ENVIRONMENTAL ETHICS FOR A FALLEN WORLD: JOHANN JAKOB SCHEUCHZER (1672–1733) AND THE BOUNDARIES OF HUMAN AGENCY

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ABSTRACT



Earth Sciences History Vol. 39, No. 2, 2020 pp. 447–473 This article traces the formation of a (self-)critical discourse around human environmental agency in early Enlightenment Europe, focusing on the Swiss naturalist Johann Jakob Scheuchzer (1672–1733) and the Royal Society milieus to which he was connected. In manuscript and printed writings, and particularly in his beautifully illustrated *Physica sacra* (1731–1735), Scheuchzer used a combination of biblical exegesis, thought experiments, and ecological insights to reflect about the relationship between God, humankind, and nature. Against claims that the tradition of natural theology in which Scheuchzer belonged "prevented and delayed the acknowledgment of the earth as vulnerable" (Kempe 2003b, p. 166), the article shows how different thinkers could use the Bible to support competing claims regarding the role of humans as agents in God's creation. While some authors enthusiastically upheld contemporary ideologies of environmental 'improvement', others—including Scheuchzer himself—called for greater self-restraint and developed a biblically-grounded form of precautionary environmental ethics.

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1. INTRODUCTION

Does the Anthropocene have a history? The case for a positive answer is becoming increasingly strong as intellectual historians over the last few years have delved into the "environmental reflexivities" of a more or less distant past (Fressoz and Locher 2012; Bonneuil 2015, p. 22). While the challenges that we face today are undoubtedly unprecedented, there have been other times in history when humankind has thought of itself as a major environmental and climatic force (Bonneuil and Fressoz 2016). From the sixteenth century onwards, generations of Europeans and North-Americans reflected upon the impact that human activity appeared to have on the planet (Grove 1995; Fleming 1998; Zilberstein 2016; Miglietti and Morgan 2017), with some writers going so far as to speculate on the human role in what we would call global climate change (Barnett 2019).

Perhaps surprisingly for us, early modern thinkers tended to regard humankind's environmental agency overwhelmingly in a positive light, in keeping with a rhetoric of 'dominion over nature' and 'improvement' that sustained engineering projects and technological development throughout the period (Hoyle 2011; Slack 2015; Richard 2017). Yet such optimistic views did not go completely unchallenged. The early modern era was also home to a more (self) critical discourse around technology and environmental intervention. For some observers, anxieties about the possible undesirable effects of climatic change on human health and character went hand in hand with an intense respect for the integrity of God's creation, which in turn led them to reflect about the boundaries of legitimate human activity on the planet.

This was the case for instance with the Swiss physician and naturalist Johann Jakob Scheuchzer (1672–1733), a prominent figure in Enlightenment discussions of primordial earth history through his seminal work on fossils found in his native Alpine region. While Scheuchzer

addressed the relationship between God, humanity, and nature in a number of manuscript and printed writings from the early 1700s onwards, the fullest treatment of the issue is contained in his monumental *Physica sacra* ("Holy Physics"), published between 1731 and 1735 in four large folio volumes and also known as *Kupfer-Bibel* ("Copper-Bible") for the over 750 copperplates that accompany the text.

It is on this work—arguably Scheuchzer's masterpiece—that I shall focus in this article. My chief goal is to demonstrate that the *Physica sacra*, traditionally interpreted as the culmination of a centuries-long tradition of 'Mosaic physics' (Blair 2000),¹ can also be understood as an early form of eco-theology and as a not-so-covert critique of contemporary ideologies of 'improvement' which celebrated intense human intervention on the environment. These ideologies, though widespread on the continent, were particularly influential in England, where the Royal Society (established in 1660) did much as an institution to promote them and put them into practice (Slack 2015; Hoyle 2011; McRae 1992 and 1996; Barnett 2019, pp. 120-125). Exploring Scheuchzer's views on this subject will give us an opportunity to revisit his relationship with the London-based society, with several of whose members (particularly John Woodward, 1665–1728) he was on friendly terms and of which he himself became a Foreign Fellow in 1703. Within the Royal Society itself, as we shall see, views differed as to how far exactly 'improvement' should be pursued. While many Fellows (including Woodward) seemed to accept quite unproblematically the notion that the Earth was there for man to enjoy it, exploit it, and ameliorate it, others, such as William Derham (1657-1735), prudently warned against the unintended consequences that can ensue from excessive technological development and unenlightened environmental intervention. Like Scheuchzer, Derham advocated a precautionary attitude to human agency that still resonates powerfully with us (Jonas 1984), and whose roots, as this article will show, were deeply biblical and theological as well as philosophical and scientific.

Cases like those of Scheuchzer and Derham demonstrate that early modern attitudes to human environmental agency were far more fraught than scholars have generally assumed, and that even an "interpretive community" (Fish 1982) that shared a common intellectual agendapromoting an "alliance between piety and philosophy" by revealing the essential unity of theological and physical truth (Blair 2000, p. 48)—could come to opposite conclusions regarding the role of humans in creation. Such debates, of course, did not originate in the early eighteenth century, nor did they disappear after the period studied in this article. More recently, the relationship between Christian theology, human agency, and the environment has been at the center of widespread debate following the publication in 1967 of Lynn White Jr's "Historical Roots of Our Ecologic Crisis", in which the "Judeo-Christian tradition" was famously accused of bearing "a huge burden of guilt" for the "present ecological crisis" (p. 1205). As shown by Todd LeVasseur and Anna Peterson in Religion and Ecological Crisis: The "Lynn White Thesis" at Fifty (2017, pp. 6–16), the on-going controversies surrounding this text testify on the one hand to scholarly dissatisfaction with White's over-simplified view of Christianity, while on the other hand they are proof of the enduring appeal that the so-called Lynn White thesis still commands among historians, social scientists, and environmental philosophers alike.

A version of the White thesis has recently been offered by Michael Kempe, the author of several important studies on Scheuchzer. In an article that discusses the environmental attitudes of Scheuchzer and other natural theologians from the early Enlightenment (2003b), Kempe argues that these thinkers "prevented and delayed the acknowledgment of the earth as vulnerable" by producing "one of the greatest errors in modern western thinking on ecological and environmental affairs" (pp. 165–166). The "error" in question consists in conceiving of the Earth as "a system

¹ This aspect has been explored by several scholars, including Robert Felfe (2003) and Michael Kempe; the latter has helpfully explored Scheuchzer's natural theology against the specific backdrop of Reformed views of divine revelation through nature and Scripture (2003a, especially pp. 150–187, partially reworked into English in Kempe 2006). For an overview of the manifold meanings of 'natural theology' in early modern Europe, see Mandelbrote 2013.

that is indestructible from the inside", and of humankind as "part of the system too"—a twofold mistake that according to Kempe blinded Scheuchzer and his fellow natural theologians to the potential dangers of "human interventions in nature" (pp. 165–166). Such a reading, in my view, does not do justice to the complexity of Scheuchzer's environmental outlook as it emerges from both the *Physica sacra* and some of his unpublished early writings. In this article, I will argue that Scheuchzer was far less optimistic than Kempe suggests about the 'indestructibility' of nature and the role of human agency within it: as we shall see, an important strand of his thought revolved around the necessity of setting clear boundaries to humankind's relationship with nature, also by preempting any kind of attitude or behavior that could yield unintended and potentially devastating effects on the planet.

The article is divided into four sections. First, I will examine Scheuchzer's view of human nature, highlighting in particular his description of humankind as simultaneously terrestrial and divine, as well as his 'anthropology of limits', which stresses the cognitive and ethical shortcomings of postlapsarian human beings. Together with the notion of God's inalienable sovereignty over the Earth, this critical anthropology structures Scheuchzer's understanding of the mankind—nature relationship and sets precise boundaries for human intervention on the planet, as will be discussed in section 3. Section 4 turns to the question of whether the Universal Deluge described in Genesis changed in any meaningful way humankind's rights and duties towards the Earth. Unlike English natural theologians such as Thomas Burnet (1635—1715) and John Woodward, Scheuchzer believed that the geological disruption brought about by the Flood had not altered the fundamental goodness and providential order of creation. It was on this basis that he criticized the attitude of those who thought that nature could, and should, be 'improved', and went on to develop a precautionary ethics of environmental intervention that has interesting parallels in other thinkers from that period (as discussed in the final section of the article).

