

THE CLIMATE CATASTROPHE



AND THE MĀLAMA HONUWA WORLDWIDE VOYAGE OF THE HŌKŪLE`A

How Can We Take Care of the Earth?

**A DEEPER LOOK INTO THE SCIENCE, PHILOSOPHY, AND POLITICS
OF CLIMATE CHANGE**

A Presentation by

TIMOTHY J FREEMAN

*Assistant Professor of Philosophy
University of Hawai'i at Hilo*

[1] Most of you know the story of the *Hōkūle`a*, the replica of an ancient Polynesian double-hulled voyaging canoe which recently completed the three-year *Mālama Honua Worldwide Voyage*. Since it was launched in 1975 by the Polynesian Voyaging Society it has served as an important symbol and vehicle for the cultural revitalization of Hawaiian and other Polynesian people. As stated on the Polynesian Voyaging Society website: [2] “She is more than a voyaging canoe—she represents the common desire shared by the people of Hawaii, the Pacific, and the World to protect our most cherished values and places from disappearing.”

The purpose of the *Mālama Honua* voyage was to carry around the world the message expressed in the name for the voyage, which means “to care for the Earth.” Citing again from the website of the Polynesian Voyaging Society, the meaning of *Mālama Honua* is explained: [3]

Living on an island chain teaches us that our natural world is a gift with limits and that we must carefully steward this gift if we are to survive together. As we work to protect cultural and environmental resources for our children’s future, our Pacific voyaging traditions teach us to venture beyond the horizon to connect and learn with others. The Worldwide Voyage is a means by which we now engage all of Island Earth—bridging traditional and new technologies to live sustainably, while sharing, learning, creating global relationships, and discovering the wonders of this precious place we all call home.

The metaphor of the Earth as an island is apt if we consider the Earth within the vastness of the ocean of the cosmos. When the Polynesians first made it to the small islands in the middle of the vastness of the Pacific Ocean, they had to develop a sustainable culture in the islands as they could

not depend on regular trade with other islands and lands in order to survive. On Island Earth we are even more isolated than the early Polynesian voyagers who landed in these islands. Despite the dreams of space exploration and the science-fiction fantasies of galactic federations, we are isolated in this tiny speck of an island in the cosmos and thus our survival as a species depends entirely upon the sustainability of our global civilization.

It should be obvious that the sense of “Earth” in the name *Mālama Honua* does not refer to simply the planet as a mere piece of rock orbiting the Sun. That “Earth” will continue its journey around the Sun long after we are gone, and life will likely evolve again in some distant future if some stray asteroid were to wipe out the era of human beings as once happened to the dinosaurs.

[4] The “Earth” in the name *Mālama Honua* refers rather to the whole global ecosystem that makes “this precious place we call home” possible. Citing once again from the website of the Polynesian Voyaging Society, the story of the *Hōkūle‘a* and the *Mālama Honua Worldwide Voyage* is “a story that is crucially important as the world’s populations struggle with the ability to live in balance with our island that we call Earth.”

[5] In carrying this message of “caring for the Earth” around the world, this small canoe might very well be the most important vessel on the seas today, just as an important symbol as the grey lady in New York Harbor. In a recent article in the *Smithsonian* magazine, Doug Herman, a geographer and specialist in cultural knowledge of Hawai‘i and the Pacific Islands, draws attention to the importance of the worldwide voyage of the *Hōkūle‘a*. Of course, in order to survive their perilous voyage across the Pacific, the ancient Polynesians had to have a “sustainable sail plan.”

[6] Herman quotes the famed *Hōkūle‘a* navigator Nainoa Thompson, who succinctly summed up the problem with our modern civilization: “The sail plan we’re on is not sustainable” (Herman, 2014). Herman emphasizes that it may be difficult to make the transition to a sustainable civilization, but it might be possible, he suggests, if we realize that “we are all in the same boat” (Herman, 2014).

As a global civilization it is obvious that we all are on the same boat. If we seriously consider the latest findings from climate scientists concerning climate change, it seems we are not on the *Hōkūle‘a* unfortunately, but rather [7] the *Titanic*. There are so many ways in which the *Titanic* is probably a perfect metaphor for our modern civilization. The largest and most luxurious ocean liner of its day, the *Titanic* was launched with the extraordinary confidence that it was literally “unsinkable” and yet it went down to the bottom of the ocean on its maiden voyage. The problem, it might be said, is that it didn’t follow a sustainable sail plan, proceeding recklessly through the dark icy waters, unable to see the looming iceberg ahead in time to avoid disaster.

As a result of the increasing impacts from the rise in average global temperature, more people are becoming aware of the danger posed by climate change. And yet, like the passengers in the minutes after the *Titanic* struck the iceberg, most people today have no real comprehension of the

impending disaster. What I want to do here tonight is explain, in reviewing the science of climate change, how it is that we really are on the *Titanic*. The question before us concerns whether or not we have enough time to change course and avoid an unparalleled catastrophe.

In 2018 we have seen more devastating consequences from climate change. [8] Everyone has been horrified in the last week by the fires that are still raging in California. In a cruel irony—or perhaps as clear a message as we are ever likely to get—a town called ‘Paradise’ was lost, burned completely to the ground, turned into an inferno overnight. It is already the deadliest fire in the State’s history and the death toll is likely to rise considerably as there are over a hundred people still missing. Whipped by the winds, the fire blew into the town so quickly many just didn’t have time to escape. [9] Two blazes in Southern California have also resulted in deaths and the loss of many homes, while the entire population of the city of Malibu, [10] has been forced to evacuate. There is a clear link between these fires and climate change. As the planet warms up some places become dryer, and California has experienced several years of severe drought which has parched the land and made it much more susceptible to these fires.

