E.O. Wilson: The Meaning of Human Existence

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I. INTRODUCTION

During the last decade of the nineteenth century, artist Paul Gauguin travelled to Tahiti. His body ravaged by syphilis, his soul tormented by the loss of his daughter, his finances a shambles. There, he painted many of his most treasured works. This piece, "Life's Questions", created during 1897 and typifying his post impressionist style, is (according to the artist) to be viewed from right to left and is punctuated by text which inquires "Where do we come from? What are we? Where are we going?"

Though Gauguin considered it his masterpiece, the work was not warmly received when displayed in Paris. Critics felt the allegory impenetrable and the work remained unsold. Today, the painting **is** considered a masterpiece, the culmination of Gauguin's art, and it resides at the Museum of Fine Arts, Boston.

Similarly, Harvard professor E.O. Wilson, who placed Gauguin's "Life's Questions" on the cover of his recent book *The Social Conquest of Earth*, has faced stinging criticism throughout his career as he boldly addressed Gauguin's questions with novel thinking and analyses running counter to accepted scholarly thought. And, like "Life's Questions", many of the theories and concepts proposed by Wilson seem to migrate from controversial to masterful with the passage of time.

II. E.O. WILSON: BACKGROUND

Who is E.O. Wilson? And what is an entomologist doing studying human existence? Edward Osborne Wilson was born in 1929 in Birmingham, Alabama. From a young age, he developed a

fascination with the natural world. While fishing as a child, young Edward suffered permanent vision loss in his right eye when the fin of a spiny fish scratched his cornea resulting in a traumatic cataract. So, though he loved birds and possessed an interest in ornithological field work, his remaining acute near-distance vision in the left eye, which he could use to examine insects and their environments at close range, led him to pursue entomology.

By age thirteen, Wilson's focus on ants led him to discover invasive, non-native fire ants in south Alabama and, as a teen he was asked by the State of Alabama to research the ants and their threat to agriculture. The study, completed in 1949, was his first scientific publication.

Wilson received his Bachelor of Science in biology from the University of Alabama in 1949, followed by his Master of Science the next year. His doctorate in biology was awarded by Harvard University in 1955 (his thesis: A Monographic Revision of the Ant Genus Lasius). He was appointed to Harvard's faculty the following year.

During the six decades since, Wilson's work has been broad ranging and often controversial. The trajectory of his research, begun as the study of social insects (ants), carried him from this complex, single species to the complexities of human society and, indeed, human nature, on toward the interaction of all species and their collective dependence upon our natural world.

In 1967, Wilson published *The Theory of Island Biogeography*, where he and mathematician/ecologist Robert MacArthur discussed biodiversity and sustaining species equilibrium. How different species fit together within our natural world has long fascinated Wilson. *Island Biogeography*, the first work of its kind, provided a mathematical formula to predict the geometric reduction in species variety within a habitat as that habitat's size is

reduced. The authors successfully tested the formula by eliminating all insect populations on a small Florida Keys mangrove island and observing its repopulation by new species over time. The book is now considered a seminal work used globally in the planning of nature reserves and conservation.

Also in the 1960s, Wilson and colleagues discovered that ants communicate with one another using chemical pheromones and, in fact, have a pheromonal language of sorts. During this time, Wilson also pursued and discovered the physiological origin of pheromones in the ant. In 1971, he published *The Insect Societies*, a definitive work on social insects, including ants, bees, wasps and termites. In this book he began to refine his concept of **sociobiology** (which he defines as "the systematic study of the **biological** basis of all forms **social** behavior"). Shortly thereafter, in 1975, he published *Sociobiology: The New Synthesis*.

In *Sociobiology,* Wilson applied his analysis of social behaviors through the lens of biology not only to insects (which was accepted scientifically at the time), but also to vertebrates, including humans. His conclusion that human genes create not only our biological forms but also much of our personas---including social nature, instincts and other individual traits--- was met with a firestorm of criticism led by fellow Harvard professor Stephen Jay Gould. Prior to the publication of *Sociobiology*, science held the belief that humans began as blank slates, capable of being environmentally socialized without regard to heredity. Wilson's lectures were picketed; though he certainly is not conservative, he was accused of using science to justify behaviors such as racism and sexism; he was attacked physically when someone rushed the stage and threw a pitcher of water on him as he spoke at a convention of scientists. He was undeterred, believing his conclusions simple and obviously right.

