

## **AC 2009-1550: THE CHANGING OF THE GUARD: SHOULD THE ENGINEERING ETHICS CODE BE CHANGED TO ENVIRONMENTAL ETHICS?**

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# **The Changing of the Guard: Should the Engineering Ethics Code Be Changed to Environmental Ethics?**

## **Abstract**

Engineers of the 21<sup>st</sup> Century must include environmental considerations in their designs. Such additions to design thinking as sustainability and consideration of environmental impacts are worthwhile; however, to place the emphasis on such considerations may override the main focus of the basic ethics statement. A series of recent publications has urged a move to broad environmental thinking as the foundation for engineering ethics. Environmentally-based ethics arises out of “deep ecology” or “morally deep ethics” in which oneness with nature, rather than our stewardship of nature, underlies our thinking. The authors warn that such an environmentally- based ethic proves detrimental to the meaning of engineering, provides an inadequate base for an ethical system, requires a major shift in worldview, and could produce a situation which is actually harmful to human lives.

## **Introduction**

Neglect of the environment in the first half of the 20<sup>th</sup> Century led to large areas of destruction: pollution of water, air, and soil, destruction of forests, and, in some case, destruction of entire species. Catalano describes the situation in grave terms: “The world is in the midst of a period of unprecedented and disruptive change. This is particularly evident when examining the health of the world’s ecological systems. A host of human forces impinge upon coral reefs, tropical rain forests and other critical natural systems located around the world. Half the planet’s wetlands are gone.”<sup>1</sup>

Because of the threat to the ecological system, modern engineers have come to recognize the importance of including environmental considerations in engineering decisions. Such additions as sustainability and consideration of environmental impacts are worthwhile; however, to place the emphasis on such considerations may override the focus of the basic ethics statement. A series of recent publications, including two books,<sup>2,3</sup> has urged a move toward broad environmental thinking as the core foundation for engineering ethics. When first considered, this change may seem to be a good idea. Any modifications of the basic ethical concepts previously established, however, including the Engineering Code of Ethics, should be examined carefully.

The solution proposed by some to the destruction of our environment (a solution which attempts to link peace, justice, ending poverty, and protecting the environment) is a move toward a new ethical foundation for engineering, a foundation that is specifically rooted in the environment. The proposed new ethical system has been termed “morally deep ethics” since it is based on the concept of “deep ecology.” “Deep ecology” is an approach to ecology based upon the complete

considerations of the large environment and upon the assumption that all living creatures, plants and organisms, are treated as equals. This approach is considered “biocentric,” or nature centered. In contrast, “shallow ecology,” which is an ecology based primarily on human interaction with the environment, is termed “anthropocentric” (or human centered.) It is based upon the assumption that human beings are the most important environmental entities, and that everything should be done to meet their needs and desires above all others.

The authors warn that such an environmentally based ethic has four major pitfalls, as follows:

1. It proves detrimental to the meaning of engineering.
2. It provides an inadequate base for an ethical system.
3. It requires a major shift in worldview, and
4. It could produce a situation that is actually harmful to human lives.

#### Historical background of environmentally-based ethics

Before discussing the specific impact of environmentally-based ethics on engineering, it is important to take a brief look at the events that brought us to our current situation. Serious concern for the environment over the last five decades produced both (1) a scientific examination of the issues at stake and (2) various philosophical or socio-political movements rooted in ecological concerns. The latter set includes such widely varying approaches as ecofeminism, socialist ecology, deep ecology, and animal liberation. De Laplante summarizes the issues this way: “The central themes of environmental philosophy, as the discipline is currently understood and practiced, revolve around two related but distinct sets of questions:

- (1) Do human beings have moral obligations to protect or preserve the natural environment? If so, what are they, and to whom, or what, are they owed? How are such obligations justified?
- (2) What are the root causes of contemporary attitudes and practices with respect to the natural environment, and how can we change them?”<sup>4</sup>

