

The Death of Nature and the Birth of Ecology

Natural History and the Preconditions of Ecology in Early Modernity

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Abstract: It has been commonplace in environmental thinking that the Western philosophical tradition is inherently hostile to the natural world and has fostered the exploitation of nature throughout history. Recent studies on the transition from the Renaissance emblematic world view to the scientific one can also be accommodated with a modified version of this thesis. However, even in the light of these recent advancements, it is still possible and, I argue, necessary to hold a more balanced and realistic view according to which early modern developments toward an ecologically more sensitive attitude would be tightly bound to the articulation of modernity's environmentally destructive tendencies. Thus, any analysis that accuses early modern philosophy of reinforcing exploitation is inherently biased, one-sided and unhistorical. The preconditions of ecology and that of unlimited environmental exploitation resulted from the same intellectual developments at the end of the seventeenth century.

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It is common wisdom in eco-philosophy and environmental thinking that the Western philosophical and theological tradition is inherently hostile to the natural world. Without further clarification of what this hostility consists of, there is no straightforward way to respond to this claim. For one thing, it can imply that thought systems that confer relatively high value on nature and relatively low value on human beings will lead to an environmentally sensitive practice, whereas those traditions that tend to exalt humanity at the expense of the rest of creation will lead to exploitation of the natural world. This superficial approach can be falsified even without deep knowledge about the environmental

history of the world. As Clive Ponting notes, although Eastern religions such as Buddhism and Jainism embrace a less aggressive notion of humans possessing a privileged status but not as absolute rulers over the cosmos, and place overwhelming emphasis on the compassion with the sufferings of sentient beings, both the Indian and the Chinese empires nevertheless “have been just as environmentally destructive as Western societies. They too have cleared forests, ploughed up land and used resources as they saw fit.”¹

Although accusations of the Western philosophical tradition launched by eco-philosophers and environmental activists frequently suppose a simple and unambiguous, thus false, causal link between thought and action, their critical stance can be rendered more plausible if we focus on the legitimising potential of philosophy or ideology in accommodating practices whose rightfulness may be questioned. I do not wish to deny that the Judeo-Christian or Baconian narratives of man’s dominion over nature cannot and were not actually put to justificatory use for legitimising actions that proved harmful or even fateful to our natural environment. In what follows I try to point out that the emphasis on the ecologically destructive aspect of the Western canon often obscures the fact that the historical and cultural procedures leading up to a full articulation of man’s dominion over nature entailed also the notion of nature seen as a sum of intricate relationships between individual creatures, each having its respective function contributing to the stability and integrity of the whole. In a short, my contention is that the emergence of the preconditions of ecology itself coincided with the rise of the so-called exploitative ideology and that this coincidence was by no means accidental but flowed from the same spring: the shift from the Renaissance symbolic view of nature to the scientific one.

Enemies of Nature

The most popular and now classic rendering of the thesis that the Western, and in particular the Judeo-Christian view of nature contributed significantly to the environmental deterioration was presented by Lynn White, Jr.² By placing man to the highest rank in the terrestrial creation and emphasizing the divine command to increase and multiply and subdue all living creatures, Judaism and Christianity have

¹ Clive Ponting, *A New Green History of the World* (London: Vintage Books, 2007), 127–8.

² Lynn White, Jr., “The Historical Roots of our Ecologic Crisis,” *Science* 155 (1967): 1203–7.

become the most anthropocentric religions of the history of mankind. According to White, Western Christianity by its effective banishment of all pagan animistic principles inherent in nature and by the consequences of its characteristically voluntaristic theology that distinguished it from the more contemplative Eastern Christianity, enabled, encouraged, justified and even commanded man to exploit “nature to his proper end.”¹

Much has been said about White’s thesis since its original publication,² and despite its enduring popularity within some environmentalist circles, now it is commonly held implausible in the form intended by White. Scholars studying the medieval commentaries written on the Book of Genesis point out the lack of interpretations that emphasize instrumental and exploitative attitudes toward nature. Peter Harrison notes that the medieval exegesis of the Biblical passages in question does not substantiate White’s thesis. The major reason for this is that the interpretative framework within which the Church Fathers and later theologians approached the sacred text was directed first and foremost to the discovery of moral and allegoric meanings. As Harrison puts it, “the Genesis injunction to exercise dominion over the beasts was commonly understood as a counsel of interior control. The beasts that were to be mastered were nothing other than fractious human passions that had become wild and uncontrollable as a consequence of the Fall.”³ Dominion over the beasts of nature was not taken in the literal sense, rather beasts were regarded as exemplars displaying specific moral qualities and the command to rule over them was seen in the perspective of the fallen state of man in which his passions were in a permanent revolt against his reason. As a result, pre-modern perceptions of the Genesis account was not utilized as justification for the material exploitation of nature, for the simple reason that the text meant something completely different for its medieval interpreters.

