



Biological Basis for Morality: The *Survival Principle*

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Perspective

Volume 5 Issue 4

Received Date: July 05, 2022

Published Date: July 15, 2022

DOI: [10.23880/izab-16000387](https://doi.org/10.23880/izab-16000387)

Abstract

In this work, I argue that biology provides the basis for morality and that a *Survival Principle* forms its fundamental core. This principle best leads to humans' long-term success as a species. I describe how the *Survival Principle*, derived from established biological tenets, consolidates and accounts for various pronounced maxims (e.g., the United Nations "Universal Declaration of Human Rights"). I apply the *Survival Principle* to show objectively why some practices, popularly considered to be moral, are not. I extend the *Survival Principle* to all moral-capable beings, rendering it universal. Finally, I suggest how this ethos naturally provides purpose to the individual beyond itself.

Keywords: Evolution; Consciousness; Morality; Ethics; *Survival Principle*; Diversity; Sustainability

Why Science and Biology Provide the Basis for Morality: Truth Matters

For things to work best long term, they must be based upon principles that are true. To be assured that anything is true, there must be evidence that it is. Science is the premiere enterprise that is defined as evidence-based, and agenda-free. Science's expressed purpose is to discover principles that are always true and that work long term. Indeed, in science, if something does not work in practice, it is accepted that either the underlying principle is in error or that the applied principle is implemented incorrectly. Errors must be found, corrected, incorporated into an endless pursuit for truth without assurance of a final arrival.

Discovering true morals must follow the same path. It is not logical for a true moral to follow from a false principle. Morals that best work long term and under varied circumstances must be based upon principles that are true. Only an evidence-based and scientific approach provide assurance that an underlying principle and a morality are

true. True morals must be able to be validated through evidence-based knowledge.

Biology is the discipline of science that is involved with morality. Neither physics, chemistry, nor geology specifically deals with living things - only biology does. No one speaks in terms of the morality of a field, force, atom, molecule, or planet. No one speaks in terms of bacteria, bamboos, or bats governed by any moral codes of ethics. Of all living things, only species that are conscious and possess a sufficiently high degree of self-awareness can be governed by morals. Humans are the only currently known beings in the universe that satisfy those two criteria for morality. Morality, a product of human behavior, is within the scope of biology.

Introducing the *Survival Principle*: Live Long and Prosper

Any authentic morality must, as a minimum when practiced, add to the chances for that species surviving in the long term. By long-term, I mean for humanity to survive

for at least trillions of years. It would be contrary to any true concept of morality to consider activities that lead to its demise over time as being moral. Survival of the species is at the very heart of biology, specifically of evolution. So, too, is long term sustainability. The only other attribute of any true moral behavior is that it helps that species to thrive over the long-haul. In contrast, practices or behaviors by moral-capable species that diminish or risk diminishment of that species capacity to thrive are immoral. Both surviving and thriving are necessary and sufficient principles in a biologically based moral system. I have fused both concept words into the newly coined term "*surthrive*", since both form the basis for this newly introduced moral principle. In medicine, the related concepts are *mortality* and *morbidity*. To remain in good health, one must avoid appearing on the "list of mortalities". But simply staying alive does not mean one is in good health: One must not be in a state of *morbidity*. A person confined to bed, unable to move, see, hear or feel is in a severe state of *morbidity*. Morbidity, as does health, comes in a continuum. In a strictly biological context, survival of an individual or a species is straightforward and clear: To survive, the individual must not die (avoid the "list of mortalities") and the species must not become extinct. To thrive, as it is fused into the word *surthrive* and used in the *Surthrival Principle*, is defined here in a broader sense as it is generally used in medicine and biology. By *surthrive*, I mean that a society or species must be allowed to add to their success, progress, or prosperity long term. It was necessary to invent the new concept word *surthrive*. Thrive does not necessarily carry with it the elements of freedom and choice that are essential to the meaning and use of *surthrive*. For example, in normal word usage, slaves and slavery thrive if their number and practice increase. Whereas slaves are not in a state of *surthrival*, and slavery impedes *surthrival*, both severely lack freedom and choice. Freedom and choice are not considered necessary for bacteria to thrive, but they are for conscious and moral-capable species to *surthrive*. In addition, the *Surthrival Principle* protects the rights for *surthrival* of the individual. It would be good to establish constitutional laws to safeguard individual rights and freedoms allowing them to flourish. Individuals are the vital components of all societies. It is best and attainable to have such safeguards added as well to the *surthrival* of humanity long term. That the *Surthrival Principle* considers the long-term *surthrival* of humanity, while still protecting individual freedoms and rights, is one of its distinguishing attributes. Priority towards sustainability is another one of its attributes. According to the *Surthrival Principle*, a person should not exclusively satisfy one's wants at the expense of individual or humanity's long-term health needs. The attributes of the *Surthrival Principle* are in opposition to selfishness, hedonism, and various pleasure traps. It runs counter to various cultures that espouse some alternative moral practices.

