns us towards justice. Being a plant, on this reading, is completely opposed to being moral.

The trick to getting past this is neither to see the plant as engaged in a breathless struggle against other existence, nor to reduce it to a kind of impassive or unmoving background. If the former part of this task is made difficult by Levinas, then the latter pits us against the substantial weight of western cultural and metaphysical tradition that Levinas in large part opposed. Even as anthropocentric or humanist approaches to understanding responsibility are challenged, these challenges can institute a kind of zoocentrism that privileges sentience and mobility, elevating the animal but downgrading the plant to a passive existence. ‘Plants’, writes Emanuele Coccia (2021), ‘are the always open wound of the metaphysical snobbery that defines our culture’ (p. 3). One of the difficulties in mending this comes precisely from the value given to separateness. As Elaine Miller (2002) argues, unlike animals, there is no point at which a plant is clearly an individual. We value the animal above the plant because the animal body is separate; the animal is independent and coherent in a way that the plant is not. With the plant, it is not always clear where the one plant ends and the other begins or whether the plant has offspring or essentially propagates itself but discontinuously. The plant does not appear to be the sort of thing in possession of an internal identity (or ipseity), so there would then be little hope of it having an outward or social identity.

This is a problem that comes back to the totalising impulse of western thought. Luce Irigaray warns of the way that the classificatory function of human culture is out of harmony with the cultivation of life (in Irigaray & Marder, 2016). We see this in the way that classification and appearance are held above recognition or encounter. In western culture, Irigaray argues, a tree can be an oak or an elm or an ash, but there is no sense of how a tree can be a tree (see Irigaray & Marder, 2016, pp. 46–61). Plants are then things we put in place but not beings we attempt to communicate with or to face. This in turn feeds into the image of vegetal passiveness – their being like things. When Levinas says that the plant invades space and takes for itself the good soup of life, he is really reproducing the

prejudice of western metaphysics; that the plant has moved, that it is not where it is supposed to be, that it does not co-operate in its own reduction in status to a thing, and therefore to an object of enjoyment, is really only a negative when looked upon with an expectation that the plant stays in its place and leaves the classificatory function of human culture untroubled.

As Michael Marder (2013) observes, in his own account of plant ethics with and against Levinas, the plant is caught in a double bind of cultural prejudice: their strangeness means that we see nothing of ourselves in them (alienation); and yet when we cultivate them, we encounter them on human terms – and so do not really encounter the plant itself (annihilation). Underneath both – this drive to see the plant as strange or as human plaything – is the persistence of the ascription of passivity to the plant. The key for Marder (2013) is to resist the temptation to argue in favour of the activeness of plants and instead to reject the binary altogether. The plant is neither active nor passive, both of which are human projections; the plant goes beyond these narrow containers and embraces a mode of existing that is actively passive and passively active, and best understood as a kind of exposure to others. The plant's future is entirely contingent on its openness to other existing entities. Marder (2013) argues that we demean this 'vegetal indifference' because it is incompatible with the human way of understanding life as a project, as an active doing, as an autonomy (p. 132). What sort of existence is it to be open to being eaten or pruned or trampled? It is an existence that is propagated by its exposure to others. Fruits are eaten by animals and their seeds spread when defaecated. Trees pruned are then given to new growth. Plants trampled might attach their spurs to the limbs of others who take them to new spaces. It is this trampling that is most emblematic of plant being for Marder; that something can fall apart is so radically out of kilter with the human understanding of identity as persistence that it is hard to see it as the quality of a meaningful existence at all.