Another common way in which Western thought is believed to be hostile to nature lays the blame on early modern ideologues of the nascent modern science, most notably Francis Bacon. The most popular exposition of this idea is the book entitled *The Death of Nature* written by ecofeminist Carolyn Merchant. In her book, Merchant traces the

¹ Ibid., 1205.

² See for example: Paul Santmire, *The Travail of Nature: The Ambiguous Ecological Promise of Christian Theology* (Minneapolis: Fortress Press, 1985)

³ Peter Harrison, “Having Dominion: Genesis and the Mastery of Nature,” in *Environmental Stewardship: Critical Perspectives Past and Present*, ed. Robert James Berry, (London – New York: T&T Clark, 2006), 17–31, 19.

process that led from the organic view of nature endorsed by Renaissance naturalism to its fateful mechanization by the seventeenth century architects of the Scientific Revolution. The author supposes that there is a direct causal relation between notions people frame about nature and the way they practically treat it. She states that “the image of the earth as a living organism and nurturing mother had served as a cultural constraint restricting the actions of human beings. One does not readily slay a mother, dig into her entrails for gold or mutilate her body, although commercial mining would soon require that.”¹ During the Scientific Revolution the old vitalistic view of the organic cosmos infused with life down to the least monad gradually gave way to a mechanistic, clockwork universe. This change, in turn, entailed drastically different behavioural patterns toward nature: “Because nature was now viewed as a system of dead, inert particles moved by external, rather than inherent forces, the mechanical framework itself could legitimate the manipulation of nature” leading through the history of capitalism up to our present ecological crisis.² Merchant thus regards decisive whether the dominant philosophy of a particular age sees nature inert and dead or active and living.

Although Merchant pays lip service to the fact that the actual landscape of late Renaissance and early modern philosophy was much more complicated as to allow the establishment of the simplistic dichotomy of vitalistic and mechanistic philosophies, she has no scruples to place particular thinkers in one of the two camps. Francis Bacon, the bogeyman in environmental philosophy is seen as a major initiator of in the mechanization and instrumentalization of nature. The problem with this view of Bacon is that now it is well known for historians of ideas that Bacon’s natural philosophy was replete with spirits and active principles – “appetites and passions” – inherent in matter, even more so than the systems of some of the Renaissance philosophers whom Merchant owes great respect.³ The observation that the Baconian manipulation of nature bears striking resemblances with natural magic is too obvious to be ignored; instead Merchant tries to downplay this inconvenient similarity by saying that Bacon “transformed the magus from nature’s servant to its

¹ Carolyn Merchant, *The Death of Nature: Women, Ecology and the Scientific Revolution* (San Francisco: Harper & Row, 1980), 3.

² *Ibid.*, 193.

³ Stephen Gaukroger, *Francis Bacon and the Transformation of Early-Modern Philosophy*, (Cambridge – New York: Cambridge University Press, 2001). For Bacon’s comparison with Telesio, see 190–3., for a hint of comparison with mechanistic philosophers, see 183.

exploiter, and nature from a teacher to slave.”¹ The depiction of the Renaissance or any other type of magus and alchemist as a humble servant of nature is apparent elsewhere in her book, for example in her treatment of Paracelsus.² However, such a characterization of Renaissance naturalism and the chemical philosophy distorts the way nature was in fact conceived by such thinkers as Paracelsus. The notion of incomplete creation, and of human activity to bring nature into fulfilment in order to meet human needs was absolutely central to his thinking and was repeated even throughout the seventeenth century. Man should “investigate and learn why [nature] has been created. Then we can explore and fathom the use of wool on the sheep and of the bristles on the sow’s back; so we can place each thing where it belongeth, and can cook raw food so that it tasteth good in the mouth, and can build for ourselves winter apartments and roofs against the rain.”³ If one still insisted that animistic naturalism is, despite its instrumental stance, much more humble, gentle and compassionate in its dealings with nature than what the Baconian receipt suggests, one should be referred to the works of Zosimos of Panopolis or Arnald of Villanova (both of them referred to by Merchant with approval) where one can find as vivid images of nature’s torture as are present in the familiar Baconian passages.⁴