While my discussion of the *Physica sacra* will rely most heavily on Scheuchzer's text, I will also pay attention to the accompanying copperplates, which add significantly to the expressive power of the work. One should of course be careful in extrapolating Scheuchzer's authorial intentions from an analysis of the plates. As Peter Wagner has rightly pointed out, the images in the *Physica sacra*, though designed under Scheuchzer's supervision, were not entirely his own "brainchild" (1995, p. 80). The three artists who worked with him on them (Johann Melchior Füssli, who designed the images in Zurich; Johann Andreas Pfeffel, who engraved them in Augsburg with the help of a team; and Johann Georg Pinz, who designed the frames) each enjoyed a certain amount of creative freedom. As Wagner reminds us, "the Physica sacra is not the work of Scheuchzer alone", and it would be misleading to "read either the pictures or the texts accompanying the illustrations as unified entities" (p. 81). Yet a case can be made, I think, for using the images as corroborating evidence of Scheuchzer's own intentions whenever the backand-forth between image and text conveys or reinforces a certain message, and especially if the meaning thus produced is confirmed in other parts of the text. One also should not forget that whatever creative license Füssli may have brought to the visual design, Scheuchzer was clearly pleased with the outcome, as he not only went ahead with the publication, but praised the work of his "excellent friend" in the Preface to the first volume of the work (1731, fol. b r-v).

2. THE HUMAN CONDITION

Scheuchzer's views on the relationship between humankind and nature cannot be understood in isolation from his conception of human nature itself. Scheuchzer's anthropology is firmly rooted in his reading of Genesis, particularly its first two chapters, which narrate God's creation of man and woman "in his own image" (1:27) and from "the dust of the ground" (2:7).² Taken together, these two passages are proof for Scheuchzer of humankind's fundamentally in-between condition: humans are made in God's image and therefore similar to Him to some extent, yet they are also thoroughly creatures, bearing traces of their terrestrial origins in their own material being. Man

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All biblical quotations are taken from the King James version, unless otherwise noted.

comes, quite literally, from the earth: *Homo ex humo* ("Man from dust") reads the caption to Plate 23 (see Figure 1), a visual commentary on Genesis 1:27 in light of Genesis 2:7 ("And the LORD God formed man of the dust of the ground").



Figure 1. "Man from dust", from Scheuchzer's Physica sacra (1731, plate 23). Photo: S. Miglietti.

There are other examples of Scheuchzer reading Scripture in such a way as to highlight the radically terrestrial nature of mankind. In commenting on the first few verses of Psalm 8, Scheuchzer notes that the very name of the protoplast, Adam, stems from the Hebrew word for soil, *adamah*, which strongly highlights his earthly origins (1733, p. 865, *ad* Ps. 8:4).³ In this case too, one finds that while Scheuchzer's source text pays equal attention to man's humble nature (v. 4, "What is man, that thou art mindful of him? and the son of man, that thou visitest him?")

³

Latin original: "Nomen ei gentilitium est Adam, de terra, quia fictus ex luto terrae". All translations are mine unless otherwise noted.

and to the special, God-given privilege that sets mankind apart from—and above—the rest of creation (v. 5, "For thou hast made him a little lower than the angels, and hast crowned him with glory and honour"), the corresponding plate in the *Physica sacra* (*Ecquid est homo mortalis*, "Whatever is mortal man", see Figure 2) strongly emphasizes the earthly, humble element over the noble and divine by depicting man in a creaturely pose, surrounded by plants and animals, and in close visual parallel to plate 23 (the creation story, Figure 1). It seems, then, that while Scheuchzer acknowledged humanity's twofold origins—terrestrial and divine—the overall effect of the work was to stress the former over the latter.



Figure 2. "Whatever is mortal man", from Scheuchzer's Physica sacra (1733, plate 537). Photo: S. Miglietti.

Ever since its origins, mankind was called upon to understand itself as a part of creation rather than as distinct from or superior to it. The idea of a humanity somehow created in order to transcend nature (an idea implied for instance in Lynn White Jr's reading of Christianity) is completely foreign to Scheuchzer's outlook. As for the chasm between God and man, which again existed from the very beginning, it became even greater in the aftermath of Adam's sin. Following Augustinian as well as Calvinist perspectives, Scheuchzer notes that the consequences of the Fall are evident in every area of human life—from fragile bodies (*corporis fragilitas*) to evil desires (*voluntatis malitia*) to curtailed intellectual faculties (*intellectus tenebrae*). Born to be noble creatures—"microcosms" of the whole creation, "tying together the spiritual and the corporeal worlds"—humans are now sadly reduced to the condition of "miserable, the most miserable" of all beings (Scheuchzer 1733, p. 861ff., *ad* Ps. 8:4).⁴

Particularly important for Scheuchzer is the current disproportion between our endless desire for knowledge and our actual cognitive abilities. In "our present state of corruption" (*in statu hoc nostro corruptionis*), he stresses, we can only know a fraction of what we wish to know, and even what we do know we know imperfectly, in a way that is merely "a shadow" (*umbratilis*) of God's perfect knowledge (Scheuchzer 1731, p. 23, *ad* Gen. 1:26–27).⁵ Unlike the seventeenth-century Baconians recently studied by Peter Harrison (2007), who dreamed of restoring the perfection of Adamic knowledge on Earth through the exploits of science, Scheuchzer does not seem to have nurtured any hope of ever reverting to an ideal prelapsarian condition (not, at least, until the new creation announced in Scripture). What he advocates instead is for man to honestly acknowledge his state of corruption and the limitations that it entails. Throughout the *Physica sacra* he incessantly points to the necessity of "self-knowledge" (*cognitio nostri*), which he intends as the contemplation and humble acceptance of one's weaknesses:

All the other sciences instruct us and make us erudite, but this one (the school of self-knowledge) makes us humble and pious . . . Constant introspection is a mirror of our fragility and mortality . . . May your constant lesson be: Know thyself, rather than all the things outside of us: this is a material and fragile abode, a house of bones and flesh, intimately united with a thinking, spiritual being . . . And even there—good God!—how many and how great are the weaknesses that manifest themselves? Our soul does not even know itself. It advances in an abyss of ignorance, shrouded in the darkness of error (Scheuchzer 1733, p. 861ff., *ad* Ps. 8:4).⁶

For Scheuchzer as for Calvin, self-knowledge, humility, and reliance on God go hand in hand and are marks of true piety—which may also explain his particular predilection for biblical passages or even entire books (such as Ecclesiastes or Job) that contain powerful reminders of man's fragility and finitude.⁷ Crucially, for Scheuchzer, none of this is purely speculative: how we think of ourselves determines the way in which we conduct ourselves in the world. Only true "self-knowledge" (*autognosia*) can ensure that we will not "elevate ourselves beyond ourselves,

⁴ Latin original: "Nobilis inquam sumus ktisis, nos microcosmus, mundi spiritualis et corporei vinculum. Sed quoque misera, imo miserrima, si animo perpendamus animam nostram a tot passionibus navigioli ad instar a tot fluctibus et conspirantibus ventis jactatam hinc, jactatam inde; jacturam deplorabilem imaginis divinae, intellectus tenebras, voluntatis malitiam, corporis fragilitatem, miselli corpusculi in animam pretiosissimam tyrannicum dominium, unionem animae cum corpore tenuissimo araneae pendulam filo, quod abrumpere valet levissima quaevis aura, quaelibet aeris mutatio, cibus, affectus, et momento quidem".

⁵ Latin original: "Alius [character imaginis divinae] Intelligentia, et sapiens operatio, sed quam et haec umbratilis, imo nulla, sapientiae Divinae comparata! Inprimis in Statu hoc nostro corruptionis et morias. Deus scit omnia et perfectissimo modo, imperfecte multa homo. Multa sciendi eum tenet cupido. Maxima pars eorum, quae scit, est minima eorum, quae ignorat". See also Scheuchzer 1733, pp. 1039–1040 (ad Eccl. 8:17): "Sed Deum inter Creatorem et nos, inter Opera Dei et nostrum scire infinita est distantia... Quo plus scimus, eo certius videmus, nos nihil scire, plus tamen scire, quam antea. Nihil respectu Omniscientiae Divinae, aliquid, si respiciamus capacitatem nostram".

⁶ Latin original: "Est haec nostri cognitio, ad quam nos Theologus noster manu ducit, post theosophian praecipua. Erudiunt nos et eruditos reddunt scientiae aliae omnes, sed haec, humiles, pios . . . eautosophias schola . . . Introspiciendum continuo est fragilitatis nostrae et mortalitatis speculum . . . Continua lectio sit: Nosce te ipsum, potius quam alia extra nos omnia: Est materiale hoc et fragile domicilium, ossea et carnea domus, unita intime cum ente cogitante, spirituali . . . Quot quantaeve, bone Deus!, heic quoque sese manifestant astheniai? Anima nostra ne se ipsam quidem cognoscit. Incedit illa in abysso ignorantiae et errorum tenebricosa".