But is this not the most social kind of existence that can be imagined? The most moral? 'Plant life is life as complete exposure', writes Coccia (2021), 'in absolute continuity and total communion with the environment' (p. 5). This is not so strange a way of being that it fails the test of really being at all; it is the most fundamental way of being in the world imaginable. For Miller (2002), the vulnerability of the plant – which plays a part in the ascription of passivity that is usually sufficient to remove it from the moral universe – is a result of how open and other-oriented the plant is. It does not seize or control, as Levinas would hold; but nor is it just there and nothing more. The plant, in exposing itself to a world of others, has shown that it is capable of living otherwise than being, not as a refusal or elevation from a state of nature, but because the natural world is like this, relational like this. We can eat or prune or trample the plant, but in so doing we have not exhausted its possibilities, or exceeded them with our own, since this might serve its propagation in the world; we do not, then, either by cultivating or mistreating plants, reduce them to human possessions. They exceed their encounter with the human.

This is not yet enough to say that the human has a moral responsibility, in the sense of Levinas, towards the plant. They might resist possession, but they would also need to interrupt my existence in the encounter, which is to say that the plant would have to be capable of speech. But speech in the precise sense of a saying and not a said, a communication of a precarious existence and not simply a string of intelligible words. If it seems absurd to say that a plant can speak, then it is only because the human has set

the scene in such a way. As Marder (2019) argues, to associate speech only with those entities capable of language is not only wrong but unjust, since it removes in advance some beings from the moral universe – it removes them before they can be encountered just so that this entity can then be said to be unencounterable in moral terms. How does the plant speak to human others? The best we can say is that it moves towards us, opens its leaves to us, that its communication is essentially spatial or perhaps ambient (Mattern, 2021). Its communication of itself is one and the same as its exposure to the other. If we find this unsatisfactory then, as Marder (2019) says, it is only because we have not yet accepted that the plant is an existence that cannot be reduced to human terms, only because we have not yet given up trying to translate their language into our own so that we can hold it in thought, which is to say, because we persist in traducing and then excluding the plant from responsibility. If the plant not only exceeds my attempts to grasp it, to take possession of it, but also communicates this to me, communicates its exposure to me, then we would have to take care in negotiating its existence. The plant would then have to be encountered as a moral entity.

### Living with light

The plant has made an entire world, a world that we share, by a more meaningful relationship to light. At the heart of this world-making and world-giving is photosynthesis. Coccia (2021) notes that the plant was the first wholly terrestrial being after the emergence of life from the sea. All other life on earth is then made possible because the plant breathes in carbon dioxide and breathes out oxygen. This respiratory activity is powered by the energy of light, absorbed by chlorophyll. Plants are then not simply an environment, or more reductively a greenspace, but instead put on an environment for all living things by creating the conditions for their very existence. Marder says that the plant nourishes the elements (in Irigaray & Marder, 2016, p. 47). We could say that the plant is not simply nourished by the sun but in turn gives nourishment to others, not the bread from its mouth, but the light from its leaves – now breathable air. As John Durham Peters (2015) puts it, plants are ‘the great mediators of the sun’ (p. 148) and photosynthesis then plenishes the earth with oxygen as the ‘universal medium’ of life (p. 130).

When we think of this from the perspective of the biologist it can tend to seem somewhat transactional; there is, however, a deep intimacy, a relationship that goes beyond mere systematicity, between all respiratory beings. Coccia (2021) suggests that since we breathe the breath of plants, our living is a consequence of the living of others, of plant others. This shows the myth of any solitary existence, and ought to explode any sense that the human might act alone; when we do so, in the posture of Gyges, we act contrariwise to moral existence. For Irigaray, the very fact of photosynthesis opens on to the necessity of responsibility in a world shared; to breathe the breath of the other is an exchange of life that exceeds any cultural difference or metaphysical barrier (in Irigaray & Marder, 2016, pp. 21–26). Irigaray says that we breathe for ourselves before we can breathe for others; we should add that the plant shows us precisely that we take a breath so that we can give to others. And if we cannot breathe without the plant then we are already in a community that transcends the human – we are already morally bound to their existence. The plant is not a greedy entity that soaks up all the sun and saps all the nutrients and crowds out the spaces of life for others, whatever Levinas says;

the plant shares its light with all the others. And whilst we should not want to go as far as Dennis McKenna, who in the foreword to *The Mind of Plants* declares that all living things incapable of photosynthesis are essentially parasites (in Ryan et al., 2021), we should at least concede from this that the human is not the only entity capable of giving as a tearing away from being, despite itself.

