Institute For Theological Encounter With Science and Technology
Volume 51 - #4 Fall 2020 Bulletin

Climate Change --- Is it Climate Armageddon or Merely an Exaggeration?

By Ralph Olliges, Bulletin Editor and Secretary of ITEST

Pope Francis, in *Laudato Si*, reminds us that we are administrators, not owners, of God's gifts. The Earth was here before us, and it has been given to us. (On a side note, this is the fifth anniversary of *Laudato Si*, Pope Francis' encyclical on environmental matters.) So where do you stand on climate change? Are you an alarmist when it comes to global warming and climate change? Is the widespread public concern merely an exaggeration? Do we, as a society, have a future? Are we facing a climate Armageddon? Is CO_2 the control knob on our temperature dial?

In June 2020, the ITEST Board discussed various topics for the Fall *ITEST Bulletin*. One topic of interest, giving rise to discussion was climate change. Several board members who are teachers stated that it is a hot topic of interest for their students. Thus, as a board, we decided that climate change should be the focus of our Fall bulletin. We needed to find essayists who could explain why CO_2 is a big deal or why it is not such a huge deal. The essayists include Tom Sheahen, Steven Parks, Gordon Fulks, Vijay Jayaraj, and Ross McKitrick. Several of them are physicists, one is an environmental scientist, and one is an economist.

Nobody denies that the globe is warming. That is a fact. The question is ***why*** is the globe warming? Or is it no big deal? The media has created a "groupthink" atmosphere of alarm. They cite a computer model that shows it. Computer models are just that --- models! As you read through the various essays in this *ITEST Bulletin*, look at the models. Generally, models are created as follows: a low-end model, a high-end model, and two models in the middle to try and explain things. Generally, we should rely on the two middle models. However, the media has cited the high-end model. Remember that models do not verify causation; they can only display correlations. Their claims cannot be made to be black and white as the mainstream media and politicians make it out to be. Are we as human beings small players in the Earth's climate or are we major contributors to Earth's decline? I challenge you to read through all of the essays and see if your position on climate change has indeed moved the pendulum.

We hope that you are staying safe during the COVID-19 pandemic. ITEST wishes you the very best!

Ralph Olliges

In This Issue...

Announcements

Coming soon!

Membership renewal notices will be mailed to you in the coming weeks. As an ITEST Member for your $80 annual membership fee ($40 for students), you receive your current benefits of the quarterly *ITEST Bulletin*, monthly newsletters, webinar/conference discounts, and the opportunity to network with colleagues who are attentive to faith/science issues. The first 100 members to renew will receive a free book.

In addition to membership dues, some have also taken advantage of donating monthly to ITEST, and we urge you to consider that opportunity. You can make an additional donation at one of three levels, with special benefits at each level. More details can be found at our Patreon page at www.patreon.com/itest or by emailing Sheila Roth at itest@archstl.org. (Please keep in mind that these donations are in addition to the ITEST Member fee.)

New Bioethics Article

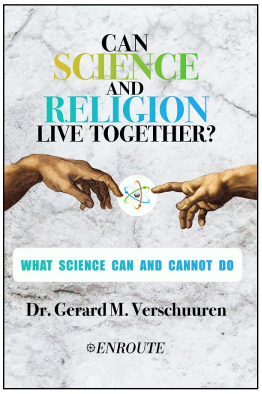
ITEST member Chris Reilly shares a new article he wrote for *The Linacre Quarterly* of the Catholic Medical Association. ***Brain–Machine Interfaces as Commodities: Exchanging Mind for Matter:***

https://faithscience.org/brain-machine-interfaces/

Brain–machine interfaces (BMIs), which enable a two-way flow of signals, information, and directions between human neurons and computerized machines, offer spectacular opportunities for therapeutic and consumer applications, but they also present unique dangers to the safety, privacy, psychological health, and spiritual well-being of their users. The sale of these devices as commodities for profit exacerbates such issues and may subject the user to an unequal exchange with corporations. Catholic healthcare professionals and bioethicists should be especially concerned about the implications for the essential dignity of the persons using the new BMIs.

New Book

"Can Science and Religion Live Together? What Science Can and Cannot Do" by Dr. Gerard M. Verschuuren.



Undoubtedly, science has one of the most impressive track records in human history. It is a success story that keeps persistently adding new achievements to the list, with no end in sight. So it shouldn't come as a surprise that science has given us reason, not only for high hopes, but also for extravagant claims. To find out what those hopes and claims are worth, this book begins with an explanation of what science can indeed do for us and how. Most people don't need to be convinced, though, that the power of science is enormous. Just look around to see the achievements we owe to science: the Big Bang theory, space exploration, the human genome project, antibiotics, vaccines, cancer treatment, and the list goes on and on. We could not live the way we do nowadays without the fruits of science. But this book is also about what science is not able to do for us. I don't mean those things that science is still searching for, but rather those things that science has no access to whatsoever—things such as thoughts, values, beliefs, hopes, dreams, and ideals. Are all of these merely the result of material, molecular interactions? Isn't love more than a chemical reaction, and aren't thoughts more than brain waves? And most of all, what about religion? People who think that science has no limitations whatsoever—it's just a matter of time, in their view—should think a bit longer and a bit deeper. This book will help them to do so and will come up with some startling conclusions. Find this book at https://enroutebooksandmedia.com/scienceandreligion/

Institute for Theological Encounter with Science and Technology
Cardinal Rigali Center • 20 Archbishop May Drive • St. Louis, Missouri 63119 • USA
314.792.7220 • www.faithscience.org • E-mail: ITEST@archstl.org

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More Announcements

Fall Webinar

Have you registered for the ITEST Fall Webinar?