Three years later, Wilson's third book addressing sociobiology, *On Human Nature,* was published. There, he detailed the role of biology in the evolution of human culture. Times and thinking had changed, and for this work he was awarded the Pulitzer Prize for Non-Fiction. Though Stephen Jay Gould continued to brutally assault Wilson's work, even publishing a derogatory essay in the mid-1980s titled "Cardboard Darwinism", Wilson's theories of sociobiology are now accepted as fundamental. Indeed, in writing for the Atlantic Monthly in 2011, author Howard French noted, "it can be difficult, from today's vantage point, to see what much of the fuss of the 1970s was about, so thoroughly has the Wilsonian idea that our genes shape our nature penetrated the mainstream." These ideas now have been supported by genetic and biological studies. He had, fellow scholars have noted, made it safe for other scientists to study human nature.

In the 1980s and 1990s, Wilson published works on many varied topics, including *Genes, Mind and Culture*, which first introduced the theory that genes and culture co-evolved; *The Ants,* a compendium of knowledge on ants and their behavior which won Wilson a second Pulitzer Prize; *The Diversity of Life*; *In Search of Nature* and many others.

At the dawn of the 21st Century, Wilson seemed to intensify the pace of his writings. In 2002, he published *The Future of Life* addressing the precarious situation of our world environment and providing sample solutions. In 2003, 2009, 2010 and 2011, Wilson published texts on ants, including *The Superorganism,* which details the societies of insects, and a second titled *The Leafcutter Ants: Civilization by Instinct.* His fascination with the parallels (and differences) between ants and humans is evident is all of these works.

2012 saw the publication of *The Social Conquest of Earth*. This work thrust Wilson into scholarly controversy as he again sought to upend conventional scientific thought. Having addressed the existence of a biological human nature earlier, Wilson now addressed what it is and how we came by it. How did *Homo sapiens* make the leap from ape level sociality to the living in complex societies?

In *The Social Conquest of Earth*, Wilson challenged evolutionary biology's prevailing theory: "inclusive fitness" (or "kin selection") which contends that species develop the skills of cooperation and division of labor between close relatives as a method to ensure reproduction of their shared genes. To Wilson, this concept of the 1960s did not seem a full explanation and was an intellectual misstep in biology which required revision.

In a study titled "The Evolution to Eusociality" published in 2010 in the journal *Nature,* Wilson posited that kin selection and inclusive fitness were not responsible for cooperation and division of labor necessary to create complex societies. Instead, he theorized that natural selection for social interaction—social intelligence enhanced via group level selection---was the defining process. Collaborating with renowned mathematicians, Wilson showed that the rule presented in support of inclusive fitness nearly always is wrong. They determined that giving one's life for the good of the group is not restricted to those who seek genetic replication of their line; our group instincts go far beyond the instinct to protect our kin. He concluded that the concept of group must also have an evolutionary importance.

The model he presented contends that what caused ants and a few other species to be highly social with division of labor and even altruism is multi-level selection (group as well as

individual). It was not solely genetic relatedness which resulted in cooperation, but the natural circumstances in which cooperation became advantageous for survival. From a Darwinian standpoint, the fittest group is most likely to survive and prevail. Thus, Wilson believes there is a multi-level evolution where natural selection acts at both the individual and group levels. This model synthesizes the disparate traits of individual competition and group cooperative success.

These concepts are fully detailed in *The Social Conquest of Earth* and were met with fierce resistance by academic scholars, including Professor Richard Dawkins, an Oxford University evolutionary biologist. As expected, Wilson stands by his theories advising that he proposes an answer to "the great unsolved problem of biology": how 20 known species transcended to become highly social and living in complex societies.

In the years since *Social Conquest,* Wilson has penned significant works including *Letters to a Young Scientist* (2013), *The Meaning of Human Existence* (2014) which was a finalist for the National Book Award and *Half Earth: Our Planet's Fight for Life* (2016). Though Wilson retired from teaching at Harvard in 1996 and is now professor emeritus, he continues to write, to research and to work actively on global conservation. And, of course, he continues to change the way all of us view the world.