The strategy of distinguishing environmentally favourable and devastating philosophies according to the criterion of the presence or absence of an organic nature endowed with activity and spontaneity proves unfruitful in the closer analysis. Recent and more sophisticated study of the transition which occurred in the attitudes toward nature at the dawn of modernity, however, may suggest that modernity indeed is inherently un-ecological. For assessing the possibility that Merchant was right, albeit for the wrong reason, we turn now to those studies that deal

¹ Carolyn Merchant, *The Death of Nature*, 169.

² *Ibid.*, 119–20.

³ Clarence J. Glacken, *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (Berkeley – London: University of California Press, 1967), 467. The quotation is from Paracelsus’ *Die Bücher von den unsichtbaren Krankheiten*. For the ambiguity of the idea of “man as finisher of creation,” see 495.

⁴ For criticism of Merchant and the exposition of passages from Zosimos and Arnald compromising Merchant’s thesis, see William R. Newman: “Alchemy, Dominion and Gender,” in *A House Built on Sand: Exposing Postmodernist Myths about Science*, ed. Noretta Koertge, (New York – Oxford: Oxford University Press), 216–226.

with the fundamental change in the perceptions of the natural world in the early seventeenth century.

Competing world views

As Michel Foucault writes in the English translation of *Les mots et les choses*, “up to the end of the sixteenth century, resemblance played a constructive role in the knowledge of Western culture. It was resemblance that largely guided exegesis and interpretation of texts; it was resemblance that organized the play of symbols, made possible knowledge of things visible and invisible, and controlled the art of representing them.”¹ Overarching analogies, similitudes and sympathies bound together the universe, and it was the task of the natural philosopher, by means of the exegesis of resemblances, to identify and interpret the signatures inscribed on things by God in order to gain access to hidden meaning of them, in much the same way as the humanist scholar strove to find out the genuine meaning buried in ancient texts overlaid by the dregs and drosses of time. The fundamental resemblance of the textual and the physical universe got its most succinct and enduring expression in the image of the two Books, the Book of Scripture and the Book of Nature, which had dominated discourse about nature from the twelfth century onwards, and which informed and permeated this discourse well into the seventeenth century and beyond.²

The essence of this symbolic view of nature, or as William Ashworth calls it, the emblematic world view, “is the belief that every kind of thing in the cosmos has myriad hidden meanings and that knowledge consists of an attempt to comprehend as many of these as possible.”³ To know a particular animal species such as the fox, is to know not only its anatomy, habits and geography but also its textual occurrences in Scripture and in ancient works, mythologies and fables in which it plays a role, symbols and proverbs attached to this animal, coins and relics on which it appears. It was precisely this rich cultural context in which the fox gained all its various and multifaceted meanings

¹ Michel Foucault, *The Order of Things: An Archeology of Human Science* (New York: Pantheon, 1971).

² Peter Harrison, “The Book of Nature”, in *The Book of Nature in Early Modern and Modern History*, eds. Klaas Van Berkel and Arjo Vanderjagt (Leuven: Peeters, 2006), 1–26.

³ William B. Ashworth, Jr., “Natural History and the Emblematic World View,” in *Reappraisals of the Scientific Revolution*, eds. David C. Lindberg and Robert S. Westman, (Cambridge: Cambridge University Press, 1990), 304–332, 312.

associated with it, and in its entirety it constituted the knowledge that Renaissance natural philosophy sought to gather, as the works of Conrad Gesner and Ulisse Aldrovandi sufficiently attest.¹

This symbolic world view remained, despite obvious differences caused by the humanist revision of the canonical texts and the introduction into the canon of newly discovered ones, similar to the medieval understanding of nature in important aspects. Before the Protestant Reformation objects, just like words, were regarded as bearers of meanings that refer to divine ideas transcending them. Thus the creatures of the world were fundamentally alike words. They functioned like signs awaiting someone to unfold their meaning. In the early Medieval Age nature was there in order to “disclose its supernatural meaning.”² The rediscovery of nature as an order of things in the twelfth century turned attention to vertical relationships within nature in addition to the horizontal relationships between the natural and the supernatural realm.³ Renaissance extended the territory of exegetical hermeneutics to ancient texts by Aristotle, Pliny and others, but the symbolic nature of the universe remained untouched and in fact reached its most eloquent levels of expression in the encyclopaedic endeavours of Gesner and Aldrovandi.

