



Missouri Catholic Conference

The Messenger

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Setting the Record Straight on Global Warming and Climate Change: A Personal Story

By Jack Fishman

Despite what you might hear on talk radio, I am here to tell you that there is universal acceptance among the scientific community that global warming is real and that humans cause it by burning fossil fuels. Most of my professional career has been as a NASA scientist specializing in the measurement of air pollution from satellites. Shortly after I accepted my appointment as a professor at Saint Louis University (SLU) in 2011, I was asked to teach a course on Climate Change.

By training, I am an atmospheric chemist, having received my PhD in Meteorology from SLU in 1977, subsequently working for 31 years at NASA Langley Research Center. As part of my preparation for the course I was asked to teach, I have learned what “climate skeptics” are saying and am concerned about how the public is being deceived into thinking that there is a scientific “debate” as to whether or not Global Warming is real. It reminds me of the early part of my career when the public was similarly deceived about the cause of the depletion of the ozone layer.

In 1974, the journal *Nature* published a study that hypothesized that chemicals used as refrigerants and propellants in aerosol spray cans (called

chlorofluorocarbons, or “cfc’s”) would eventually drift to the stratosphere where they could destroy the ozone layer. The paper proposed that the cfc’s remained inert in the atmosphere until they drifted up 20 miles, above the protective ozone layer, where certain chemical reactions could then take place that would eventually destroy the ozone layer itself (a process that takes decades). Consequently, more harmful ultraviolet radiation would reach the earth’s surface causing substantial harm to humans in the form of increased skin cancer and cataracts.

A decade after the 1974 study, a “hole” in the ozone layer was discovered by balloon measurements from the South Pole. At that time, I was in the Atmospheric Sciences Division at NASA Langley and we had several satellite instruments under construction to further study the ozone hole. These state-of-the-art satellites would make measurements to provide the scientific community the data needed to understand the reason for the ozone hole. As these satellites were being built, some local citizens questioned why NASA was “wasting the public’s money” to study the ozone hole.

Our Public Affairs Office approached me so they

could provide answers to the doubting public. The office said callers were referring to a popular talk-radio show, which was quoting from a book entitled, “*The Holes in the Ozone Scare: The Scientific Evidence That the Sky Isn’t Falling.*” They gave me a copy of the book to read; it provided a lot of convincing factoids that the ozone hole was a natural phenomenon and that the theories behind its explanation were inconsistent with scientific facts. The book belittled the idea that chlorine from cfc’s was responsible for ozone destruction. A table in the book showed that the amount of salt in the ocean released to the atmosphere (mostly as small sodium chloride particles) was a much larger source than the amount of chlorine reaching the stratosphere from cfc’s. What the authors did not say, however, is that salt is soluble in water. Thus, any time it rains, the small granules of sea salt in the atmosphere that contain chlorine are removed and none of the chlorine from this admittedly very large source ever reaches the stratosphere to play a role in ozone destruction.

Part of the public’s early confusion concerning the effect of cfc’s on the ozone was caused by skeptics who selectively cited earlier research and failed to mention newer scientific developments. Once

the ozone hole was discovered, there were several scientifically peer-reviewed papers that theorized viable explanations. Reputable scientists conducted these studies and they provided alternative explanations that were worthy of publication after going through the peer review process. Over the course of time, however, as new measurements became available (many by the instruments built at NASA Langley), these theories fell by the wayside and the cfc explanation was validated. Thus, the cause of the ozone hole has been found, and the world has banded together to find a solution through the use of alternative refrigerants and propellants that do not deplete the ozone layer.

Today, global warming and human-induced climate change are held in doubt in much the same way as the ozone hole was several decades ago; only now the stakes are much higher and the debate much more politicized. A defining point for this debate was when Dr. James Hansen, then Director of NASA's Goddard Institute for Space Studies, testified before Congress in 1988 that global warming was already here and that its cause was the burning of fossil fuel. Hansen predicted that the warmest years in the 20th century would take place in the 1990s. Analysis of temperature measurements, dating back to the 19th century, confirm Hansen's testimony, only to see the first decade of the 21st century warmer than any decade in the 20th century .

When Hansen delivered his testimony, the scientific community did not accept what he said *carte blanche*. Considering the complexity of climate, very few scientists were about to make a statement as bold as Hansen's, especially in front of Congress. Furthermore, several years before Hansen's testimony, the United Nations formed the Intergovernmental Panel on Climate Change (IPCC) to assess the state of climate science as thoroughly and as objectively as possible and to release its findings as an assessment report. The first one was issued in 1990. The fifth report, published in 2013, concluded:

"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentration of greenhouse gases have increased."

The IPCC is an ongoing project that involves hundreds of scientists from around the globe. The IPCC considers only peer-reviewed scientific papers, which are thoroughly cross-checked. As with the ozone controversy, however, there are skeptics. Shortly after the release of the IPCC's 5th Assessment report in 2013, a report, written by the Nongovernmental International Panel on Climate Change (NIPCC), entitled "Climate Change Reconsidered II," provided alternative expla-

nations for observed global warming and highlighted shortcomings of the IPCC report. This document, produced by several dozen scientists, did not go through extensive peer review (or any peer review of which I am aware). It was published by The Heartland Institute, a well-known conservative think tank, but not an organization recognized for peer-reviewed scientific research. The document is clearly written and believable, just like the book about the Ozone Hole that I referenced earlier, but it misleads the public.