Do You Want to be Genetically Engineered?

This October 10th webinar will be skillfully led by ITEST member, Fr. Kevin FitzGerald, SJ. He will be joined by Richard Doerflinger and Tim Hunt. After an introduction on the topic of genetic manipulation, our presenters will explore what is practical, moral, and ethical on the topic of genetic engineering. There will be ample time for discussion.

For webinar details and registration, go to

https://faithscience.org/genetic-engineering

Did you know?

ITEST members come from many different vocations and professions. There are 22 in administration, 4 authors, 26 Catholic bishops, 3 Catholic deacons, 35 consecrated religious men, 20 consecrated women religious, 11 diocesan priests, 2 economists, 8 engineers, 9 ITEST supporters, 5 lawyers, 11 libraries, 1 Lutheran pastor, 14 in medicine, 5 philosophers, 1 psychologist, 64 scientists, 2 seminarians, 5 students, and 20 theologians. Of these listed professions, more than 63 members are teachers at the high school and college levels.

Do you know others who are interested in the complementarity of faith and science? Tell them about ITEST and send them to our website at www.faithscience.org.

In Memoriam

"He ain't heavy, he's my brother."

Please pray for the repose of the soul of Fr. Valentine (Val) J. Peter, from Omaha, Nebraska. He was a longtime ITEST member, former director of Boys Town and Board Member of the OSV Institute. He was very supportive of ITEST, not only in being our advocate on the Board for *Exploring the World Discovering God*, but also in acquiring large grants earlier in ITEST's search for funding. We are grateful for his friendship and for his priestly vocation. He died and entered eternal life on June 30, 2020.

We also ask your prayers for ITEST members who are ill. May they feel the restoring hand of the Lord.

Old News is New News

Here is a quote from Paul Davies, a physicist who won the "Templeton Prize" a couple of decades ago for his books at the intersection of religion and science. He perceives in God's elegantly designed laws of the universe a much more plausible pathway of creation than either the "randomness" of the atheists or the "precision" of the creationists.

"Physical processes come in two varieties -- lawful and random. Traditionally, scientists assumed that the origin of life was a chemical fluke of stupendous improbability, a quirk of fate unique in the entire cosmos. If so, then we are alone in an otherwise sterile universe, and the existence of life on earth in all its exuberant glory, is just a meaningless accident. On the other hand, a growing number of scientists suspect that life is written into the fundamental laws of the universe, so that it is almost bound to arise wherever earth-like conditions prevail. If they are right -- if life is part of the basic fabric of reality -- then we human beings are living representations of a breathtakingly ingenious cosmic scheme, a set of laws that is able to coax life from nonlife and mind from unthinking matter. How much more impressive is such a magnificent set of physical principles -- which bear all the hallmarks of design -- than the sporadic intervention of a Deity who simply conjures these marvels into existence."

From the Templeton Calendar for the period ending July 1, 2020

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The Great Climate Change Controversy

Summarized by Thomas P. Sheahen

Over three decades have passed since "Global Warming" first came onto the national scene. In the intervening years, the topic has been re-named "Climate Change" and it has moved from a serene scientific discussion at learned meetings to a political hot potato involving pundits, journalists and media types. Both on TV and in ordinary conversations, an opinion begins with "I'm not a scientist, but …" and then proceeds to quote from some other source ... which is most often just another opinion. After spending countless billions on studies worldwide, there has been virtually zero progress toward deciding the issue since 1979. But almost everybody has an opinion now.

Areas of Agreement

There are certain facts about which all sides agree, and you would think the level of agreement would serve as a basis for solid scientific discussion:

1. **The climate is changing.** The climate always changes. It has been doing so for countless millions of years. Absolutely every scientist acknowledges that. There is no such thing as a "climate change denier." That term is merely an epithet intended to demean "climate skeptics" and make them seem like Nazis, because of similarity to the term "Holocaust Denier."

   It bears mentioning that the climate never actually reaches equilibrium; even on a daily basis, the spinning of the planet prevents that.

