An Ecological Perspective on the Role of Death in Creation

John R. Wood

"The large fish eat the small fish; the small fish eat the water insects; the water insects eat plants and mud." –Chinese Proverb

"The young lions roar for their prey, seeking their food from God." –Psalm104:21 (ESV)

"Life matters. Death matters. Both rely on one another." –Scott Peck

"... the final word of evolutionary biology always seems to come to this: death is the engine of nature." –Paul Santmire

"Truly, truly, I say to you, unless a grain of wheat falls into the earth and dies, it remains alone; but if it dies, it bears much fruit." –John 12:24 (EVS)

Death is pervasive in ecological relationships. Living systems are animated at every level by mortality, cessation, and endings. Nothing in ecology makes sense apart from death. Through long and often personal association, it is difficult for us to see death as anything but evil. If death is present, then something must be wrong. Yet this primarily moral and emotional judgment does not adequately represent our understanding of the ecological role of death in biotic systems. Death animates living systems at every level so that without death there is no community, no ecosystem, no biosphere as we know them. Recent theoretical and empirical work, particularly in aquatic ecology, has focused on the role of programmed cell death (PCD) in regulating population and community structure. Ecologists are now linking the smallest cellular events, genetic and physiological, with planetary biogeochemical processes. Researchers tracking the origin of predation have taken a turn into deep time and the symbiotic origin of cell organelles, asking if they are seeing the roots of multicellularity in death. This understanding of life will continue challenging conventional views of Genesis linking sin and the Fall to bodily death and complex ecological processes.

Opening to Death

Life dominates planet Earth, shaping its form and processes at every scale. Single-celled organisms link the rocks and the oceans together, with atmospheric processes providing the means for renewing and sustaining life in the biosphere. A living fabric drapes the geological bones of every landscape, even to the depths of the oceans. And it is not just multicellular plants, but wherever there is free water much of this living tissue is in the form of biofilms. We are learning that these complex associations form a thin film over all but the driest or most dynamic exposed surfaces. Biogeochemical cycles supply the chemical building blocks for life. These complex elemental and molecular exchanges are mediated by a myriad of microbial species. Single-celled organisms are so pervasive that the fingerprint of living processes is virtually everywhere. There is evidence for a biogenic graphite signature in rocks dating back.
3.7 billion years. And with new remote sensing tools we can identify the light back-scatter from photosynthetic microbes on Earth. This is also a promising way to search for a biosignature in deep space. In the ecological sciences, a newly integrated view of life is linking the smallest organisms to planetary ecological processes. Yet, surprisingly, this emerging new view of life is based squarely upon death and dying. Death is a pervasive phenomenon in ecological relationships. The ecological services of living systems are animated at every level by mortality, cessation, and bodily or physical endings. Our challenge is to find a comprehensive theory of death to encompass these observations.

It is surprisingly difficult to find the word “death” in the index of ecology or conservation biology books. It is seldom listed separately, perhaps because the effects of death are pervasive, present in nearly every other subject. One finds detailed coverage of physical disturbances and other mortality mechanisms (e.g., predation, trophic cascades, and population regulation). But there is little coverage of any attendant definitional issues for death. The brute fact of a physical ending is seemingly self-evident. James Carey, a pioneer in the field of biodemography, and specializing on insect models for aging, comments “that [although] death is one of the most mysterious and inexorable problems in biology. There is little direct coverage in basic biological science and textbooks seldom contain any reference to death or dying.”

In the source book Keywords in Evolutionary Biology, for instance, “predation” and “extinction” are listed, but not “mortality” or “death.” This lack of detailed attention to death means that it remains under-theorized in biology. Life scientists may simply be reflecting a more generalized societal discomfort with death. But environmental ethicist Holmes Rolston III suggests that at least part of the reason may lie in the simple avoidance of the challenging philosophical questions raised by evolutionary theory and the associated mechanisms of biotic death. As he says,

"Biology in the last half-century has not been particularly comfortable with the word “struggle” which has largely disappeared from biology texts, being replaced by the notions of “adaptedness” and “fittedness.” Still, plenty of “struggle” remains in biology (although the switch in emphasis is revealing), and when philosophical participants find that they themselves have ascended via this struggle, they are confronted with the question whether such a struggle can be meaningful.

The advent of evolutionary theory and its putative mechanisms of natural selection and sexual selection confront us with the challenge of physical death and the meaning of life. The hypothetico-deductive approach of the Darwinian method, as Michael Ghiselin points out, has been a robust success. And as such, it is a challenge to many-received ideas across a wide range of social, philosophical, geological, and ecological domains. The mechanism of struggle, loss, and death that is so vital to evolutionary theory, Keith Miller says, serves “as an unnecessary stumbling block to a productive engagement of both science and faith.”