De Laplante further places the movements into historical context: “The 1960s saw the rapid growth of information concerning a diverse array of environmental threats, including overpopulation and its relation to poverty and famine, the depletion of non-renewable resources, and the harmful effects to human and nonhuman welfare caused by chemical pollutants. The result was the birth of modern *environmentalism*, a socio-political movement predicated on the belief that current attitudes and practices toward the environment are at best imprudent, and at worst, gravely immoral, to other human beings and perhaps to nature itself. ‘Environmental philosophy’ as an academic discipline arose in the early 1970s in response to a perceived need for intellectual support and defence of the ethical and political commitments of environmentalism.”<sup>5</sup>

Much of the philosophical controversy surrounding the environment stems from a 1967 article in *Science* magazine by historian Lynn White, Jr. entitled “The Historical Roots of Our Ecologic

Crisis.”<sup>6</sup> In this article White placed the bulk of the blame for environmental problems squarely on the western Christian Church, which, he suggested, had taken the command to “subdue the earth and have dominion over it” (Bible, Genesis 1:28) as license to pillage and destroy the earth. As a result of this critique, new philosophical approaches to the environment were encouraged. White’s thinking also prompted an entirely new worldview, which will be described later in the paper. White wrote, “... somewhat over a century ago science and technology—hitherto quite separate activities--joined to give mankind powers which, to judge by many of the ecologic effects, are out of control. If so, Christianity bears a huge burden of guilt.”<sup>7</sup>

Environmental writer Aldo Leopold introduced a new approach to ethics. Leopold suggested in his *Sand County Almanac* that our interaction with nature should be in terms of what he called a “land ethic,” which he defined in this way: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." <sup>8</sup>

The specific terminology and development of deep ecology arose from the writings of Norwegian philosopher Arne Naess. Naess called his approach “deep ecology” because it dealt with the deep questions of life and survival.

The eight points of the “Deep Ecology Platform” set forth its basic principles:

- “1. The flourishing of human and non-human life on Earth has intrinsic value. The value of non-human life forms is independent of the usefulness these may have for narrow human purposes.
2. Richness and diversity of life forms are values in themselves and contribute to the flourishing of human and non-human life on Earth.
3. Humans have no right to reduce this richness and diversity except to satisfy *vital* needs.
4. Present human interference with the non-human world is excessive, and the situation is rapidly worsening.
5. The flourishing of human life and cultures is compatible with a substantial decrease of the human population. The flourishing of non-human life requires such a decrease.
6. Significant change of life conditions for the better requires change in policies. These affect basic economic, technological, and ideological structures.
7. The ideological change is mainly that of appreciating life quality (dwelling in situations of intrinsic value) rather than adhering to a high standard of living. There will be a profound awareness of the difference between big and great.
8. Those who subscribe to the forgoing points have an obligation directly or indirectly to participate in the attempt to implement the necessary changes.”<sup>9</sup>

One website summarizes deep ecology in these terms: “Deep Ecologists emphasize that human beings are only part of the ecology of this planet, (and) believe that only by understanding our

unity with the whole of nature can we come to achieve full realization of our humanity. Deep Ecology believes that all organisms are equal: Human beings have no greater value than any other creature, for we are just ordinary citizens in the biotic community, with no more rights than amoebae or bacteria.”<sup>10</sup>

Lawrence Johnson later combined the land ethic of Leopold with the deep ecology of Naess to formulate a system of “morally deep ethics.” Johnson develops his philosophy on the following beliefs:

1. “There is an intrinsic moral significance in wildernesses, ecosystems, species, and so forth, in addition to their significance for humans.”<sup>11</sup>
2. “If there is a moral universe at all, it must extend beyond the human sphere.”<sup>12</sup>
3. “Morality is not the exclusive domain of rational beings...sub-rational animals can act morally, and sometimes do so.”<sup>13</sup>
4. “Animals, plants, ecosystems, and even species have interests, and that these interests are, to the extent of each interest, morally significant.”<sup>14</sup>
5. The interests of animals and nature include their basic survival and freedom from suffering as experienced by each individual member.
6. Species count more than individual animals.

