God of Life: Contemplating Evolution, Ecology, Extinction

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> "For if one link in nature's chain might be lost, another might be lost, until the whole of things will vanish by piecemeal." (Thomas Jefferson)

Introduction

Contemplation of the "God of Life" provides the opportunity for reflection on themes of evolution, ecology, and species extinction. Perhaps linking the "God of life" theme with extinction seems strange, but extinction is a natural part of evolution (as will be shown below), an essential life process on earth, and thus death becomes a means by which natural processes occur. This paper will focus on four major themes that are all related to this issue:

- Evolution is the unifying theory within biology, and nothing in biology makes sense without it.
- Evolution is tightly linked to ecology, and failure to accept evolution often leads to a failure to accept ecological principles.
- Extinction is a part of evolution of life on earth; human causes may be responsible for extinctions of many species.
- In recent years, human activity has accelerated climate change leading to an alarming rate of extinctions.

The goal of this chapter is to weave these themes together from both a scientific and a religious perspective to demonstrate the importance of concerns about extinction as they relate to ecology and evolution and finally to relate them to the "God of Life" theme that resonates throughout this volume.

Evolution as the Unifying Theory of Biology

In the broad sense, evolution can merely describe change in social and political systems. Biological evolution, on the other hand, is the change in populations that transcends the lifetime of any individual. Individuals do not evolve, populations do. As Futuyama noted: "The changes in populations that are considered evolutionary are those that are inheritable via the genetic material from one generation to the next."[1] Darwin himself proposed much of this definition, although DNA had not been identified as the genetic material at his time.[2] His

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[1] Douglas J. Futuyama, *Evolutionary Biology*, (Sunderland, MS, Sinauer Asssociates, 1997), p. 751. This definition of evolution is commonly used in most courses on evolution and even basic biology taught in the US today. Another text that also clearly expresses many of these ideas is: John M Smith and Eörs Szathmáry, *The origins of life: From the birth of life to the origin of language* (New York: Oxford University Press, 1999).

[2] Darwin Charles, *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured*

general view was that there was a common ancestry for life on earth, that species develop from common ancestors through the induction of mutations, and that natural selection accounts for the survival of organisms best suited for a given environment. Species extinction was a key component of Darwin's model; those species that were not best suited for a given environment would eventually survive poorly in the environment and become extinct.

Theodosius Dobzhansky, the noted Harvard biologist and son of an Orthodox priest summed it up well in his famous statement that nothing in biology makes sense unless it is understood in the light of evolution:

> Let me try to make crystal clear what is established beyond reasonable doubt, and what needs further study, about evolution. Evolution as a process that has always gone on in the history of the earth can be doubted only by those who are ignorant of the evidence or are resistant to evidence, owing to emotional blocks or to plain bigotry. By contrast, the mechanisms that bring evolution about certainly need study and clarification. There are no alternatives to evolution as history that can withstand critical examination. Yet we are constantly learning new and important facts about evolutionary mechanisms.[3]

Many approaches have been used by modern science to utilize information that is derived from evolutionary biology. Rational drug design involves studies of relationship trees of genes and proteins from multiple species. Examination of responses to drugs, radiation, and other toxic agents among multiple species helps to elucidate mechanisms that would be impossible to uncover in humans. During the past 20 years, 69 different human genomes, and genomes of thousands of different species have been sequenced.[4] The cross-species comparisons of this information have shown overwhelming support for evolutionary theory. The availability of the genome data has allowed for testing of many different experimental models, all of which depend upon evolutionary theory. Conclusions that have been drawn from these studies include:

- The more related two organisms are, the more alike their gene sequences are; the more distant two organisms are, the more unlike their genetic sequences are.
- Genes provided support for standard taxonomical methods for determining relatedness of different organisms in most cases.
- Similarities among species are explained by genetic similarities; differences are explained by genetic divergence.
- Species that have evolved special features for their environment often have rudimentary organs that are reminiscent of their origin – tail bone and "wisdom teeth" in humans, for example.