The striking passage from the English botanist John Ray’s ornithological work published in 1678 is thus surely symptomatic of some kind of fundamental change. Ray declares in its preface that all “hieroglyphics, emblems, morals, fables, presages or ought else pertaining to Divinity, Ethics, Grammar, or any sort of humane learning” must be excluded from natural history.⁴

Foucault, being aware of the futility of fixing definitive turning points in history, regards the publication of John Jonston’s *Natural History of Quadrupeds* in 1657⁵ as a symbolic watershed between the age

¹ For the elements of the emblematic world view see Ashworth’s paper cited above and also William B. Ashworth, “Emblematic Natural History of the Renaissance”, in *Cultures of Natural History*, eds. N. Jardine et al., (Cambridge – New York: Cambridge University Press, 1996), 17–37.

² Charles E. Raven, *English Naturalists from Neckam to Ray* (Cambridge: Cambridge University Press, 1947), 2.

³ Peter Harrison, *The Bible, Protestantism and the Natural Science* (Cambridge: Cambridge University Press, 1998), 39ff.

⁴ Cited by Charles E. Raven, *Natural Religion and Christian Theology* (Cambridge: Cambridge University Press, 1953), 56.

⁵ In fact, the work Foucault refers to is the English translation of one of the four volumes Jonston published in Latin between 1649 and 1653. Charles E. Raven, *English Naturalists...*, 312.

of resemblance and the subsequent era.¹ Jonston is otherwise a minor figure in the history of natural history who is usually deemed a mere plagiarist. Indeed, the substance of his book is drawn from Gesner and Aldrovandi. The difference between him and his predecessors, then, is all the more telling. What Jonston refuses to reiterate in his own work are precisely those hitherto indispensable sections dealing with fables, emblem and myths, which Ray also banished from his treatise on birds.

The cause of this radical limitation on the scope of natural history, whose direct and most obvious consequence was the very appearance of modern natural history as we know it, is much contested. Foucault himself deliberately refrained from explaining the transformation.² Other historians of science ventured to give an account of why this switch took place. The most plausible accounts rely on the close relationship between language theory and scientific discourse which has been manifest ever since writers of ancient Christianity turned to nature in order to find out its allegorical and moral significance instrumental to the salvation of human beings.³

Peter Harrison identifies the literal turn in the interpretation of Scripture as one of the most important factors that led to the collapse of the emblematic world view. "The Protestant insistence on the literal sense of canonical texts" writes Harrison, "had far-reaching, if unintended, consequences. (...) To insist now that texts be read literally was to cut short a potentially endless chain of references in which words referred to things, and things in turn referred to other things. (...) The assertion of the primacy of literal reading, in other words, entailed a new, non-symbolic conception of the nature of things. No longer were objects in the natural world linked to each other by sets of resemblances. As an inevitable consequence of this way of reading texts nature would lose its meaning, and the vacuum created by this loss of intelligibility was gradually to be occupied by alternative accounts of the significance of natural things – those explanations which we regard as scientific. In the new scheme of things, objects were related mathematically, causally, or ordered and classified according to categories other than resemblance."⁴

¹ Michel Foucault, *The Order of Things*, 128–9.

² *Ibid.*, xii–xiii.

³ Detailed accounts can be found in Peter Harrison, *The Bible, Protestantism...*, and James J. Bono, *The Word of God and the Languages of Man* (Madison: University of Wisconsin Press, 1995).

⁴ Peter Harrison, *The Bible, Protestantism...*, 114–5.