⁷ In Book 1, Chapter 1 of his *Institutes of the Christian Religion* (1536–1559), John Calvin draws a strong connection between self-knowledge and knowledge of God, arguing that "from the feeling of our own ignorance, vanity, poverty, infirmity, and—what is more—depravity and corruption, we recognize that the true light of wisdom, sound virtue, full abundance of every good, and purity of righteousness rest in the Lord alone" (1960, vol. 1, p. 36). Calvin then goes on to explain how knowledge of God comes from the joint contemplation of nature and Scripture (Book 1, Chapters 5–6).

beyond our condition" (Scheuchzer 1733, p. 941, *ad* Ps. 103:14–16)⁸ or fall into the dangerous illusion of "knowing more than we actually do" (Scheuchzer 1733, pp. 1039–1040, *ad* Eccl. 8:17),⁹ which always leads to catastrophic results. "Humility, and continuous dependence upon the supreme Being" is the recipe for a good and contented life: "Happiness is our lot if we do not overstep the limits either of what we know or of what it is possible to know . . . let us be mindful of our finitude and ignorance" (Scheuchzer 1733, pp. 1039–1040, *ad* Eccl. 8:17).¹⁰ As we shall see in the next section, Scheuchzer's anthropology of limits also has a range of important practical applications for what concerns humankind's relationship with nature.

3. HUMANKIND AND NATURE

Scheuchzer's biblical point of departure for thinking about this topic is God's command to Adam in the first chapter of Genesis: "And God said, Let us make man in our image, after our likeness: and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth" (1:26). For Scheuchzer (as for countless other biblical exegetes before and after him: see Cohen 1989; Harrison 1999; Horrell 2014, pp. 23–36), the key question is how to interpret that phrase "let them have dominion", which in the King James Bible translates the *dominentur* of Jerome's Vulgata and the *praesit* of the Zurich Latin Bible of 1543 (both versions are offered in parallel throughout the *Physica sacra*). Exactly what kind of human relationship with nature is being sanctioned in this passage?

Scheuchzer's answer to this question can be summed up in the following three statements:

1. The Earth belongs to God;

2. When the Bible says that man has been granted "dominion" over the Earth, we must understand this "dominion" in the feudal sense of *dominium utile* (right of use) as opposed to *dominium directum* (lordship and ownership). God is lord; man is merely an usufructuary. This means that while man has the right to live on (and off) the land, he holds this right from God (the ultimate sovereign) and thus remains responsible before God for how he uses it;

3. This explicitly feudal conception (which reflects actual legal systems of land ownership and management in Old Regime Europe, including Scheuchzer's Switzerland: see Blum 1978, p. 20) creates a double bond of obedience and protection between God and man on the one hand, and between man and nature on the other. Just as God the sovereign grants man protection in exchange for man's faithful obedience, so is man granted dominion over the Earth in exchange for a duty of care and protection towards it.

Scheuchzer's use of a language of homage and subjection to describe both Adam's relationship with God and the animals' relationship with Adam in Genesis 1-2 suggests that he understands this feudal bond to have been a foundational aspect of human life on Earth since its very origins (Scheuchzer 1733, p. 865, *ad* Ps. 8:4).¹¹ Yet Scheuchzer also clearly views God's

⁸ Latin original: "... lectionem pro nobis, quotquot sumus, mortalibus, terrae vermiculis, imo pulvisculis, ut non nos elevemus unquam supra nos, supra conditionem nostram, ut commendatam habeamus ten autognosian, ut nos humiliemus devoti".

⁹ Latin original: "Quo plus scimus, eo certius videmus, nos nihil scire, plus tamen scire, quam antea... Cadimus protinus, et turpiter, extra centrum autognosias elati. Rumpitur facile filum imaginationis nimium tensum. Huic fato obnoxii sunt, qui altos nimis sibi sumunt spiritus, plus se scire sibi putant, quam revera sciunt, pro demonstrato habent, quod specie duntaxat veri fulget".

¹⁰ Latin original: "... porro humilitatem, et continuam a supremo Ente dependentiam. Felicibus nobis esse continget, si non exsiliamus ultra limites, tum scientiae, tum rerum cognoscibilium; si perpetuo, dum volamus, et alas ingenii vibramus, memores simus finitudinis nostrae et ignorantiae, continuo tamen tendentes ad veritatem et Deum".

¹¹ Latin original: "Aderant homagium Domino praestatura omnia bruta, et recipiebant nomina in signum subjectionis [Gen 2, 19-20] . . . Quoque neonoma diploma dominii feudatario concessi extat [Gen. 1, 28]:

dealings with Noah as the most paradigmatic example of this feudal arrangement. In Genesis 7:1-3, God commands Noah to gather all the animals in the Ark "to keep seed alive upon the face of all the earth" during the upcoming Flood. Commenting on this passage, Scheuchzer begins by explicitly describing Noah's mission as one of "guardianship" (*tutela*) and "conservation" (*ut conservarentur*) (Scheuchzer 1731, p. 23, *ad* Gen. 1:26-27).¹² He then goes on to explain how the "feudal letter that God gave Noah after the Flood" (a reference to God's covenant with Noah and his sons in Genesis 9) granted mankind not a form of "absolute lordship" (*absolutum dominium*) over nature but a "limited and feudal dominion" (*dominium restrictum et feudale*)—indeed not even a "dominion" but a "right to quiet enjoyment" (*usus potius quam dominium*), pursued for the various necessities of life (*ad varios usus, cibarios speciatim*) and with a thankful heart (*ex iis Creatorem Deum laudare*) (Scheuchzer 1731, p. 23, *ad* Gen. 1:26-27).¹³

Scheuchzer's characteristic interpretation of the God-mankind-nature relationship as a feudal pyramid has two main consequences. On the one hand, it establishes a series of limits to man's behavior towards lower forms of life, which God has entrusted to his care. On the other hand, it lays an exceptionally strong emphasis on God's sovereignty and on mankind's vassal status. That God's absolute lordship encompasses *all* of creation, mankind included, is a recurrent theme in the *Physica sacra*, as Scheuchzer devotes ample attention to passages and books that particularly emphasize this aspect—such as certain psalms (see Scheuchzer 1733, p. 903, *ad* Ps. 50:9-11),¹⁴ or God's momentous speech to Job in Chapter 38 of the eponymous book (see Scheuchzer 1733, p. 815, *ad* Job 38:34-35).¹⁵ Of course, Scheuchzer's predilection for Psalms and Job (together with Genesis) is far from exceptional for an early-modern natural theologian: these three books represented the pillars of physico-theological exegesis since at least the early seventeenth century (Blair 2000, p. 46). Peculiar to Scheuchzer, however, is his interpretation of these books in light of an anthropology of limits (as discussed in the previous section) and a feudal conception of the God-mankind-nature relationship, which taken together place a series of important constraints on man's environmental agency.¹⁶

Human beings, Scheuchzer concludes, lack both the foresight and the authority to behave with nature as they please. Their appreciation of the future effects of their actions is curtailed by the power of sin, which obscures their understanding. Moreover, their status on Earth is not that of owners but that of usufructuaries—or, to put it in Scheuchzer's own terms, of "tenant farmers" (*colonus, subjectus agricola*; Scheuchzer 1733, p. 885, *ad* Ps. 24:1-2), an expression he borrows from the sixteenth-century German Protestant Konrad Pellikan.¹⁷ They are allowed to use freely

Fructum edite, et augescite, et implete terram, et subijcite eam, et dominamini in piscem maris, et in volucrem coeli, et in omnem bestiam, quae reptat super terram. Et iterum Gen. 9, 2".

¹² Latin original: "Propterea et venerunt ad Noah omnia animantia [Gen. 7:14], ut sub ejus tutela conservarentur in Arca".

Latin original: "Sed ô quam restrictum est hoc dominium, et feudale, ut contra Dei absolutum, semper idem, haud interruptum, in Creaturas omnes: Imo vero et haec nostra praerogativa Usus potius quam Dominium. Debebat Homo naturas Animalium nosse, ex iis Creatorem Deum laudare, ea ad varios usus, cibarios speciatim applicare. Patet id ex litera feudali, quam dedit Deus Noacho post Diluvium [Gen. 9: 2-4]".

¹⁴ Latin original: "Manifestum reddit Ter Optimus Ter Maximus Deus absolutum suum in omnes creaturas dominium, imo & autarcheian suam".

¹⁵ Latin original: "Est vox Dei ipsum potentissimum, nullisque limitibus circumscriptum dominium, velle suum est mandare, praecipere est efficere. Voci huic obediunt in momenta creaturae omnes, animatae et inanimatae". My emphasis.