2. **The globe is warming**. The climate changes on many different time scales, including one with a period of about a thousand years. There was a "Roman Warm Period," a cool period in the dark ages, the "Medieval Warm Period" followed by the "Little Ice Age," and now we are in the "Modern Warm Period." Exactly how big were the changes isn't certain, because the thermometer was only invented around 1700. In the two centuries since around 1820, the globe has already warmed by more than 1°C, and in the century ahead, natural forces alone are expected to cause further warming. Ever since 1979, satellites have enabled very accurate measurements of temperature. Satellites see nearly the entire globe. *Figure 1* is a plot of such satellite data. In 40 years, the global average temperature has gone up by about 0.5°C, in line with one degree per century.

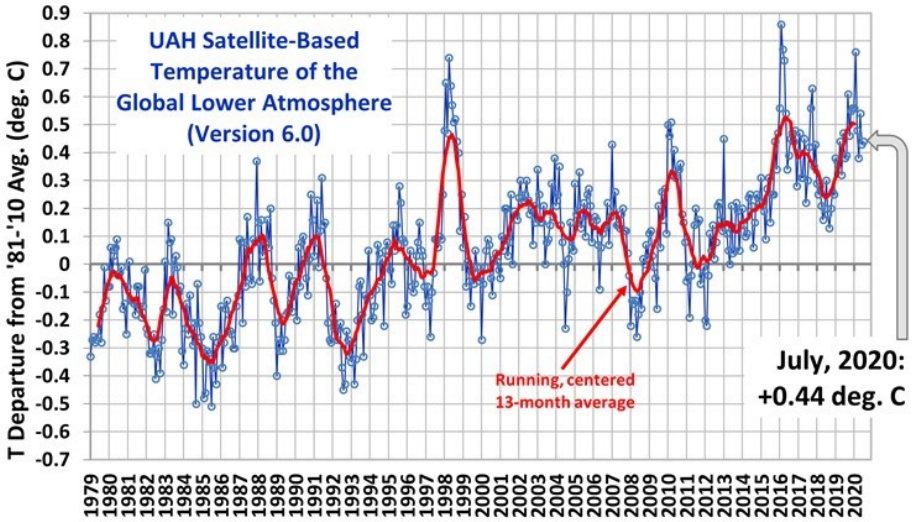

Figure 1: *Increase in Global Average Surface Temperature (GAST) as measured by satellite data, covering the entire time span that satellites have been gathering such data. (From Roy Spencer, University of Alabama.)*

3. **There is a human influence on temperature**. It's called the "Urban Heat Island" effect. You can witness it on nearly any day by driving from the city out into the countryside. The effect varies a lot because of wind and rain, etc., but it's discernable from temperature records in adjacent regions.

4. **The earth is heated** each day by incoming sunlight, and **cooled** at night by outgoing thermal (infrared) radiation. That cooling radiation comes mostly from **Greenhouse Gases (GHGs)** in the atmosphere.

5. **Water (H_2O) is the most important "Greenhouse Gas."** In addition to infrared radiation from the vapor state, H_2O forms clouds which act to reflect away incoming sunlight and delay the escape of outgoing thermal radiation. H_2O is thus responsible for at least 75% of the

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"Greenhouse effect."

6. **Carbon Dioxide is increasing**. CO_2 is a trace gas in the atmosphere, comprising about 0.04% (as contrasted to Nitrogen > 77%, Oxygen > 20%, Argon 1%, and H_2O varying around the 1 ~ 2% range). *Figure 2* is data on CO_2 taken at Mauna Loa, a mountaintop observatory in Hawaii. Measurements of CO_2 began in the 1950s. The increase in atmospheric CO_2 since the start of the Industrial Revolution is estimated to be over 40%.

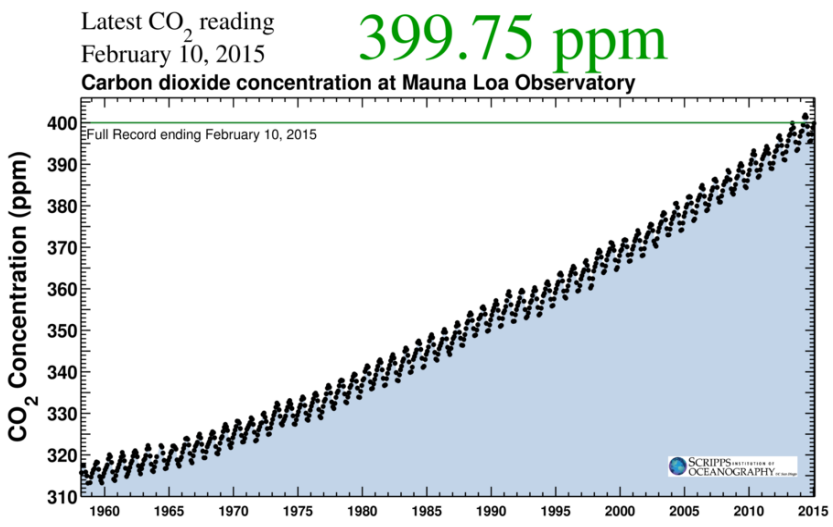

Figure 2 *Atmospheric CO_2 measurements since 1958. The saw-tooth seasonal variation is because there is a higher fraction of land in the Northern Hemisphere, hence more plant life.*

Core of the Disagreement

With all that agreement, we must ask what is causing the controversy? The answer is: Carbon Dioxide. The core of the argument is about the relative importance of CO_2. The scientists known as "climate skeptics" say that a trace gas of 0.04% cannot possibly be the primary determinant of the earth's temperature. Those who are alarmed by the prospect of steadily rising CO_2, attribute the rising temperatures of the recent past to mankind's release of CO_2, and foresee many adverse consequences from further increases in the decades ahead. Very sophisticated computer models of the atmosphere are employed to bolster that assertion.