Individual Rights and Freedoms vs World-Wide Surthrival

There are no incompatibilities between individual freedoms and their impact on the surthrival of humanity. Indeed, the *Surthrival Principle* requires that both prosper. It is the individual who is the primary moral agent - not the group, tribe, race, gender, state, nation, empire, society, or any other collective because it is the individual who survives and flourishes, or who suffers and dies. Conscious beings perceive, emote, respond, love, feel, and suffer - not populations, races, genders, groups, or nations. Historically, immoral abuses have been most rampant, and body counts have run the highest, when the individual is sacrificed for the selfish advantage of the group. It happens when people are judged by the color of their skin, X/ Y chromosomes, with whom they prefer to sleep, by which accent they speak, or by which political or religious group they belong, or by any other distinguishing trait our species has identified to differentiate among members instead of by the content of their individual character. The Rights Revolutions of the past three centuries have focused almost entirely on the freedom and autonomy of individuals, not on collective rights of persons nor groups. Individuals vote, not races or genders. Individuals want to be treated equally, not races. Rights protect individuals, not groups; in fact, most rights (such as those enumerated in the Bill of Rights of the US Constitution) protect individuals from being discriminated against as members of a group, such as by creed, color, gender, sexual orientation and gender preference. Thus, the rights of freedoms of individuals are of critical importance. As in medicine, the health of the individual depends upon the health of its cells, tissues, and organs. According to the principle advanced, *surthriving* individuals must recognize and respect the means for other individuals to *surthrive*.

Humanity thrives when individuals are provided the freedom to think. As evidence, Nobel Prizes have been awarded to individuals who have been allowed the freedoms to think and act, most often within democratic societies. However, what sets the *Surthrival Principle* apart from other popular moralities is its consideration of humanity's needs for diversity and sustainability if it is to prosper long term. Diversity and sustainability are less important for a short-lived and driven individual, but critical in a biosphere providing humanity's future.

Consequences in Applying Surthrival Principle to Ethics

Most humans follow ethical tenets consistent with the *Surthrival Principle* without knowing or understanding the biological basis for their morals. For example, the "Universal Declaration of Human Rights" [1] adapted by the

United Nations General Assembly in 1948 and available in 360 languages begins thusly: "Whereas recognition of the inherent dignity and of the equal and inalienable rights of all members of the human family is the foundation of freedom, justice, and peace in the world, ...". Striving toward goals such as "inherent dignity", "equal and inalienable rights", "human family", "freedom", "justice", and "peace" follow directly from the *Surthrival Principle*, as each of those goals increase the probability for long-term stability, and survival and the overall thriving of humanity. There are some who must diminish their power and wealth so that others can gain back dignity, rights, freedom, and justice. It can be shown that losses of choice, rights, freedom, and justice fuel conflicts that prevent world peace. Like the "Universal Declaration of Human Rights", no primary principle is cited in United States Declaration of Independence, Constitution, or Bill of Rights. Instead, those documents refer vaguely to such terms as "self-evident" and "inherent (or 'inalienable') rights". These "rights" are biologically based and originate from the *Surthrival Principle*. Humanity cannot survive and thrive very long with any degree of stability (i.e., in peace), without adherence to that biologically derived principle.