¹⁶ Note that a feudal conception of nature without an associated anthropology of limits such as Scheuchzer's does not necessarily yield the same results: see for instance the case of Matthew Hale, who in his *Primitive Origination* of Mankind (1677) uses explicitly feudal language to present the God-mankind-nature relationship as described in Genesis, but does so to celebrate man's "superintendent industry" rather than to set limits to human environmental intervention (see Glacken 1967, pp. 480–482).

¹⁷ Latin original: "Habent & heic, quod discant, Principes terrae, maximae authoritatis feudatarii. Digne humiliandi sunt, scientes non se dominos terrae esse, sed tantum colonos, et subditos agricolas, et hominum in terra pastores, sub unius veri Pastoris providentia et potentia; ne se, ut ethnici reges, dominos hominum jactent, sed servi Dei esse studeant. Non enim eorum est terra et plenitudo ejus, quicquid scilicet in orbe terrarum habitat et continetur, sed Domini per antonomasiam et excellentiam unici et omnipotentis. Pellicanus in Psalmos, p. 69". The reference is to Pellikan 1534, volume 4, folio 69r.

of the fruits of the land—including fruits that result from their own labor (Scheuchzer 1731, p. 33, *ad* Gen. 3:18)¹⁸—but they may not engage in any form of damaging or destructive behavior, as that (from a legal perspective) would violate the conditions of their *usus*.

Interestingly, for Scheuchzer, these were to a large extent the original terms that God had set for human life on Earth, even before Adam's sin. Neither the Fall nor the Flood had marked a decisive watershed in how humanity was meant to behave towards the rest of creation: God's covenant with Noah in the aftermath of the Deluge had indeed largely restated the feudal relationship previously established with Adam. This does not mean, however, that Noah's Flood had had no lasting consequences for the history of humankind and the planet. As we shall see in the next section, Scheuchzer's view of prediluvian and postdiluvian times was not without nuance: though strongly continuist in some respects, it was also influenced by contemporary discussions of the Flood's dramatic impact on the geology and climate of the Earth.

4. AFTER THE FLOOD

Early Enlightenment discussions of Noah's Flood were conducted under the long shadow of Thomas Burnet's Telluris theoria sacra, first published in Latin between 1681 and 1689, and selftranslated into English as Sacred Theory of the Earth (1684–1690). In this controversial text, which enjoyed a wide reception in England and across the continent, the Anglican cleric Burneta Cambridge graduate with a penchant for the new mechanical philosophy-portrayed the biblical Deluge as a catastrophic event that had radically and permanently transformed the destinies of both mankind and the Earth. Following the Flood, "everything that was beautiful and comfortable about the earth, from a human point of view, was destroyed" (Barnett 2019, p. 94). The planet that God had created—a smooth sphere "without mountains or sea" (Burnet 1722, p. 194), whose axis was perfectly parallel to the ecliptic—was wiped away, leaving only chaos and ruins: "the elements displac'd and disorder'd . . . an [sic] huge mass of stone or rock rear'd into the air, and the water creeping at its feet" (Burnet 1719, p. 43); "wild and multifarious confusion . . . pits within pits, and rocks under rocks, broken mountains and ragged islands, that look as if they had been countries pull'd up by the roots, and landed in the sea" (Burnet 1719, p. 182). The climate was spoiled forever, too, as the Earth was tilted on its axis under the extraordinary weight of the water, thus generating seasonal cycles and unprecedented climatic variation across different regions (see Barnett 2019, pp. 98–107). In short, there was very little in common between the primordial Earth and that which emerged from the retreating floodwaters: "We do not seem to inhabit the same world as our first fore-fathers did, nor scarce to be the same race of man . . . the antediluvian Earth . . . in some sense was another World from this, and it may be, as different as some two Planets are from one another" (Burnet 1719, p. 254, 332; see Figure 3).

Though aspects of Burnet's theory were met with skepticism or even indignation when the book was published (see Barnett 2019, Chapter 3), his view of the Flood as a landmark event in human and natural history proved so influential that it became an unavoidable point of reference for anyone engaged in 'Mosaic physics' at the turn of the eighteenth century. For instance, the English naturalist and Royal Society Fellow John Woodward gave ample consideration to the geological impact of the Deluge in his *Essay towards a Natural History of the Earth* (1695), although he did so in part to overturn Burnet's idea of the present Earth as fundamentally alien to God's providential design. Indeed, for Woodward, the Flood itself was part of a divine plan to "reform and *new-mold the Earth*" to better suit human needs after the Fall (Woodward 1695, p. 93).

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Latin original: "Manducabis herbam agri alterum Versiculi Lemma, ita, ne contradicere videatur usui Plantarum in ipso Innocentiae statu [Gen. 1, 29], explicari debet, ut cedat Homini in commodum. Vixit hactenus Adamus in Paradiso, Horto fructibus delicatissimis a Deo ipso creatis, affluentissimo: nunc, facile rerum mutata, relegandus est peccator in exilium ad herbas agri, in cibum adsignantur herbae extra Paradisum nascentes, magno labore, in sudore vultus colendae, plantandae, colligendae; Ita quoque Calvinus in h[oc] l[oco]".



Figure 3. Frontispiece of Burnet's Sacred Theory of the Earth, contrasting the smooth primordial Earth (second from top, clockwise) to the rugged postdiluvian Earth (fourth from top, clockwise). Photo: S. Miglietti.

It is in this context that one must situate Scheuchzer's account of the Flood in the relevant chapters of the *Physica sacra*. Scheuchzer knew Burnet's *Sacred Theory* well, criticizing aspects of it (particularly its theory of mountain formation) in early works such as the *Beschreibung der Natur-Geschichten des Schweizerlands* ("Description of the Natural History of Switzerland", 1706–1708: see especially volume 3, pp. 179–188). He also entertained a personal correspondence with both Burnet and Woodward, whose *Essay* he translated into Latin in 1704. He was, in sum, well familiar with the main protagonists of the English diluvian debate. On the

subject of the Flood, Scheuchzer adopted a characteristically nuanced position—so nuanced in fact that it may appear self-contradictory unless it is properly unpacked. On the one hand, he pointed to a number of important continuities between the prediluvian and postdiluvian Earth: plants, for instance, grew exactly identical and in the exact same places after as before the Flood (Scheuchzer 1731, p. 41, *ad* Gen. 6);¹⁹ mountains, *pace* Burnet, "obviously existed before the Deluge" and were not products of it (Scheuchzer 1731, p. 47, *ad* Gen. 7:17–20; see also Figure 4, which depicts mountains as part of God's work on the third day of creation).²⁰ In short, "the primitive earth was nearly identical to the one we now inhabit" (Scheuchzer 1731, p. 60, *ad* Gen. 9:12).²¹



Figure 4. "Work of the third day", from Scheuchzer's Physica sacra (1731, plate 6), depicting mountains as part of the primordial Earth. Photo: S. Miglietti.

¹⁹ Latin original: "Pondus addit consideratio plantarum, quarum semina et radices resuccrescere debebant iis in locis, provinciis, climatibus, ubi creverant ante".

²⁰ Latin original: "Fuisse montes ante Diluvium constat".

²¹ Latin original: "Primus orbis idem prope fuit cum eo, quem nunc incolimus".

A lot is at stake in that "nearly", however. From other passages in the *Physica sacra* one learns that the Flood did in fact provoke many important changes: postdiluvian mountains, for instance, are different from prediluvian ones—they are higher and differently shaped, due to sedimentary deposits accumulated during the inundation (Scheuchzer 1731, pp. 47–48, *ad* Gen. 7:17–20; see Figure 5).²² These deposits formed strata or layers that can be examined through stratigraphic analysis (pioneered in the seventeenth century by the Danish geologist Nicolas Steno): in addition to yielding precious information about prediluvian life forms through the study of fossils (Figure 6), these strata also prove that the Flood entailed dramatic geological transformations, to the point that "the whole surface of the primordial earth" was "completely undone" by the "violence" of the floodwaters (Scheuchzer 1731, pp. 47-48, *ad* Gen. 7:17-20).²³



Figure 5. "Remnants of the cataclyism", from Scheuchzer's Physica sacra (1731, plate 46). Photo: S. Miglietti.

²² Latin original: "Certum, cacumen montis Ararat depressius fuisse Aquis Diluvialibus: certum quoque esse, et nostros montes, etiam altissimos productum diluvii et ex alibi demonstratis constare . . . Considera montium structuram, in ordinatissima strata dispositam, imo ex iis extructam, videbis, indices esse sedimenti in altissima Aquae columna facti, ut ex rupturae ex post introductae, certissimos".