We have also seen more powerful and more frequent storms as a result of climate change. [11] This year, once again, there were increasingly more powerful typhoons and hurricanes which left much [12] destruction in their wake. Of course, in August we felt the impact of Hurricane Lane, [13] the wettest tropical cyclone on record in Hawaii. We were lucky that it didn’t cause more destruction than it did; [14] but our luck will surely be tested in the future as warmer ocean temperatures will likely bring even more powerful storms our way. The data shows that hurricanes and typhoons are getting stronger, more frequent, and lasting longer. [15] This chart shows the increasing intensity of hurricane seasons since 1900. The link between climate change and more frequent and powerful storms is clear. As the oceans heat up as a result of global warming, there is more energy to drive the storms. [16] This chart shows the increase in temperature of the four major oceans since 1970 as well as the steady increase in global ocean temperature over that time period.

There are many other consequences of climate change that have already had devastating impacts across the globe and will surely be getting much worse in the years to come. [17] In some parts of the world torrential rains flooded densely populated areas. [18] Sea level rise is already threatening coastal areas and small island nations. Rising temperatures and increased acidification in the oceans have already led to coral bleaching here in Hawaii and most dramatically [19] across the Great Barrier Reef, much of which has become a dead zone. California, of course, has not been the only place that has experienced devastating impacts from the dryer conditions. [20] Much of Europe experienced severe drought conditions in the spring and summer of 2018 leading not only to fires, but also crop failures across the continent. The rise in temperature alone led to many deaths

across Europe. According to the World Meteorological Organization, the heat waves across the northern hemisphere in the summer of 2018 are linked to climate change.

It also must be said that climate change has not affected the world equally. [21] Severe drought and famine have had horrific consequences in places like Ethiopia and South Sudan. According to the international relief organization OXFAM, 60 million people are facing a food crisis across the Horn of Africa, Southern Africa, Central America, Asia, the Caribbean and the Pacific. There is also a clear link between climate change and political conflict. [22] The conflicts in Yemen and Syria are seen as harbingers of climate wars to come.

Despite the terrible news that keeps coming in from around the globe concerning devastating impacts from climate change, most people still seem to have no conception of seriousness the problem. [23] As described in *The New York Times*, the recently released 2018 report from the IPCC (Intergovernmental Panel on Climate Change) “paints a far more dire picture of the immediate consequences of climate change than previously thought.” The report describes a strong risk of global crisis as early as 2040. When one fully understands the gravity of the situation, all of the issues that framed the recent mid-term political campaigns amounts to rearranging the deck chairs on the *Titanic*. In reviewing the science of climate change, I hope to make it clear to you that I am not exaggerating in using this metaphor.

[24] *The Science of Climate Change*

What is the evidence that the average global temperature is indeed rising, and why is there such a strong scientific consensus that the only explanation is the effect human beings are having on the atmosphere? As early as the 1820s scientists began to understand the importance of gases in regulating the temperature of the earth. As vast as the sky seems from our human earthly perspective, we now know, which images from space make so clear, [25] that the atmosphere is a rather thin blue blanket covering the earth. We know that it took millions of years of the evolution of plankton in the oceans just to produce through photosynthesis the oxygen in the atmosphere that makes possible the diversity of life on earth today. We also know that although they make up a small fraction of the atmosphere, [26] the presence of greenhouse gases—water vapor, carbon dioxide, methane, and nitrous oxide—play a huge role in regulating global temperature. They are called "greenhouse gases" because of the greenhouse effect [27] in which they trap solar energy that would otherwise be reflected back into space. If it were not for the greenhouse gases the earth would be too cold for life as we know it. But too much of the greenhouse gases lead to too much warming, and too much warming leads inevitably to the extinction of life. Life is possible only within a certain temperature range, and the evolution of life on earth today would not have been possible if there were not a relatively stable average global temperature over that time period. [28]

There have, of course, been oscillations in the average global temperature and climate during this period, resulting in the coming and going of ice ages in the geologic record. We also know that these changes in average global temperature and climate correlate with changes in the concentrations of greenhouse gases. How do we know this? Ice core samples. [29]

I remember first learning about this year ago in a National Geographic article. There were nice pictures, of course, of scientists extracting cores of ice very deep in the ice cover over Greenland and Antarctica. The analysis of the ice provided evidence of temperature oscillations over hundreds of thousands of years, and the analysis of the air bubbles in the ice provided evidence of greenhouse gases in the atmosphere over that time. The ice core samples provided dramatic evidence of the greenhouse effect. [30] Average global temperatures rose when the concentrations of greenhouse gases were high, and temperatures fell, and ice ages took place, when the concentrations of gases were low.

We also know that global average temperature has been rising over the last hundred years, dramatically so in recent decades. [31] Ice core samples show a rise in average global temperature after the Industrial Revolution gets going in the 18th and 19th centuries. Since the late 19th century, [32] there has been enough data from instruments on the land and the oceans around the world, and from satellites since 1979, to provide reliable measurements of average global temperature. [33] According to the September 2018 Global Climate Report from the National Oceanic and Atmospheric Administration, “the September 2018 global temperature across the world's land and ocean surfaces was 0.78°C (1.40°F) above the 20th century average.” It may not seem like much, but we are talking about average global temperature. The difference between where we are now, and ice ages is only about 5.0°C (9.0°F) in average global temperature. In addition to these temperature measurements there are other indications of global warming: heat waves are more frequent while cold snaps are generally shorter and milder; snow and ice cover is decreasing in the northern hemisphere with glaciers and ice caps dramatically melting; many plant and animal species are moving to different latitudes or higher altitudes. All these data sets lead to the inescapable conclusion, as summarized in the 2014 IPCC Report, [34] that global warming is indeed happening. Moreover, the temperature record reveals that most of this warming has taken place only in the last 40-50 years. [35] The same report shows a corresponding rise in global sea levels.