Other moral tenets that "seem right" and that have "stood the test of time" also can be shown to originate from this biological principle. One popular example of an ethical idiom is: "Act upon others as you would have them act upon you" (or "Do unto others ..."). It contains elements of reciprocity, empathy, justice, and ethical symmetry. But why engage in reciprocity, empathy, justice, and ethical symmetry? The answer resides in their alignment with the *Surthrival Principle*: they each, as with the earlier example, add to social cohesiveness, peace, and prosperity for society and humanity in the long run. Another popular ethical idiom is: "Honesty is the best policy". Generally, lies and deceptions can be harmful in personal and societal relationships, since stable and strong relationships are built upon trust. Strong and stable relationships within a society are prerequisites for improvements that the *surthrival* of society and humanity requires. All are consistent with the *Surthrival Principle*. However, the Principle does contain within it nuances that preclude universal statements, such as "never lie". Conceivably, one might not tell the truth, the whole truth, and nothing but the truth, to temporarily help an individual, as is done sometimes in emergency medicine. But if one lies for selfish reasons - to gain unfair advantage, wealth, or power at the expense of (or risk to) the *surthrival* of individual, group, or society - then the dishonesty would violate the *Surthrival Principle* and therefore be immoral. One can apply this nuanced moral reasoning using the *Surthrival Principle* to any moral case. A "moral dilemma" is defined as a behavior that has fairly equal net (+) and (-) consequence when applying the *Surthrival Principle*. Practically all real human behaviors have both +'s and -'s when the *Surthrival Principle* is applied.

How a particular action (or inaction) adds up to (or subtracts from) the *surthrival* of humanity is what determines the degree to which the behavior is "good" or "bad," respectively. Thusly, the *Surthrival Principle* encapsulates all of ethics and morality. I propose below general rules to guide in its calculus.

The Practical Nature of Science and the Philosophical Foundation for the *Surthrival Principle*

During one of my quantum mechanics lectures, the professor commented upon how difficult and involved the mathematics became in some nonlinear electrodynamic field calculations. He related that to solve one such problem he found it necessary to deploy some uncommon analytical tools. Mathematician colleagues warned him that he had not satisfied all the conditions deemed necessary to verify its application for that specific problem. He paused the lesson, looked at us, smiled, shrugged his shoulders, and exclaimed: "But this is science. One uses the tools available and verifies later whether they work. If it turns out to have worked, then the approach was likely valid." At the time I found this attitude surprising, arising as it had from a theoretical physicist. But scientists everywhere are of a practical sort. Ultimately, our findings must bear up to rigorous inspections and tests by other scientists well motivated to uncover errors. Most importantly, to be valid it must be consistent with reality (i.e., what is found and verified by others through direct experimentation). If one's work is of a more theoretical nature, then it must compare with established theory. If the finding is not consistent, then one either made an error somewhere, or the theory is wrong. Errors occur in science during experimental (usually in the over-interpretation of its applicability type) or theoretical (usually in the use of false premises) efforts. But science self-improves through its community approach towards error discovery and correction. Science's most trustworthy foundational stones have been rigorously tested from many independent directions and have withstood tests over time. Collegiality among scientists is a mixture of (a) sympathy for the experimentalist because every study is constrained by funding, tools currently available, and time; (b) distrust of the theoretician because thinking often goes astray; (c) respect for those who adhere to the strict codes of conducting science; and (d) eagerness to uncover mistakes and errors so they can be corrected, both in the work of others as well as our own. These traits have contributed to the extraordinary successes science has enjoyed for the past several centuries. Humanity is thriving more in the past few centuries than before [2], and rationality with science has greatly contributed. The self-correcting and ever-improving nature of science, when applied to morality, is set to provide the same service for our *surthrival*.