²³ Latin original: "Certum, et vel ex Stratorum ordinatissima diathesei demonstrabile, dissolutam fuisse prorsus Terrae primaevae saltem corticem, partim nempe a Violentia aquarum e fontibus Abyssi undique prosilientium, partim a vi aquarum pluvialium".



Figure 6. Images of fossils, from Scheuchzer's Physica sacra (1731, plate 54). Photo: S. Miglietti.

On this last point at least Scheuchzer seemed to agree with Burnet—but with one crucial difference. Unlike Burnet, Scheuchzer thought that the Flood had brought about not just destruction but a second creation. For Burnet, the postdiluvian Earth was a landscape of random ruins without any trace of God's design. For Scheuchzer (as for Woodward), it embodied God's wisdom and loving care no less than the primordial one. Inhospitable and hostile for Burnet—who described human life after the Flood as a constant struggle against external forces ("this short Life is employ'd, in a great measure, to preserve our selves from Necessity, or Diseases, or Injuries of the Air, or other Inconveniencies"; Burnet 1719, p. 254)—planet Earth was welcoming and bountiful for Scheuchzer, who often paused with the Psalmist to praise "the three-times good, three-times great God" for His generous gifts (Burnet 1733, p. 913, *ad* Ps. 65:10).²⁴ Scheuchzer

Latin original: "Ter Optimi, Ter Maximi Dei immensam erga omnes terrae, sanctae in specie, incolas metaphoricis simul, et naturae rerum adaequatis, laudibus decantat eloquentissimus Psalmus". For context, Scheuchzer is commenting here on Psalm 65, which itself strongly emphasizes how God has generously provided for all the necessities of human life: "Thou visitest the earth, and waterest it: thou greatly enrichest it with the river of God, which is full of water: thou preparest them corn, when thou hast so provided for it. / Thou waterest the ridges thereof abundantly: thou settlest the furrows thereof: thou makest it soft with showers: thou blessest

saw blessings precisely where Burnet saw signs of global degeneration—in the alternating seasons, for instance, each one bearing its own distinctive fruits as part of God's providential plan: "Over the course of the entire year there is not one day, not one hour, not one minute that does not shed drops, nay showers, of divine goodness" (Scheuchzer 1733, p. 913, *ad* Ps. 65:10).²⁵

Yet human life after the Flood did present some new challenges. One was the fact stressed by many natural theologians, including Burnet and Woodward²⁶—that the postdiluvian Earth was far less fertile than the prediluvian one. When the diluvial waters finally retreated and "man was given back to the earth and the earth to man", it took time and great effort before this "shapeless and empty new earth" was able to yield fruit again (Scheuchzer 1731, p. 62, *ad* Gen. 9:20–21).²⁷ Far from lifting the curse imposed upon Adam's sinful progeny (Gen. 3:17, "cursed is the ground for thy sake; in sorrow shalt thou eat of it all the days of thy life"), the "diluvial slaughter" (*diluviana strages*) had made it worse: an unprecedented amount of "labor—in other words, agriculture—was now needed to remove the obstacles" (Scheuchzer 1731, p. 62, *ad* Gen. 9:20–21).²⁸



Figure 7. "Noah as farmer and vine grower", detail from Scheuchzer's Physica sacra (1731, plate 67). Photo: S. Miglietti.

While agriculture certainly existed before the Flood (plate 67 indeed provides a visual commentary on Noah's horticultural activities, see Figure 7), postdiluvian mankind was forced to scale it up and to develop new technologies, which in turn prompted a whole new set of questions: How much is enough? How far should one go?²⁹ Through technology, humans had gained not

the springing thereof. / Thou crownest the year with thy goodness; and thy paths drop fatness" (vv. 9-11, my emphasis).

²⁵ Latin original: "Quinimo non est per totius anni decursum dies, non hora, non minutum, quod non det stillantes bonitatis divinae guttae, imo imbres".

On Woodward's theory of soil degradation and his related "theology of improvement", see Barnett 2019, pp. 116–128. Burnet highlighted the much lower fertility of postdiluvian soils in several passages (see *e.g.* 1719, p. 257).

²⁷ Latin original: "Terrae redditus Homo, Homini reddita Terra, sed ea non sponte fruges proferens".

²⁸ Latin original: "Non sublata maledictio Homini peccatori indicta, & Terrae ipsi Gen. 3, 17-19. Imo vero licet in Diluviana strage imprimis fuerit execrationi data, magis aucta, foecundissima nempe, quae fuerat, nunc sterilis reddita. Labore nunc opus, qui impedimenta removeat, id est, Agricultura".

On these questions, Scheuchzer's answer differed markedly from that of Woodward, who was a staunch proponent of 'improvement': see the thorough discussion in Barnett 2019, pp. 116–126.

only new abilities but also new responsibilities, and an environmental agency that was all too easy to abuse:

We ourselves treat mother nature in a hostile way: we cut it open with our ploughs, we break into its secret parts, we oppress it with buildings of great size and burden, when we could be content with little houses: metals, stones, wood serve more for our pleasure and splendor than for necessary use: we deviate whole rivers from their beds, we cut holes in mountains, we dig into the innermost parts of the earth. (Scheuchzer 1735, p. 1500, *ad* Rom. 8:19–22)³⁰

Though rich in classical and humanist echoes that reveal Scheuchzer's debt to a long tradition of reflection on such matters,³¹ this passage should not be dismissed as purely rhetorical but rather understood against the backdrop of Scheuchzer's philosophy of limits, which, as seen in Section 2, is foundational to both his anthropology and his ethics. Central to his view of human agency (including, though not limited to, environmental agency) is his strong sense that mankind, particularly after the Fall, has a tendency to turn use into abuse and good things into evil ones—and thus stands in need of precisely those boundaries that it is so inclined to transgress.

A biblical case in point is offered by Genesis 11, which is set in early postdiluvian times and describes the development of the first new industries, including the art of making bricks from clay (Gen. 11:3; see Figure 8, which depicts several kilns for firing bricks). As the story unfolds in the following verses, one can see how a useful skill was quickly turned to evil purposes: no sooner had Noah's descendants learned the art of brick-making that they decided to build themselves "a tower, whose top may reach unto heaven" (Gen. 11:4), so as to gain eternal glory. Instead, they brought upon themselves God's deep displeasure and punishment, famously in the form of linguistic chaos and geographic dispersion. In addition to illustrating the slippery slope of technological development (whereby a perfectly innocent invention such as brick-making can lead to catastrophic consequences because of mankind's sinful inclinations), Scheuchzer's interpretation of Genesis 11:3-4 lays great emphasis on the political context of the passage: the construction of the tower is part of Nimrod's strategy for establishing a "monarchical, nay tyrannical" rule over Babel, by "concentrating all kinds of laws-natural, common, civil, perhaps even divine—into his own hands" and thus "be the only ruler" (Scheuchzer 1731, p. 64, ad Gen. 11:4).³² Thus Genesis 11, from Scheuchzer's perspective, is as much about the risks of unrestrained technological development as about the hybris of fallen human beings, who chase for themselves the glory that they should reserve for their creator (see Figure 9, offering a visual memento of the Calvinist principle Soli Deo gloria). Indeed, the two aspects-hybris and technology-are not separate but tightly conjoined in Scheuchzer's worldview.

Excessive technological development is censured by Scheuchzer for a number of reasons: it is indicative not only of a lack of trust in God's provision,³³ but also of a drive to fulfil needs that are not entirely natural and necessary. One is reminded here of Scheuchzer's distinction between "necessary use" and "pleasure and splendor" in the passage quoted above, as well as of his frequent construal (in both printed and manuscript writings) of the lifestyle of Swiss Alpine communities as a model of simple, innocent life in communion with nature—a long-standing trope which enjoyed an important afterlife in the pre-Romantic period (Marchal 2010; Schär 2015). But the core of Scheuchzer's critique revolves around the issue of *hybris* and its close ties

³⁰ Latin original: "Et nos ipsi hostiliter tractamus terram matrem: proscindimus vomere, perfodimus penetralia, aggravamus maximae molis structuris, quum contenti esse possemus casulis: Inserviunt metalla, lapides, ligna voluptati potius et pompae, quam necessitati et usui: integros deflectimus fluvios a suis alveis, perforamus montes, excavamus interiora terrae".

³¹ See for instance classical critiques of mining (*e.g.* in Seneca and Pliny the Elder) and their early modern reception, discussed in Merchant 1982, pp. 29–34; Moore 2017, pp. 56–57. The Seneca–Scheuchzer connection is especially relevant, as I will show in more detail in a separate study.