The interconnectedness of our breathing ought to certify the moral value of giving, moral since without this giving the already precarious existence of others is negated. But what does the orientation of the plant to the light itself tell us about responsible ways of being in the world? Plants can of course be harmed by excessive sun. In living as an exposure, the plant's existence is more vulnerable than an existence sheltered from others and because of this, because of this open relationship with light that makes possible relationships between a whole world of others, it is a way of living that is profoundly moral, precisely because it imperils itself. To live responsibly is to take the risk of living with others, to extend oneself to the sun, literal and figurative. To exist beyond egoism and solitariness is to direct oneself towards the other, which is always a risk since it is an orientation to the unknown and the unknowable. Take the sunflower, which is heliotropic, following the sun to maximise its exposure to the light, despite the risk of being scorched. The movement of the sunflower is more obvious than its rootedness in the soil, where it takes up nutrients it can process because of the energy of the light it receives. The sunflower turns at night to face the direction of the dawn, ready for the sun to come, but in anticipation of a relationship with the light that grounds it in the earth. This openness is not straightforwardly the extraction of a resource; it is, as Marder puts it (in Irigaray & Marder, 2016), the plant 'extending itself toward the inaccessible other' (p. 185), waiting to greet the sun with an 'unconditional vegetal hospitality' (p. 157). The plant welcomes the sun not so much to itself, as if chlorophyll were a fly trap, but to the earth itself, on behalf of the earth, risking itself in its exposure. As Coccia (2021) argues, chlorophyll is the only direct material relationship between the sun and the earth, bringing its energy straight into the soil. To the extent that it is a giving despite itself, it is also a moral relationship.

We too need to welcome the sun unconditionally. Emulating the plant is complicated, however, by the human elevation of itself to the position of mediator between earth and sun, a usurpation every bit as egregious as that of Gyges. From this position the human extends a blind overconfidence in its own and separate destiny. Georges Bataille warns of the way that the human is filled up with energy by the sun, energy to consume and expend, that maroons it on earth and drives it to death, that the energy of the sun is always at risk of being absorbed by capital (see Boetzkes, 2021), an apposite warning when we consider responses to global warming such as solar geoengineering. Tampering with reflectivity would dim the sun – but not the relentless drive for consumption and development and expansion that capital demands and that geoengineering ultimately aims to keep in place. But Bataille (2004) does not give due credit to plants when he describes them as extending themselves towards the light in a mass uniformity and then when dead falling back to the ground, as if they were caught between the sun and the earth. This misses the way that the plant instantiates a radically different way of being with the sun, one that connects it to the earth not as a delirious and destructive energy, an intensity of selfish and consumptive drive, but as giving, as community, as being with others. As Nicole

Starosielski (2021) argues, the human is not in receipt of the sun as gift; we are not the primary recipients of the sun's light – we have not the chlorophyll for it. Instead, any relationship to the light must be borne of attentiveness to the sun and an openness to the way that it brings us into relationships with other things. The sun, Starosielski says, does not produce growth; growth is the product of labouring entities that embrace their exposure to the sun.