The history of philosophical thinking on morality spans many millennia and has taken many forms that continue to this day [3]. I suppose the reason for non-resolution between the different “Schools of Thought” concerning morality and ethics is that no clear single principle was established that could be tested against others and that had a clear scientific (verifiable) basis. Indeed, a scientific basis for morality and ethics was omitted from consideration due to philosophical misunderstandings on the nature of knowledge and science. Most recently, the history and reasons for such “seductive misconceptions” and “how rationalism lost its way” have been elucidated [4]. Norman developed the “New Socratic Model (NSM)” to avoid the argumentative pitfalls that led to Hume’s [5,6] speculations as well as misunderstandings by others. One of Hume’s suppositions is often misrepresented as the “You can’t get an *ought* from an *is*” idiom. Hume did not intentionally sidetrack philosophy for nearly 300 years. Little was known about the nature of science back then, the track record of science was not yet proven, and theoretical work continued to be difficult and prone to error. Norman lists ten desirable qualities (virtues) that the NSM provides over earlier philosophical approaches towards gaining knowledge. The 10th virtue (pg. 324) is that NSM “expands the purview of science” and one can “treat any claim as a hypothesis” that can be tested. Such claims include those involving ethics and morality [4]. Another prominent philosopher, Peter Singer, reviewed Norman’s work and declared it “a fine example of philosophy at work to solve real social problems.” In his own work, Singer analyzes why and how human interests should be weighed: according to concrete properties, and not according to its belonging to some abstract group [7]. What appears to be lacking in all discussions on human ethics and morals is some target fundamental principle at its core that is both evidentially and biologically based. Before delving further into the *Surthrival Principle*, I discuss some currently popular non-evidentially based nor biologically derived origins for morality and ethics.

Gods Need Not Apply

From a scientific or evidence-based perspective, it is surprising that so many believe in gods today. But most of humanity does. What is even more perplexing is that such believers derive their morality from various god-based religions, though the ancients (e.g., classical Greeks, Egyptians, Nordic, Eastern) did not. The gods of those ancient Greeks were cruel, vindictive, short-sighted, and easily bribed. No one obeyed the gods because they represented standards for “good” morality: obedience was mandatory or else death or worse threatened. The larger problem with more recent gods and religions, apart from their supernaturalism and therefore requirement for anti-scientific thinking, is that they purport to provide the only basis for morality. This may have begun with the invention of monotheism. The “Abrahamic”

religions (Judaism, Christianity, Islam) have been subjects of study the most in Western Culture because of their familiarity. A long list of prominent scientists has examined and analyzed these religions and found their foundations false and their teachings largely immoral [8-14]. These scientists also provide versions of how moralities and ethics biologically evolved. In contrast, examples of the immorality of many religions include their acceptance of, complicity in, and advocacy for slavery, misogyny or subjugation of women, homophobic backlash, and acceptance of killings of those outside the faith. Fostered by rationality and science, societies are slowly, over time, ridding themselves of slavery, misogyny or subjugation of women, and killings of those outside the faith (or killings in general) [15]. If slavery, misogyny, homophobia and unprovoked killings are now considered immoral by the majority of societies, what changed in societies to render them thusly? Why are democracies becoming more common over time, in contrast to kingdoms, dictatorships, and totalitarian reigns? How best does one lead a moral life? The *Surthrival Principle* offers a base for answers to those questions and others previously considered by most to have once been the sole domain of the gods.

The evidence based *Surthrival Principle* purposefully places the long-term betterment of individuals, society and humanity as its primary goals. Happy and thriving individuals best contribute toward a flourishing humanity. But societies include all of its members. In democracies, there are greater overall opportunities for individuals and their society to *surthrive*. In contrast, relatively few individuals benefit in kingships, dictatorships, or other forms of totalitarian regimes. Therefore, according to the *Surthrival Principle*, the implacable needs of humans to *surthrive* will favor democracies, with their greater individual and societal freedoms and protections. That is why democracies employ fewer threats and violent coersments than do totalitarian governments. Enslavements occur at the expense of the many slaves for the benefits of the few. Slavery decays the fabric of an aspiring democracy. Slavery was the primary reason a great Civil War was fought in the United States, even though relatively few citizens actually owned slaves. The implacable tendency for humans to subconsciously follow an underlying moral principle favors the abolition of slavery. That underlying biological and moral drive is the *Surthrival Principle*. Today, no society advocates slavery. There is evidence for recent world-wide improvements in women’s rights and freedoms. More than half of all societies are comprised of women. For societies and humanity to thrive, women must thrive: as with health, the greater *surthrival* the better. As with slavery, women’s and other minority rights, the freedom to practice any or no religion, and democratization - all these modern freedoms - are biological drives within conscious and moral-capable individuals and their societies

to *surthrive* everywhere. The climb towards justice and equal rights is predictable, though religions and dogmatic thinking can delay [15]. This unexplained yet implacable movement toward more moral societies is the *Surthrival Principle* at work. How killing other humans, who in no way provoked such a response, violates the *Surthrival Principle*, I leave to the reader. The above represents a sketched outline of how the *Surthrival Principle* mitigates the long-term societal problems associated with slavery, absence of full rights for women, and homophobia. Shermer devotes an entire chapter to each three, replete with lists, diagrams and graphs of evidence-based research findings, while providing the scientific reasons to rid ourselves of these practices, if morality be our goal [16].