Johnson’s guiding principle for morally deep ethics is the following: “Give due respect to all the interests of all beings that have interests, in proportion to their interests.”<sup>15</sup>

The final step in the philosophical transition, promoted by engineering professor George Catalano, was to link Johnson’s morally deep ethics to engineering ethics. The noble yet misguided goal expands the boundaries of engineering problems and attempts to develop a new mindset in engineering practitioners. In 2006 Catalano explained the new thinking as follows: “If we are to make sense of our place in this natural world, we need a very different sense of ethics. One attempt at providing such an ethical framework has been offered by Johnson in his development of a morally deep world...Johnson discusses how non-sentient land can count morally and focuses upon the concept of a living being. For Johnson, a living being is best thought of not as a thing of some sort but as a living system, an ongoing life-process. A life-process has a character significantly different from those of other processes such as thermodynamics processes for example. Our character, as living beings, is the fundamental determinant of our interests.”<sup>16</sup>

Environmentally-based ethics and the changing definition of engineering

Environmentally-based ethics essentially redefines the nature of engineering itself. Engineering design is classically understood as a distinctly human endeavor, performed primarily for the

human community. If an activity impacts the environment, we should act responsibly to preserve the environment. If an activity does not affect the environment, we should not weaken its meaning and focus by forcing environmental considerations.

Dym et. Describe engineering design in this way: “Design is fundamentally a human endeavor. It involves the interactions among members of a design team, the relationships between designers, clients, and manufacturers, and the ways that purchasers of designed devices use them in their lives...To design means to accept responsibility for creating designs for people.”<sup>17</sup>

The NSPE code of ethics states that “Engineers shall hold paramount the safety, health, and welfare of the public.” A recent book (*Engineering, Poverty, and the Earth*) suggests that “the fundamental canon of the new code of ethics is the following: Engineers, in the fulfillment of their professional duties, shall hold paramount the safety, health and welfare of the identified integral community.”<sup>18</sup> This recommendation represents a significant change to the meaning of the ethical code.

Morally deep ethics implies a change to our definition of engineering. According to ABET, engineering is understood to be: “the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind.”<sup>19</sup>

A new definition based on morally deep ethics must substitute “the benefit of the environment” or “the benefit of the integrated community” for “the benefit of mankind.” Many engineers face issues of public safety, honest reporting, and conflict of interest. Relatively few will be required to consider the broadest aspects of the environment.

Catalano provides an example of identifying the integral community in an engineering decision. The scenario involves a project in the area around White Sands Missile Range in New Mexico:

“Johnson would challenge us to first identify all the members of the community. For this example a listing would include the following:

- Wolves
- Prey animals including domestic sheep and cattle as well as deer, rabbits, coyotes, and others
- Desert lands
- Ranchers and sheep farmers
- Hunters
- US Fish and Wildlife Service and other state and local government agencies
- US Department of Defense
- Residents of White Sands and nearby towns and settlements
- Residents of New Mexico and the entire United States
- Native American residents.”<sup>20</sup>

The sheer numbers of variables introduced here make such a problem unworkable. Engineers agree not to practice outside of their area of competence or expertise. In this case, the engineer

requires the expertise and knowledge of multiple species. In some design areas it may be reasonable to pull in a biologist, an environmental engineer, or other expert as a member of the design team, but most engineering decisions do not occur at this level.

The engineering design process would also be modified by basing it upon the environment. In addition to the steps of investigation, reflection, and creation, a new step of transformation would be added: “The fourth and final step asks the following questions of the engineer: Has the suffering in the world been reduced? Have the social injustices that pervade our global village been even slightly ameliorated? Has the notion of a community of interests been expanded? Is the world a kinder, gentler place borrowing from the Greek poet Aeschylus?”<sup>21</sup>

This transformational consideration is a positive idea; however, it is not always possible to examine. (For example, suffering and social justice do not enter in the design of a gear.)