Latin original: "Consultum ducunt Noachidae . . . sub auspiciis forte Nimrodi, condere Monarchiam, aliarum Gentium dominatricem . . . Volebat nempe Monarchici, imo Tyrannici Regiminis Conditor in Babele sua concentrare omnia jura, Naturae, Gentium & Civilia, imo forte Divina, ut solus ipse regnare posset".
Sca abava Ecotnete 24

³³ See above, Footnote 24.



Figure 8. "Burning bricks and lime mortar", from Scheuchzer's Physica sacra (1731, plate 68). Photo: S. Miglietti.



Figure 9. "Only to God be glory", detail from Scheuchzer's Physica sacra (1735, plate 750). Photo: S. Miglietti.

to another characteristic human weakness: lack of (self-)knowledge. Scheuchzer observes how our wildest technological pursuits often result from the fact that we mistakenly think of ourselves as eternal: "We live as though we were to exist forever on this earth . . ." (Scheuchzer 1735, p. 1500, *ad* Rom. 8:19–22).³⁴ Yet Scripture tells us that everything will perish in the end, including all the achievements to which we have entrusted our glory: "All woods, mountains, trees, plants, cities, the palaces of kings and princes, the most magnificent monuments, everything that human activity has produced—all will be burnt by fire and reduced to ashes", writes Scheuchzer, commenting on the final destruction prophesied in the second epistle of Peter (Scheuchzer 1735, p. 1524, *ad* 2 Pet. 3: 5–7; see Figure 10).³⁵ Although apocalyptic and eschatological reflections are far less prominent in Scheuchzer's work than in that of Burnet and other early-modern natural theologians, on this occasion they do play a critical role in pointing to the true worth of mankind's earthly endeavors, all of which are bound to disappear one day without a trace.

Scheuchzer's thinking on technology and its boundaries thus relates directly to his anthropology and theology, and particularly to his views on God's sovereignty and wisdom on the one hand, and man's *hybris* and short-sightedness on the other. There is proof that Scheuchzer was already reflecting on these issues long before he published the *Physica sacra*. In the winter of 1707–1708 he sent to the Royal Society (from Zurich where he was based) a manuscript in Latin, entitled *De ignis seu caloris certa portione Helvetiae adsignata* ("Concerning the fixed and proportionate amount of heat assigned to Switzerland"). The manuscript, which was read before the Society on 28 January 1708, contained a striking thought experiment on climate change. Scheuchzer began by reporting on a widespread desire "for greater heat in many parts of Switzerland, and especially in the mountainous areas, so that crops could mature more quickly, perpetual snows could be melted, summers could be prolonged, winters could be shortened, and

³⁴ Latin original: "Laboramus non aliter, ac si aeternum in haec terra essemus victuri, et tamen experimur in dies, esse omnia vana, morti et corruptioni obnoxia... Moriuntur nobiscum animalia, plantae, durissima saxa et marmora. Pereunt Regna, Monarchiae; collabuntur montes, siccantur lacus, depauperantur agri, prata. Multae terrae non sunt nisi cadavera veteris fertilitatis... Legatur integra de maledictione terrae, Diluvio inprimis illata, Historia".

³⁵ Latin original: "Omnes sylvae, montes, arbores, plantae, urbes, Regum et Principum palatia, monumenta sumptuosissima, omne, quod humana paravit industria, conflagrabunt, concident in cineres".



Figure 10. "Final trial of the earth by fire", from Scheuchzer's Physica sacra (1735, plate 744). Photo: S. Miglietti.

so that we would enjoy so many other comforts that the bitter cold now denies us" (Scheuchzer 2015, p. 149).³⁶ Such a wish is hardly surprising, when one considers that Scheuchzer was writing

³⁶ Latin original: "Ratio perversa maiorem desideraret pro plerisque Helvetiae partibus, speciatim montanis, calorem, ut maturescere possent fruges, solvi aeternae nives, prolongari aestas, decurtari hiems, aliaque plura in nos redundare commoda, quae nunc surripit acerbum frigus".

at the peak of the Little Ice Age, after decades of severe winters and advancing glaciers that had swallowed entire villages and dramatically reduced the surface of pasturable land in the Alpine region (Grove 1988, Chapters 4 and 6; Le Roy Ladurie 2004, pp. 302–304, 473, 537–539). While the climatic extremes of the mid-seventeenth century were never matched, still in 1714 the Swiss theologian Abraham Ruchat (one of Scheuchzer's correspondents) could write in his *Délices de la Suisse* that the "mountains of ice" commonly known as "glaciers" not only never melted but kept on getting bigger: "Little by little they grow in width and length, destroying the country all around them" (Ruchat 1714, pp. 22–23).³⁷ He accompanied his text with an engraving that pictured the Lower Grindelwald glacier, in the canton of Bern, and sparse dwellings that had had to be "moved further down the valley" to escape the advancing ice (Figure 11).



Figure 11. The Lower Grindelwald glacier advancing into the valley above the town of Grindelwald, from Ruchat's Délices (1714, p. 31). Courtesy of Viatimages / Bibliothèque cantonale et universitaire, Lausanne.

Given this context, the residents' desire for warmer temperatures seems understandable. Scheuchzer, however, dismissed it as utter nonsense: "foolish wishes" (*vota ineptissima*), "a perverse reasoning" (*ratio perversa*), based as he would prove on a complete ignorance of the principles of natural philosophy. "Let us assume that Switzerland *could* receive more heat than we now actually perceive", he suggested, "and let us see what would happen as a consequence" (Scheuchzer 2015, p. 149). The rest of the manuscript described an environmental catastrophe in several stages. First, the Alpine glaciers would melt. The excess meltwater would flow into the

³⁷ French original: "Il se trouve en divers endroits des montagnes de glace, qui non seulement ne fondent jamais, mais qui deplus vont toujours en croysant, à mesure qu'il tombe de nouvelle neige, tellement qu'elles s'étendent peu à peu au long & au large, & ruïnent le païs qui les environnes. Les Allemands les appellent Gletscher: nous les appellons vulgairement des Glacières".

great rivers that spring from those glaciers—the Rhine, the Rhone, the Po, the Danube—causing them to burst their banks and thus provoking extensive flooding in low-lying areas all across Europe.³⁸ Sea levels would rise, forcing entire populations to evacuate coastal areas and migrate elsewhere. Meanwhile, the exceeding moisture in the air would cause atmospheric events of an unprecedented violence, including torrential downpours with heavy lightning of the scariest kind. As the melting continued, freshwater reservoirs would in due course become depleted. The water cycle would be thrown out of balance, and widespread drought would turn once-verdant meadows and farmland into parched wastelands. Animals and plants would die of thirst, and with the loss of vegetation the heat would soon become as intense and unbearable "as between the Tropics" (Scheuchzer 2015, p. 151). In the long run, large swathes of Europe would become completely uninhabitable.

Scheuchzer's gloomy (and, for us, eerily prophetic) thought experiment was founded upon an ecological understanding of nature as an interconnected whole. I use this term, 'ecological', in full knowledge that it did not yet exist in Scheuchzer's time (see Warde 1996, pp. 9-11). Yet no other word can better describe Scheuchzer's awareness of how all living beings (mankind included) depend on each other and on their natural surroundings in order to survive, in a fragile equilibrium that is easily put at risk. The implacable domino described in Scheuchzer's paper is there to remind everyone that actions, even the smallest ones, have consequences that are wide-ranging and often unforeseen. The form of the thought experiment is important in this respect, because it enables readers to imaginatively walk through the future effects of their wellintentioned but ultimately self-destructive desires. Scheuchzer's message is clear: those who long for a warmer climate because it will lead to increased productivity and a more comfortable life simply do not know what they wish for. By showing them how easily one's dreams can turn dystopian when one is not fully informed about their consequences, Scheuchzer demonstrates the need for forethought in undertaking any action that could potentially disrupt the natural order. Such (pre)caution seems all the more urgent in light of mankind's fallen nature: human knowledge is hopelessly limited, its judgments short-sighted and unsound (see above, Section 2). Thus Scheuchzer invites his readers to suspend their judgment and trust and praise instead the "infinite wisdom" and "most powerful goodness" of God, who "created all things according to fair weight, number and measure" and "blessed our regions, otherwise surrounded by thinner and colder air, with sufficient heat, well-proportioned for our land and the whole of Europe" (Scheuchzer 2015, pp. 149–153).³⁹ Desiring anything different from what God has established is equivalent for Scheuchzer to questioning the goodness of God's creation and claiming for oneself the right to improve it—a "perverse reasoning", and possibly the greatest act of hybris that could ever be conceived of.