Organized Studies

The *Intergovernmental Panel on Climate Change* (IPCC) is a UN-body that began in the 1980s. Its charter is to coordinate and direct the search for human influences on climate. (It is noteworthy that natural influences on climate are excluded from their purview.) The supercomputer programs that predict the future climate are under their control. The IPCC enjoys very high prestige, and outside the scientific community, few political officials will oppose their predictions.

Within the IPCC, there is Working Group 1 (WG1), which attends to the science of the climate across the globe. A second body of experts, Working Group 2, accepts the output from WG1 and asks what will be the consequences; and then a third, Working Group 3, begins with that output and inquires what should be done about it. The scientific controversy is entirely within the domain of WG1; the others are policy-related groups. Notice that if WG1 were to dramatically change its conclusions, the function of the other two working groups would likewise change, and the relevant policy measures could be quite different. Clearly, therefore, there are many political bodies worldwide who are heavily invested in having no change occur at WG1, which means no change in the science.

Nevertheless, science does change over time, as more and better data are accumulated. In the case of climate science, there is now a 4-decade record of temperatures all around the earth, measured from satellites put into orbit at the close of the 1970s. None of that data was in hand when the IPCC got underway. That observational temperature record (*Figure 1*) is quite different from the outputs of computer models, and the obvious discrepancy demands re-examination of the underlying theory fed into the computer programs.

Current Situation

Within the broad field of climate science, there are disputes about many important aspects of the oceans, the land, and the atmosphere. Every argument about the future of the climate boils down to an argument about the validity of computer models. In reality, there is an ongoing vigorous scientific debate, involving people from many different countries.

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However, both the media and the general public are not attentive to that, nor skilled enough to examine the details. Hence the default position for most people is "I'm not a scientist, but ..." followed by a choice to follow one camp or the other, made on totally non-scientific grounds. Consequently, the issue has become politicized, with insults and ad hominem attacks taking center stage and pushing scientific discussion aside. From a scientific point of view, that is very regrettable, and greatly impairs the search for an understanding of climate science.

Dr. Thomas P. Sheahen has been Director of the Institute for Theological Encounter with Science and Technology (ITEST) since 2008. He has written frequently on faith-science topics. He is also Chairman of the Science and Environment Policy Project (SEPP). Dr. Sheahen holds B.S. and Ph.D. degrees in physics from the Massachusetts Institute of Technology.

Review of Current Climate Science

Climate Physicist Michael Ghil and his collaborator Valerio Lucarino have written a major paper for the Journal *Reviews of Modern Physics* that describes a large piece of contemporary climate science. That paper is at https://doi.org/10.1103/RevModPhys.92.035002. It's 77 pages (with 52 figures) of pretty dense science, not for the beginner. Subsequently, *Physics* magazine [July 31, 2020 • *Physics* 13, 121] conducted a Q&A interview with Ghil about his writing. Here are some excerpts from his answers.

A huge challenge the research community faces is dealing with uncertainties in future climate projections. Addressing these uncertainties, particularly in the climate's response to human activity, is a really important issue.

… there is a perception that "the science is done when it comes to climate change"; …But the science is very far from done. We're only just getting to the really hard, fundamental questions.

… most people think of climate as something static that anthropogenic factors are just pushing around. But the natural climate constantly fluctuates.

Global warming is accompanied by a reduction in the equator-to-pole temperature difference ... This reduction can increase the number of extreme events, such as the recent polar-vortex-induced cold snaps in the Midwest and Eastern US. But this conjecture is still hotly debated.

The climate system is complex, and there are unsolved problems in understanding how it behaves that merit attention.

Letter to the Editor

One Hurricane, Two Homes By Ed O'Boyle

Even with our present-state scientific and technological achievements, hurricanes, earthquakes, and tornadoes we can predict but not prevent. We still build and rebuild in zones that are prone to these natural disasters hoping they will not repeat. We humans have a short memory which helps us cope and move on.

The hurricane reminded me of a long-deceased friend who loved her native Savannah, GA. I found myself thanking her for sending linemen from a Georgia power company to our street in Monroe, Louisiana. They restored the electricity that supplies us with air conditioning. Not a small thing in the suffocating heat and humidity of Louisiana in August. Like all first responders, the linemen came to relieve our hardship because it's their job.