III. WHERE DO WE COME FROM?

We come from the natural world. But, historically, as a socially complex species we are a very recent arrival. Social insects, including ants, termites and honeybees, evolved into existence approximately 100 million years ago. Via slow evolution with their environments, they reached their current levels of development by about 50 million years ago.

Humans of the species *Homo sapiens*, on the other hand, emerged in savannah woodlands and grasslands from pre-human primates along with many species (*Homo sapiens, Homo erectus, Homo neaderthalensis,* and others) a few hundred thousand years ago and spread globally only over the last sixty thousand years. *Sapiens* is the sole survivor among these species. Just ten thousand years ago, *Homo sapiens* invented agriculture. Unlike most other species, including all remaining eusocial species, *Homo sapiens* did not evolve slowly with the biosphere in which it emerged. Rather, we burst upon the scene with relative speed, in evolutionary terms.

In *The Meaning of Human Existence*, Wilson details how our pre-human ancestors underwent a series of pre-adaptations on their way to becoming complex, eusocial creatures. He contends each such pre-adaptation was the response of natural selection to prevailing conditions at the time.

The first pre-adaptation was large size and relative immobility. And, our primate ancestors possessed the ability to live and feed in the trees. This resulted in muscle structure for swinging, in the development of opposable thumbs and great toes, and in flat nails on fingers and toes. Once it became bipedal and earthbound, the animal could carry food a significant distance; could pick fruit, grasp and tear objects; and had a heightened sense of touch. Eyes became large with color vision and faced forward on the head.

As they diverged from chimpanzees, pre-humans were reshaped with longer and straighter legs, elongated feet and a shallow pelvis. This stature provided quicker, more efficient movement even as it set the species on a course for something we likely all share with our predecessors…back and knee pain.

Next came a series of pre-adaptations in the upper extremities of the body. These created the ability to manipulate and throw objects. Thus equipped, pre-humans were capable of injuring or killing prey or predators at a distance by hurling stones or other objects. This would give them a distinct advantage both in hunting animals for food and in repelling competitors during territorial combat.

Controlling fire, both by using it as a method to trap and kill animals for food and to cook prey once slain, proved a significant step forward about half a million years ago. Pre-humans began to gather in campsites. Archaeological digs have revealed that *Homo sapiens, Homo neanderthalensis and Homo erectus* all used campsites, the first instance of a "nest" made by human beings.

Brains began to enlarge and develop large language centers. With varying climate patterns and migration to colder regions, diet changed. As the pre-human diet became more protein based, how the prey was hunted changed. Hunting became a cooperative, group collaboration.

Gathering for campsites and cooperating in hunts, various *Homo* species developed social intelligence, memory and reasoning. Brains grew larger at a remarkably rapid rate. Wilson opines that at this point, "a conflict [likely] ensued between individual-level selection, with individuals competing with other individuals in the same group, on one side, and group level selection, with competition among groups, on the other. The latter force promoted altruism and cooperation among all group members." It led to group-wide morality, a sense of conscience and honor. And, it set us on a course for eternal, internal conflict: individual selfishness versus the group virtuosity. The development of the large brain set humans on the

course to jump beyond a eusociality governed purely by instinct to one including independent thought as well as group dynamics.

IV. WHAT ARE WE?

Remarkably rare and unusual in the natural world, in so many respects. We are bipedal, with a large brain in a massive skull atop a slender spinal cord. We possess culture, use language and have high intelligence. We are deceitful. We are capable of forming close relationships with relatives and strangers alike. We are highly social, with the ability to empathize, judge intentions of others and imagine consequences of our actions. We can be cruel and inhumane. We are selfish and selfless. We are the first and only species to become capable of destroying the only realm in which we can survive.

Wilson believes the key to answering the great question "What are We?" lies in the process which created our species, explaining our transition from solitary primates to complexly organized human societies. While many fellow scientists and others were surprised by his flow of thought from ants to humans, to Wilson it was quite natural. Humans and ants (and roughly two dozen other species) share a natural instinct to build complex societies with intricate divisions of labor. He wanted to discover how and why this small selection of species developed into masters of their respective worlds.