How do we know that this recent global warming is due to the greenhouse effect from human emissions of greenhouse gases and not the result of natural cycles? We have to go back to 1896 [36] when a Swedish scientist named Svante Arrhenius hypothesized that an elevation in "carbonic acid" (now referred to as carbon dioxide) would lead to global warming. Decades of observation has confirmed this hypothesis. Until the 1950s it was thought that the oceans could absorb any excess CO₂, but an important scientific paper in 1957 hypothesized that the oceans could not absorb

all the CO₂ being emitted into the atmosphere from the burning of fossil fuels. To test this hypothesis, a scientist named Charles Keeling began collecting air samples and measuring CO₂ levels from the atmospheric observatory on Mauna Loa. [37] The records show a rapid rise in CO₂ levels since the 1950s. [38] The "Keeling curve" is a famous graph that shows this rise in atmospheric CO₂ levels. Keeling's work showed the first significant evidence of CO₂ levels, and the "Keeling curve" has been credited with bringing the world's attention to the problem of CO₂ emissions from the burning of fossil fuels. In bringing attention to this problem, Keeling's work at the Mauna Loa observatory has been hailed as one of the most significant scientific works of the 20th century.

When combined with the record of CO₂ levels and average global temperatures from the ice core samples, the Keeling measurements are absolutely frightening. [39] What they show is that the rising CO₂ levels today are way off-scale from the oscillation of CO₂ levels over the past 800,000 years that include the coming and going of ice ages. Al Gore dramatically presented this in the 2006 film *An Inconvenient Truth*, but the deniers lampooned his efforts and laughed it off. It is no laughing matter though. I remember being absolutely stunned when I first saw that graph in that National Geographic article long ago. It was explained in that article that there is a lag time between rising CO₂ levels and the corresponding rise in average global temperature. It takes a little while for the increase in CO₂ to have an effect. The rise in average global temperatures today is the result of the emissions of CO₂ some years back, and the consequences of the CO₂ level today will not be felt for some years to come. So, if one only looks at the graph, sees how far off-scale current CO₂ levels are today, [40] and understands how an increase in average global temperature inevitably follows rising CO₂ levels, one should definitely not be laughing.

How can one be so sure that the rising CO₂ levels are due to the burning of fossil fuels and not to natural causes? CO₂ is produced and consumed in many natural processes, and the records show that CO₂ levels have varied considerably over the last 800,000 years leading to dramatic changes in climate over that time period. [41] It is the stark difference, however, the so off-scale levels of CO₂ today from what levels were during that entire 800,000 year period that indicates that what we are seeing today cannot be the result of natural fluctuations. [42] CO₂ levels began rising steadily after the industrial revolution in the 18th, 19th, and early 20th century, but as the Keeling curve shows, the rise has been accelerating dramatically since the 1950s. In an important paper in 2007, noted climate scientist James Hansen posited that in order to avoid a tipping point after which climate change becomes irreversible, a safe upper limit of 350 ppm of CO₂ must not be crossed. Shortly after Hansen's paper was published, noted environmentalist Bill McKibben founded the organization 350.org to raise awareness about the problem of climate change and pressure world leaders to take action. Unfortunately, we passed 350 ppm several years ago, [43] and earlier this year reached 411 ppm. Every year in the last decade has been the hottest year on

record, and the consequences of the increase in temperature are evident everywhere across the globe.

Still there are obstinate climate change deniers who insist that global warming isn't even happening, or that if it is it can be explained as the result of natural causes and not human activity. [44] Prominent climate change deniers like Senator James Inhofe, who is now Chairman of the Senate Environment Committee, like to make fun of the idea of global warming during the middle of a particularly cold winter blizzard. One of the great misunderstandings about global warming is that when the average global temperature is rising, some places can experience colder than usual temperatures during the winter. Climate instability due to global warming can lead to changes in atmospheric circulation. [45] In recent winters, the weakening of the Polar Vortex that usually keeps cold air at the poles, has allowed frigid temperatures to escape the Arctic and move South, leading to unusual snowstorms in places that have previously rarely seen snow. Scientists are confident that the destabilization of the Polar Vortex is just another symptom of the rise in average global temperature.

Others accept that maybe the planet is heating up but raise doubts about the causes. Maybe it is due to changes in solar activity, or slight changes in earth's orbit around the Sun, or the tilt of the earth in its orbit. Surely these changes must be greater than any effect human beings can have. These objections proceed from a fundamental misunderstanding about science. Scientists come to tentative conclusions about cause and effect based on multiple lines of evidence and doing their best to examine all other possible explanations. The reason why there is such a strong consensus among climate scientists that climate change is happening and is due to human causes is that they have ruled out other explanations. [46] Satellite measurements of solar activity since the late 70s show no significant activity that could explain the recent dramatic rise in average global temperature. Scientists have also used climate models to test what temperature changes would occur if humans were not influencing the climate and only natural factors such as the Sun, volcanoes, or ocean cycles were taken into account, and what the models show is that only slight warming, and perhaps even cooling of the earth would be the result. [47] The 2014 IPCC report states: "Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history." [48] As a result of a worldwide effort of scientists studying the problem, there is a 97% consensus that most of the global warming in the last 50-60 years can be attributed to emissions from the burning of fossil fuels and other human activities.

Just to put this in perspective ask what would happen if 97% of structural engineers came to the conclusion that a bridge was about to collapse. If there were that high a consensus the bridge would be closed and you wouldn't even be permitted to drive over it. Unless, of course, the government were taken over by the same folks who paid off the 3% to falsify documents in order to say the bridge was safe. Well that is exactly the situation with regard to our government and the

problem of climate change today. [49] There is ample evidence that it is the fossil fuel corporations that have funded the 3% of scientists who deny climate change, as well as the politicians and news media propagandists who perpetuate the myth that the problem of climate change is a hoax. Despite all the evidence that climate change is happening and is caused by human activity, so many Americans are still in denial and eager to drive over that bridge. If 97% of structural engineers warned that a bridge was about to collapse, would you want to drive over that bridge? [50]

[51] Let's return to the conclusion stated in the 2014 IPCC report: "Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems." What this means is that the impacts we are already seeing are going to get much, much worse in the years to come. As you can see in this image from the IPCC report, average surface temperature is projected to rise significantly around the globe throughout this century. All the impacts from climate change that we are seeing now will just get much worse in the years to come.