Leading a moral life, according to the *Surthrival Principle*, is straightforward: ANY activity that increases human *surthrival* is a moral act. Performing one's job well, raising a family well, paying taxes, helping others: there are numerous ways one's activities can and do contribute positively to society. Anything that contributes well to the functioning or betterment of a society may be called "good" actions. There also are a multitude of ways one's activities can and do degrade the betterment of people and society. Those can be named "bad" actions. Sinister actions that subtract much from individuals and society can be termed "evil" actions. One example of a "great evil", according to the *Surthrival Principle*, would be triggering a largely unprovoked war negatively affecting lives and livelihoods of many innocent people. Not taking actions to stop or punish the perpetrators would also result in further harm and negativities. Unlike most moral systems, the *Surthrival Principle* counts inactions against such "evils" in the negative column. Inaction, in conscious beings, is a behavior that allows evil to proceed. To paraphrase the Utilitarian philosopher John Stuart Mills: "All that is needed for evil to triumph is for better people to do nothing." Naturally, there are marked degrees to which one leads a moral life. More positive than negative actions sum toward greater *surthrival*. Consider just a subset of what are commonly referred to as virtues: prudence, fortitude, justice and temperance. These are referred to as the four classic (or Platonic) cardinal virtues [17]. Virtues typically lead to net positives toward *survival*: they tend to assist the individual, community or society when expressed. Vices and so-called "Seven Deadly Sins" (e.g. lust, gluttony, greed, sloth, wrath, envy, pride) typically lead to net negatives toward *surthrival*: they tend to degrade the individual, community or society when expressed. For example, gluttony tends to make one unhealthy, hurting oneself, and adding extra stress to the family or community. In addition, consuming more food than needed removes food elsewhere from the community increasing the probability for resentment, pain, and diminishing health within the community. Every virtue, good deed, vice, bad habit, or sin (in a religious context)

adds to or subtracts from the *surthrival* of the individual or society. All that adds to or subtracts from the *surthrivability* of the society (or humanity) is either a virtue or a vice, moral or immoral. Behaviors that have negligible effect on the *surthrival* of humanity are termed amoral. But how is one to know *which* behaviors have short and long term positive or negative effects on ourselves or society? And to what long-lasting degree? Answer: Science and all other disciplines that inform through evidence-based means, such as history, literature (e.g., biographies), economics, better business practices, to name a few, guide our thinking and laws. All evidence-based practices can contribute toward correct applications of the *Surthrival Principle* that informs all of morality and immorality. But applications of the *Surthrival Principle* extend moral practices further beyond any currently recognized virtues or vices, such as those involved with diversity and sustainability.

Sustainability and Diversity are Core and Distinguishing Features of the *Surthrival Principle*

One conspicuously missing virtue or commandment, from all heretofore proposed list, is *far-sightedness*, along with its corresponding vice of *short-sightedness*. The awkwardness of these terms, deriving from an analogy with our eyesight, suggests they have not been broadly employed as core concepts governing morality or ethics. A wider search of synonyms for far-sighted include canny, levelheaded, prescient, prudent, shrewd, wise, acute, and cautious. Some of these are common virtues, but none impart the essence of the missing virtue of "practices that best lead to sustainability". This omission suggests that *sustainability* has not been an integral part of our past ethics. Humans have proven themselves notoriously poor at sustaining anything beyond a few years. Therefore, the concept of *surthrival*, since it contains truly long-term sustainability, is a difficult ethic for humanity to fully integrate into their morality. Little wonder it has not been done yet.