A. Eusociality

Eusocial is a term given to those few species which have developed the most complex societies. The prefix "eu" in eusocial means "true;" these species are fully and truly social. The defining traits of a eusocial species include: (1) group members who span multiple generations (that is,

young do not migrate once adult, but stay and rear their own young in the community); (2) the society has a complex division of labor; and (3) the society involves some members surrendering all or part of their own reproduction to ensure the lifetime reproductive success of others. Real altruism and complex cooperation define these species.

Of the 19 previously defined eusocial species, most are insects such as ants and termites, marine crustaceans and a single variety of a subterranean rodent. Since we know of only about one-fifth of Earth's life forms, there may well be more than 19 eusocial species. Still, it is certain that the number is quite small when compared to the overall sum of life forms. EO Wilson proposes that we, *Homo sapiens*, are the 20th eusocial species, and the sole primate line to attain this status.

For the nineteen previously identified eusocial species, the components of eusociality, including division of labor and rearing of young, are done by **instinct**. Yet, each species' cooperative abilities along with each individual's singularity of purpose allowed them to conquer their environments. Since eusociality confers such superiority upon a species, why does it appear to have happened so infrequently?

Wilson believes the answer comes from what he terms "the special sequence of preliminary evolutionary changes" which must occur to attain eusociality. Stated more simply, a large number of changes must occur in a very specific order, making the odds of it happening quite small.

In all identified eusocial species, the last step before attaining eusociality was the creation of a protected "nest" or home where young are raised and from which trips (for hunting, combat,

etc.) commence. Once such a process was developed for individuals, the next step was for the offspring to stay at the site to rear their own young, creating a colony or society. From that, divisions of labor easily developed and true society emerged.

For Wilson, the concept of eusociality became especially important as he reconsidered human evolution.

B. Natural Selection

Evolutionary biology long has sought to define how **humanity** developed complex social organization. Darwin's theory of natural selection is based upon the general principle that the unit of heredity is the gene. Genes best suited for survival of the host being are propagated; those deficient in some manner or form are discarded. Genes which positively affect an individual's longevity and reproductive success relative to other individuals are considered genes subject to individual level selection. Scientists observed this theory to be accurate for individual traits and physical attributes. But, perplexed biologists could not reconcile the individual dominance of a gene with the collective characteristics of cooperation, altruism and virtue exhibited by humans. Each of these characteristics---self sacrifice, altruism, cooperation--seems to be behavior which would render one less likely to prevail and survive in individual competition. Yet, these traits did survive and evolve to become commonplace.

In an effort to explain human traits of cooperation and self-sacrifice necessary for complex social structure, biologists in the mid 20th century developed the theory of *inclusive fitness*. They sought to prove that because members of a related group (such as an extended family) share genes, and genes can increase their evolutionary success by promoting the reproduction

and survival of multiple individuals who carry the them, humans must have developed altruism and cooperation in their extended families to ensure longevity and reproductive success. Inclusive fitness analysis views the individual group member (not the gene) as the unit of selection for these traits. By the mid 1960s, inclusive fitness became largely accepted as it seemed best to reconcile the "selfish" gene of natural selection with selfless, cooperative behavior shared by relatives and group members.

Wilson long believed that evolutionary biology's reliance upon inclusive fitness theory was incorrect. Early in the 21st century, he embarked on a thorough analysis of inclusive fitness. Wilson showed the field data supporting the theory could be explained equally or better via natural selection. He determined that in addition to genes which affect individuals, and thus subject to individual level selection, there also exist genes which further traits for cooperation and interaction with fellow group members. These genes are subject to group level selection. That is, groups possessing traits of cooperation and interaction are more likely to succeed when competing with other groups (either in conflict or for resources). Wilson's formula states that **within** groups, selfish individuals win but **between** groups, groups with altruism and cooperation always beat groups of selfish individuals. The findings were published in *Nature* in 2010 and appear as a chapter in 2012's *The Social Conquest of Earth.*

C. The Human Condition

Our evolution has taken us far beyond the instinct driven societies of ants and other insects. Each human is capable of independent thought, reflection, emotion, and much more. So,

though it is our instinct to cooperate, we also evolved with an individual drive for survival and superiority. This is basis of our double nature, what Wilson terms "our divided selves."