The greatest danger, however, would come if climate change passes a 'tipping point' and initiates positive feedbacks that lead to runaway climate change. Positive feedbacks in terms of climate change are not at all 'positive' in a good sense. A positive feedback is a process in which there is a self-reinforcing loop that magnifies and accelerates change. [52] For example, as the oceans warm they will give off more water vapor, a greenhouse gas, and this leads to more warming, which leads to even more water vapor, and then more warming. It is estimated that a rise in average global temperature of 1°C (1.8°F) would lead to 7% more water vapor being released into the atmosphere from the oceans. This is why the flooding we experienced here as a result of Hurricane Lane is just the tip of the iceberg. When the process from these feedback loops start accelerating past the tipping point, then even if we completely stopped emitting greenhouse gases into the atmosphere, the process will be unstoppable. This is when we will experience out of control nonlinear abrupt climate change.

[53] This is why the nations of the world pledged in the Paris climate accord to do their best to hold average global temperature well below 2°C (3.6°F) above pre-industrial levels, and to pursue efforts to limit the temperature increase even further to 1.5°C (2.7°F). Once we are past the tipping point, then there is no stopping the rise of global warming to 3°C, and then 4°C, 5°C, and 6°C.

[54] There is a really fine book on climate change titled *Six Degrees: Our Future on a Hotter Planet*, which lays out what could be expected with a rise in average global warming from one to six degrees. If we get to six degrees, then it is all over for life on Earth, at least for millions of years to come. It is now thought that the great Permian Mass Extinction some 250 million years ago when 96% of all life became extinct was triggered by a rise in average global temperature of 6°C. [55] The cause of the warming then were massive volcanic eruptions in present day Siberia.

Scientists think that temperature rise took thousands of years, while many fear that we may already be dangerously close to the tipping point.

If one understands this, then one should grasp the importance of the Paris climate accord, [56] the world's first comprehensive climate agreement. Unfortunately, recent scientific papers report that there is about only a 5% chance of limiting warming to 2°C and only one chance in a hundred of keeping to the 1.5°C goal of the Paris accord. Considering that the effect of the accumulation of greenhouse gases in the atmosphere today won't be felt for some years to come, recent research has shown that we may already be locked into 1.5°C warming even if we somehow managed to cease all greenhouse emissions today.

This is why the just released 2018 IPCC report is so alarming. [57] It states with “high confidence” that “Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate.” One also has to take into account that these IPCC reports are likely conservative in their conclusions. This is understandable considering the vastness of the project that goes into producing these reports. The 2018 IPCC Report, citing again from that recent article in the *New York Times*, “was written and edited by 91 scientists from 40 countries who analyzed more than 6,000 scientific studies.” It takes time to produce such a report, and due to the rapidly developing problem, by the time it is released it is in some respects already outdated. The reports have also been criticized for not adequately taking into consideration the positive feedback loops.

This is why what is happening today in the Arctic region is so frightening. [58] This image is really shocking. It does not show global temperature, but rather global temperature anomalies, that is to say, the temperature differences above normal. As you can see it is the Arctic region that is heating up most dramatically, with Arctic air temperatures warming at double the rate of global temperature increase. [59] Last winter in February temperatures in the Arctic rose above freezing even though the Sun had set in October. This has led many scientists to reconsider the worst-case scenarios. Why is the Arctic heating up at such an alarming rate? On the one hand, large weather systems carry more energy into both poles. The breakdown of the Polar Vortex, for example, not only allows cold Arctic air to move to lower latitudes, it allows warm air into the Arctic. This is another positive feedback loop. As the global temperature heats up, this increased temperature disrupts the Polar Vortex, and this results in the Arctic heating up faster, which leads to further destabilization of the Vortex. As Arctic temperatures rise the polar ice cap melts, and this initiates another positive feedback loop. [60] This is the result of what is known as the "albedo effect." As the Arctic ice melts exposing the dark ocean waters, more sunlight is absorbed into the ocean instead of being reflected back into space. This in turn leads to more ocean warming, which then leads to more melting, and then to more warming.

[61] A number of scientists think that an ice-free Arctic ocean may be a tipping point. One of these, Peter Wadhams, professor emeritus of Ocean Physics at the University of Cambridge, is considered one of the foremost experts on sea ice, and his recent book *A Farewell to Ice: A Report from the Arctic* sounds the alarm about the retreating Arctic ice. The ice is melting much faster than previously was thought. The 2007 IPCC report projected that there would be an ice-free Arctic by the end of this century. Now it seems we are likely to see an ice-free Arctic in the very near future.

Now the reason why an ice-free Arctic is so alarming is because of another positive feedback loop, [62] and that is the release of methane from the seas and soils in the permafrost regions of the Arctic. Methane is a powerful greenhouse gas and it turns out there is an enormous amount of it in the Arctic. It is now thought that the cause of the Permian Mass Extinction was the release of methane due to global warming from those massive volcanic eruptions at that time. A team of Russian scientists has drawn particular attention to the [63] East Siberian Arctic shelf where they estimate that there is not less than 1,400 gigatonnes (Gt) of carbon locked up as methane and methane hydrates. To get some perspective on that amount, it is estimated that the total amount of carbon emitted into the atmosphere through human activity since the dawn of the Industrial Revolution is only about 226 Gt. The shelf is not in the deep ocean, but in relatively shallow waters, and in a 2008 paper they concluded that a release of up to 50 Gt of methane is "highly possible for abrupt release at any time."