In James J. Bono's account theology is also a key factor in the changes took place in the seventeenth century. Particularly the voluntarism endorsed by the Jesuit opponents of Rosicrucianism and magic proved fatal to the notion that creation bears necessary relation to divine ideas so much so that the former could be interpreted as signs of the latter. Nature came to be as contingent on the divine will. Thus creation could now be only regarded as God's workmanship and a manifestation of his power but it proved to be unable to bring closer to the understanding the divine mind. In the book of nature "things were defined not as individual essences (...), but rather in their configuration, proportion, operations and activities in relation to each other and to the larger systems of which they are collectively a part. For Mersenne, and still more, Descartes, the key to interpreting God's Book of Nature was mathematic itself."¹

It is not the plausibility of the particular explanations that matters us here, but the consequences of the changes. Although the account Bono provides differs from that of Harrison, and Foucault himself stayed away from discussion from causes, they all agree that the new view of nature was syntactic in opposition to the preceding symbolic view. As Bono asserts, "by contrast to the exegetical/symbolic nature I described, this latter view of the language of things seeks knowledge of the »grammatical« or »syntactic« dimensions of the language in which God has inscribed the Book of Nature."²

Foucault observes that in the Classical ages science became occupied with the ordering of things, *taxonomia* and *mathesis* being its two major principles. *Taxonomia* "treats of signs in their spatial simultaneity, as a syntax."³ Harrison says that in the seventeenth century "natural objects have been stripped of their intrinsic meanings, and even their qualities and essences have gone. In the physics of Descartes and Newton, simple natural objects are denuded of all but basic quantitative properties. In this new language of nature, syntax has triumphed over semantics. Henceforth the science of nature will deal with mathematical or classificatory rules which govern the relations between natural objects."⁴

¹ James J. Bono, *The Word of God...*, 268.

² Ibid., 263.

³ Michel Foucault, *The Order of Things*, 74.

⁴ Peter Harrison, *The Bible, Protestantism...*, 263–4. See also David Freedberg, *The Eye of the Lynx: Galileo, His Friends and the Beginnings of Modern Natural Philosophy* (Chicago – London: University of Chicago Press, 2002), 384–6.

Meaning has been thus left behind in the huge but for now outmoded tomes of Gesner and his kin. What really happened is not a change in the thinking of philosophers that led them to perceive nature as inert and dead instead of active and alive. It was the symbolic meanings attached to nature that vanished away and all that remained was a nature stripped of both secondary qualities and intelligibility. Huge spaces in the world were now turned vacuous and ready to be filled in. It was the task of the new science to fulfil this mission. Mathematics and taxonomy gained prominence; however, the syntax they offered was far too insufficient in itself to exhaust the immense profusion of the natural world.

A Place for Ecology

In fact, meaning was not irretrievably gone from nature. Even Harrison insists that in the wake of the collapse of the emblematic world view the search for meaning still continued if not intensified. The middle decades of the seventeenth century onwards, the new synthesis of natural history and natural theology launched the programme of searching for hitherto undiscovered ends that would disclose the divine providence throughout the natural world. This programme was still in full vigour when Charles Darwin attended university more than a century and a half later.

The up-dated genre of physico-theology was a powerful ideological vehicle. It justified the importance of natural history and the investigation of nature in a hitherto unprecedented depth exercised by the Royal Society. At the same time it promulgated a view about an ordered social and natural world benevolently maintained and ruled by the trinity of God, King and the Church of England.¹

But for our purpose its most relevant aspect was its relentless search for utility in nature.

The literal reading of the Bible trivially encouraged the literal rendering of Genesis 1.28 too. For the first time in the history of biblical exegesis, literal interpretation of the Creation, the Garden of Eden, the Flood, the Heaven and Hell became the norm.² The subjection of non-human creatures and the whole earth received divine sanction. In Harrison's view, the thesis of Lynn White, at least in a modified form,

¹ For the ideological use of natural history and theology see Neal C. Gillespie, "Natural History, Natural Theology, and Social Order: John Ray and the »Newtonian Ideology«,” *Journal of the History of Biology* 20 (1987): 1–49.

² Peter Harrison, *The Bible, Protestantism...*, 138–160.

can be regarded as plausible. "Aspects to the Christian tradition contributed to the development of modern science; inevitably they led also to the exploitation of nature. It is not clear that the former could have occurred without the latter, for science is motivated by the same instrumental view of the world which led to environmental degradation."¹ As this theologically grounded instrumentalization of nature is a typically seventeenth century development which is entangled with the articulation of the incipient scientific enterprise, the modified White thesis is also a modified Merchant thesis.