Perhaps the most important lessons we can learn from evolutionary biology are about the relationship of humanity to the world around us – we are related to the cosmos because we share elements with it; we are related to our planet because we share water, air, atmosphere and environment with her; we are related to all species because we share the building blocks

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Races in the Struggle for Life (1st ed.) (London: John Murray, 1859); Darwin Charles, T*he Descent of Man, and Selection in Relation to Sex* (1st ed.) (London: John Murray, 1871)

[3] Dobzhansky Theodosius "Nothing in Biology Makes Sense Except in the Light of Evolution", *American Biology Teacher* Vol. 35 (March 1973), reprinted in *Evolution versus Creationism* edited by J. Peter Zetterberg (Phoenix: ORYX Press, 1983).

[4] *Wikipedia*, List of Sequenced Eukaryotic Genomes, List of Sequenced Bacteria, List of Sequenced Archaea; Accessed 15 November 2012.

of life and a genetic code with all organisms.[5] We have also learned that about human origins. We are all "out of Africa", born on the "dark continent" and migrating across the globe. We are a product both of our genes and our environment, as is all of life on earth. We are a part of creation, but perhaps we are unique because we are that part of creation that contemplates all of this including our own evolution.[6]

Based on these conclusions about the biology of evolution, there are several implications that can be drawn that are important. It is clear that creation is an on-going process and that creation is not static but is ever changing. This was expressed as early as Basil the Great writing in the *Hexameron.*[7] If one contemplates the broad picture of creation from the beginning of the universe until the present, it is clear that the "laws of nature" change with time and are not static. The genetic code that is part of the central dogma of biology now did not exist when life on earth was not DNA-based; during that period of evolution, the laws of nature were different. Physicists note that the laws of physics that occurred at the time of the big bang would of necessity be different than the "laws of physics" that are used today. This gives a different meaning to that term "laws of nature" because they are temporally situated and not laws for eternity. Finally, life depends upon death. Extinction is essential for evolution, and life-death cycles are essential for creatures. Likewise, extinction is essential for ecology, and life as we know it on earth consists of the consumption of dead or dying matter. (All fungi and animals, most bacteria and even complex plants depend upon the degradation of matter derived from other organisms; only some primitive plants are able to use simple components such as sunlight and heat to enhance life.) One of the processes essential for human life is the biological process of apoptosis in which cells commit suicide, often to carve out body parts or to prevent mutant cells from surviving in the body to go on to become cancer cells. This cellular response of apoptosis is programmed into cells of higher life and when it does not function properly, the death of the entire organism can be the result. This shows that biology is so utility-oriented that even death is co-opted into the process of bringing about life.

Linking Ecology and Evolution

The term "ecology" was first used by the noted biologist Eugenius Warming in 1866 to define the science of the relationship between an organism and its environment. Ecology is usually considered to be an inter-disciplinary field that includes population biology, statistics, geography, geology, biology, and others. The word "ecology" is derived from the Greek words "oikos" which means household and "logos" which means knowledge or study; ecology, then, is the study of our household, the earth. The ecological movement has become the focus of studies relating to the misuse of natural resources, disturbing natural systems, atmospheric disturbances, global warming, pollution of air, soil, fresh waters, oceans, overtaxing of resources, loss of species and environments, erosion of top soil and so much more.

There are many links between ecology and evolution, particularly since they both study different aspects of how the environment affects species. For ecology, the focus is on how the environment influences the organism at some point in time, while for evolution the focal point

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[5] I have put forth some of these ideas in more detail elsewhere. See for example, Gayle E. Woloschak *Beauty and Unity in Creation: The Evolution of Life* (Minneapolis, Light and Life Publishing Co., 1996).

[6] This idea of humanity (*anthropos*) as the one who "looks up" and contemplates is described by Bishop Kallistos Ware in *Through the Creation to the Creator* (London, UK, Friends of the Centre, 1997), p. 8.