5. QUESTIONING 'IMPROVEMENT'

While Scheuchzer's manuscript on climate change preludes in more than one way to the anthropological and theological reflections developed much later in the *Physica sacra*, it is also a document that speaks directly to (and to a large extent against) the cultural environment in which its author was immersed. Addressed to the Royal Society, possibly with hopes of publication in the *Philosophical Transactions*,⁴⁰ the paper targeted a type of mindset of which the London-based

³⁸ I will address in a separate paper the similarities between Scheuchzer's description of Noah's Flood in the *Physica sacra* and the catastrophic flooding imagined in this manuscript.

³⁹ Latin original: "Deus... omnia iusto condidit pondere, numero, et mensura... Laudemus plenis buccis infinitam Dei sapientiam, ac potentissimam bonitatem, quae regiones nostras, aere alias rariori et frigidiori circumfluas, calore sufficienti, et terrae nostrae, totique Europae proportionato beat". Similar ideas were also expressed in Scheuchzer's printed works, for instance in his Helvetiae historia naturalis of 1716, on which see Schär 2015, pp. 32–34.

⁴⁰ On Scheuchzer's ties to the Royal Society and the specific history of this manuscript, see Barton and Miglietti 2015, pp. 135–147, and the bibliography cited therein. Just as that article was in press, another important study of Scheuchzer's English connections was published (Leu 2015).

institution—or at least several of its Fellows—was a vocal and powerful advocate in early modern Europe, 'Improvement' was high on the agenda of the Royal Society since its earliest days. It took a variety of forms: from scientific studies of soil quality to experimentation with new farming techniques down to speculations on how to "rectifie and purify the ayre of all the neighbouring countrey, both for the health of body and of minde; and to prepare and dispose for vertue, and for sanctity, and to procure longevity".⁴¹ More broadly, the ideology of improvement fit into a larger narrative that emphasized the need for human industry to tame and perfect an unruly nature. Widespread in England as on the continent, and especially crucial in justifying European colonial expansion overseas, this ideology was often buttressed by recourse to biblical passages such as Genesis 1:26, which could be interpreted as a God-given injunction to rule and transform the Earth (see discussion in Section 3 above). Others understood improvement as specific to the postlapsarian world—a restorative intervention that could bring creation back to its lost primordial perfection (see Miglietti 2016; Barnett 2019, p. 122). Though differing in some respects, these various ideologies of improvement overall contributed to spreading an optimistic vision of human intervention in nature that made its way into the works of many prominent natural theologians, including the above-mentioned Woodward and the English parson-naturalist John Ray (1627–1705), also a Fellow of the Royal Society (Glacken 1967, pp. 475–484).

At first sight, Ray was an unlikely candidate to support the myth of improvement. Like Scheuchzer, he held a very pessimistic view of human cognitive abilities, which led him to warn his readers against any hasty criticism of God's creation. "The works of God... are all very wisely contriv'd and adapted to ends both particular and general", he wrote in his highly influential *Wisdom of God Manifested in the Works of Creation*, first published in 1691 (Ray 1762, p. 10). "Our understanding [is] too dark and infirm to discover and comprehend all the ends and uses to which the infinitely wise Creator did design them" (Ray 1762, p. 32). In later editions of the work, Ray particularly reproached and ridiculed those "atheists" who, out of "deep ignorance", questioned the goodness of God's creation and put forth their own personal suggestions for improvement:

What need was there (may some say) that the sea should be made so large, that its superficies should equal if not exceed that of the dry land? Where is the wisdom of the Creator in making so much useless sea, and so little dry land, which would have been far more beneficial and serviceable to mankind? Might not at least half the sea have been spar'd, and added to the land, for the entertainment and maintenance of men, who by their continual striving and fighting to enlarge their bounds, and encroaching upon one another, seem to be straiten'd for want of room? This, as most other of the atheists' arguments, proceeds from a deep ignorance of natural philosophy . . . the wise Creator therefore did so prudently order it, that the sea should be large enough to supply vapours for all the land, which it would not do if it were less than now it is. (Ray 1762, p. 76).⁴²

Ray, however, stopped short of questioning a fundamental assumption of the ideology of improvement: the anthropocentric notion that everything on Earth must indeed be "beneficial and serviceable to mankind" if it is to serve a purpose at all. While he thought that there were many aspects of creation whose human purpose was yet to be discovered, he never doubted that "all things were in some sense made for us" (Ray 1762, p. 108)—nor that, conversely, "we are thereby oblig'd to make use of them for those purposes for which they serve us, else we frustrate this end of their creation" (Ray 1762, p. 120; see Brooke 2000). The human species, in other words, had not only the right but the *duty* to exploit non-human nature and make it serve its own purposes. It

⁴¹ John Beale to Henry Oldenburg, 30 September 1659 (Royal Society, London, Early Letters, B1/13). The folder Agriculture in the Classified Papers at the Royal Society Archives contains a wide range of relevant materials. On the culture of improvement in early modern England (not confined to the Royal Society), see McRae 1992 and 1996; Hoyle 2011; Slack 2015.

⁴² Many of these additions (which appear for the first time in the third edition of 1701) were written in response to Burnet's *Sacred Theory of the Earth* and cited passages from John Keill's refutation of the latter (*An Examination* of Dr. Burnet's Theory of the Earth), printed in Oxford in 1698. Keill—like Ray, Derham, Woodward, and Scheuchzer—was a Fellow of the Royal Society.

was on this basis that Ray came to justify, indeed invoke, the practice of "improving" and "ameliorating" nature through "culture" and "industry" (Ray 1762, pp. 108–111). God himself had sanctioned such behavior: "The bountiful and gracious Author of man's being and faculties, and all things else" was "well pleased with the industry of man" and "delighted" that man would "adorn the earth", transforming "a barren and desolate wilderness" into "a civil and well cultivated region" (Ray 1762, p. 111). What Ray does not spell out here but obviously presupposes is that the Earth *without* human intervention would be nothing but a "barren and desolate wilderness".

Scheuchzer, as we have seen, felt very differently on this point. His position resembles much more closely that of another English natural theologian and Fellow of the Royal Society, William Derham (1657–1735), whose Boyle Lectures (held in the winter of 1711–1712 at St Mary-le-Bow church in London) were collected and published in 1713 under the title Physico-Theology. A close friend and collaborator of John Ray, as well as his personal biographer, Derham nevertheless espoused a very different, non-anthropocentric view of nature.⁴³ Speaking of the "great variety" of plants and animals existing on Earth, he wrote that they represented God's "most wise provision for all the uses of the world in all ages, and all places... either to man, or to some of the inferiour creatures themselves" (Derham 1714, p. 57, my emphasis). Even for these "inferiour creatures", he assured, "the liberal Creator hath provided all things necessary, or any ways conducing to their happy, comfortable living in this world, as well as for man" (Derham 1714, p. 57). Ray's strong sense that *all* living creatures had intrinsic value in God's eyes—from human beings down to the most humble fly-led him to shift and expand his understanding of the purpose of nature. Unlike Ray, who kept mankind firmly at the center of creation, Derham reckoned that God could very well have made certain things for reasons that had nothing to do with the human species:

If there be many things of little immediate use to man, in this, or any other age; yet to other creatures they may afford food or physick, or be of some necessary use. How many trees, and plants, nay, even the very carcasses of animals, yea, the very dust of the earth, and the most refuse, contemptible things to be met with; I say, how many such things are either food, or probably medicine to many creatures, afford them retreat, are places of habitation, or matrixes for their generation, as shall be shewed in proper place? (Derham 1714, pp. 57–59).

What right do humans have then to alter nature in their own favor, forgetful that nature does not exist for their sake only but "for the sustentation, use and pleasure" of a range of creatures whose life is just as precious as theirs? How dare they "find fault" with aspects of God's design that they find useless or inconvenient—"the distribution of the dry land and waters", "the creation of noxious animals, and poisonous substances; the boisterous winds; the vulcano's [*sic*], and many other things which some are angry with, and will pretend to amend"? (Derham 1714, pp. 80–83). Divine wisdom is so much greater than human minds can ever grasp: "It is only for want of our knowing these things better, that we do not admire them enough; it is our own ignorance, dulness, or prejudice, that makes us charge those noble works of the Almighty, as defects or blunders, as ill-contrived, or ill-made". There are simply no reasonable grounds for wanting to "amend [God's] work" (Derham 1714, p. 82), because His work, which is already "contrived and made in the best manner" possible (Derham 1714, p. 444), does not need to be amended in the first place.