What I would like to emphasize is that from the very start the search for immanent ends within the natural world drew attention to the interrelatedness of the organic world. I would not like to deny the obvious, namely that these early physico-theological treatises clearly abound with examples, often far-fetched and artificial ones, about the uses of nature for the benefit of humankind. Instead, I would like to point out that once plants and animals were taken under close empirical scrutiny, the notion of mutual relations and intricate connections could no longer be ignored. Thus, the discovery of more and more uses of which humanity could take advantage was inseparable from the parallel advance in the recognition of, anachronistically speaking, ecological relationships. The inseparability of the two aspects results in some degree of ambiguity or confusion for the natural historian who is overwhelmed by two different kinds of wonder at the same time: the wonder of the intricacies of nature and the wonder of its glorious and bountiful Creator.

This ambiguity is conspicuous in John Ray's *The Wisdom of God Manifested in the Works of the Creation* (1691), which is the first famous physico-theological treatise written by a natural historian in the modern sense. Ray's stance could not have been more anthropocentric, if we look at the speech by which the Almighty might "interpretatively" address man:

"I have now placed thee in a spacious and well furnished world, I have endued thee with an ability of understanding what is beautiful and proportionable, and have made that which is so, agreeable and delightful to thee; I have provided thee with materials whereon to exercise and employ thy art and strength; I have given thee an excellent instrument the hand, accommodated to make use of them all; I have distinguished the earth in hills and valleys, and plains, and meadows, and woods; all these

¹ Peter Harrison, *The Bible, Protestantism...*, 270.

parts capable of culture and industry by thee; I have committed to thee for thy assistance in thy labours of plowing, and carrying, and drawing, and travel; the laborious ox, the patient ass, and the strong and serviceable horse; I have created a multitude of seeds for thee to make choice out of them, of what is most pleasant to thy taste, and of most wholesome and plentiful to your nourishment; I have also made a great variety of trees, bearing fruit both for food and physic, those too capable of being meliorated and improved by transplantation, stercoration, incision, pruning, watering, and other arts and devices.”¹

And so he continues through a couple of passages. However, Ray elsewhere is reluctant to endorse an exclusively human-centred position. In connection with the various minerals and salts buried in the earth he admits that he cannot see “the primary end of formation them.” He tentatively concludes “that among other ends, they were made for those [uses] for which they serve us and other animals.”² In a famous passage near the end of the first book of his treatise he explicitly rejects the Ciceronian opinion according to which the visible world had been created for man. “But though this be vulgarly received, yet wise men now a-days think otherwise,” he comments.³

The Boyle lecturer of the years 1711 and 1712, William Derham is similarly vague about absolute anthropocentrism. He rhetorically asks: “What need of so many Creatures? Particularly of so many Insects, so many Plants, and so many other Things?” His answer is that everything is useful in some respect: “Some for Food, some for Physick, some for Habitation, some for Utensils, some for Tools and Instruments of Work, and some for Restoration and Pleasure, either to Man, or to some of the inferior Creatures themselves; even for which inferior Creatures, 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.”⁴

Some scholars warn us not to make too much of Ray’s denial of anthropocentrism. John Hedley Brooke points out that the most Ray admits is that things can have other uses *besides* purely human uses, as

¹ John Ray, *The Wisdom of God Manifested in the Works of the Creation* (London: John Ray Society, 2005), 140–1.

² *Ibid.*, 88–9.

³ *Ibid.*, 151–2.

⁴ William Derham, *Physico-Theology: Or, A Demonstration of the Being and Attributes of God from His Works of Creation* (London, 1723) 55–7.

the remark on minerals cited above testifies. Brooke states that the real meaning of Ray's message is that "wise men now knew that all things were not made for man alone; but all things were still of some use to man." After all, Derham states that hemlock is useful for goats as nourishment, but goats are, in turn, useful to man.¹