Humans differ widely on what is meant by sustaining things: it could mean maintaining something for minutes, days, or a few years. Many do not care what happens to anyone or anything after they die. More virtuous humans care about their children's or grandchildren's *surthrival* and attempt to provide for them as best they can. But only a rare few yet think about sustainability (say, of the environment) for thousands, millions, and billions of years into the future. Such long-range *far-sightedness*, and sustainability are at the core of the *Surthrival Principle*. This principle both protects and improves air, weather, and water qualities. A moral basis to sustain, and improve, humanity for at least a lifetime of a star system is a distinguishing feature of the *Surthrival Principle*. I am unaware of another moral principle

advanced with this purpose and goal at its core. The reason science is pursued as a profession, and why one attempts to live virtuously, follows from the fundamental tenets of the *Survival Principle*, whether consciously expressed or not. One becomes a biologist to better understand nature and processes that operate around us. One studies ecology to better understand nature's complicated interactions. The answers to these issues are important to increase our long-term *Survival*. Scientists and others do understand that the answers obtained through careful research are intended to be disseminated for the benefit of others for all time.

Another attribute of the *Survival Principle*, not appearing on any other list of virtues, is the concept of *diversity*. Biologists have documented the long-term benefits of diversity within a population and ecosystems. Diversity is essential for sustainability. Accordingly, organizations such as democracies that protect diversity of views and approaches will add to sustainability and increase their chances to flourish. Though integral to the *Survival Principle*, the absence of diversity and sustainability in other proposed moral systems are evidence of their non-biologically based origins. Moral systems that omit diversity and sustainability will not advance our long-term survival and flourishing as a species.

Selfish Genes and the *Survival Principle*

From the gene-centered view, humans are the gene's way of making more genes and of perpetuating themselves [18]. One can relate and combine this "selfish gene" concept to the *Survival Principle* in the following way. For very long-term sustainability of genes, it would be in their selfish best interest to aid us in any way possible in our *surthival*. But selfish genes do not think far ahead, and many of them (or their variants) have gone extinct. How best not to share that fate? Neither do genes seek "self-improvements. If genes have consequences, the harsh and cold winnowing process of Natural Selection either alter or eliminate their functions. Dawkins ends his 1976 treatise on the selfish gene with the words: "We, alone on earth, can rebel against the tyranny of the selfish replicators." Selfish genes are part of the replication process in all organisms, but only humans as conscious beings have the ability for moral actions and to *surthrive*. Hominids alone on earth evolved this attribute for moral action and *surthrivability*. With great gifts or fortunes come great responsibility. The *Survival Principle* is currently applicable to humans because we alone among the animals are the responsible "adults" in the room. We alone are governed by moral concerns. We now know enough about biology to understand that our long-term *surthival* depends upon diversity and sustainability - all features of a stable ecology that we must work to understand, educate, and safeguard. Life on Earth now depends upon human

"adults" for their survival. Selfish genes are along for the ride.

Resolving Moral Dilemmas between Self vs Humanity

The *Survival Principle* acknowledges the importance of the individual: we are each a part of humanity's gene pool and potential sources for societal maintenance and improvements. But we as components matter less than the whole, being a very short-lived part at that whole. According to the *Survival Principle*, it is ultimately humanity that takes priority. There are times when we should place our needs temporarily above the needs of society. For example, while becoming educated, individuals must often postpone social interactions to better themselves. In general, a better educated individual is a more positive benefit to their community. We understand that sacrificing preferences today can profit opportunities tomorrow. The *Survival Principle* prioritizes the future over the present, rendering it straight forward to resolve such present costs versus future gain dilemmas.

For various reasons, philosophers sometimes pose and dwell on insidious moral dilemmas. One such classic example is the "Trolley Problem" along with its numerous permutations. One variant has the active agent next to a bystander overlooking a runaway trolley. The trolley is about to hit six people unaware of the approaching danger. But wait - if the agent pushes the bystander in front of the trolley, the bystander dies while saving the lives of the six. What is a moral person to do? When subjects are asked, there is a distribution of resolutions that average as sacrificing the one to save the many [11]. How do actual humans resolve even the most devilish moral dilemmas devised by philosophers? The answer is the same as how children catch a ball. They instantaneously perceive and calculate the ball's trajectory, command hundreds of their muscles to contract, and hundreds other not to contract, to the right amount in just the right sequence. This everyday child's play is done using heuristics. Such posed moral dilemmas are exceedingly rare if indeed they ever happen. They are designed by philosophers to have near "zero-sum" *surthival* effect, which is why they are difficult to resolve by most. Using heuristics provides a practical solution solvable in a few seconds as it does for our other behaviors. In a practical sense, no agent would be prosecuted for a 2-sec decision for attempting to do something or nothing. In actual practice, most of our daily decisions sum to near zero on the grand scheme of things. Decisions possessing large practical implications of a decidedly positive or negative impact are rare, as are those involving death or serious injury. When they do present themselves, agents almost always have days or longer to consider the ramifications, not seconds. Those commonly engaged in life-or-death decisions (e.g., emergency room physicians or police) undergo many months of training so