The suggestion has also been made that the ABET Criteria be modified to include an additional outcome for Engineering programs beyond the given outcomes (a) through (k):

“Engineering programs must demonstrate that their students attain...

(outcome l) A fully integrative approach to engineering problems incorporating both reason and compassion in the development of solutions.”<sup>22</sup>

In addition, the article “Promoting Peace in Engineering Education: Modifying the ABET Criteria” urges three modifications to ABET Criterion 3:

“Modification 1: Promote peace through the development of an individual plan for the lifelong cultivation of an awareness of the interdependence of all and of the qualities of compassion, caution, and reflection...

Modification 2: Promote peace through an improved understanding of other cultures...

Modification 3: Promote peace through employing the principles of peaceful conflict resolution.”<sup>23</sup>

While these are noble goals, some will question whether they are measurable skills that are compatible with engineering accreditation.

The change to morally deep ethics could lead to unprecedented results, eventually eroding the practice of engineering since the radical environmental movement often holds hostility to technology itself. Repercussions of this transition would lead to the conclusion that the best action an engineer could take would be to do no engineering at all; that is, simply leave the natural system alone, because the very presence of humans in a natural environment is detrimental to that environment.

De Laplante describes *ecological pessimists* who “understand natural resources primarily in material terms, as fixed stocks of energy and matter in the environment that are drawn down by human consumption and that have a slow or nonexistent rate of renewal; they use this conception of resource use to argue that human beings are at imminent risk of irreversibly degrading the environmental resource base on which the welfare of current and future generations depends.”<sup>24</sup>

Environmentally-based ethics -Inadequate for an ethical foundation

Morally deep ecology is insufficient to serve as a foundation for engineering ethics because of its inherent ambiguity. Virtually all decisions are subjective. Nothing is fixed except the requirement to respect the interests, wellbeing, and moral standing of all living things.

Johnson clearly indicates the limitations of his morally deep ethics: “I must say right now that I cannot offer an adequate formula for determining the nature and scope of our moral obligations. I cannot do so even in the case of humans, and certainly I cannot pretend to do so with regard to the nonhuman world.”<sup>25</sup>

Johnson continues, “It would be quite handy if we had an adequate set of moral principles –a philosopher’s stone- by means of which we could, at least in principle decide what we ought to do in a given case. However, quite apart from considerations having to do with nonhumans, we humans have not worked out any completely satisfactory set of principles for getting along with one another.”<sup>26</sup>

Engineers we are familiar with the need for standards in making measurements. If one cuts a piece of string to a given length he uses a ruler. When cutting several pieces of string of the same length, it is folly to use each successive piece as the measuring instrument for the next piece. If the standard for ethics is not an established constant, our entire system of ethics will eventually become unrecognizable. Morally deep ethics contains no hierarchy of humans and animals, no principles for ethical decision, and no solution for conflicting interests.

Environmentally-based ethics creates confusion in design, in the sense that there are no specific guidelines for favoring one species above another. Engineers are called upon to make decisions regarding biological systems far outside their areas of competence.

The issues raised are large:

- What does it mean to involve all living forms in an ethical decision? Can we even know all the species that will be affected?
- Is it truly possible to predict the effect of decisions on all species in an environment?
- Who decides that all living things are equal?
- If all things are equal, is anything of special value? Are humans no more valuable than worms?
- Who defines the interests, wellbeing, and rights of animals?
- Who determines what actions may be taken in the *integrated community*?

Those who argue for the absolute equality of all living species find themselves facing a contradiction when it comes to human survival. In self-defense we will kill animals that attack us, even if the attack is their normal instinct. We will end the life of plants to have vegetables for



our dinner. We will use antibiotics and sterilizers to kill pathogenic bacteria. In a further step, technology makes life more comfortable for humans by exterminating cockroaches, keeping birds out of orchards, and spraying lawns for weeds. We make a region more comfortable for humans and less comfortable for other local species. In times of emergency (flood, tornado, hurricane, fire) all resources are first directed to the rescue of persons. Environmental considerations are temporarily secondary and are dealt with afterwards.