[7] St Basil the Great, *Hexaemeron. Nicene and Post-Nicene Fathers, Volume 6*, edited by P. Schaff and H. Wace. (Grand Rapids, WB Eerdmans, 1952), p. 52-107.

is on how the environment drives and selects for changes in organisms over longer periods of time. Both fields of study involve the determination of interactions between organisms and their environment(s). Understanding ecology determines the selection pressures for evolution, and understanding evolution defines the selection pressures on organisms and populations.[8] The study of evolution and ecology are united in one department at many universities. Academically, the courses are often taught separately but then by the same faculty members who emphasize different aspects of the environment-organism or environment-population in ecology and evolution courses.

What does this mean for public acceptance of global climate change and public discussion about evolution? There appears to be a relationship between the two. Failure to accept evolution can lead to a failure to understand the links between organisms and their environment. It is possible that much of the anti-evolution sentiment in the USA may be associated with anti-green sentiment as well. Often it is the same groups of political aspirants who deny evolution and also fail to recognize global climate change as a human-driven problem. These denials occur in the face of incontrovertible scientific evidence and firm scientific support for both processes. In essence, one cannot understand ecology without understanding evolution and vice-versa.

An aspect of the ecological problem is the failure of humanity to consider its responsibility for creation. In the Genesis story we learn that Adam was charged with the naming of the animals. What is the significance of this story? What does it mean when someone names something? In the Orthodox tradition, often the godparent gives the name to the godchild as a demonstration of responsibility. We name those things we are responsible for – our children, our pets, our farms, those things we discover. Adam's naming the animals is a story of humanity being responsible for those animals that are named. This responsibility is part of the ecological message to humanity – responsibility for life, for creation, for safekeeping of the other animals. This responsibility has elements of protection, tender love, and nurturing that take place during a lifetime and not just at convenient moments.

Human Behaviour Influences Ecosystems and Life

There are at least three levels of biodiversity on Earth: genetic diversity (of the gene pool of all organisms combined), species diversity, and ecosystem diversity. Biodiversity is essential for life. Humanity is dependent on biodiversity for so many different components of life. The production of many medicines is dependent upon multiple species. The penicillin fungus lives on the roots of special plants, and the Taxus tree, which is dependent on a moist and cool environment, produces the anti-cancer drug Taxol. Biodiversity in wetlands and coastal areas protects us from the dangers of weather disasters. Deep-rooted plants help protect soil from erosion. Our food is dependent upon a diversity of species – just the elimination of a single type of insect can affect pollination of crops. Life is interconnected and intertwined in complicated ways that we often do not understand.

Perhaps the most discussed example of the interconnectedness of life is illustrated by the Chinese "War on the Sparrows".[9] In 1958-1961, China suffered one of its greatest famines primarily because of poor planting techniques, adverse weather conditions, and the "War on

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[8] Several chapters in Daniel Buxhoveden & Gayle E.Woloschak, *Science and the Eastern Orthodox Church*, (Ashgate Press, 2011) deal with this issue of the relationship between evolution and ecology or with Christian perspectives on ecology.

[9] See Frank Dikötter, *Mao's Great Famine: The History of China's Most Devastating Catastrophe, 1958-1962* (Walker & Company, 2010), p. 333. This book provides a detailed description of the War of the Sparrows and also the subsequent famine that was so catastrophic for China.

the Sparrows." The Chinese government noticed that seeds that were being planted by farmers were eaten by sparrows before the seeds could take root. To combat this problem, the government declared war on all sparrows and sent all Chinese citizens out to kill sparrows. During this war, it is estimated that 4-8 million sparrows were killed in China. Children that killed large numbers of sparrows were heralded as heroes. Nevertheless, this presented a problem that was unanticipated – the one scientific fact that the Chinese did not appreciate was that the sparrows killed locusts, and in the absence of sparrows the locusts were able to overrun the crops particularly feeding on grain. After the "War of the Sparrows", there was a 15% decrease in grain production in China. Due to a combination of the weather, poor farming practices and the "War of the Sparrows", after three years, 30 million people starved to death in China. By 1960, Mao decided that the programme was not working and declared an end to the policy of killing sparrows, and now the story remains as a prime example of the interconnectedness and interdependency of life on earth.