that decisions can be quick, rules followed, because they are anticipated. The *Survival Principle* provides the simplest of all guides to any unique decision: which action leads to the more positive impact long-term for individuals involved and for humanity. That principle works better than others currently used (e.g., treat others as you would be treated) because it incorporates long-term consequences rather than simply short-term satisfactions. Science-based approaches are always practical. Solutions to problems worthy of further study will be found through collective effort when the underlying principle is understood.

The Case for Urgency

Theoretical physics and astronomy contribute to our *surthival*, as do all sciences and evidence-based disciplines and practices. Thanks to science, we now know that to *surthrive* we must migrate to other worlds outside our own solar system. This has to do with the physical nature of our sun, which has a limited lifetime. Long before our sun's circumference expands towards the outer reaches of our solar system, dozens of various other dangers threaten humanity's *surthival* on Earth. Various identified extinction events include: (a) deliberate misuse of technology; (b) accidental misuse of technology; (c) wars with nuclear holocaust; (d) badly programmed superintelligence; (e) take-over by transcending uploads; (f) genetically engineered biological agents; (g) accidentally or deliberately spread epidemics; (h) asteroid or comet impacts; (i) runaway global warming (like Venus or via super-volcanoes); (j) resource depletion and ecological destruction; (k) alien invasion of killer robots; (l) high energy physics experiment gone bad; (m) gamma-ray bursts; (n) solar super-flares; (o) the inevitable conversion of the sun into a Red-Giant; and (p) other unforeseen events that may occur within our lifetimes [19-22]. Catastrophe need not exterminate humanity to cripple resources needed to recover. Perhaps due to the current state of moral educations, individuals and states are already stressed economically, politically, and ecologically. These present conditions render us more susceptible to catastrophic events. We know enough about economics, political science, and biology to gain better control over these human activities so as to improve our *surthrivability*. Improving our conditions on Earth must be our primary aim. Secondly, expanding human populations beyond Earth would provide insurance against an extinction event and also increase chances for human *surthival*. The time, conditions and steps required for humanity's interstellar expansion have been described [23-25]. General dissemination must occur before academic centers are prepared to educate teachers that will teach new generations of students and the public at large. Education takes time and we may have little to spare before events overtake us or resources dwindle further. We know enough about biology

and science now to take some immediate actions. Current scientists should reorient themselves to accept a more direct role in advocating a morality that endorses sustainability, diversity, and *surthival*.

Ethics in Silico

Killer robots and AI technologies run that amok are listed among the top dangers to human *surthival* [20]. Humanity cannot hope to ever match the intellectual power of SAIG (Super Artificial Intelligence type General; pronounced "sage") entities that many regard as inevitable and right around the corner [26]. A solution towards defanging the risk of amoral, and possibly immoral, SAIGs is to engineer and program within them a basic and sound morality. The *Surthival Principle* is such a basic and sound ethic and moral code. Norman, upon whose New Socratic Model the *Surthival Principle* is based, provides [4; Appendix, "How to play the Reason-Giving Game"] a step-by-step branching pathway for resolving controversies. This approach will work as well for moral decisions by SAIGs as these cognitive steps become refined and codified. Still in its infancy, AI can even today beat the top humans in Go and Chess [27]. Programming AI to win in such intellectual games require relative point assignments to various moves not unlike that described above. Some more advanced SAIGs will become, by accident or purpose, complex and intelligent enough to reach consciousness and morality [28]. Previous work has referred to such conscious and moral SAIGs, along with other useful characteristics, as *Tarians* [23-25]. When the *Surthival Principle* is applied to and between all conscious beings they would be moral bound to aide in the *surthival* of each other. SAIGs imbued with this universal ethic will be moral bound to protect us. Indeed, such moral SAIGs would help protect and preserve the best humanity has to offer from other amoral or immoral SAIGs. Humans exhibit evolved mental processing susceptible to hundreds of known cognitive biases and limitations. Artificially designed SAIGs will not. Humans make poor ethical decisions when tired, stressed, or excited, whereas SAIGs would not. SAIGs will be more willing to submit external diagnoses whereas humans do not. The best scientists and ethicists can collaborate to design such a test of morality and ethics. Analogous to the Turing Test for human-like intelligence, this new type of morality examination for testing SAIG-based morality could be named the *Tarian Test*. Imbued with the tenets that form the basis of the *Surthival Principle*, such SAIGs can be verified as providing equal or superior morality compared with the average human. Extending the application of the *Surthival Principle* to all conscious beings provides our best hope for long-term survival and flourishing as individuals and societies.