Rolston, in his chapter “The Life Struggle,” shows that questions in evolutionary theory can actually enhance our understanding of God’s good earth. We could gain much by applying these new findings on the ecological functionality of death to the stewardship of the earth. The emerging creation-care discourse has necessarily invoked the negative aspects of human actions as a destructive agent of ecosystem change or loss. But it has also taken Job’s view of awe and wonder at the dangerous behemoth. In contrast to the traditional view, this literature has also emphasized the fundamental goodness of God’s creation in all of its operations, even those involving pain and death. We circle the questions of biotic death, pain, and life in a troubling dance, looking for clarity. The range of answers that we have available through the traditional view of death seems to me theoretically unsatisfactory and is increasingly polarizing. Perhaps a closer look at the phenomenology of biotic mortality through an ecological lens will give us some new insight.

To appreciate the pervasiveness of death in ecology let us start by considering how the end of life animates the entire range of ecological relationships. Population ecologists, trying to understand the regulatory mechanisms in the ebb and flow of populations and communities, mathematically model death in what are called “loss processes.” The famous Snowshoe Hare-Canadian Lynx (SSH-CL) predator-prey cycles have been described with linked population equations. The customary view of this species pair is that a proficient predator will regulate the prey in a cyclically balanced fashion.
Yet close analysis shows that more than simple predation is going on. Numerous biotic (competitive) and abiotic (physical) factors are interacting to regulate these populations. We typically think of predator-prey interactions resulting in the demise of prey in a dramatic chase that ends in a cloud of dust, blood, and gore. Predation on this view is a winner-take-all exchange in which the prey species is the loser. But the ecological action of death is considerably more complex. In the classic SSH-CL cycle, the synchronizing mechanism remains elusive. Grouse are an alternate prey item. And the buds, seeds, and twigs of understory shrubs are browsed by both the hares and birds. This nonanimal death also has a regulatory influence. Plants can be predators too: carnivorous plants dominate in nitrogen-poor habitats such as acid bogs in the Boreal Forest or high on the table-like “Tepuis” of Venezuela in South America. Ecologists conclude that death shapes ecosystem processes in a much wider array of feeding (trophic) relationships than that typically imagined as one animal eating another.

In the broadest sense, plant-feeding herbivores (such as bison, elk, antelope, and elephants), fish grazing on phytoplankton, or parasites invading hosts are all forms of predation. But the predator does not need to kill outright in order to have an impact. The mere threat of death is also a population-regulating mechanism. Described colorfully as “landscapes of fear,” the indirect or nonconsumptive effects of the threat of predation are increasingly recognized as important determinants of ecosystem structuring. The prey item is not consumed, but simply alters its behavior in the presence of the perceived risk of predation. A classic case of predator-induced stress is the reintroduction of wolves into Yellowstone National Park. The activities of this top-level predator influence species at multiple levels in what is called a “trophic cascade” throughout the food web. The fear that wolves engender is sufficient to prevent elk from freely browsing on aspen trees as they once did near streams. Reduced browsing by the elk releases aspen growth, which in turn has an influence on beaver populations, and so on. In the end, as ecologist Paul Colinvaux pointed out bluntly in his text, “all population control is by death,” either by outright mortality or starvation, or by the failure to reproduce.

Ecologists describe the significant biological features in the life cycle of an organism as its life history. Detailed life history studies have shown that there is an energetic cost to these prey responses. The measurable effect of predator presence on reproductive output is one influence on Darwinian fitness. The fear of death response happens in aquatic systems as well as terrestrial ones. Small minnows, or “bait fish,” will bulk up around the pectoral fins if they detect the odor plume of a predator. The energy cost of doing so is measurable for vertebrates and invertebrates alike. Water fleas (Daphnia), a common zooplankton in lakes, go through a seasonal cycle of body forms called “cyclomorphosis.” In the presence of chemicals released by predators, each generation grows energetically expensive spines called “helmets.” Back on the land, entomologists have noticed that tree leaves will toughen, becoming distasteful after the plant has been fed upon by herbivorous insects. And trees are said to “talk” to one another via the volatile chemical signals released when a herbivorous insect begins feeding. So a variety of ecological life history strategies, from outgrowing a predator to becoming distasteful, are deployed in the face of death. Population regulation by predation and stress are not the only death-mediated mechanisms that are structuring the biodiversity of ecosystems.

A World Shaped by Dying

Today there is an abundance of new research in ecological studies on death, senescence, and the process of dying. Yet biological death remains a profound mystery to us. Through long and personal association, it is difficult for us to see death as anything but evil—so much so that we might easily pass over the ways that physical mortality has been shaping the form and functioning of the biosphere. It would be difficult for an ecologist to imagine the overall appearance of a prairie landscape, for instance, without death operating in that ecosystem. The influence begins at the lowest structural levels. Cell mortality is a normal developmental component of life-forming processes, eliminating abnormal cells, deleting structures, and shaping tissues.

These processes then scale upward. Ultimately death is expressed in the maintenance of every biotic community, providing structural integrity and vital ecosystem services. The vascular systems of plants, for example, are composed primarily of nonliving...
tissues. These dead cells are essential for conducting water and nutrients to the heights of redwood trees. The points and incised margins of leaves are complex functional surfaces shaped by death. These finely divided forms develop from undifferentiated lobes when embryological cells die leaving a gap between the outwardly growing outer surfaces. Likewise programmed-cell demise is at work at the community and ecosystem levels too. Yet our cultural ambivalence with death can lead us to overlook the vital functional and structural roles that disturbance-mediated death plays in the biosphere.