There are also changes in animal and plant populations that result inadvertently from human activity. A study done in Chicago several years ago[10] examined the mitochondria of mice from the deer-footed field mouse (*Peromyscus leucopus*) in the city of Chicago. The deer-footed mouse is actually a different genus from the house mouse *Mus musculus*, is slightly larger in size and is slowly being removed from city locations because of the shrinking wooded areas that make up the habitat of the *Peromyscus* mouse. In different locations within the city of Chicago and suburbs, *Peromyscus* mice had a particular gene sequence for their mitochondria that we will call type A. Between 1900 and 1949 some locations still retained mice with mitochondria with haplotype A, but in particular locations, the frequencies of mice with new gene sequences we will call B and C appeared. Slowly, animals with type A were pushed out or selected against, and from 1950-1999, sequence A virtually disappeared as did sequence C, leaving only sequence B in the remaining Peromyscus mice. Most ecologists attribute this change to changes in the ecosystem of the city – fewer field areas, increased urbanization, fewer wetlands – all of which contributed to changes in the distribution of animals and hence changes in gene distribution within a single animal species. As the size of the habitat dwindled, change led to the result that only populations of *Peromyscus* mice with the B gene were left in the Chicago area. (It is also possible that the presence of the B gene gave the animals an improved chance of handling "city life" which could have attributed this change to natural selection and evolution.) In any case, this illustrates an example of how human activity, in this case urbanization, exerted a new selection pressure on a species resulting in new DNA sequences in the mitochondria. Whether in 1850 types B and C existed already in small numbers and showed a population explosion at the turn of the 20th century or whether new mutations introduced the new haplotypes into the species is not yet know. Nevertheless, it is clear that human activity influenced the mitochondrial genome frequency in the deer footed mouse.

Perhaps the most classic example of evolution-environment interdependence is that of the colour of the peppered moth. The study was originally carried out in Britain and then later expanded to Detroit and industrial areas of the United States.[11] The peppered moth (*Biston*

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[10] See O. R. Pergams & R. C. Lacy, "Rapid morphological and genetic change in Chicago-area Peromyscus", (2008). *Molecular Ecology* 17:1, p. 450-463. In additional to mitochondrial DNA changes this group also identified morphological changes in the mouse populations over time. Their study suggested that "replacement with genotypes from external populations [outside the population] may be a common mechanism for evolution of newly adaptive local forms in an increasingly human-impacted world."

[11] The story of the peppered moth is well-discussed in the scientific literature. Some key papers include: L. M. Cook, (2003). "The rise and fall of the Carbonaria form of the peppered moth", *Q Rev Biol* 78:4, p. 399-417; B. S. Grant (2004). "Allelic melanism in American and British peppered moths", *J Hered* 95:2, p. 97-102.

betularia) evolution has been studied for over 200 years. When first identified, these moths had a light coloration which camouflaged them against light-colored trees with lichens growing on them so they would not be eaten by their predators the bird called the great tit. The industrial revolution and rampant air pollution in England caused the death of lichens and the trees became covered with black soot. The species variant of peppered moths that were dark colored survived because they could not be easily identified by their primary predator, while those that were light colored were eaten more often than ever before by the birds because they could easily be seen against the dark background of the soot-covered trees. In modern times, with cleaner air standards the lichens returned and the bark of the trees returned to their pale color, and the peppered moth of the lighter variety is once again better adapted to the environment. This switch in wing pattern for the moths has been well-studied in the scientific literature and appears to be associated with a difference in the frequency of two versions of a single gene. One gene allele gives the moth the dark color and the other gives the light colour. This complex interplay between environment and species selection – the soot in the environment, the lichens growing on the trees, the peppered moth species adapting to the environment, with the great tit predator driving the selective pressure – demonstrates how complicated the process of environmental change and species interaction can be. Nevertheless, they all depend upon a firm grasp of evolutionary concepts.

These examples illustrate the interplay between environment and evolution and demonstrate how difficult it is to understand one without the other. Rejection of the ideas of evolution, then, can lead to a misunderstanding of the relationship between organisms and their environment and may contribute to an ambivalent attitude toward environmental concerns. Anti-evolution sentiments may be associated with anti-environmental attitudes, and rejection of models demonstrating that human activity is responsible for global climate change, huge extinctions, and a threat to human existence.