A number of reports have suggested that methane release from the Arctic regions may already have become exponential. It is this that has led some to think that we are already past the tipping point and thus we will soon be experiencing nonlinear abrupt climate change. The most prominent of these voices is Guy McPherson, emeritus professor of natural resources, ecology, and evolutionary biology at the University of Arizona. He is quite convinced we are already past the tipping point. He has gained considerable notoriety for claiming that we are headed for [64] "near term extinction" perhaps as soon as 2030. He thinks that as a result of the methane release, we will be well past the 2°C in a few short years. He thinks this will lead to ecosystem collapse, and then we simply won't be able to grow food.

Let me say I sure do hope he is wrong about this; but even if he is wrong about near-term extinction, it seems we are inevitably going to go down like the [65] *Titanic* unless we can change course. How can we avoid this catastrophe? The conclusion of the 2018 IPCC report put it much more forcefully than previous reports in stating that meeting the Paris accord goal of holding global warming to 1.5°C "would require rapid, far-reaching and unprecedented changes in all aspects of society." I think it is necessary, in order to begin to understand the changes that must take place if we are to avoid this catastrophe, to go beyond merely considering the science of climate change and consider, also, the philosophy of climate change. What are the underlying conceptions about

our relationship to the Earth that have shaped our modern civilization and set in on this course toward catastrophe?

[66] *The Philosophy of Climate Change*

A little over fifty years ago, in December of 1966, the historian Lynn White Jr. presented a paper titled “The Historical Roots of Our Ecologic Crisis” at a scientific conference that engendered considerable controversy, to put it lightly. [67] The paper, published the following spring in the journal *Science*, became an instant classic and required reading in a wide range of university environmental courses. We review it at the beginning of my *Environmental Ethics* course that I frequently teach.

White begins by noting some of the ways in which human beings have radically altered the environment leading to the present ecological crisis. Contrary to what many have thought, he argues that this began much earlier than what resulted from the Scientific and Industrial Revolutions in the 17th and 18th centuries. He notes that London already had a smog problem in 1285 from burning soft coal, and then presciently observes that “our present combustion of fossil fuels threatens to change the chemistry of the globe’s atmosphere as a whole, with consequences we are only beginning to guess.” He goes on to sardonically observe that “no creature other than man has managed to foul its nest in such short order.” White did not think that more science and technology were going to save us. He thought it was necessary to first examine “the presuppositions that underlie modern technology and science.” Part of what was shocking to many of the scientists in the audience at that conference was his suggestion that modern science and technology had deep roots in a religious worldview. “Human ecology,” he noted, “is deeply conditioned by beliefs about our nature and destiny—that is by religion.” The most controversial aspect of his paper was his assertion that “Christianity bears a huge burden of guilt” for the ecological crisis we face today.

His main point was that Christianity deeply shaped the worldview of Western culture in radically separating human beings from the natural world. Since human beings were made in God’s image, and the Christian image of God was of a wholly transcendent being, separate from nature, then human beings were not part of nature. In the traditional Christian worldview, only human beings have a soul, and all other living things were created by God to serve human beings. In the traditional Christian reading of *Genesis*, it is God’s will that man exploit nature for his own ends. White describes the Christian overturning of the paganism as “the greatest psychic revolution in the history of our culture.” Whereas in pagan animism it was necessary to placate the guardian spirits before “one cut a tree, mined a mountain, or dammed a brook,” Christianity made it possible, in destroying pagan animism, “to exploit nature in a mood of indifference to the feelings of natural

objects.” Perhaps the main point of agreement among contemporary environmental philosophers, is that the source of the ecological crisis is the [68] anthropocentric worldview that conceives human beings as the center and sole purpose of creation. White emphasized that “[e]specially in its Western form [in contrast to the Greek orthodox view], Christianity is the most anthropocentric religion the world has seen.” Some have begun to refer to the whole epoch of our modern civilization at the *Anthropocene*. [69] As explained here, the Anthropocene defines Earth's most recent geologic time period as being human-influenced, or anthropogenic, based on overwhelming global evidence that atmospheric, geologic, hydrologic, biospheric and other earth system processes are now altered by humans.

I am not at all sure to what extent White was aware of it, but his critique of Christianity was anticipated in many respects by the philosopher Friedrich Nietzsche at the end of the 19th century. Throughout his writings Nietzsche was critical of the anthropocentrism and the sharp separation between human beings and nature in the Western tradition. [70] In an essay from the early 1870s, Nietzsche makes fun of the arrogance of anthropocentrism: “if we could communicate with the gnat, we would learn that he likewise flies through the air with the same solemnity, that he feels the flying center of the universe within himself.” At the end of his career, in 1888, he asserts that the “human being is by no means the crown of creation: every creature is, alongside the human, at a similar level of perfection.” He was also critical of the dualism that separates the soul from the body, and thus human beings from nature. He thought this separation led to a profound misunderstanding of both human beings and the natural world. [71] He challenged this view, suggesting that human beings are part of nature, and that the soul is rooted in the body in the same way that a tree must be rooted in the earth in order for its branches to reach into the heights.