On land, physical disturbances, such as fire, shape forest ecosystems. But, for over half a century, best management practices effectively suppressed wildfires and other ecological disturbance agents, such as floods, whenever possible. But excluding all death-dealing ecosystem disturbance agents is widely recognized as poor management practice. We are now beginning to learn how to live adaptively with fire by accepting this necessary mortality as a sign of ecosystem health.

In the ocean, the riot of color and swirling behavior among species in a coral reef community is mediated by complex interactions of physical, chemical, and behavioral processes shaped by death. Among the web of trophic relationships are the interesting coral-feeders (e.g., parrot-fish, filefish, and puffers). These herbivores consume coral in copious amounts extracting the algal and coral polyp nutrients. Their finely divided feces rains down a white cloud forming sand grains that accumulate in many places, including the tropical white sand beaches we find so attractive. Without this constant cropping, the algae would overgrow the reef, dramatically altering its structure and community composition. In every kingdom and domain of life, we find that the genetic program of death operates.

Contemporary views of living systems from cells to ecosystems are increasingly focusing on death and death-like processes. Seemingly every taxonomic level is represented in our emerging understanding of PCD. Ecologists have discovered that PCD has regulatory influence on carbon flow through food webs, and in overall ecosystem structure, particularly in marine ecosystems. Cyanobacteria, better known as blue-green algae, are some of the smallest photosynthetic organisms in the ocean. They make up the base of the food pyramid, converting carbon dioxide into plant tissue and playing key roles in biogeochemical cycles and, ultimately, in regulating Earth’s climate. Over the last three decades, we have gained deep insights into the detail of how death, mediated through PCD and the associated genetic pathways, is central to the function and structure of the entire biosphere.

Then, at an entirely different scale, we find another kind of death study giving insight into the colony dynamics and behavior of social insects. Ant and honey bee workers can detect the “sweet smell of death” on a dead or moribund nest mate. At death, the suite of chemical signals associated with life begin to dissipate. This triggers the living to engage in life-conserving housekeeping actions, removing the dead to the refuse heap. And painting a live nest mate with a coat of specific fatty acids elicits a quick ride outside.

Finally, there has been a surge of research on death assemblages in conservation biology that are just now beginning to emerge. It is as if to advance the study of life it is necessary to look carefully at death. In an imaginary world without death there would be few of the many biological distinctions that we take for granted as fundamental to living systems. D’Arcy Thompson’s classic study On Growth and Form delightfully details the physical rules of shape and form. In an imaginary world without death, all that he describes and all that we observe simply disappear, to be replaced by mineral mechanics. There would be no cell shape, no tissue or texture to living systems. The shape of trees and forest stands, the mix of grassland species on the prairie, the shimmering blue depths of the open ocean, and the riot of color in a coral reef would not be the same. Without the formative mechanism of mortality through which ecological processes occur, we cannot describe the shape, or the behavior, or the system functioning of
the biosphere. Nothing in ecology makes sense apart from the operations of physical death.

What Is Death?

Ecological textbooks, as we said, show little awareness of death per se and seldom address the definitional issues associated with the term that crop up in the medical sciences. But biological mortality, even in ecology, is not so simple; there are varieties of death. In simplest terms, biological death is the act of being killed and the end of life for an organism. More technically, we speak of death as the ceasing to be a self-organized entity. The body may remain, but the capacity for change is missing. Death is sometimes described as the loss of life. And medically, it has been marked by the irreversible cessation or stoppage of the heart, brain activity, or respiration. In science, physical or biological death is a normal process of the contingent, material world.

In some settings, death is characterized as a fundamental force or agent of change. Thus, ending is thought to be necessary for change and renewal to occur. There are many kinds of endings that occur in nature. Biotic life is constituted of events and ends through a myriad of contingent processes. Atoms end in the light-matter quantum exchange of radioactive decay. Molecules end in metabolic respiratory pathways. Cells end with necrosis and PCD, both vital homeostatic processes that ensure the good health of organisms and of ecosystems. Tissues end by replacement, most interestingly in a complex program of dissolution and regrowth called “metamorphosis.” Ecologically, species and biotic communities come to an end point in extinction and successional change over time. The arrow of time mediates these endings we commonly label “death.”

However, death itself does not have agency. Physical death is not a force like gravity. Rather, it is a condition that results from the power, action, or change mediated by some agent during the course of life. Or put another way, death is an outcome of the lack of life. In these definitions, it is already clear that death is less a discrete event and more a process. And this insight presents life scientists a problem in specifying precisely when death has occurred for a biotic entity.