Global Climate Change and Extinctions

The extinction of species is predicted by evolutionary theory. Nevertheless, extinctions in large numbers create problems for the genetic diversity of life on earth. It is generally accepted that as species near extinction they show a loss of genetic diversity (similar to the white-footed deer mouse in Chicago, described above). Populations of tigers, elephants and other endangered species of the world have much more genetic similarity (more limited diversity) when one examines the genetic make-up of the species. This lack of genetic diversity among members of the species makes it easy for extinction to occur because the genetic resilience of the species is lost. For example in the peppered moth story described above, if the air in Britain did not get cleaner for another 200 years, it is possible that the peppered moth gene for white would have been lost entirely from the species' genetic pool, and if the environment did not become cleaner again, all moths would be eaten and their predator the great tit would have to start eating other insects or become extinct as well. What that means is that when all of the animals of a species are genetically similar and when at the same time the environment changes even slightly, there is no opportunity for natural selection to occur and permit the fittest creature from the species to remain. Genetic diversity is required to prevent species diversity.

A second way in which loss of genetic diversity affects life on the planet is through the interdependence of all species. When one species is lost, others can become vulnerable as well. The example of the sparrow wars of China described above showed that when the sparrows are lost, locusts are no longer controlled and any organism that is harmed by locusts (such as grain) will be decimated as well so that the next organism in the food chain (humans, in this case) will be adversely affected.

All species are also inter-related at the level of genetics whereby species inadvertently share at least some small amounts of genetic material. Human DNA contains sequences from bacteria that live in our intestines, viruses that invade us, even the plants that we eat. These genetic sequences somehow through evolution found their way into human germ cells (eggs and sperm) and were propagated throughout time. This "genome sharing" aspect of life on earth is a critical component of the survival of species because it enriches genomes and provides some of the diversity of life needed to survive in different kinds of environments.

Table 1 below lists the relative abundance of multicellular life (not including all bacteria and Archea) on earth in each of the various categories of species among life on earth. Humans are covered in the vertebrate category along with fish, amphibians, reptiles, mammals and others. A quick glance at this table demonstrates how humans make up a very small component of life on earth, and yet the impact of humans on the environment is vast and far-reaching.

Table 1. Relative Numbers of Named Multicellular Life on Earth [12]	
Organism	**Percent of Organisms on Earth**
Vertebrates	1%
Beetles	22%
Flies	9%
Wasps	8%
Butterflies and moths	7%
Other insects	13%
Other invertebrates	12%
Plants and algae	18%
Fungi	4%
Other organisms	6%

Studies of extinction in the fossil record and in recent times have demonstrated that humanity has caused a huge increase in the extinction rate of life on earth. In the distant past, according to the fossil record, for every thousand mammalian species less than one became extinct in each millennium. When we examine the recent past, a time when we can attribute at least some of the extinctions to human behaviour, the extinction rate is up to 1000-fold higher than in the documented recent fossil record. Other spikes in extinction (similar though proportionally smaller) have been associated with huge cataclysmic events in the earth's past. The projected future extinction rate in the next 50 years is expected to be more than ten times higher than the current rate. While in the recent past since 1700, there have been relatively few species extinction events, beginning around 1900 an exponential rise in the number of extinct species occurred, increasing dramatically from 1980 to2000. E. O. Wilson estimated that by 1995 Planet Earth was losing 30,000 species per year. [13] This sharp and dramatic increase in species extinction is due to human activity.

Some other points of interest that one can glean from a search of the scientific literature include:

- Malcolm et al (2006): Global warming induced rates of species extinctions in the tropics

[12] Derived from *UNEP/GRID-Arendal Maps and Graphics Library*. http://maps.grida.no/go/graphic/species_diversity_in_the_world_s_seas1.