However, it was not a sense of duty that prompted extended family members and others to come to our rescue helping us deal with Hurricane Laura's devastating damage to our second home in Lake Charles. It was a most fundamental human response conditioned powerfully by their faith in a Redeemer who taught us how to truly love one another. Psychology calls what they did for us empathy. Faith tells us it was Christian charity.

Laura forces us to confront the reality that there are limits to what we as sons and daughters of the Enlightenment can do with our advanced science and technology. Even so, men and women struggle every day to push back the limits that stand between us and perfection. With faith, however, there are no such limits because love is a gift from our Creator who is ever-giving. Wondrously we discover that, unlike everything else among our possessions, the gift of love is never depleted in the giving.

The Case for Pro-Global Warming

By Dr. Steven I. Parks

Most of the scientific community agrees that over the past century the world has gotten warmer. That includes the folks who call themselves "climate skeptics." Three topics are up for grabs: How much, how come, and how will it affect us?

The thermometer was invented in 1714, and it was another 150 years before real "weather stations" were widely deployed. Before then, everything we can say about temperature is inferred by indirect evidence, called "proxies." These can vary from studying the chemistry of sea shells, to the north-south distribution of plant species, to written accounts of rivers freezing over. So when someone says "warmest or wettest in history" … well, "history" is less than two centuries. But we CAN look at that short history and see some trends. And the trends show a distinct rise in temperature measurements, even when we account for the "heat island" effect, where urban growth overtakes weather stations and makes their measurements look hotter.

One big problem talking about global temperature is that the data are "noisy." That is, natural fluctuations occur all the time. On an annual scale, random fluctuations are caused by volcanoes and forest fires and other unknown factors. On a decadal scale, by cycles such as El Niño. On a millennial scale, proxies tell us there was a Roman warm period around the year 100 and another warm period in the middle ages, around 1000 … every thousand years; so maybe part of what we're seeing is just one more warm period.

I maintain that the speed and scale of the current warming is more than "natural fluctuations" can explain. The NOAA graph in *Figure 1* shows estimates of "global average temperature" year by year. There is a sharp upward hook in the past half-century, and that upward change is much more abrupt than any change in the previous century. How much of the hook is natural wiggles, and how much is the human-caused warming we are talking about? Depends on how you draw the trend lines, and you and I may draw them differently. The way my eyes see it, it looks like "anthropogenic" warming so far accounts for about one °F (0.6°C). That hook coincides with the rapid growth of industrial civilization and a big increase in world population and agriculture. It makes sense that such major changes in land use and in the atmosphere will have an effect on things like global temperature.

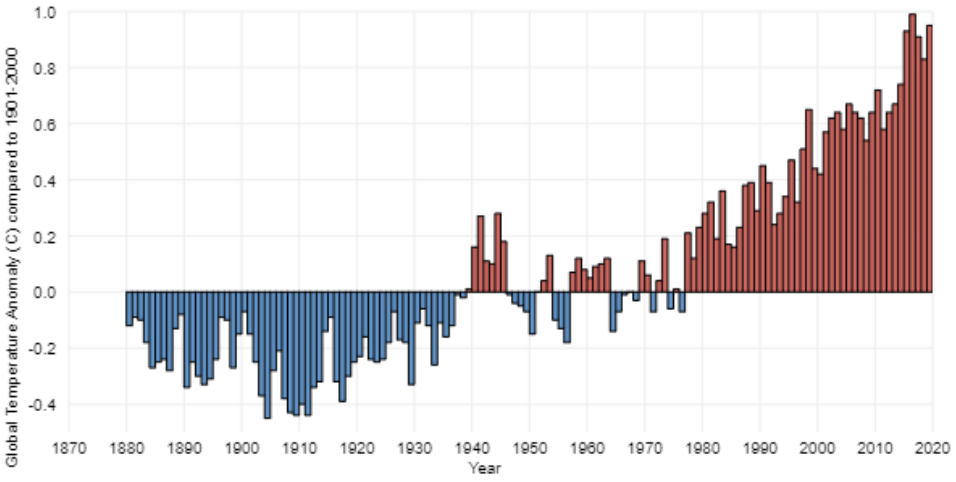

Figure 1: *A graph of the estimated "global average temperature" since widespread observations began. The warming trend in the last 50 years seems much faster than the trend over the past 140 years. (NOAA)*

How come the temperature is rising? The most common explanation is that the atmosphere's carbon dioxide (CO_2) level is rising. Burning forests to clear land, burning fossil fuels to power machinery, and the humus in soil oxidizing due to plowing and harvesting … all contribute to that rise. CO_2 and water vapor are big "greenhouse gases" that reduce the rate that Earth's surface can lose heat into space. H_2O is the biggest; but we don't have a lot of control over that, so the focus is on CO_2. Infrared heat-radiation spectrograms made by orbiting satellites show big swathes of spectrum where heat radiation is limited by those gases, as in *Figure 2*.