His main critique, however, was that in focusing on the goal of obtaining eternal life in another world, Christianity devalued this world. The longing for another world, Nietzsche thought, was a symptom of a sickness within human beings. Nietzsche’s thought has drawn some comparisons with Buddhism since he understood this sickness to be the result of the problem of suffering. Because life upon the Earth involves suffering and eventual death, Christianity promises liberation from the earthly realm and eternal life in another world. From this perspective the Earth is not our home. Nietzsche warned that this longing for another world set the course of Western culture on a trajectory toward catastrophe. Unless human beings evolved and overcame the longing for another world, the day of the last human on Earth might one day come. The target of Nietzsche’s critique is easily recognized today in those who actually look forward to the end of the world, so convinced they are of their eternal reward to come. [72] Against this view, Nietzsche’s Zarathustra, the fictional protagonist of his philosophical novel, *Thus Spoke Zarathustra*, exhorts his followers to “remain loyal to the Earth!” He goes on to say that “once the sin against God was the greatest sin . . . but now the sin against the Earth is the most dreadful thing.”

One of the main differences with White's thesis was that Nietzsche did not suggest this problem originated with Christianity. Instead he traces it further back to Greek philosophy, to the philosophy of Socrates and Plato. It was Plato who described, through his portrayal of Socrates, that the soul is literally imprisoned in the body, and that the goal of life is to free the soul from the body and its earthly prison. The denial of the body and the earth resulted in a way of living that did not care for either the body or the Earth. This led to carelessness with regard to what we eat, what we do with our wastes, and also with how we deal with sexual desires. Christianity merely inherited this view as it developed in a time dominated by Greek culture and Plato's philosophy. Nietzsche suggested that it may not even have been the philosophy of Jesus at all. In one of his last works, he suggested that the whole of Christianity may have been a misunderstanding, a misinterpretation of his teachings. [73] Perhaps the "Kingdom of Heaven" was not another world at all, but rather a state of the heart, an experience of the heart, a possibility here and now in this world if one is able to follow the example of the life of Christ and become a loving human being. Instead of emphasizing the practice that would follow from the example set by the life of Christ, Christianity became the religion that promised eternal reward in another world in exchange for correct belief. [74] "The very word "Christianity" is a misunderstanding," Nietzsche asserted, "in truth, there was only *one* Christian, and he died on the cross." This misunderstanding changed everything. It led to the persecution of those who did not have 'correct belief' and set the whole trajectory of Western culture down the path toward catastrophe.

Nietzsche is often simply dismissed by Christians as an atheist; but I think this is a gross misunderstanding. If one understands anything of his philosophy, it should be obvious that he warns against the arrogance of thinking that one knows the truth concerning whether a God exists or not. What he does suggest is that we should be cautious about our conceptions of God, for they probably suggest more about ourselves than anything about God. To conceive of a jealous God, so vain that he would condemn peaceful, loving human beings to burn in hell forever because they don't believe in him, is to project upon God the very worst of human characteristics.

As a result of the environmental crisis that was becoming more obvious by the 1970s, a whole field of environmental philosophy, or environmental ethics, developed. [75] One interesting, and somewhat controversial view, called "The Land Ethic," was first put forward by conservationist Aldo Leopold in the 1940s. By the "Land" he meant the whole system involving soils, waters, plants, animals and all living things in that biotic community. Leopold challenged traditional views by proposing a holistic view, maintaining that what counts is the whole biotic community. "A thing is right," he argued, "when it tends to preserve the integrity, beauty, and stability of the biotic community. It is wrong when it tends otherwise." Leopold pointed out that our views about morality have evolved from the time of the ancient Greeks, and that it should further evolve in rejecting anthropocentrism. He contended that "a land ethic changes the role of *Homo sapiens*

from conqueror of the land-community to plain member and citizen of it.” The Land Ethic has been popular among environmentalists and conservationists due to its focus on the health of the biotic community. From this perspective it is justifiable to kill pigs and goats here in the National Park, for example, since they are such a threat to the biotic community, especially to endangered birds and other threatened native species. But the Land Ethic has also been criticized for its implications when one recognizes that it is human beings that have been the greatest threat to the health of the whole ecosystem. The philosopher J. Baird Callicott, whom I met in the late 80s when he was a visiting professor at Manoa when I was a graduate student, has defended and developed Leopold’s view by arguing that respect for human rights must be assumed in the Land Ethic.

[76] An environmental movement called “Deep Ecology” was initiated in the early 1970s by Norwegian philosopher Arne Naess. He was critical of what he deemed “Shallow Ecology” which focused on merely superficial changes without really addressing the underlying structures of civilization that have resulted in the ecological crisis. The Deep Ecology movement emphasized there need to be profound changes in basic economic, technological, and ideological structures. The recent IPCC report seems to agree with the Deep Ecology movement in calling for “rapid, far-reaching and unprecedented changes in all aspects of society.”

An example of such a deep or profound change in our civilization has been suggested by the writings of German philosopher Martin Heidegger, who is often included in the Deep Ecology movement as a result of his writings in the 1950s addressing the problem of modern technology. Heidegger suggested the problem was rooted in a way of thinking that goes back to the ancient Greeks, a way of thinking that conceives of all of nature as a mere resource for human use. [77] Looking at a forest and only seeing lumber is an example of the way of thinking Heidegger considered to be the underlying problem. One aspect of Heidegger’s thought that is interesting is that he thought this way of thinking was so deeply entrenched in our civilization that most people cannot even comprehend that there might be another way of thinking. Heidegger thus called for a profound transformation of our very being-in-the-world, or our dwelling upon the Earth.

Some recent environmental philosophers have suggested that we might be able to get a glimpse of a different way of being-in-the-world by examining other cultures and philosophies outside the Western tradition, and Asian traditions of thought have particularly drawn the attention of these philosophers. The Daoist philosophers of ancient China, for example, did not separate human beings from nature. [78] The Daoist view is well illustrated in the painting *Early Spring*, which some have suggested is the most important work of Chinese art. The Daoist philosophers recommended seeing human beings within the vastness of the Earth, and the even vaster cosmos, illustrated here as human beings are such tiny specks in this painting. Daoist philosophy suggests a gentler way of dwelling upon the Earth, limiting desires, and not interfering so much in the natural course of things. The Daoist philosopher Zhuangzi also suggests the importance of having

a long-term perspective, finding the short-term perspective of some human beings pitiful. Our civilization is certainly not designed to last very long. Who would even conceive of a civilization that would dump such vast amounts of toxic wastes into the land, rivers, oceans, and the atmosphere that the Earth would one day become inhospitable to life itself? Who would ever consider creating huge stockpiles of nuclear waste that will remain deadly for hundreds of thousands of years? It seems our modern civilization is designed as if the world was going to end soon and that the Earth is not really our home.