This double nature means that although we are competitive individuals, we also are built to belong to groups. As anyone who attends a large sporting event such as football, baseball or hockey readily learns, we have a rather significant predisposition to tribalism. These events are, more or less, a ritualizing of war, Wilson notes.

Such group cohesion confers great benefit, but also may promote significant harm. Inclusive, it provides safety, security and a sense of belonging. Exclusive, it is harsh and even life threatening for the excluded. Racism, extreme nationalism and even religion qualify.

In fact, Wilson posits that religion likely has its origins in our group instincts, as it provides a strong sense of group with purpose. He has called religion "the highest expression of our tribal longing to be part of a group." Individual wants and desires serve as sin, while collective, cooperative goals define virtue.

Our species' struggle, then, is to balance our individual desires and group needs while working to preserve the planet upon which we reside.

V. WHERE ARE WE GOING?

"Science and technology, combined with a lack of self understanding and a Paleolithic obstinacy, brought us to where we are today. Now science and technology, combined with foresight and moral courage, must see us through the bottleneck and out." The Future of Life, p. 23.

Wilson realizes our circumstances are dire. He believes that our reticence to accept environmentalism is at least partially evolutionary, noting "[t]o look neither far ahead nor far afield is elemental in a Darwinian sense. We are innately inclined to ignore any distant possibility not yet requiring examination." In *The Future of Life*, he contemplates how we can best shift to a way of life which he calls a "culture of permanence" for ourselves and for the biosphere which sustains us.

A. The Bottleneck of Population

Perhaps our most immediate concern is what he terms the "bottleneck of population." The twentieth century saw more humans added to the world than in all of past human history. In late 2016, approximately 7.5 billion humans called Earth home. A little over two hundred years earlier in 1800, only 1 billion humans lived on earth. By the turn of the next century in 1900, the number stood at only 1.6 billion. The twentieth century's rate of growth, which Wilson notes is bacterial more than primate, cannot continue. Our evolutionary success, defined numerically, may well be our demise.

Fresh water and arable land are diminishing and, as more of the planet is razed for farming and production, we risk the collapse of ecosystems of flora and fauna. A recent study estimates that Earth's sustainable capacity was exceeded in 1978. The planet has lost its ability to regenerate and heal from human-inflicted wounds. To achieve Wilson's culture of permanence, returning to sustainable population is critical and requires a reduction in the birth rate.

Fortunately, we seem to be headed in the right direction. In 1960, the global birthrate was 4.3 children per woman; by 2000 the number dropped to 2.6. The birthrate necessary to achieve zero population growth is 2.1 children per woman, allowing for infant mortality. Once the rate drops below 2.1 children per woman, population numbers decline.

If the global trend toward smaller families continues, population growth should slow, then reverse. What remains both unknown and unknowable is whether the downward trend will continue, when the peak (or bottleneck) population will occur and if Earth can survive through and beyond that bottleneck.

B. HIPPO and the Decline of Biodiversity

Much of EO Wilson's study of the natural world has focused on flora and fauna which form global ecosystems and how outside forces can wreak havoc upon them resulting in their ultimate demise. Conservation biologists have created the acronym HIPPO to label the multiple factors arising from human activity which, working in concert, result in the destruction of species and ecosystems. The elements of HIPPO must be addressed cohesively and successfully in order to transition to Wilson's culture of permanence.

In HIPPO, H represents Habitat Destruction. Forest destruction in areas such as the Amazon rainforests and Hawaii serves as the precursor of the decline and extinction of many species. I stands for Invasive Species. Invasive species of plants and animals, introduced into ecosystems where they have no natural predators and no place in the hierarchy, displace native species often to the point of extinction setting the stage for collapse of the ecosystem. The first P in HIPPO represents Pollution. The contamination of water, soil, and air weakens many species

which results in failed breeding, disease and demise. The second P stands for Population …population of humans. The more humans inhabiting the globe, the more pronounced all other elements in HIPPO become. Finally, O represents Overharvesting. Initially restricted largely to land animals and birds, overharvesting now extends to marine coastal waters and rivers.

The end result of HIPPO's combined forces is the decline and elimination of biodiversity. It is estimated that current rates of species extinction are approximately 1000 times greater than the rate present prior to man's arrival.