This complexity arises in ecology too, from our inability to unequivocally identify organisms as individuals with a distinct end point. Without this precision, we cannot say when, or if, an organism has died. The discrete, unitary organisms we encounter every day (e.g., a dog, a cat, or a bird) are only one of two fundamental body forms in nature. Many species, including plants, fungi, and social organisms, live as modular units of a collective, sometimes designated a “superorganism.” This presents a challenge for population ecologists tracking the mortality of living units. For example, the typical cluster of aspen trees is a “clone.” The founding unit that develops from seed is designated a “genet.” The genetically identical shoots that grow to form the stand of trees are called “ramets.” But what is the age of this group and when does this clone die? Is it the death of the genet or of the several offshoots that count? And symbiotic relationships push the boundaries of the individual into even fuzzier conceptual and terminological territory. On close examination, we are finding that there is a relational character to living systems that does not sit easily within commonsense platonic categories of discrete individuals.

Careful observers had known from antiquity that there were inherent mechanisms operating to limit the growth and development of plants and animals. The beginnings for a theoretical framing of death came in the eighteenth century with experiments by Linnaeus and his students on the potential consequences of uninterrupted plant growth. “A single plant,” he wrote, “if left unchecked by animals, could cover and envelop our entire globe.” And Malthus and Darwin, following him, both knew that death was the necessary twin of life. This is perhaps best illustrated by the famous last paragraph of The Origin of Species. In it, Darwin explicitly names the agency of death operating as part of a complex system that is naturally selected to sustain life.

Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.

With Darwin, ecologists have a useful theory explaining new species development. It provides a
mechanism for competitive exclusion and physical or reproductive death.\textsuperscript{61}

Death then is axiomatic in the theoretical underpinnings of evolutionary theory, framing key questions in ecology. The so-called “Copernicization” of death is not rejecting Darwin, but suggesting that a more comprehensive theory of death is needed.\textsuperscript{62} To better understand death, it may be necessary to examine what is living versus what is merely material and, hence, dead. At the outset of the modern discipline of biology, organisms were defined by their intentionality, their telos. Kant delimited living organisms from mere machine “tools,” using the term “self-organized” to indicate their intentionality.

However, as Evelyn Fox Keller shows, since the advent of cybernetics in the 1940s this definition has become problematic. She proposes that we “drop the question of intentionality for living entities and focus instead on agency.”\textsuperscript{63} Making this move changes the focus for the definition of life to power, action, or change. And now we have a clear link between life and death, in which the lack of agency is defining.

Biology is centered entirely on the study of life and life-like processes; therefore, biologists have defined life by a series of functional properties that we all memorized in high school biology. For most biologists, these functional definitions of living systems seem adequate for our work. But this approach is problematic for philosophers. In a detailed and highly personal accounting, analytical philosopher Fred Feldman undertakes a search for robust definitions of both life and of death. He concludes that “in spite of its magnificent pedigree and its popularity, the life-functional approach to the analysis of life is unsuccessful.”\textsuperscript{64} In the end he says that “life is a mystery.” Nor is he sanguine that we can do any better in precisely defining death.\textsuperscript{65} Life and death circle one another in an endless cycle as Steven Peck and the wise Preacher (Koheleth) in Ecclesiastes both claim.\textsuperscript{66}

From a different disciplinary direction, organic chemist Addy Pross claims greater certainty about his theory of the origin of life, but he also alludes to some mystery, or at least ignorance, as life emerges from lifeless matter. He proposes that a unification of Darwinian theory and the chemical theory of evolution must take place for an “integration that forms the basis of the theory of life.”\textsuperscript{67} Unfortunately, Pross says little specifically about death. But any integrated theoretical framing of life linking chemistry with evolutionary theory will need a complementary theory of death. We are left then, from both philosophical and biochemical directions, with the theoretical mystery of biotic life and death. We currently lack a means of effectively connecting these two phenomena into a satisfactory theoretical framework. The call by André Klarsfeld and Frédéric Revah for a comprehensive theoretical reframing of death is important to biologists.\textsuperscript{68} A deeper insight into the theoretical place of death in ecology may open new avenues for investigating the course of life on Earth than that currently available in the neo-Darwinian synthesis.

From Definition to Meaning

Two aphorisms from Claude Bernard, a founder of modern physiology, sum up a paradox of biotic existence. “Life is creation,” he said, and in challenge to the vitalism of the day, “Life is death.”\textsuperscript{69} Mechanistic theory is conclusive, and we no longer assert a vital force or élan for life. In our attempts to understand life, we are closing in on the goal of producing it artificially and/or identifying it in deep space.\textsuperscript{70} But the challenging question is, how will we know it should life appear on the lab bench or even in deep space?\textsuperscript{71} Research in ecology, biochemistry, and astrobiology is testing the adequacy of our theoretical understanding of both life and death. Is there an essence to life that links to death? In the end, we simply cannot say that there is one thing that unequivocally defines either end of this wonderful continuum of life that we find ourselves within. How interesting! So I am simply going to continue using each term as if we all understood exactly what is meant by them. And, if Feldman is correct, life and death do form identifiable ontological categories.\textsuperscript{72} But it all depends upon how the question is approached.