The central teaching of Buddhism emphasizes the interdependence of all things. [79] The contemporary Vietnamese Zen master Thich Nhat Hanh famously expressed this teaching by holding up a blank piece of white paper: “If you are a poet, you will see clearly that there is a cloud floating in this sheet of paper. Without a cloud, there will be no rain, the trees cannot grow, and without trees, we cannot make paper.” One can easily grasp this teaching if one thinks about one’s body and all that contributed to what that body is today: all the food one has eaten and what has produced that food—the plants and other living things, and what produced all those things, the soil and microbes, worms and insects, the rains, rivers, and oceans, all the other human beings, the farmers, the migrant harvesters, the truck drivers, the marketers and grocery store clerks, the cooks and waitresses. . . . If one really thinks about it, your body today is the result of a vast network of interdependence. What is really radical about this Buddhist teaching is that it holds that this is true of all aspects of who we are and not just the body. This teaching stands in such sharp contrast to the view that our identity consists of a soul that is completely independent and separate from the body and the Earth and all other living things.

Returning to Lynn White’s paper, he argued that “[m]ore science and more technology are not going to get us out of the present ecologic crisis until we find a new religion, or rethink our old one.” In this context he noted the sound instinct of the beatniks, whom he describes as the “revolutionaries of our time,” in “their affinity for Zen Buddhism, which conceives of the man-nature relationship as very nearly the mirror image of the Christian view.” [80] Perhaps foremost among these writers is the environmental activist and Pulitzer Prize winning poet and essayist Gary Snyder, considered by some the “poet laureate of Deep Ecology.” My good friend Jason Wirth, a professor of philosophy at Seattle University, author of the acclaimed recent book, *Mountains, Rivers, and the Great Earth: Reading Gary Snyder and Dōgen in an Age of Ecological Crisis*, was here earlier this semester giving a presentation about the relevance of Snyder’s work and Zen in this time of ecological crisis.

Although White noted the sound instinct of the beat writers in their affinity for Zen, he did not think Zen would be influential enough in the United States to make enough of a difference. Perhaps that is still true today. Instead of turning to a different religion, White suggested rethinking the old one, and thus explored the possibility of an alternative Christian view. In doing so, he looked to

the example of Saint Francis of Assisi, [81] the early 13th century founder of the Franciscan order. His views were so radical at the time that White suggested the prime miracle of his life is that he was not burned at the stake. White thought the reason for this and thus the key to understanding him “is his belief in the virtue of humility—not merely for the individual but for man as a species.” The most radical aspect of the teachings and life of Francis is that he tried, as White put it, “to depose man from his monarchy over creation and set up a democracy of all God’s creatures.” Although he was recognized by the Church as a saint only two years after his death, the “Franciscan doctrine of the animal soul” was soon suppressed and excised from Catholic teaching.

It is thus very significant that the current Pope took the name of Francis when he became Bishop of Rome. [82] In an extraordinary document, the 2015 encyclical on the environment and sustainable development, Pope Francis recalls the teachings of Saint Francis, borrowing the title of his letter from Saint Francis’ “Canticle of the Sun” (also translated as “Canticle of the Creatures”), a poem and prayer in which God is praised for the creation of the different creatures and aspects of the Earth. In the title of the encyclical, the Pope refers to the Earth as “our common home” and calls for us to take care of it. The Pope’s encyclical does suggest that Christianity, even a tradition as ossified as the Roman Catholic Church, can evolve over time. It should be noted that the attempt to rethink Christianity, to develop an ecological or Green Christianity, is a broad movement developing across the span of the faith, including Greek Orthodox and Protestant Churches.

Nevertheless, there is still a very powerful force in American Christianity, both Catholic and Protestant, which opposes efforts to meet the challenge posed by climate change. I think it would be fair to say that all the powerful Republican Senators and members of Congress, many of whom are in the front ranks of those who dismiss the science of climate change, consider themselves to be devout Christians. I think it would also be fair to say that almost all of those Americans who identify as Republican take their Christian faith seriously. Many seem to think that the Republican Party is the Christian Party. [83] President Trump, of course, has stated that he thinks climate change is a hoax, and he has pulled the United States out of the Paris accord. Many of his supporters seem to think that it is God’s will that he is the President of the United States. I would like to close here with some brief reflections on the politics of climate change.

The Politics of Climate Change

Given the strong scientific consensus about climate change, and all the terrible news that has been coming in from around the world about the devastating impacts of climate change, how is it that such obstinate climate change deniers hold such power in this country, controlling the Senate and the White House? How in the world did a man like Trump become Captain of the American Ship

of State? Part of the answer is simply that that identification of the Republican Party as the Christian Party. Conservative Christians tend to be the most confident that their faith guarantees their eternal salvation, and thus they are the ones least able to examine their faith. What they don't understand is that when faith is blind, one is more susceptible to placing it in the very opposite of what one thinks one has placed it in. Part of the answer is also Trump's appeal to the fears and prejudices, the very worst instincts, in a wide swath of the American people. But another major part of the problem, and perhaps the most important, is the conservative political ideology that opposes the very idea of government, believing that government is opposed to freedom. This notion has been most evident, of course, in conservative economic theory, and can be traced back to the origins of Capitalism and the ideas of Adam Smith, in his influential text, *The Wealth of Nations*. He argued that government should not interfere at all in the marketplace. He thought an unregulated market would be self-correcting—'the invisible hand' as he put it—and that this free market would lead to greater wealth, and that this wealth would somehow provide more prosperity for all. This is the infamous 'trickle-down' theory. Unfortunately, as this theory was put into practice, it turned out that it was not wealth that trickled down. It has only increased the economic inequities in society. In the last several decades, the deregulation of the marketplace has led the rich to get much richer and the poor to become only poorer.