[13] E. O. Wilson, *The Future of Life* (New York, Random House Books, 2003).

that exceed those from deforestation.[14]

- Pounds et al. (2006): A mass extinction of 67 of the 110 species of frogs was caused by pathogen outbreaks tied to global warming.[15]
- Sinervo et al. (2010): Since 1875 12% of local lizards in Mexico have become extinct. Levels of extinction may reach 39% worldwide by 2080.[16]

The list of similar studies increases in the scientific literature documenting the significant contribution of human activity to species extinction and global climate change. Among scientists there is little doubt that human activity is the major contributing factor to global climate change that we are experiencing (there is no doubt that there is climate change) and that the extinction of large numbers of species is occurring in a relatively short amount of time.

Species that are most vulnerable are those that require unique habitats for a portion of their lives such as amphibians or certain insects. Potts and other reported in 2010 that there had been a dramatic drop in pollinating insects throughout the UK and the Netherlands. At the same time hoverflies (Syrphids), which are not pollinators but only consume nectar, were increasing dramatically in the same environment taking up much of the niche left behind by the bees.[17] This is likely to have a huge impact on humanity because insect pollinators like bees are responsible for pollinating a huge percentage of crops grown for food throughout the world. While we might associate bees with honey and mourn at the decrease in honey production throughout the world, the loss of a natural mode of pollination is perhaps a significant concern because it will affect vegetables and fruits that humans consume.

From all of this we can conclude that the threat to humanity caused by species extinction may be dramatic. Loss of species diversity is so great that the threat of massive death of organisms from infections and predatory species is enhanced. We can predict that humanity will experience difficulties in sustaining not only natural ecosystems (which we have already seen), but also crops that form our food supplies, and the vitality of complex interactions between other living organisms upon which we depend. Thus, while extinctions are a "natural" part of evolution and in fact a requirement for evolution, the loss of species through global climate change and other results of human intervention is "unnatural", being unprecedented in nature and unprecedented on Earth as far as scientists can discern. Humanity as a species is entering into a new era that we are unprepared for. We may not have the means of surviving. We depend upon a balance of nature in which our ancestors evolved. If we do not appreciate that we are changing our environment faster than we can evolve to keep up with it, we will vanish as a species.

There is certainly an attitude throughout human society that technology can cure all ills and that technology will rise to the fore to cure all of the problems created by global climate change and every other problem encountered by humanity. An important aspect of the general "technology problem" in our age is that the development of technology at such a rapid pace, with such dramatic consequences, has lead to a societal feeling that technology is a sort of god that functions as a latter-day saviour. This concept underlies much of our culture and leads

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[14] Jay R. Malcolm, Canran Liu, Ronald P. Neilson, Lara Hansen and Lee Hannah (2006). "Global Warming and Extinctions of Endemic Species from Biodiversity Hotspots", *Conservation Biology* 20:2, p. 538-548.

[15] See Pounds et al. (2006), "Widespread amphibian extinctions from epidemic disease driven by global warming", *Nature* 439, p. 161-167.

[16] Sinervo et al. (2010), "Erosion of lizard diversity by climate change and altered thermal niches", *Science* 328 (5980), p. 894-899.

[17] Potts et al. (2010), *Trends in Ecology and Evolution* 25, p. 345-353.

people to believe that technology will solve everything – cure diseases, prevent death, prevent aging, satisfy desires, and so forth. To this way of thinking, all technology and its applications are seen not only as good but even as necessary. Society becomes divided into "those who use" and "those who don't know how". The very rapid movement from discovery to technology makes it hard if not impossible to limit the use of technology. Most limitations to technology are exercised at the level of applications, and even then these limitations are often arbitrary and are loosely regulated. The negative aspects of technology impact our society as a whole and make it difficult to practice any form of discernment. If it is automatically assumed that all technology must be used regardless of the situation, then people become blinded not only in terms of discernment but also in terms of intuition and instinct with regard to appropriate times to intervene. Here lies is an opportunity for religious groups to have a major impact on society – by insisting upon the need for insight, in-depth understanding, discernment, awareness, and thoughtfulness it may be possible to reverse this trend at least among our friends and relatives and perhaps in society as well. To do that, however, we must each start with ourselves; we must determine whether we are fearless and willing to engage the world we live in – to change it and let it change us; we must embrace the fact that none of us knows everything and be willing to cooperate with others to reach the crux of each issue, not to be deluded by the promises of earthly paradise, nor to deny the truths that come our way.