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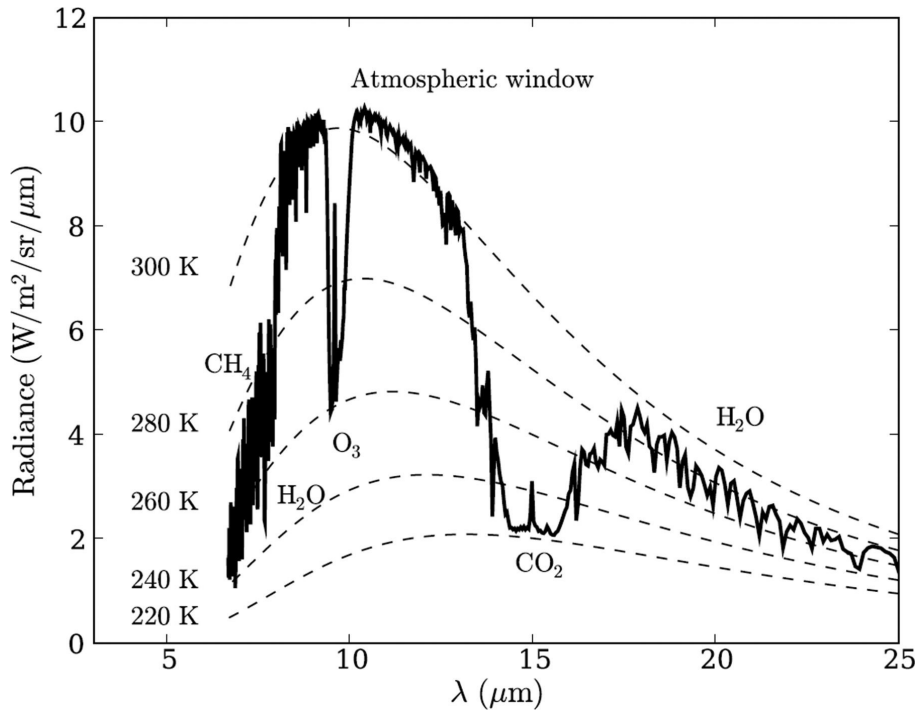

Figure 2: *A spectrogram taken by a satellite in Earth orbit. The upper dotted line shows how much heat energy would have been radiated from a warm surface at 80°F, if the atmosphere were not in the way. Various gases absorb some of the thermal radiation and keep it on Earth. On the left and the far right, water vapor absorbs ("blocks") much of the energy at those wavelengths. Near the peak, stratospheric ozone (O_3) absorbs a good deal, and on the right slope, CO_2 absorbs a big notch of the spectrum. Increasing CO_2 will increase the depth but not the width of that notch. The main hump is an infrared "window" where clear air lets heat radiation pass without interference.*

Scientists have worked very hard to construct computational "models" to predict just how much the global temperature will change as CO_2 changes. The task is quite daunting, especially due to the effect of H_2O in its various forms. Clouds block the sun and make things cooler. Snow and ice reflect sunlight away. But water vapor and clouds also block infrared and make things warmer. The interplay of these effects is the "wild card" in all these models, and largely explains the difference in the forecasts. The models are also run several times, assuming different levels at which human civilization might use fossil fuels. The first models wildly over-estimated the amount of warming. Models are tamer now, but their numbers still vary widely. I favor the more conservative estimates where a doubling of CO_2 yields a 1.5°C (3°F) rise in global average temperature.

How will the rise in temperature affect us? One degree Fahrenheit doesn't sound like a really "big" effect: it is only 1/500 of the temperature measured from absolute zero. But big enough to make a difference to living things.

The models mostly predict that the equatorial zones will be least affected, and the Arctic will warm the most. Glaciers and the polar ice caps have been receding and melting for centuries, but the rates will increase. A 1°F global temperature change might double the rate of glacial melting. Alaska, Greenland, and Sweden will warm a lot more than Hawaii and Florida.

Looking for effects on weather, remember the mantra "Weather is not climate." Just as one cannot say that Uncle Bob's cancer was caused by chain-smoking, you cannot say that this hurricane was caused by climate change. You can only say that smoking, or climate change, made the effect *more probable.* And again, Mother Nature enjoys throwing wiggles into any graph of average annual whatever.

Some of the predicted effects are benign: Very likely, Canada and Siberia will find they can raise more wheat, or maybe even soy beans. Some places get wetter and others get drier. For example, satellites have noticed a definite greening in the southern edge of the Sahara Desert.

Some of the predicted effects are bad. As climate zones shift – you know, those colored bands on the back of a packet of garden seeds – native flora and fauna will have to follow their climate bands northward. Some species will succeed and some will be left behind. Will humans be wise enough to help them move? Your guess is as good as mine.

Higher temperatures will mean more water evaporates from the ocean, and that might drive more energetic storms. Looking over the brief records we have, though, there isn't too much evidence of that. Strong tornadoes may have

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actually decreased, but strong hurricanes may be increasing. Natural fluctuations? Changes in observation and record-keeping? Or a consequence of warming? 2020's hurricane season looks like a doozy. It was made more likely by warmer ocean water.