Even skeptical scientists are coming round to the conclusion that the UN's IPCC climate assessments are accurate. Dr. Richard Muller, a highly respected physicist at the University of California in Berkeley, initially disputed the IPCC assessments, but in 2012 he concluded: "Three years ago I identified problems in previous climate studies that, in my mind, threw doubt on the very existence of global warming. Last year, following an intensive research effort involving a dozen scientists, I concluded that global warming was real and that the prior estimates of the rate of warming were correct. I'm now going a step further: Humans are almost entirely the cause."

Some recent research suggests that global warming has at least slowed down since 2000, but the reason for the "warming hiatus" is an active research topic within the climate-science community. What is not in dispute and remains the scientific consensus is that global warming has been occurring and much of it has been and is caused by greenhouse gas emissions. Pope Francis' new encyclical is calling all of us to embrace a much greater moral responsibility to care for God's creation.

Recently, Joseph Bast, president of The Heartland Institute, was quoted in the New York Times as follows: "The Holy Father is being misled by 'experts' at the United Nations who have proven unworthy of his trust. Though Pope Francis' heart is surely in the right place, he would do his flock and the world a disservice by putting his moral authority behind the United Nations' unscientific agenda on the climate."

I completely disagree with Mr. Bast's comments. Pope Francis has based his encyclical on the best scientific information available, even if it is not perfect. But it is the consensus of the foremost climate scientists in the world. I urge you to listen to what the Pope says and to take statements like those made by Mr. Bast with a very large grain of sea salt, a natural component of the planet that has absolutely no impact on the ozone layer!

Jack Fishman is a professor and director of the Center for Environmental Studies at Saint Louis University. His research focuses on global pollution and ozone depletion.

3.2

The sea level has risen an average of 3.2 mm per year, due in part to the vast amount of ice melt world-wide.

10

The 10 warmest years in the 134 year record have all occurred since 2000, with the exception of 1998.

134

In billions, number of metric tons of ice Antarctica has lost per year since 2002.

888

In thousands, number of acres of global forest loss between 2000 and 2012. 309,000 acres has regrown during that time.

*Statistics obtained from the official NASA global climate change website.



A peach hybrid rose grows in the Missouri Botanical Garden.
Photo provided by missouribotanicalgarden.org



A look inside the Climatron at the Missouri Botanical Garden.
Photo provided by missouribotanicalgarden.org

Missouri Botanist Peter H. Raven Signs Climate Change Report

One of the principal signers of the climate change report that provided guidance to Pope Francis as he prepared his new encyclical was Dr. Peter H. Raven, President Emeritus of the Missouri Botanical Garden. For four decades Dr. Raven worked to make the Missouri Botanical Garden a world-class center for botanical research and education. *Time* magazine has called Dr. Raven a “Hero for the Planet.”

The Missouri Botanical Garden, headquartered in St. Louis, is more than a pretty garden; researchers from the Garden work in poorer regions of the world, helping to restore degraded environments so people can live and thrive. For more, visit the Garden’s website at missouribotanicalgarden.org.

Pontifical Academies on Climate Disruptions

Distinguished scientists from around the world are members of Pontifical Academy of Sciences and the Pontifical Academy of Social Sciences which developed the report, “*Climate Change and The Common Good: A Statement of the Problem and The Demand for Transformative Solutions.*” Here is an excerpt from the report:

“This century is on course to witness unprecedented environmental changes. In particular, the projected climate changes or, more appropriately, climate disruptions, when coupled with on-going massive species extinctions and the destruction of ecosystems, will doubtless leave their indelible marks on both humanity and nature. As early as 2100, there will be a non-negligible probability of irreversible and catastrophic climate impacts that may last over thousands of years, raising the existential question of whether civilization as we know it can be extended beyond this century. Only a radical change in our attitude towards Creation and towards our fellow humans, complemented by transformative technological innovations, could reverse the dangerous trends that have already been set into motion inadvertently. A sustainable future based on the continued extraction of coal, oil and gas and their use in the ‘business-as-usual mode’ will not be possible, because it raises the specter of a world that could be significantly warmer than 2°C by the end of this century. Such a temperature rise, occurring in a warm inter-glacial epoch that we call the Holocene, has not been seen in tens of millions of years. This creates a serious risk that Earth will cross critical thresholds and tipping points, pushing whole environmental systems, such as rain forests, continental ice sheets, coastal wetlands, monsoon patterns and marine food webs into different states or even annihilation. To quote the most recent IPCC (Intergovernmental Panel on Climate Change) Synthesis Report released in 2014: We risk ‘increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems.’”