We should want to reject this emphasis on labouring, however, not least because the kind of growth given primacy in responses to climate change is still economic growth. The plant's orientation to the light is a being with others before it is an industriousness. And as Dominic Boyer (2021) points out, working less would do more to reduce our emissions than any amount of industry expended on geoengineering solutions to climate change. When we privilege human activity over the plant's indifferent exposure, we take ourselves – and others – further away from a liveable ground. But as tempting as it is to go along with Boyer's call to replace work with play and joy, the emphasis needs instead to be on responsibility. This is not to say that a more responsible way of being with the light cannot take its inspiration from slowing down. Jennifer Atchison (2021) calls for a more serious reckoning with the need for shade, and we might think of being shaded in line with Boyer's *revellion* – his radical embrace of revelry versus work – and emphasise here the small pleasure of reclining under the shade of a tree on a hot summer's day. Yet there is an urgency that takes precedence; as Atchison explains, we do not tend to grasp the importance of shade in a world where cities are becoming uninhabitable due to the excoriating heat. Nor do we tend to recognise these small moments – reclining under trees – as events of comfort and conviviality indicative of more-than-human togetherness (see Straughan et al., 2022). When we think of the role of the tree in generating shade, we see it as straightforwardly passive, and ignore the role that the tree is playing in making for us the air from the sun whilst also shielding us from its rays. We can relax under the cover of leaves but not before the tree has already placed us in a relationship with the light and with the world that is marked by the alertness of an exposure to otherness that is subtended by giving. Given the extreme heat that attends climate change, would we not be better off finding those solutions that are one with the vegetative world, subordinating the human, putting ourselves under the trees, so to speak, and not jeopardising the giving of air and of shade by changing the amount of light that comes down to those entities that give them to us?

In the end, what we have here is a groundwork for an idea of photosynthetics, which is really a way of thinking about the fecundity of the relationship of the plant to the light, and the human place in, or rather what ought to be its orientation to, this exposure. In the work of Levinas (2007) 'fecundity' stands for the way that an openness to the other gives birth to the future. We can think of this on two scales: the first, the way that I am set forwards in motion and in time because I expose myself to the other and every possibility that exposure can offer, so that something happens, a happening that takes us beyond an otherwise stuck present; the second, the way that it is only with a maximal openness to entities beyond the human, such as plants and light, that the idea of a future for humanity is really sustainable, that we can look ahead and see anything more than the outright devastation of life wrought by climate change. Here, we can locate the fragile hope of rethinking the present in the encounter with the other (see Bergo, 2009), which is to say, the hope of a future of intersubjectivity made possible by intersubjectivity. In this we go

beyond Levinas and his exclusion of the plant but take with us his seriousness about moral existence as responsibility for the other – the other who can now be a tree or a bush or a flower.

This is a groundwork to the extent that it offers an idea that itself would need to be applied and extended and put into motion if it is to do its fullest work. This would have to extend the moral welcome offered to the sun and to the plants to those other elements and entities that would make the moral revellion of the future possible, such as the rains that slake the trees and the winds that cool as they ripple through the leaves, so that photosynthetics is then situated as a vital relationship within a broader ecological responsibility. The work set out here has indicated that we can embrace the fecundity implied by photosynthetics only if we reject the imaginary of light that tethers it to human ends; only if we allow that the plant, in the way that it exceeds the human, binds us in a moral relationship; and only if we are humble enough to learn from the relationship of exposure that the plant shares with the light. This is learning not as a taking-in, but as a responding to, responding to the way that the plant responds to the sun as a spur to continual navigation of the existence of both. The best we can say of solar geoengineering without supplementary work is that, taking photosynthetics into account, it would appear to be an ungenerous and unwelcoming orientation to the sun. It is a short-termism when we need long-term, but no less urgent responses. At the very least, no decision can be made, no solution can be agreed upon, without consideration of the relationship of the plant to the light.

This is because photosynthetics is itself a groundwork, in the sense that the plant's relationship with the light connects the sun to the earth, to the soil, and to the human. We are all much more tightly bound together than visions of geoengineering seem to allow. That binding is a relationship that can only be understood as an openness and responsibility for others, a sharing and giving that goes beyond the separateness of human and plant and element, that resolutely situates us all together here on a heating planet, which only underscores the urgency of finding our future together. To say that we cannot move forwards without first considering our responsibilities to non-human entities is not to delay but to recognise that our responsibilities to them are prior to any deliberation or decision or endeavour. We cannot act without responsibility. We ought then to be grounded by the light.

## Disclosure statement

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