While humans and other species share the same environment, they are not morally equal. Humans make deliberate large-scale and small-scale choices which could enhance or destroy most living species. (An example would be nuclear warfare.) Humans ask moral questions (moral reflection) and define moral behavior. Humans are morally responsible for their choices.

The foundation for engineering ethics must be a set of values that is codified. Morally deep ethics has nothing specific to say about our particular responsibilities to employers, clients, public users, and other engineers. On the other hand, it is a small logical step from “Do unto others as you would have them do unto you,” “Love your neighbor as yourself,” and being “your brother’s guardian” to defining ethical responsibilities.

Environmentally-base ethics -Requires a shift in worldview

Morally deep ethics specifically requires a shift in worldview. The term *worldview*, in its broadest sense, means a person’s outlook on life. A worldview, more specifically, is a foundational set of philosophical presuppositions about the nature of the universe, a filter through which we deal with reality.

In Catalano’s book *Engineering Ethics-Peace, Justice, and the Earth*, the case is made that engineering historically has been based upon a “medieval worldview.” Such a worldview was based upon a “great chain of being,” with God on top, and the lowest animals on the bottom. Such a view, according to the author, is clearly unacceptable as a base for engineering ethics: “The ethical codes put forward by countless engineering societies and engineering education agencies are by and large locked into a world-view that was first developed in the Age of Enlightenment.”<sup>27</sup>

In its foundational presuppositions, environmentally-based ethics follows from a non-Western worldview. A recent article on engineering ethics from a deep ecology foundation suggests a modification of the ABET Criteria to include issues of peace with the planet: “Included in the concept of living at peace with the planet are an ecological consciousness, an understanding and commitment to biodiversity as well as an understanding and commitment to the maintenance of a natural balance...Ecological consciousness entails identity with the cosmos, an understanding of and respect for evolutionary forces and ultimately a respect for life.”<sup>28</sup> Environmentally-based ethics arises out of *deep ecology*, in which oneness with nature, rather than our responsibility towards nature, underlies our thinking. This approach has been shown to be most closely aligned with pantheistic beliefs.

We need to distinguish between seeing ourselves as linked to other people and species as fellow creatures and sharers of the earth versus being mystically united with the universe. We should not base our worldview on the environmental results it produces, but rather on its conformance to reality.

The worldview recently suggested for environmentally-based engineering ethics is actually that of “a self-organizing system.”<sup>29</sup> This is not a completely defined worldview in that it says nothing about origins or the actual place of humans in the universe. (Note the Appendix to this paper.)

Environmentally based ethics -Could prove destructive to humans

If taken to extremes, environmentally-based ethics may be destructive to humans. While the deep ecology and animal rights movements differ in some presuppositions, they share the belief that no value distinctions should be made between animals and humans. Peter Singer, the De Camp Professor of Bioethics at Princeton University’s Center for Human Values, contends that animals have the same rights as humans. He also fundamentally agrees with Michael Tooley, a philosopher who states that “new-born humans are neither persons nor quasi-persons, and their destruction is in no way intrinsically wrong”.<sup>30</sup>

According to Beissner, “Naess sees and embraces the logical implications of his views: *‘Biospherical egalitarianism-in principle...To the ecological field worker, the equal right to live and blossom is an intuitively clear and obvious value axiom. Its restriction to humans is anthropocentrism with detrimental effects upon the life quality of humans themselves...’* Or as Earth First! Founder David Foreman puts it, ‘...man is no more important than any other species...It may well take our extinction to set things straight...’ ”<sup>31</sup>