Some areas, like California, are in the throes of multiyear droughts. Weather or climate? Looking back through history, and prowling through archaeological sites, we see evidence of decades-long droughts right back to Biblical times. Remember Joseph and his Dreamcoat? Models indicate that overall rainfall will not change much, but patterns may change. If your local crop fails or your home floods, you might find that very inconvenient.

Trade winds and weather fronts are driven by temperature differences north-to-south. As the Arctic warms and the equator doesn't, those differences decrease. Warm and cold fronts may move more slowly and become less stable. That means longer regional hot or dry or cold or wet spells. And yet, data from weather stations indicate that global average wind speeds are actually picking up. That's a bit humbling.

But headlines saying that "life as we know it" will end, are just a teensy bit hysterical.

As Arctic ice melts, sea levels will rise. Also, as ocean water warms, it will expand, and that will cause sea levels to rise some more. The bad news is that sea level could eventually rise tens of meters. The good news is it will take centuries for all the ice to melt, so cities have time to follow the shoreline inward.

Maybe the melting will stop, like it paused 6000 years ago. We'll not be able to use fossil fuels forever; the easy stuff will get used up. Coal, gas, and oil will get more and more expensive as time goes on, and that will force a shift to nuclear, solar, and wind energy. CO_2 levels in the atmosphere may drop within the next century or two. Maybe the melting will stop too.

Or maybe it won't stop. Some scientists believe that as the ice caps melt and water and soil are exposed to summer sunlight, the poles will absorb more of that energy. That, in turn, will raise temperatures and cause more melting. Even if CO_2 levels drop, melting will beget more melting until all the summer ice is gone. That runaway positive feedback is called a "tipping point." Climate models can't evaluate that argument.

As populations are forced to migrate due to salt water flooding on coastal farmland, or due to persistent droughts, they will find no "unoccupied" place to go. They will be moving in on other people. Climate refugees will likely be disruptive and resented intruders. Will there be war?

But headlines saying that "life as we know it" will end, are just a teensy bit hysterical. Humans have adapted to unimaginable differences in environment: from jungles, to deserts, to frozen tundra. Civilization will survive. Forecasts by the IPCC indicate that by 2100 the world economy will probably change by only a few percent due to climate change.

For a really long perspective, look at Earth's geological history. Billions of years ago, life originated with CO_2 levels a thousand times higher than today. Dinosaurs and coal forests prospered when CO_2 was twenty times higher. We'll make it, and our increasing prosperity and numbers will make demands on this planet that are far more concerning than temperature change.

Dr. Steven Parks' career as a physicist includes work for NASA, NBS [now NIST], private industry, and law enforcement agencies. His interest in human effects on climate goes back to 1960, when his hometown in Central Florida suddenly started having extreme winter weather. Now retired, he attempts to keep up with the developing science of climate change, and is a contributing "expert reviewer" for the IPCC.

After close on two centuries of passionate struggles, neither science nor faith has succeeded in discrediting its adversary. On the contrary, it becomes obvious that neither can develop normally without the other. And the reason is simple: the same life animates both. Neither in its impetus nor its achievements can science go to its limits without becoming tinged with mysticism and charged with faith.

— Pierre Teilhard de Chardin, *The Phenomenon of Man*

The "Climate Skeptic" Explanation

By Thomas P. Sheahen

The "controversy" in the field of climate change is about the role of CO_2. Observations showed that from 1978 to 1998, both the concentration of CO_2 and the mean temperature of the earth rose in tandem, and that correlation was enough for Al Gore to convince many people [via his 2007 movie "An Inconvenient Truth"] that increasing CO_2 was the *cause* of the increasing temperature.

However, scientists know that "*Correlation* does not prove *Causation*." The "climate skeptics" assert that CO_2 is not to blame for rising temperatures. Their argument is considerably more sophisticated than Al Gore's, and requires attention to scientific detail. Skeptics point to the enormous complexity of forecasting weather and climate, and reject the idea that a single parameter (Global Average Surface Temperature, GAST) could adequately characterize the climate; and furthermore reject the notion that a single factor (atmospheric CO_2 content) could be the "control knob" that determines that parameter.

Here are two examples of skeptical reasoning:

The eminent Professor of Earth Sciences Richard Lindzen (MIT, emeritus) has written a new paper summarizing what we know with reasonable certainty, what we suspect, and what we know is incorrect about: climate change, the greenhouse effect, temperature trends, climate modeling, ocean chemistry, and sea level rise. Key elements include these scientific statements:

1. The climate system is never in equilibrium.
2. The core of the system consists of two turbulent fluids interacting with each other. They are unevenly heated by the sun, which results in transport of heat from the equator towards the poles (meridional flow). That in turn creates ocean cycles that may take 1,000 years to complete.
3. The two most important substances in the greenhouse effect are water vapor and clouds, which are not fully understood and are not stable.
4. A vital component of the atmosphere is water in its liquid, solid, and vapor phases; the changes in phases have immense dynamic consequences.
5. Doubling carbon dioxide (CO_2), creates a 2% disturbance to the normal flow of energy into the system and out of the system. That amount is similar to the disturbance created by changes in clouds and other natural features.
6. Temperatures in the tropics have been extremely stable. It is the temperature differences between the tropics and polar regions that are extremely important. Calculations such as global average temperature largely ignore this important difference.