With specific regard to environmental crisis, many propose that cloning, for example, will bring extinct species to life, and eggs and sperm of endangered species are being banked now for the future such use. While this is a useful endeavour in the face of the global crisis of extinction, we need to be aware that cloned animals and a few saved embryos will not have all of the characteristics and features of their original natural parents. Many cloned animals die a premature death from diseases of aging. Dolly the sheep, the first cloned organism, died at age 6 from a neurologic disease that occurred well before it usually occurs among sheep (usually at age 12-15 years). While technology can be an aid, it is not likely to solve all of the problems brought about by the failure of humanity to limit its unquenchable desires and to promote environmental conservation.

Religious views on the preservation of life

It is interesting that ecology provides a link among many different religions throughout the world. One can find threads of environmental conservation among all major religious faiths. For example, one finds Rabbi Moshe Cordovero of Safed (1522-1570) reflecting upon a Jewish respect for life:

> One's compassion should extend to all creatures, and one should neither despise nor destroy them; for the Supernal Wisdom [i.e. divine wisdom that brings all existence into being] extends to all of creation – the "silent" or mineral level, plants, animals, and humans. This is why our sages have warned us against treating food disrespectfully. Just as the Supernal Wisdom despises nothing, since everything is produced there – as it is written, "You have formed them all with wisdom" (Psalm 104:24) – a person should show compassion to all of the works of the Holy One, blessed be He.[18]

Similarly, the Druze Prayer for the Forests is as follows:

> In the name of God the most merciful, the most compassionate, My Lord, I raise my prayer

[18] *Ohr Yakar* ("A Precious Light") – A Magnum opus of some 16 volumes in its extant manuscript form, which had occupied Ramak throughout his adult life – a classic commentary on the Zohar, Sefer Yetzirah and the Zoharic literary offshoots. Its publication ended around 2005 in Jerusalem (some 22 volumes).

to Thee from nature's bosom, from where Thy greatness manifests itself and Thy wisdom shows.

My Lord, my soul reaches towards Thy splendour, as the mountains and oases stretch, and my prayer rises, along with the uprise of lofty trees and the flow of rivers, with the chants of birds and the whispers of the breeze, and with the succession of night and day and the sequence of the seasons.

My Lord, love is Thine and to Thee prayer is offered with every new dawn, with every soft murmur of light, every repose of darkness, every gust of warmth and every bite of cold; whenever a crescent moon emerges and a wind whistles, a sea surges, a crop grows and a tongue makes an utterance.

My Lord, Thou gavest us the whole of existence: of every kind, race, colour and measure – a splendid creation and an utmost innovation. So make us reverent and inspire us by thy wisdom that is visible in all that thou innovatest. And maintain Thy glory in ourselves, in our societies, in our world and in all Thou created!"[19]

In the Hindu tradition, planting trees is encouraged, all rivers are holy and polluting them is a sin, and humans are considered to be the sustainer of interrelationships among various species on earth. Buddhist views include the idea that the separation of humanity from nature is an illusion and that an appreciation for the natural cycle of life is essential. In 2005 the Dalai Lama appealed for Tibetans to stop killing endangered tigers because it is against Buddhism, and the killing stopped almost overnight.

Certainly from a Christian perspective, one can find passages throughout the entire Bible that express a love for nature and for God's creatures. The Green Bible[20] was designed to mark in green all passages that support ecological claims. Numerous Christian scholars have reflected on this issue. Even in the Book of Revelations, one can find "Hurt not the earth, neither the sea, nor the trees." (Rev. 7:3) and in more recent times Silouan the Athonite (who died in 1938) wrote "The saints embrace the whole world with their love."[21] This common thread of ecological concern among different world religions could provide a unifying voice to the world to show respect and love for all species of life on earth, for nature and for the environment.