Gardiner warns that, “Deep ecologists demand a large population decrease worldwide. In the platform co-authored by Arne Naess and George Sessions, we find the following statement: ‘The flourishing of human life and cultures is compatible with a substantial decrease of the human population. The flourishing of non-human life requires such a decrease.’ These two sentences alone expose the dark heart of deep ecology. Their goal is not just zero population growth, but a great decline in human population. That this point was allowed to remain... shows how uncontroversial population reduction had become. Naess taught that the present environmental crisis is chiefly one of population and economics, and that the way to reduce our numbers is by a profound change in ‘economics, technology and science, politics, education, philosophy, and religion.’ ”<sup>32</sup>

For the cases in which, for instance, an addition is made putting preservation of a species on a par with the safety of humans, the engineer may be put into a position requiring a choice between the safety of humans and the safety of animals or plants. Different presuppositions and different worldviews would produce different results for that choice.

## Alternate approach – Humble stewardship of the earth

Theologians point out that the original thesis of Lynn White’s seminal paper (“The Historical Roots of Our Ecologic Crisis”) was flawed: “All the article’s erroneous statements seem to stem from White’s heretical concept that there is a ‘Christian axiom that nature has no reason for existence save to serve man.’”<sup>33</sup> Christian theology was not, in fact, the root cause of the ecological crisis, but rather human greed, ignorance, irresponsibility, and a twisted application of the *dominion of the earth* concept. The Christianity he describes is not the Biblical version that is true to the teachings of Christ but a perverted one, in which the environment is seen as something to be used for man’s purposes. Jesus taught in the “Sermon on the Mount” (Bible, Matthew 5:8) that God even cares for sparrows. In addition, the Jewish dietary and cleanliness laws as well as the Sabbath and Jubilee rules acted to preserve the environment. Geisler<sup>34</sup> divides these laws into several categories: good stewardship, Sabbath rest (for animals as well as humans), rest for the land, Jubilee laws, harvesting rules, sanitation rules, rules for ecology and warfare, and rules against greed for land.

The basic Christian position has often been represented as misogynic, giving license ownership and beating of slaves, and ecologically ravaging the world. If the Christian Scriptures are carefully examined, however, they lead to a very different conclusion – that man is to exercise “dominion without tyranny.”<sup>35</sup> The classical Christian position deals with the environment in this way:

1. All creation was originally declared “good.”
2. All human beings have enormous value, by virtue of being made “in the image of God.”
3. God cares for every creature, including sparrows.
4. A distinction is made between the worth of humans and the worth of animals. (“You are of more value than sparrows,” says Jesus.(Bible, Matthew 6)
5. The first assigned duty of man was to cultivate a garden. Mankind’s dominion over nature did not include spoiling nature, but rather promoting nature to flourish for our benefit.
6. Humans have a responsibility to care for the earth as responsible agents. The concept is “stewardship of the earth.”
7. The Sabbath, the Sabbath year, and the Jubilee concept (every 50 years) allowed the land to “rest.”

The resulting movement arising from this approach combines theology with ecology, including such concepts as Earthkeeping and CreationCare.

Much of the literature in philosophical ecology places blame for environmental problems as well as interpersonal problems on some particular group of people: industrialists, capitalists, landowners, loggers, engineers, and others. Such an approach misses the idea that we are all at fault. None of us have always protected the resources of nature. None of us consistently treat our fellow humans with care and respect.

Frair et. al. summarize the environmental problem: “Our present ecological crisis is due to several possible causes-ignorance, inertia and irresponsibility:

1. People were, and in some cases still are, unaware that their exploitation practices would be on a large scale and in the long run detrimental.
2. As a result of former procedures, instituted at a time when a future tragedy would not have been expected, it now is too late or the inertia of the program has become so great that there appears to be little opportunity to reverse a trend.
3. Some people have acted with irresponsibility, preferring to ignore or disregard the balance of nature, the welfare of a species, and the interest of their fellow man for selfish reasons. As a result of modern technological advance, selfish men have had greater opportunity to exploit resources at the expense of others.”<sup>36</sup>