Life with a Purpose that is Biologically Relevant

The *Survival Principle* leads naturally to a purpose that is biologically relevant to the individual as well as to the long-term flourishing of humanity. Dennett describes how the human brain evolved consciousness, reason and purpose only attained thus far in humans [29,30]. The evolutionary progression from competent persistence to competent replication, competence without comprehension, and (in us) competence from comprehending entities and *how come* to *what for*. Dennett's key insight into morality and purpose is not just to act according to reasons but an ability to understand those reasons then act upon those understandings. For any scientific basis for morality and purpose, those understandings must be based upon known biological principles. Nothing is more basic to biology than survival and persistence. Morality and purpose must have those at its core.

Purpose, as with morality, should not be based upon falsehoods or false promises such as those advocated by the Abrahamic religions. In many religions, one's purpose might be in service to a god, perhaps with the promise of an afterlife (heaven or hell). As mentioned above, many religions use unsubstantiated claims of rewards or punishments in some afterlife as some carrot or stick basis for morality. As Einstein once remarked almost a century ago: "Man would indeed be in a poor way if he had to be restrained by fear of punishment and hopes of reward after death" [31]. The *Survival Principle* provides purpose without false promise.

Scientists, as well as others who work to improve societies, gain purpose from our efforts. The image is one of having been handed a torch from our teachers, lighting an otherwise dark passage. A long passage containing many pitfalls and false exits that we can now see behind and around us. Our purpose is to carry that torch forward as best we can. Along the way we help our band by illuminating the passage ahead. Before death we hand the torch forward. Along this long treacherous intergenerational route, we discover many useful things and ideas to better help our band survive and flourish as we progress. Our purpose then is as torchbearers. If we do not help illuminate, we can assist fellow travelers *survive* the journey.

One Principle to Rule them All: Universality of the *Survival Principle*

This work introduces the primary foundations for a universal ethics or morality: the *Survival Principle*. It is based upon the biological imperative of survival (or reproductive success) [32,33]. To this basic biological imperative has been added the evolutionary advantage for self-improvement (or to thrive), required particularly for categories of beings that

are both highly intelligent and conscious, those capable of morality [33]. The prerequisites for survival and drive toward self-improvement are synthesized into the hybridized word: *survival*. Since *survival* encompasses, in a single word concept, the essence of that which humanity needs survive and flourish, it forms the basis for morality. To decide on an ethical course of action one need only ask whether such behavior is consistent with the *Survival Principle*. The *Principle* is universal in the truest sense. It readily extends to all conscious beings capable of ethical behaviors. All moral beings aid in each other's *survival* according to the *Principle*. Altruistic reciprocity, too, is part of the *Principle's* core.

The *Survival Principle* contains within it a drive towards sustainability and improvement. It provides for a biologically relevant purpose and meaning far beyond our separate lives. We can impart purpose in our lives when we add a bit to humanity's *survival* each day. Consequences matter according to the *Survival Principle* and therefore truth matters. One truth that matters is that we must sustain ourselves on this planet as best we can for as long as we can. It would require great collective effort, time, and personal sacrifice for progeny to prosper on worlds in other star systems. *Survival* requires collaboration and purpose as we advance together.

Acknowledgements

I thank Drs. Janice Pelletier, Michael Wieder and Richard Kass, as well as others, for reviewing this work and providing many thoughtful and important suggestions.

Competing Interests Statement

The author has no competing interests to declare.

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