His Holiness the Ecumenical Patriarch Bartholomew has become known as the "Green Patriarch" for the commitment he has made to environmental concerns. He has said:

> To commit a crime against the natural world is a sin. For humans to cause species to become extinct and to destroy the biological diversity of God's creation … for humans to degrade the integrity of Earth by causing changes in its climate, by stripping the Earth of its natural forests, or destroying its wetlands…for humans to injure other humans with disease … for humans to contaminate the Earth's waters, its land, its air, and its life, with poisonous substances … these are sins.[22]

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[19] For the first time ever, the Druze of Lebanon have announced their theology of the forest. Sheikh Sami Abilmona, the Secretary General of the Druze IFRAN schools in Lebanon, presented a statement on the Druze and the Environment at the Visby Faith and Forestry Gathering, organized in August 2007 by the Alliance of Religions and Conservation on Faiths and Ecology

[20] *The Green Bible*, Revised Standard edition, (New York: Harper Collins Publishers, 2008).

[21] Archimandrite Sophrony, *St. Silouan the Athonite* (Crestwood: St Vladimir's Seminary Press, 1999).

[22] Quoted in the booklet "Life Transfigured" published by the Orthodox Fellowship of the Transfiguration, a society devoted to proclaim the ecological mission of the Orthodox Church as the reconciliation of all things in Christ; the Patriarch's views on ecology are expressed in his boo*k Encountering the Mystery: Understanding Orthodox Christianity Today* (New York: Doubleday Books, 2008).

Similarly, the National Council of Churches in the Unites States of America has issued a call to repentance:

> We have listened to a false gospel that we continue to live out in our daily habits – a gospel that proclaims that God cares for the salvation of humans only and that our human calling is to exploit Earth for our own ends alone. This false gospel still finds its proud preachers and continues to capture its adherents among emboldened political leaders and policy makers.[23]

We are called to repent of the sins we have committed against nature and each other so that we can pursue a new journey with courage and joy, calling all to dedicate themselves to a mission of restoration and renewal of the environment.

Concluding Reflections

The Orthodox theologian Sergei Bulgakov reflected upon the question of evolution and how it relates to creation as a whole:

> The stumbling block for contemporary thought … is that the history of the world preserves traces neither of Eden nor of the perfection of the original man, which is why the biblical story is considered only a naïve legend … What should one's attitude be toward this story in the face of the existing critique? One can say that the remembrance of an edenic state and of God's garden is nevertheless preserved in the secret recesses of our self-consciousness, as an obscure anamnesis of another being.[24]

Bulgakov was aware of the fact that evolution calls into question our understanding of Eden, that place of perfection where humans reside in harmony with their Creator, the God of Life. Instead of placing Eden sometime in our past, Bulgakov notes that God is not limited by time and that to God all time has been, is now, and will be. As such, then, Eden is to Bulgakov a remembrance of something yet to be, a remembrance of an age of perfection that is to come that is somehow embedded into the being of humans and in some way calls us to a deeper reflection and contemplation of life and our existence.

How is it possible for humanity to recover this perfection that we are meant to have, that we are called upon to show, that we are in a journey toward?

Perhaps we are called upon to develop a new understanding of nature. Instead of observing from a distance either as the one who uses nature for his own purposes or even the scientist who observes with the purpose of understanding, perhaps the correct relationship with nature is the one that comes to us from the Genesis story – the one who names creatures and therefore takes responsibility for nature in a tender and loving way. This requires relationship, compassion, and intimate contact. Similarly, our contemplation of Eden requires us to understand our bonds to all other, be it human or non-human, because in Eden we are to encounter it all as if nothing is lost, and we will face it with joy and remorse.

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[23] World Council of Churches "God is Sacred: An Open Letter to Church and Society in the United States", ", 14 February 2005 available at http://www.ncccusa.org/news/14.02.05theologicalstatement.html, accessed 19 November 2012.

[24] Bulgakov, Sergius, *The Bride of the Lamb* (Grand Rapids: WB Eerdmans, 2002).