## Conclusions

The authors applaud the recent call for an emphasis in engineering on peace, eliminating poverty, and protecting the environment, including the development of modules on peace and justice in engineering. The authors, however, state strongly that a move to environmental, or morally deep, ethics in engineering would be a serious mistake. Such an environmentally-based approach requires a change in the definition of engineering, a change in the ethics code, and a shift in basic worldview. The authors have no desire to leave all mention of the environment out of the Engineering Ethics statement; but the primary concern of the engineer must be to benefit humanity by satisfying stakeholder requirements, not by achieving zero change to the environment. The environment does support mankind, but in the end if it comes to a decision to kill an animal, a plant, or a man, the welfare of a human must always come first. There must be a criterion by which to choose, one or another in the Ethics statement.

Much advancement has been made in the area where engineering and the environment intersect: a new emphasis on sustainability, a requirement for sustainability in the ASCE Code of Ethics, the inclusion of the environment in design constraints and impacts in the ABET Criteria. The current NSPE Code of Ethics includes the following statement under *Professional Obligations*: “The engineer shall at all times strive to serve the public interest... Engineers are encouraged to adhere to the principles of sustainable development in order to protect the environment for future generations.”<sup>37</sup>

Environmental considerations should be included in engineering design decisions where appropriate. Not all engineering designs involve the environment. The selection of filter

standards for software-defined radio, the modeling of knee ligaments, and areas of software engineering are a few examples. Courses or course modules in Environmental Engineering or Alternate Energy Systems are desirable for all engineering students. Electrical engineers should be familiar with such topics as lead solder replacements, PCB's, antenna and cell tower construction issues, Environmental Impact Statements in manufacturing, and the recycling of electronic appliances. Some progress has been made at including such considerations in engineering, but much more can be done. We are responsible for the earth, and we can and must protect it, without the necessity of altering our ethical codes or worldviews.

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## Appendix

### Worldview Categories

Note: Portions of the Appendix were developed by the authors for the paper “The Effect of Basic Worldview and Culture on Engineering Ethics” (1999 ASEE Gulf-Southwest Conference)

The term “worldview,” in its broadest sense, means a person’s outlook on life. A worldview, in fact, is a foundational set of philosophical presuppositions about the nature of the universe, a filter through which we deal with reality. Only three Basic Worldview Categories (BWCs) exist, upon which all others depend, and these are mutually exclusive. A society’s culture derives from one of these three BWCs, and the traditions and idiosyncrasies of that society can be traced to that worldview category.

### Finding One’s Own Basic Worldview Category

A person’s BWCs category can be determined by one’s answer to the three following questions: The first question is “Does a supernatural realm exist, or does the entire universe simply consist of physical matter?” If a person answers that the universe is strictly physical, that person holds to BWC #1. If not, a second question is asked: “Is that which is supernatural in the universe personal, or impersonal?” That is, “Does the supernatural entity care about humankind, and, in particular, about me?” One may conclude that several spiritual entities exist which have personalities; however, the real focus is the Prime Spiritual Entity, the source of all the rest. Does that entity have personality and care for humanity? If the answer is “no,” that the Prime Focus is not personal, the individual holds to BWC #2. If the answer “yes,” that the Prime Focus is personal, that individual operates from BWC #3.

Each BWC has some inherent logical consequences, and people may tend to “pick and choose,” often illogically, the consequences of one or more BWCs outside their own. However, given a culture which predominantly holds to one of BWC’s, one can predict some general trends in that culture, given the passing of a few generations.