This illustrates what I take to be the central challenge in speaking about the place of death in ecology. We often take hold of the wrong end of such questions. Asking “when were you born?” or “when did she die?” are relatively straightforward questions to answer. But actually these questions lack the necessary precision for all but the most ordinary examination. If we go further and try to exert the full force of our analytical methods to bring precision to our understanding, the questions escape our empirical grasp. The answer that we actually want cannot
be found in the empirical-theoretical facts of the matter. No amount of scientific exactitude will explain the meaning of human death, the necessity of suffering among creatures, and the putative silence of God in the face of relentless human interrogation. The Creator will not be justified to the creature; and as George Murphy details, the triune God remains wonderfully hidden in plain sight, having become a creature and submitting to these same creaturely limits, including death on the cross. Here is where we must begin our humble inquiry of faith in order to understand death. For as Job discovered in his day, it is in the silence of faith before the Creator that, after all, the answer lies.

The approach to meaning in death that recommends itself to me is much like that found in Robert Farrar Capon’s description of how everything was created in his short essay “Let Me Tell You Why.” He starts by describing a fanciful party where God decides to make the world. The scene is closer to what might happen by a gathering of artists, rather than by a sovereign royal ruler. And he ends saying,

It is, I grant you, a crass analogy; but crass analogies are the safest. Everybody knows that God is not three old men throwing olives at each other. Not everyone, I’m afraid, is equally clear that God is not a cosmic force or a principle of being … Accordingly, I give you the central truth that creation is the result of a Trinitarian bash, and leave the details of the analogy to sort themselves out as best they can.

We can scarcely do better in talking about the meaning of death.

Ecologists sometimes say the first rule of ecology is “eat and be eaten,” and the aphorism is affirmed in numerous biblical texts. This observation and its ambiguity are captured wonderfully by Annie Dillard in an incident with a mosquito feeding on a copperhead snake.

Is this what it’s like, I thought then, and think now: a little blood here, a chomp there, and still we live, trampling the grass? Must everything whole be nibbled? Here was a new light on the intricate texture of things in the world, the actual plot of the present moment in time after the fall: the way we the living are nibbled and nibbling—not held aloft on a cloud in the air but bumbling pitted and scarred and broken through a frayed and beautiful land.

That food is derived by the consumption of living tissue is our descriptive position. The Bible places eating into the economy of God saying, “He provides food for the cattle and for the young ravens when they call” (Ps. 147:9). And the wonder of God’s hand in predation is acknowledged in Psalm 104:14, “The lions roar for their prey and seek their food from God.” So death in biotic systems has always been seen as a normal part of nutrition and life in God’s kingdom.

Ecological Applications of Death to Creation Care

The ecological retheorizing of death that I propose may yield insights into creation care. First, this view supports the theological assertion that biotic death was present from the beginning and is inherently part of the goodness of creation. Second, the land, as scripture calls the biosphere, is a gift. And biotic death is a part of that gifting to which we need to open our hands and gratefully receive it. This does not mean that we actively seek out death, but we no longer fear it either. Third, the fruitfulness of creation is necessarily balanced by endings. While this imperative is intuitively obvious, the mechanism of death still troubles us deeply.

Fourth, a flourishing creation, our stewardship charge, depends on better understanding dying. The ecological rethinking of death that I am advocating opens new insights into biotic functionality and shalom—the biblical concept of the flourishing of all creation. Could it be that the groaning of creation is not primarily from physical death, but from the dislocation of relationships caused by human sin? Restoring those ruptures in relationship of humans to God, and of humans to the creatures is, as Middleton says, what we are interceding for and actively working to accomplish. The lesson of creation care is that the redemptive concern for people requires that we also care for the earth. And that this is possible in the presence of death. Mortality is not an optional, embarrassing, or inconvenient truth, but integral to the order of creation. It is as necessary to life as is the law of gravity. Dying is how our bodies—and likewise all those organismal bodies upon whom we depend for human flourishing—work.

Fifth, we know that our traditional view of death has contributed to an “ecological blind spot” for many in
the evangelical church. The linking of missions and creation care at the 2012 Lausanne Global Consultation on Creation Care and the Gospel is a welcome and exciting sea change in this thinking. Sixth, lament may be the response that will transcend the evil we perceive and bring us hope. Differing varieties of theodicy, Celia Deane-Drummond says, address evil in three forms—natural, moral, and, she suggests, anthropogenic evil. Although the available theodicies may be inadequate, she says that the “attempt to consider theodicy” is still worth doing.

I agree that the full answer to the problem of death will not likely lie in a more detailed theodicy. We need to explore other ways forward. The “grief work” that Walter Brueggemann recommends is both a hopeful sign and, as he says, our prophetic task. The human community faces stark choices that are as old as the covenant announced by Moses in Deuteronomy 30:15–18. Brueggemann says that we can have

Either ideology or realism;
Either denial or grief;
Either despair or hope.

And scientific realism, including embracing the reality of biotic death, is required to address “both methodological and substantive challenges to Christian theology,” says Arthur Peacocke. Embracing the reality of biotic death is a vital step on the path to reimagining our relationship to the natural world.