There are deep affinities between Derham's outlook in *Physico-Theology* and Scheuchzer's 1707–1708 paper on Alpine climate change.⁴⁴ Derham's dismissal of the "objections" of improvers as "products not of reason, but of peevishness" (Derham 1714, p. 82) reminds one of Scheuchzer's critique of the "perverse reasoning" of those wishing for a warmer

⁴³ On this point I disagree with Glacken, who claims that both Ray and Derham's "idea of a unity of nature" has "a kinship with modern ecology" (1967, p. 423).

⁴⁴ As a Fellow of the Royal Society Derham may have had knowledge of Scheuchzer's manuscript. He certainly was aware of other Scheuchzer materials, including his meteorological observations, some of which were printed in the *Philosophical Transactions*. On Derham and Scheuchzer, see Kempe 2003a, pp. 221–222.

climate in the Alps (see above, Section 4). Also strikingly close to Scheuchzer is Derham's precautionary approach to technology and environmental intervention, which is similarly dictated by a form of epistemic modesty. This approach is fleshed out in chapter V.1 of *Physico-Theology*, which offers a "Mosaick history" of human craftsmanship as described in Genesis 3-4: from the earliest examples of tilling soil (Adam, Abel), sheep-keeping (Cain), and nomadic herdmanship (Jabal, "inventor of tents"), down to the invention of metallurgy (Tubal-Cain), spinning and clothmaking (Naamah), and music (Jubal). But Derham is quick to distinguish these "useful crafts and occupations"-which "easily occurred to the invention of man" because they were "of great and absolutely necessary use"-from other, less obviously beneficial arts that have been slower to come into existence or are yet to materialize at all (Derham 1714, pp. 276–277). There are many innovations, Derham muses, that seem "in appearance innocent, yea perhaps very useful" but might in fact prove "of pernicious consequence" and should therefore remain hidden-for instance "the art of flying", which however convenient in some ways "might prove of dangerous and fatal consequence" in many others (Derham 1714, p. 279).45 Humans simply lack the clearsightedness to distinguish between one category of inventions and the other. If left to their own devices, they would probably make one bad choice after another. Thankfully though "the infinitely wise Creator and Ruler of the world hath been pleased to lock up these things from man's understanding and invention ... because they might be of ill consequence, and dangerous amongst men" (Derham 1714, p. 279). Where human judgment fails, God arranges all things according to His providential design. Mankind only has to trust and obey.

6. CONCLUSIONS

As the cases of Derham and Scheuchzer suggest, natural theologians at the turn of the eighteenth century could build upon Scripture to advocate completely different attitudes towards nature. Although many thinkers supported bold environmental intervention and 'improvement', there were others who called for a much more prudent, 'precautionary' approach to technological development and human geological agency. Drawing attention to this wide range of responses is important on several levels, first and foremost because it enables us to question one-sided descriptions of early-modern Christian theology as an "ecologically bankrupt" tradition (Santmire 1985, p. 1). According to Lynn White Jr, the Old Testament idea of humankind as created in God's image to subdue and dominate the Earth led to an irresponsible attitude to science and technology whose ultimate consequences we are witnessing today. Western Christians, White argues, have historically been inclined to believe not only that "man shares, in great measure, God's transcendence of nature", but also that "it is God's will that man exploit nature for his proper ends" (1967, p. 1205). These two ideas (that man is not really part of nature, but outside and above it; and that nature itself exists only for the sake of mankind) are central to White's construal of Christianity as a crucial player in the environmental crisis. Authors like Scheuchzer and Derham, however, shared neither of these ideas. They not only stressed the creaturely status of humankind and its immanence in creation, but also challenged the anthropocentric notion (admittedly widespread at the time) that everything in nature should ultimately serve a human purpose. Also, and crucially, they came to these conclusions through sustained engagement with precisely those scriptural passages that according to White inevitably led to an instrumental view of creation. Instead of using the Bible to sanction humankind's exploitation of nature, both Derham and Scheuchzer developed what we could call an "ecological biblical theology" (Horrell 2014) sensitive to the challenges of human agency in creation.

A close reading of Scheuchzer's *Physica sacra* also offers grounds for reconsidering Kempe's claim that Scheuchzer (and the natural-theological tradition in which he belongs)

⁴⁵ Derham, *Physico-Theology*, p. 279. Flying, for Derham, can prove detrimental in several ways: "by putting it in man's power to discover the secrets of nations and families, more than is consistent with the peace of the world for man to know; by giving ill men greater opportunities to do mischief, which it would not lie in the power of others to prevent; and as one observes, by making man less sociable".

"prevented and delayed the acknowledgment of the earth as vulnerable" by presenting humankind as part of a "system that is indestructible from the inside" (Kempe 2003b, pp. 165–166.), Kempe's argument is far more insidious than White's, because it correctly starts from the assumption that early-modern natural theologians viewed mankind as part of nature rather than as transcending it in God-like fashion. The question then is whether Scheuchzer really did believe that man's immanence in nature made him incapable of causing great and irreversible damage to the Earth. I have argued in this article that this is not the case, for two main reasons. First, Scheuchzer's anthropology revolved around a twofold notion of humanity's fallen nature and consequent need for boundaries, and its inherent tendency to overstep such boundaries, with often catastrophic (if unintended) consequences. Thus, far from having a naïvely optimistic perception of human agency, Scheuchzer was actually quite alert to the disastrous impact that misguided human actions or desires (such as that for a warmer climate in his thought experiment of 1707–1708) could have on the entire planet.⁴⁶ To this one must add a second, and crucial, point: although Scheuchzer took seriously man's creaturely status and immanence in nature, he also acknowledged that mankind, alone among all other creatures, possesses technological powers that give it the ability to transform (and potentially destroy) the Earth. For this reason, humanity is the only species whose environmental agency requires some reflection-the only species, in other words, in need of an environmental ethics.

The Physica sacra, I have suggested, can be read as Scheuchzer's fragmentary (but not inconsistent) attempt to build precisely such an ethics in light of the truths contained in the Bible. Some of these truths concern human nature—its fallenness, sinfulness, and cognitive limitations, which should make us wary of setting in motion processes whose consequences we are unable to fully fathom (as illustrated in the 1707-1708 manuscript on climate change). Other truths are theological and relate to God's exclusive status as creator of, and sovereign over, nature—which in turn has implications for how mankind should conceive of, and behave towards, the Earth. Indeed, while many of his contemporaries thought of the postdiluvian Earth as 'co-created' by God and mankind, Scheuchzer was keen to maintain a clear distinction between God (the only true creator) and man (a 'vassal' agent whose geological powers did not amount to a form of creation).⁴⁷ A further and crucial element of Scheuchzer's environmental ethics was his "ecological" view of the Earth as a system of mutually inter-connected biological and geological processes. Such a view-which is well exemplified by his thought experiment on climate change—led him to distance himself from theorists who assessed the value and purpose of the natural world from less holistic, and often narrowly anthropocentric, perspectives. Taken in isolation, natural features such as mountains or Alpine glaciers might very well seem bleak, useless, and inconvenient (so they did for instance to Burnet, for whom they were nothing but "wild, vast, and indigested heaps of Stones", Burnet 1719, p. 193). But when properly understood as part of a much wider system of inter-relations, they reveal their real and vital role as guarantors of Europe's hydrological cycle and climatic balance.

Thus, as I hope to have shown in this article, Scheuchzer's anthropology, theology, and natural philosophy worked together to sustain an understanding of human environmental agency as tightly regulated by a set of eternal boundaries. Together, they formed the cornerstones of a biblically-inspired environmental ethics that shows how at least certain strands of early-modern natural theology, far from fueling "errors in modern western thinking on ecological and environmental affairs" (Kempe 2003b, p. 166), actually laid the foundations for the development

Kempe himself expressed a slightly more nuanced view in another publication, acknowledging that Scheuchzer's (overall optimistic) notion of human agency was not completely blind to the possibility of negative outcomes (see 2003a, p. 322).

⁴⁷ Creatures, in Scheuchzer's world-view, can never be creators in the full sense of the word—a point he stresses for instance in his commentary on Job 39:26: "jure ipsius creationis a Jobo quaerit Deus, num eius prudentiae seu intelligentiae debeatur nova replumescentia? Jure inquam creationis, licet enim perspecta fuisset perspicacissimo Philosopho plumarum generatio, et vel remedia, vel alimenta nota, quibus deficientes protrudi possent, formare tamen illas haud potuisset. <u>Est hoc Creatoris opus, non creaturae</u>" (1733, p. 831, my emphasis).

of modern eco-theology by advocating a precautionary attitude to human intervention in God's creation.

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