A society composed entirely of BWC #1 will probably eventually result in a totalitarian system because of the absence of an absolute moral base on which to build an ethical system. Democracy in a society predominantly composed of BWC #1 cannot work; an authoritarian structure becomes necessary to prevent total anarchy. Communism and fascism are illustrations of this condition. Further, this system does not value human life. In the similar case of a society composed only of BWC #2, that culture would eventually see a complete loss of science. Progress would be considered a negative concept, and logic would lose importance. Human life would be considered less important than, or on the same level of importance as, animal or vegetable life. Examples of this trend are already present in our western civilization. Monism is

very nearly equivalent to (though a subset of) BWC #2, and, according to Guinness: “-- Here is the first problem: Monism as related to reality does not give a sufficient basis on which to ground continuing scientific investigation or to distinguish between fantasy and reality.”[1]

Humans usually do what is logical, whether consciously or not. When a person feels hungry, that individual does not go to bed, but eats, instead. People see that things fall down, so they do not walk out of second story windows. The same is true concerning a person’s BWC. If one believes that there is a God who is aware of and cares about human action, that person tries to avoid what displeases the Deity. The individuals who do not believe this way act in whatever way pleases or satisfies them.

In his treatment of moral authority, Hunter uses the same concepts used here to define BWCs, particularly BWC#3:

“To speak of moral authority is to speak of the fundamental assumptions that guide our perceptions of the world. These assumptions provide answers to questions about the nature of reality –what is real and what isn’t. For example, is there a spiritual as well as a physical and material realm of existence? Does God exist? If so, what is God’s nature? Is God an active agent in human affairs or a distant ideal of human aspiration? These are also the assumptions that define the foundations of knowledge—how we know what we know. Upon what do we ground our knowledge of the world, our understanding of truth, and our conception of moral and ethical behavior? Does our knowledge derive from divine revelation, through the analysis of empirical evidence, or through personal and subjective experience? These assumptions act as a lens that highlights certain aspects of experience as important or unimportant, relevant or irrelevant, good or bad, and right or wrong. These generally unspoken assumptions are the basic standards by which we make moral judgments and decisions.

The point needs to be made that all individuals ground their views of the world within some conception of moral authority. Not only those who are religious in a traditional sense, but also those who claim to have no religious faith at all base their views of the world in unprovable assumptions about ‘being’ and ‘knowledge.’ To imagine otherwise would be philosophically naïve. ...Even average, nonactivist secularists—ordinary people who maintain no religious belief, who worship no deity—live by unspoken assumptions about their world; they too are people of particular, even if implicit, faith commitments.” [2]

The basis of the Engineering Code of Ethics is the moral code presented in the Bible. Ertas and Jones express this in their chapter on engineering ethics:

“In the United States, Judeo/Christian beliefs are held by most people, and ethical value systems are largely based on writings in the Bible. The Old Testament includes a significant amount of text concerning the way a person should live. The most notable text in this regard is the Ten Commandments, Exodus 20:3-17. The New Testament also has much to say about value systems and ethics. Possibly the most widely quoted verse from this portion of the Bible is the statement of Jesus in Matthew 7:12 which is paraphrased as the Golden Rule: ‘Therefore all things whatsoever ye would that men should do unto you, do ye even so to them. (Bible, KJV)’



It can be seen from the above that the principal difference in secular and Judeo/Christian ethics is that secular ethics are defined by man and as such, are subject to change and interpretation, depending on the interpreter and the time in which he or she lives, whereas Judeo/Christian ethics are based on God's word, the Bible, which does not change but is subject to interpretation." [3]

In a recent ASEE presentation, Niewoehner made the case that a Christian foundation for engineering ethics is compatible with protection of the environment and professional duties to the public:

"How might a Christian articulation of engineering ethics contribute to the broader cause of progress in engineering ethics scholarship and practice?" *Prima facie*, a Christian view of does *not* offer profoundly different conclusions with respect to our duties to protect life and to protect the environment. It *does* offer a substantially different foundation for such conclusions, as well as substantially different motivations for adherents. Furthermore, it offers an avenue for future discussion and development as Christians interact with our broader pluralistic society on the meaning, significance and purpose for technology." [4]

The fundamental principles in this system are love for God, followed by love for humans, and, finally, respect and care for the environment as a creation of God. BWC #3 is not only compatible with engineering ethics but provided the social context out of which the ethical system arose.

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