Conservatives tend to think that the cherished American freedom is simply the freedom to become as wealthy as possible. The problem is that this drive for more economic growth, more and more wealth, turns out to be one of the main contributing factors to the current ecological crisis. The Pope's encyclical also strongly criticized the global economic inequities and drew attention to the connection with the problems of environmental degradation and climate change. [84] He may have put his finger precisely on the main problem when he stated: "When nature is viewed solely as a source of profit and gain, this has serious consequences for society." It is no wonder that Trump and the top Republicans deny climate change. They are the ones who most view nature as solely a source of profit and gain, and they have profited enormously from the exploitation of the natural world. They are among the wealthiest Americans and want no restrictions on their ravenous appetites. There is a serious question today whether Capitalism, an economic system primarily designed to produce wealth for the few and based on the assumption that success must be measured by perpetual economic growth, can ever really be compatible with a sustainable civilization. [85] Naomi Klein's recent book, *This Changes Everything: Capitalism vs. The Climate*, takes up this question. For many Americans, it doesn't matter that Paradise burnt to the ground as a consequence of climate change; they will still support Trump as long as the stock market is doing well.

There is a long tradition of American thought, going back to the founding fathers and the political philosophies of that time, which understood that there is a positive role for government

in protecting not merely private interests, but also the public good, and that sometimes the interest of the public good should override merely private interests. Environmental protection regulations are a good example of this. Trump is doing his best to destroy this role of government. He would like to eliminate the Environmental Protection Agency. He has conned enough Americans into thinking this will make America great that he now steers the Ship of State. It does not make America great, however, to steer directly into the iceberg of climate change.

[86] Martin Schönfeld, one of the leading philosophers focusing on the problem of climate change today, whom I met last spring at a conference in England, has drawn attention to the heavy responsibility America bears for the crisis. He notes that the American way of life was once “considered to be the high point of human development.” Unfortunately, he points out that “now it turns out that this lifestyle is what unleashed the climate crisis in the first place.” It turns out that we have “the fattest *per capita* carbon footprint of any country on the planet.” He goes on to point out: “There is no other society worldwide with such excessive consumption, waste, and greed for energy. Although the US American population constitutes less than five percent of the world population, it has produced more than a third of the cumulative greenhouse gas emissions of our species.” In a stinging indictment of our society Schönfeld concludes: “Anthropogenic climate change is really *Amerigenic* climate change.”

Denying climate change and ignoring America’s responsibility for this global crisis, Trump has pulled America out of the Paris climate accord because he thinks it is not a good deal. It is not a good deal for him and his friends who view nature only as a resource for profit and gain. Trump has never served the public good in his whole life. He was born wealthy and has spent his life using every resource, perfecting the art of the con, in order to maximize his own wealth. He attempts to run the country as if it were his own private business. It should be obvious to anyone who understands the problem of climate change and knows anything about Trump’s career, that he is perhaps the very worst possible person to be President, especially in this time of unparalleled global crisis, and yet he is the Captain of this ship and is steering it directly toward the iceberg.

[87] It was Plato who introduced the metaphor of the ‘Ship of State’ for government. He was very critical of the idea of democracy, contending that it would end up as a drunken pleasure cruise. That’s what the *Titanic* probably was for its wealthy first-class passengers. In its separation of first, second, and third-class passengers, the *Titanic* was a perfect representation of the economic inequities of that time. Of course, the majority of those who perished in that disaster were either crew members or third-class passengers, many trapped in the lower decks by barriers to keep them in their place. Unfortunately, it is the poorest people in the world are most suffering from the consequences of climate change, starving of famine in the drought ravaged regions. But in contrast to the *Titanic*, there are no lifeboats to save anyone from the catastrophe of climate change. Eventually, if we do not dramatically change course today, we will all go down with the ship. One

of my favorite philosophers, [88] John Lennon, perhaps summed up today's problem quite well when he said: "Our society is run by insane people for insane objectives. I think we're being run by maniacs for maniacal ends."

It should be clear that if we are going to avoid the global catastrophe that is impending as a result of climate change, it is going to take the greatest collective effort in the history of humankind. I think this is what is implied in the recent IPCC report when it calls for "rapid, far-reaching and unprecedented changes in all aspects of society." The report goes on to say that this would require transforming the world economy at a speed and scale that has "no documented historic precedent." The article in the *New York Times* quotes Myles Allen, an Oxford University climate scientist and an author of the report, who said: "It's telling us we need to reverse emissions trends and turn the world economy on a dime." The report also finds that these "rapid and far-reaching changes" would also involve "land, energy, industry, buildings, transport, and cities."

I think meeting this challenge would also involve a profound philosophical reorientation of our relationship to the Earth. We need to fully embrace the Earth as our common home, and thus stop thinking of nature as merely a resource for satisfying short term interests and selfish desires. Perhaps Hawaiian culture also suggests a different way of dwelling upon the Earth. [89] This is why I think the *Hōkūle'a* is such an important symbol today, and not just for the Hawaiian people. Perhaps we do have something important we can learn from Hawaiian culture, in the kinship relationship between human beings and the Earth and all living things that is suggested in the *Kumulipo*, in the notion of *Aloha 'Āina*, and in the message of *Mālama Honua* that was carried around the world by the *Hōkūle'a*. We really need, as Nainoa Thompson suggested, "a sustainable sail plan."