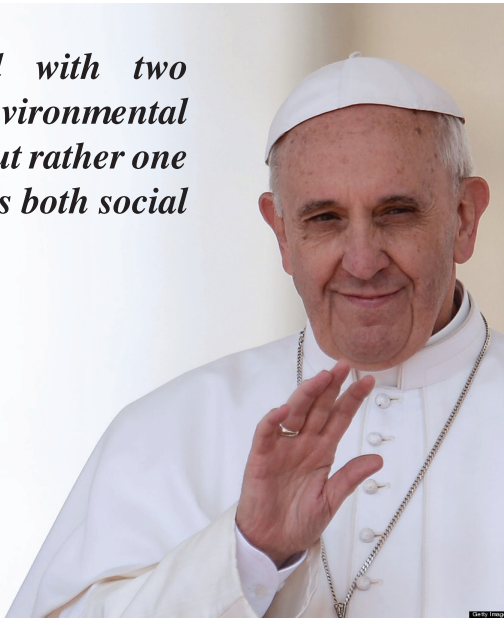
Coming to Terms with Pope Francis' Climate Change Encyclical

By Mike Hoey

In his encyclical *Laudato Si'*, Pope Francis urges us to care for our common home, Earth, and asks a question that every parent and grandparent understands: “What kind of world do we want to leave those who come after us, to children who are now growing up?” Most of us have concerns for our children’s future: will they find work as adults, will they enjoy prosperity and health? But the Holy Father’s concerns about climate change can seem remote, something that may or may not be happening, and that we have no control over.

“We are not faced with two separate crisis, one environmental and the other social, but rather one complex crisis which is both social and environmental.”

-Pope Francis



CRITICS, MEANWHILE, EQUATE THE POPE’S CONCERNS to the talk of starry-eyed environmentalists who drive hybrid cars and live in mist-shrouded cities like San Francisco or Seattle. Who do these people think they are? Have they ever lived through a Missouri summer without air conditioning?

And isn’t the climate always changing? The earth has seen ice ages and warm periods before. Skeptics point to this variability to argue that people are not responsible for climate change. Nearly all scientists, however, agree that over and above the background “noise” of climate variability, human activities are warming the globe and leading to climate disruptions.

Global warming is real and has serious consequences for human life on Earth; this is the scientific consensus. The pope’s advisory committees on science and social science, which consists of some of the most distinguished scientists in the world, warns that the “business-as-usual mode” of extracting and using coal, oil and gas is not sustainable. By the end of this century it could lead to a much warmer world, causing severe damage or even annihilation of rain forests, wetlands, continental ice sheets and other ecosystems that make human life possible on Earth.

Pope Francis is gravely concerned about the 3 billion who live in impoverished conditions: places that are very hot but have no air conditioning, where clean water is scarce and where families depend on subsistence farming. The bottom three billion contribute less than 10 percent to the world’s greenhouse gas emissions. Yet these are the people most affected by global warming and climate disruptions

Some deny this crisis and see no need for action, but not the pope. He understands, however, the temptation to rationalize: “As often occurs in periods of deep crisis which require bold decisions, we are tempted to think that what is happening is not entirely clear. Superficially, apart from a few obvious signs of pollution and deterioration, things do not look that

serious, and the planet could continue as it is for some time.” Indeed, what the Holy Father is calling for – bold action now to protect future generations – is a tough sell.

Leaders, however, must have the courage and foresight to address this unfolding crisis. The pope is urging policies that will drastically reduce the emission of carbon dioxide and other highly polluting gases, offer more investment for alternative and renewable energy sources and provide assistance to poorer nations trying to adapt to the harsh effects of a warmer world.

Some action is underway and the pope commends nations that have cleaned up polluted rivers, restored native woodlands, began producing non-polluting energy and established more efficient public transportation systems. Poorer countries, however, will need assistance if they are to follow this example and create a sustainable future for their citizens. Indeed, no nation by itself can halt global warming and adverse climate change. We are in this together.

New laws and policies, however, are not enough. “The external deserts in the world are growing, because the internal deserts have become so vast. For this reason, the ecological crisis is also a summons to profound interior conversion.” The pope invokes his namesake, St. Francis of Assisi, in calling for simpler lifestyles that will allow us to have “a loving awareness that we are not disconnected from the rest of creatures, but joined in universal communion.”

This kind of paean to simplicity can make Americans uneasy. We have worked hard to make our country a comfortable place to live, is there something wrong with this? No, the pope would say, but there are many modest things we can do, such as rejecting the extreme consumerism, the “whirlwind of needless buying and spending” that is so much a part of American culture. Our throwaway culture leads to so much wasted food and too much piled up rubbish.

By reusing and recycling we can mimic nature and protect God’s creation. And there are spiritual benefits, too: “It is a return to that simplicity which allows us to stop and appreciate the small things, to be grateful for the opportunities which life affords us, to be spiritually detached from what we possess, and not to succumb to sadness for what we lack.”

Though the present crisis is serious, the pope firmly believes that “[h]umanity still has the ability to work together in building our common home.” What do we want to pass on to our children and our children’s children? Is it an accumulation of material goods or is it a Catholic faith that respects God’s creation and extends assistance to the least among us? If the answer is the latter, then the time for action is now.

-Mike Hoey is the executive director of the Missouri Catholic Conference