Why should we be concerned with biodiversity? Wilson notes that science likely has discovered only about twenty percent of the biosphere's fauna and flora. New discoveries occur daily, and we can't yet know whether species which could provide great benefit to humankind are being extinguished before being identified. "No one can guess the full future value of any kind of animal, plant or microorganism." As he notes in *The Meaning of Human Existence*: "If there were no fungi of the right kind, there would be no antibiotics. Without wild plants with edible stems, fruits and seeds available for selective breeding, there would be no cities…without nature, finally, no people."

Moreover, biodiversity provides what Wilson calls an "insurance policy" so that if one species does decline and die off, others exist in the food chain who can quickly claim the space, resulting in little harm to the overall balance. Raising the rate of extinction from external sources leads to an unknowable result. We do **not** know the location of the tipping point. We

do not know at what point human existence will be threatened by our damage to the biosphere.

C. Why We Should Save Wilderness

Wilson advocates for the creation of vast, connected swaths of undisturbed wilderness which would allow flora and fauna to thrive. He notes, "[t]he issue, like all great decisions, is moral. Science and technology are what we CAN do; morality is what we agree we SHOULD or SHOULD NOT do. The ethic from which moral decisions spring is a norm or standard of behavior in support of a value and value in turn depends on purpose." The ethic of conservation, then, is working to preserve for future generations the best version of the nonhuman world in order to ensure both our and the planet's existence.

What To Do

Wilson contends the concern is not whether to support conservation, but which methods are best utilized for biosphere survival. He provides the following key elements:

- Salvage immediately the world's top 25 hotspots, which he defines as those habitats which are both at the greatest risk of destruction and shelter the largest concentrations of flora and fauna found nowhere else.
- Keep intact the five remaining frontier forests, including the rainforests of the Amazon Basin, the Congo block in central Africa, New Guinea, the conifer forests of Canada and Alaska, and the conifer forests of Russia/Finland/Scandinavia.

- Cease logging in all old growth forests. Destruction of old growth forests results in steep losses of biodiversity. Instead, promote the agribusiness of lumber and wood pulp by working on international agreements similar to Kyoto's Protocols which work towards use of fast growing, regenerative species for timber extraction.
- Concentrate conservation efforts on lakes and river systems. These are the most threatened ecosystems on Earth.
- Define and designate marine hotspots, including coral reefs and those areas overharvested by the fishing industry.
- Complete mapping of the planet's biodiversity. Otherwise, scientists remain unable to determine which species are "keystone," upon which the life of an entire ecosystem is dependent.
- Use recent advances in mapping the planet's ecosystems (terrestrial, fresh and salt water) to ensure that all are included in the global conservation strategy.
- Make conservation profitable. Work towards raising the incomes of those living near reserves and engage them in their protection. Demonstrate to developing countries that ecotourism, bio-prospecting, and carbon credit trades can provide better income than logging and agricultural use of the same land.
- Initiate restoration projects to increase the share of the Earth set aside for nature. Currently, about 10 percent of the world's land is protected. This is insufficient for survival of the biosphere. [For a fully detailed discussion of Wilson's thoughts on this path, see his most recent work, *Half Earth: Our Planet's Fight For Life*].

- Increase breeding capacities of zoos and botanic gardens to assist endangered species. Enlarge seed banks and create reserves of frozen embryos and tissue for use once habitats have been restored.
- Support human population planning. This is imperative for the success of all other initiatives.

We face a choice: Understanding our role in the biosphere, adopting more forward looking views and practices so that we save it and ourselves, or obstinately staying the course as our planet degrades and we descend. After spending a lifetime studying ants, Earth and us, E.O. Wilson remains hopeful that humanity will choose the former and survive. He observes:

"We need nature, and particularly its wilderness strongholds. It is the alien world that gave rise to our species, and the home to which we can safely return. It offers choices our spirit was designed to enjoy."

And, he believes we possess the collectively ability to locate our better selves, concluding:

"Pride and humility in better balance, we'll also take a more serious look at our place in nature. Exalted we are, risen to be the mind of the biosphere without a doubt, our spirits uniquely capable of awe and ever more breathtaking leaps of imagination. But, we are still part of Earth's fauna and flora, bound to it by emotion, physiology, and, not least, deep history…"

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