Seventh, the concept of biophilia, our innate creaturely affinity for nature, can give us insight into the paradox of love and relationship lying at the heart of creation. I suggest that understanding biophilia helps us understand who we are, biophysically and spiritually. It links us to our calling as stewards made in the image of God. In spite of all our passion for utilitarian efficiency, and the stewardship failings that ensue, we humans deeply love this biodiverse world. As N. T. Wright suggests, we were created in love, in a relational world. And “love freely given creates a context for love to be freely returned.” The world, he notes, has been “created good but incomplete.” Biological dying is a necessary correlate in the story of a free and contingent universe. But physical death is not the only story.

Why Study Death? A Speculative Postscript

Having a clearer understanding of the “telos of death” as it operates in creation is vital. Ecologist Jeff Schloss gives carefully nuanced accounts for the question of death and predation in ecology. “While death is not necessary for life,” he says, “the possibility of death is necessary. So constitutive for life is the possibility of not-being that its very being is essentially a hovering over this abyss, a skirt ing of its brink.” In the beginning God’s spirit creates life. I wonder if physical death is not simply assumed in the biblical account of life giving, particularly in Genesis 1 where the abundance of life is springing forward. Can we conceive any functioning ecosystem, under any of the range of suggested time frames (days to millennia to billions of years), functioning without organisms dying? Not under any ecological conditions that we have experienced or theorized. Furthermore, throughout the scriptures, physical death is often linked to flourishing. The metaphors of “pruning,” of “dying daily,” and of saying that “unless a seed dies it abides alone” all seem to point to physical death as a normal end.

What is life? What is death? We still do not know with precision, and we may never. The gift from God of the biosphere in all its complex ecological processing includes death. In Nature Reborn, Paul Santmire gives a clear-eyed account of the ambiguities of both gospel and nature with respect to death. We Christians, he says, “are unable to deny death. A religion that has a crucified Messiah as its fulcrum hardly permits that.” So can we find a better vision of death in science and in theology? Can we, he wonders rhetorically, embrace the ecology of death? Yes, it is possible, and I believe that we must do so.

The nexus of ecological relationships is part of our spiritual as well as our physical inheritance. Seeing the land as gift and death as integral to that gift is the way forward. We need to regain the sense of land that Moses laid out in Deuteronomy. It is a sense that the prophets and psalmist praised; and that the wisdom writers declared as a good gift from God our Creator, and it included dying.

Ronald Osborn, in his recent account of Death before the Fall, challenges the static reading of scripture which fails to account for the dynamics of death in creation. What are we to make of this flourishing
of life so deeply tied to death? There is a Christian path toward the ecology of death that we have not taken. It was embodied by the Celtic saints and also in the thought of Saint Francis of Assisi. Perhaps as the mystic Francis recognized nearly eight hundred years ago, ecologists are right to welcome “sister death” as an integral part of creation’s processes. This understanding of life will continue challenging conventional views of Genesis. One implication of this new complementarian view is that if death is the engine of nature, then life is the fuel.

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Notes
2The Psalmist is perhaps speaking descriptively rather than normatively here—or perhaps not. See verse 27 in Psalm 104 of Calvin’s Commentaries, http://www.studylight.org /commentaries/cal/view.cgi?bk=18&ch=104.
3All these wait upon thee The prophet here again describes God as acting the part of the master of a household, and a foster-father towards all sorts of living creatures, by providing liberally for them. He had said before, that God made food to grow on the mountains for the support of cattle, and that sustenance is ministered to the very lions by the hand of the same God, although they live upon prey.

... the Psalmist asserts, that if God hide his face they are afraid; and, secondly, that if he take away their spirit they die, and return to their dust ... The amount of what is stated is, that when we see the world daily decaying, and daily renewed, the life-giving power of God is reflected to us herein as in a mirror. All the deaths which take place among living creatures, are just so many examples of our nothingness, so to speak; and when others are produced and grow up in their room, we have in that presented to us a renewal of the world. Since then the world daily dies, and is daily renewed in its various parts, the manifest conclusion is, that it subsists only by a secret virtue derived from God.

Charles H. Spurgeon, in his commentary on Psalm 104:29, is more direct in saying that this death related to eating is from God.

Note here that death is caused by the act of God, “thou takest away their breath”; we are immortal till he bids us die, and so are even the little sparrows, who fall not to the ground without our Father.

And a parallel comment regarding scavengers is made in Psalm 147:9 (ESV): “He gives to the beasts their food, and to the young ravens which cry.”

4H. Paul Santmire, Nature Reborn: The Ecological and Cosmic Promise of Christian Theology (Minneapolis, MN: Augsburg Fortress, 2000), 94. Two iconic stories illustrate the range of emotive power Santmire’s observation elicits. In a letter to Asa Gray, May 22, 1860, Charles Darwin recounts his consternation “that a beneficent & omnipotent God would have designedly created the Ichneumonidae with the express intention of their feeding within the living bodies of caterpillars.”

In the second story, Annie Dillard describes walking along the edge of an island in a stream “mainly to scare frogs” when she notices a small green frog.