However, if we accept this interpretation, there remains a huge number of examples, in which we do not find direct or indirect reference to utility. In fact, examples of this kind make up the bulk of the works of Ray and Derham. Beavers build shelters, birds swallow pebbles to improve digestion, salmon ascend the river to spawn and so forth. The life of those creatures that reproduce quickly is short, whereas long living creatures increase slowly.² The profusion of seemingly useless insects has been disturbing natural theologians for ages. Ray is particularly fascinated with the nutritional connections in which insects play a major role as the foundation of the food pyramid: "Now birds being of a hot nature, are very voracious creatures, and eat abundantly, and therefore there had need be an infinite number of insects for their sustenance. (...) Nay, which is more strange, divers quadrupeds feed upon insects, and some live wholly upon them, as two sorts of tamanduas upon ants, which therefore are called in English ant-bears; the chameleon upon flies; the mole upon earthworms. The badger also lives chiefly upon beetles, worms, and other insects."³ Now supported by novel microscopic observations, Ray is able to report food chains operating beyond the capacity of human vision: "I have often thought that there was some more than ordinary use in the creation for such insects as are vastly numerous. Such as the *puleces aquitici*, which are in such swarms as to discolour the waters, and many others (...). I have so far succeeded as to discover, that those vastly small animalcula, not to be seen without a microscope, with which the waters are replete, serve for food to some others of the small insects of the waters, particularly the *nympha culicaria* (...). Neither yet do these animalcules serve only for food to such nymphae, but also to another, to me anonymous, insect of the waters (...). These insects hunt these animalcules, and other small creatures that occur in the water, and devour them: and I am apt to think (...) that the *pulex aquaticus arborescens* liveth upon these or more minute and tender

¹ John Hedley Brooke, "'Wise Men Nowadays Think Otherwise': John Ray, Natural Theology and the Meanings of Anthropocentrism," *Notes and Records of the Royal Society* 54 (2000), 199-213, 213.

² William Derham, *Physico-Theology*, 169.

³ John Ray, *The Wisdom of God...*, 306.

animalcules, and it is to catch them that it so leaps in the water.”¹ Ray also points out several biotic relationships that are less obvious than predation. His accounts of parasitism have proved exact in the light of present knowledge. He observes that certain kinds of maggots creeping out of the bodies of caterpillars are not examples for ambiguous generation, but a genuine parasitic relationship, in which the host’s food preference can also be of ecological importance: “I do believe that these flies do either cast their eggs upon the very bodies of the forementioned caterpillars, or upon the leaves on which they feed, all in a string: which there hatching, eat their way into the body, where they are nourished till they be come to their full growth.”²

The effect of these examples presented by Ray and Derham does not depend on whether it is possible to identify some specifically human use of them or not. Maybe there is always some utility for us in things natural, the relationship being somewhat more indirect than in the case of the goat and the hemlock. This does not undermine the relevance of the realization of the interrelations permeating the natural world. After all, even today’s naturalists claim that the damage to the environment is self-damage to humanity. Of course, in recent biocentric discussions the human species is just another species in the ecological network. Early modern naturalists realized how man participates in this network, even if they still had firm belief in man’s ontological, moral and intellectual superiority. They turned to natural phenomena as these could be observed empirically in the field and in the lab. They realized with unprecedented clearness the mechanisms operating within organisms, between organisms, between organism and environment and even, in a rudimentary form, in Derham’s demographical speculations, between populations. Their focus was on the creatures themselves, even if everything they observed in them was another occasion to glorify God and even if the case for the honourable established Church was always on their minds. In a word, the preconditions for genuine ecological research were there.³

It is not necessary to answer the moot and probably irresolvable question when ecology really began in order to appreciate the advance

¹ Ibid., 307.

² Ibid., 265.

³ On this point I concur with the opinion of Clarence J. Glacken, *Traces on the...*, 415, 423.

made towards it in the late seventeenth and early eighteenth centuries.¹ This is not to cast doubt on the impact of Romanticism and that of the Darwinian evolutionary theory on the formation of ecology. Whatever historical reasons made it possible, for the first time in history there arose the opportunity to observe the behaviour and relations of non-human living things; and Ray, Derham and others in their footsteps grasped it without hesitation.²

They can be blamed for insisting on Christian anthropocentrism but only at the expense of a great deal of anachronism and hindsight. Not without injustice can they be accused of providing ideological support for the exploitation of nature, but it must be kept in mind that without them even the accusers themselves could not be here today to accuse.

¹ A review on the debate surrounding the historical source of ecology, Robert P. McIntosh, *The Background of Ecology: Concept and Theory* (Cambridge – New York: Cambridge University Press), 9–27.

² Perhaps the most renowned of their successors is Gilbert White who, according to his biographer, was strongly influenced by the physico-theological tradition. Richard Mabey, *Gilbert White: A Biography of the Author of the Natural History of Selborne* (London: Century, 1986), 11–2. Here Mabey asserts that “Ray and Derham were also pioneering the study of ecology.”