He didn’t jump; I crept closer. At last I knelt on the island’s winter killed grass, lost, dumbstruck, staring at the frog in the creek ... And just as I looked at him, he crumpled and began to sag ... being sucked dry by a giant water bug ... I stood up and brushed the knees of my pants. I couldn’t catch my breath. (Annie Dillard, Pilgrim at Tinker Creek [1974; New York: Harper Collins, 1998], 7–8)

3In John 15:1–27, we find a related agricultural metaphor in the vinedresser pruning away moribund or nonproductive branches.

8The terminology of death is challenging as we use one word for a complex of meanings. Theologian Gordon J. Spykman has helpfully emphasized that “dualist views of human nature also create insuperable dilemmas, not to mention needless complications” for both end of and beginning of life issues. Gordon J. Spykman, Reformational Theology: A New Paradigm for Doing Dogmatics (Grand Rapids, MI: Wm. B. Eerdmans, 1992), 242. In this article, I simply focus on physical or biological death and will not attempt to untangle this theological complex. Getting a better understanding of the biological meaning of death may yield useful insights into what is meant variously by metaphysical death.

By traditional, I mean the theological consensus that has emerged from the influence of early twentieth-century fundamentalism. As N.T. Wright, in *Surprised by Hope: Rethinking Heaven, the Resurrection, and the Mission of the Church* (New York: HarperCollins, 2008), has noted, “Christian thought has oscillated between seeing death as a vile enemy and a welcome friend” (p. 15). For an entrance into this extensive literature, see Mark Noll, *The Rise of Evangelical Science* (Chicago, IL: University of Chicago Press, 2005).

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Article

An Ecological Perspective on the Role of Death in Creation


In addition to predation, he lists six forms of death that regulate population numbers. “Perhaps the commonest form of ‘death’ is not being born at all because of the stress of competition.” The failure to find a mate is an equally effective form of biological death as is that of carnivory or the death which results from starvation, malnutrition, parasitic disease, or accident. P. Colinaux, Ecology 2 (New York: John Wiley & Sons, 1993), 201–202.


Stanley Dodson, Introduction to Limnology (Boston, MA: McGraw Hill, 2005), 172–76. Predation is only one of the numerous biotic forces shaping biological communities. Cooperation is another. Theories of community assembly also entail abiotic disturbance and stochastic processes. In the end, as Colinaux in Ecology 2 says, population regulation is by some form of biotic death (p. 201).

For a detailed discussion of the chemical defenses of plants (called allelopathy), see Price et al., Insect Ecology, 492–501.


Klarsfeld and Revah, The Biology of Death.

Every form of life we know or can imagine is sustained by this fountain of energy; remove death, and the fountain dries up” (Wilkinson, Christian Ecology of Death, 321).


There is no single definition for a biological organism. See John W. Pepper and Matthew D. Herron, “Does Biology Need an Organism Concept?,” Biological Reviews 83 (2008): 621–27, Table 1 “Terms referring to variants of the organ-
The challenge also appears in defining ecosystems and communities. Trying to specify the difference between living and nonliving material is challenging in any but the simplest of pathways as nutrients cycle in and out of biotic and abiotic compartments. See Timothy F. H. Allen and Thomas W. Hookstra, Toward a Unified Ecology (New York: Columbia University Press, 1992), 45–47.

See the delightful new commentary on the Book of Job by Lindsay Wilson, Job (Grand Rapids, MI: Wm. B. Eerdmans, 2015). The central issue, she says, “is not suffering but rather faith” (p. 352).


Capon, The Romance of the Word, 177.

Dillard, Pilgrim at Tinker Creek, 230.

The death that entered with the sin of Adam and Eve was relational separation from God and consequently from the creation. Robert J. Berry explores this thesis in detail in “Did Darwin Dethrone Humankind?,” in Darwin, Creation and the Fall: Theological Challenges, ed. Robert J. Berry and T. A. Noble (Nottingham, UK: Inter-Varsity Press, 2009), 63–69. For an early use of the term “creation care” and the presence of physical death in the Garden of Eden, see Ron Elsdon, Bent World: A Christian Response to the Environmental Crisis (Downers Grove, IL: InterVarsity Press, 1981), 104.

This deep ambiguity is perhaps best and elegantly articulated by Dillard in “Fecundity,” chap. 10 in Pilgrim at Tinker Creek, 161–83.


Humans have power and agency for good or ill. See, for example, Middleton’s description of the flood as a restorative measure for shalom, to inhibit human violence to each other and the earth in Liberating Image, 220–21.

He speaks of it as our human vocation as the imago Dei in God’s world (Middleton, Liberating Image, 90).

In John R. Woodward and S.C. Bouma-Prediger, “Seeking Shalom,” chap. 10 in Living the Good Life on God’s Good Earth, ed. David S. Kootje (Grand Rapids, MI: Faith Alive, 2006), 79–83, we said, “The vision of all things in right relationship [shalom] is itself rooted in our understanding that God is a God of relationship.” We are beginning to appreciate that biotic death is a necessary part of that flourishing.

Article

An Ecological Perspective on the Role of Death in Creation

89Deuteronomy 30:15–20 (ESV): “See, I have set before you today life and good, death and evil. If you obey the commandments of the Lord your God that I command you today, by loving the Lord your God, by walking in his ways, and by keeping his commandments and his statutes and his rules, then you shall live and multiply, and the Lord your God will bless you in the land that you are entering to take possession of it. But if your heart turns away, and you will not hear, but are drawn away to worship other gods and serve them, I declare to you today, that you shall surely perish. You shall not live long in the land that you are going over the Jordan to enter and possess. I call heaven and earth to witness against you today, that I have set before you life and death, blessing and curse. Therefore choose life, that you may live, loving the Lord your God, obeying his voice and holding fast to him, for he is your life and length of days, that you may dwell in the land that the Lord swore to your fathers, to Abraham, to Isaac, and to Jacob, to give them.” The entire creation is portrayed as standing within the royal court as witnesses against one species, humanity, the only species gifted with the imago Dei. We might have formerly read these words as a mere metaphorical flourish, a quaint cultural turn of phrase perhaps. But I wonder. Today we are living in what has been called the Anthropocene Age. Thus, invoking the agency of creation in testimony as Moses does here seems eerily prescient. See Richard Monastersky, “Anthropocene: The Human Age,” Nature 519, no. 7542 (2015): 144–47.
91Deuteronomy 30:15–20 (ESV): “See, I have set before you today life and good, death and evil. If you obey the commandments of the Lord your God that I command you today, by loving the Lord your God, by walking in his ways, and by keeping his commandments and his statutes and his rules, then you shall live and multiply, and the Lord your God will bless you in the land that you are entering to take possession of it. But if your heart turns away, and you will not hear, but are drawn away to worship other gods and serve them, I declare to you today, that you shall surely perish. You shall not live long in the land that you are going over the Jordan to enter and possess. I call heaven and earth to witness against you today, that I have set before you life and death, blessing and curse. Therefore choose life, that you may live, loving the Lord your God, obeying his voice and holding fast to him, for he is your life and length of days, that you may dwell in the land that the Lord swore to your fathers, to Abraham, to Isaac, and to Jacob, to give them.” The entire creation is portrayed as standing within the royal court as witnesses against one species, humanity, the only species gifted with the imago Dei. We might have formerly read these words as a mere metaphorical flourish, a quaint cultural turn of phrase perhaps. But I wonder. Today we are living in what has been called the Anthropocene Age. Thus, invoking the agency of creation in testimony as Moses does here seems eerily prescient. See Richard Monastersky, “Anthropocene: The Human Age,” Nature 519, no. 7542 (2015): 144–47.
92H. Paul Santmire, Nature Reform, p. 95. He also asks, “Is it really possible for us to embrace the ecology of death? Is it spiritually realistic to aspire to encounter nature untamed, unpacified, and unromanticized, with all its ambiguities and its death-driven violence, as a gift from the giver of every good and perfect gift, as a tabernacle of the most high, and thereby to be able to embrace nature spiritually, as a world charged with the glory of God, overflowing with blessings, beauty and goodness? (p. 95)
97Animal welfare is a closely related topic. There have been attempts to explain animal death and suffering that rely on the Cartesian mind-body dualism and Descartes’s theory that animals are mere machines, and that their death or pain is no more significant than breaking a rock or a machine. Snoke takes this approach to maintain the significant difference between humans and animals. I agree that a robust theory of death will necessarily incorporate human uniqueness. David Snoke, “Why Were Dangerous Animals Created?,” Perspectives on Science and Christian Faith 56, no. 2 (2004): 117–25. But this approach to predation is not the same as an ecological theory of death. It is based on a stark human-animal dualism that was contested by philosophers even as it was being proposed, and it seems to undercut the motivation of animal care embodied in antivivisection legislation. For the history and a theological review of human-induced animal pain, suffering, and death, see Donna Yarri, The Ethics of Animal Experimentation: A Critical Analysis and Constructive Christian Proposal (Oxford: Oxford University Press, 2005).
98Santmire, Nature Reform, p. 95. He also asks, “Is it really possible for us to embrace the ecology of death? Is it spiritually realistic to aspire to encounter nature untamed, unpacified, and unromanticized, with all its ambiguities and its death-driven violence, as a gift from the giver of every good and perfect gift, as a tabernacle of the most high, and thereby to be able to embrace nature spiritually, as a world charged with the glory of God, overflowing with blessings, beauty and goodness? (p. 95) That is what the classical Celtic saints did. And that is why we need them as our mentors today: so that, having confronted the stark reality of death in nature, our spirituality will sustain, not undermine, our theology of nature. (p. 96)
100With respect to our wanton destruction of the biosphere, few have noticed the significance of the setting of Deuteronomy 30 cited above. Moses explicitly calls on “heaven and earth to witness against you today.” The entire creation is portrayed as standing within the royal court as witnesses against one species, humanity, the only species gifted with the imago Dei. We might have formerly read these words as a mere metaphorical flourish, a quaint cultural turn of phrase perhaps. But I wonder. Today we are living in what has been called the Anthropocene Age. Thus, invoking the agency of creation in testimony as Moses does here seems eerily prescient. See Richard Monastersky, “Anthropocene: The Human Age,” Nature 519, no. 7542 (2015): 144–47.
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