Another expert who has been an IPCC author, Japanese climate modeler Mototaka Nakamura, wrote about the incredibly difficult problems facing modelers. In translation, his main objections deal with:

- Ignorance about large and small-scale ocean dynamics.
- A complete lack of meaningful representations of aerosol changes that generate clouds.
- Lack of understanding of drivers of ice-albedo (reflectivity) feedbacks: "Without a reasonably accurate representation, it is impossible to make any meaningful predictions of climate variations and changes in the middle and high latitudes and thus the entire planet."
- Inability to deal with water vapor elements.
- Arbitrary "tunings" (fudges) of key parameters that are not understood.

Nakamura further states that two major problems in the models are ocean flows (ocean circulation) and water in the atmosphere. Nakamura rejects the IPCC concept that the influence of humans adding CO_2 can be predicted by models. He states: "I want to point out a simple fact that it is impossible to correctly predict even the sense or direction of the change of a system when the prediction tool lacks and/or grossly distorts important nonlinear processes, feedbacks in particular, that are present in the actual system."

These are just two recent examples of the "Skeptic" side of the controversy, which the IPCC has not been able to counter. Taken together, these multiple points make it clear that it is *impossible* to write a computer program to predict the future climate. It's not a matter of needing more computing power; it's that very fundamental physical properties (which are unknown) dominate the behavior of the entire system. We see this on TV every night with the weather forecast: tomorrow's prediction is right on; 3 days is pretty good; 5 days is iffy; and 7 days is hopeless. That's a consequence of *mathematical chaos*. In several of its major reports, the IPCC has very honestly used the term "no predictive value" to describe its computer results. They employ the terms "scenarios" or "pathways" rather than "predictions."

Caveats and cautionary notes have a way of being buried in thousand-page reports. Before publishing each report (about one every six years), the IPCC issues a "Summary for Policymakers," and that really is all that is ever read by politicians,

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journalists and TV pundits. What reaches the public is boiled down from the summary. But what is never stated is that the "Summary for Policymakers" is written independently from the full IPCC report, and does not reflect the true position of the scientific authors. Some very capable scientists have noisily resigned from the IPCC, furious over the way their original meaning was distorted. A careful reader who takes the trouble to read deep into an IPCC report will often find precise scientific words that express uncertainty, but that is lost in the filtering and summarizing and boiling down *en route* to public perception.

Across all categories, the news cycle is driven entirely by the desire for garish headlines. Here is how it works in the case of climate science: The IPCC computers produced four specific "scenarios" associated with different amounts of CO_2 emitted into the atmosphere. They intentionally contrived one scenario to be too low, two to be in the plausible range, and one to be too high. The whole idea was to be a guide for further computational modeling, not to give a prescription about the future climate. Each of the four models input a certain amount of *forcing* due to CO_2, which then output a certain increase in Global Average Surface Temperature (GAST). The results for the reasonable scenarios indicated that temperature would rise about 1ºC. That was hardly newsworthy. However, in the unrealistically high case [labeled RCP8.5], higher temperatures were predicted (about 3ºC). That one scenario is what got all the media attention, despite being totally unrealistic. The IPCC committed a *sin of omission* by not stridently refuting that exuberance by the media. Consecutive newspapers repeated the quotation until it was "well known" or "the consensus" that the artificially high case was a sure thing to happen.

All the IPCC scenarios predict a temperature rise after the total amount of CO_2 has doubled. "Double CO_2" is a convenient point for calculation. But that milepost might **never** be reached, based on the amount of recoverable coal in the ground. That's one of the factors making the RCP8.5 scenario so unrealistic. But the two central (plausible) scenarios only predict a temperature rise of ~ 1ºC, which is not headline-worthy.

This kind of distortion is rampant in publicity about climate science. In early August 2020, the outstanding Danish Economist Bjorn Lomborg took a very close look inside a report that predicted huge numbers of people inundated by rising sea levels. It turned out that they had used a model with **no** dikes or barriers at all in order to boost an outlandishly high death toll.

Such breaches of scientific integrity are commonplace in today's world of rapid-sound-byte selectivity. The promoters of IPCC calculations have clearly departed from the scientific method in favor of the more flamboyant world of wild speculation.

What is the right way to proceed? In ***real*** science, ***data*** from experiments or observations is what drives progress, and computer models have a subordinate role. No model is better than the data that goes into it. Here's a very basic rule: If your theory doesn't match the data, you have to revise your theory. In climate science, that has not been done.

Five years ago, John Christy of the University of Alabama at Huntsville, a principal analyst of the satellite data about temperatures, showed this graph (*Figure 3*) at a Congressional hearing.

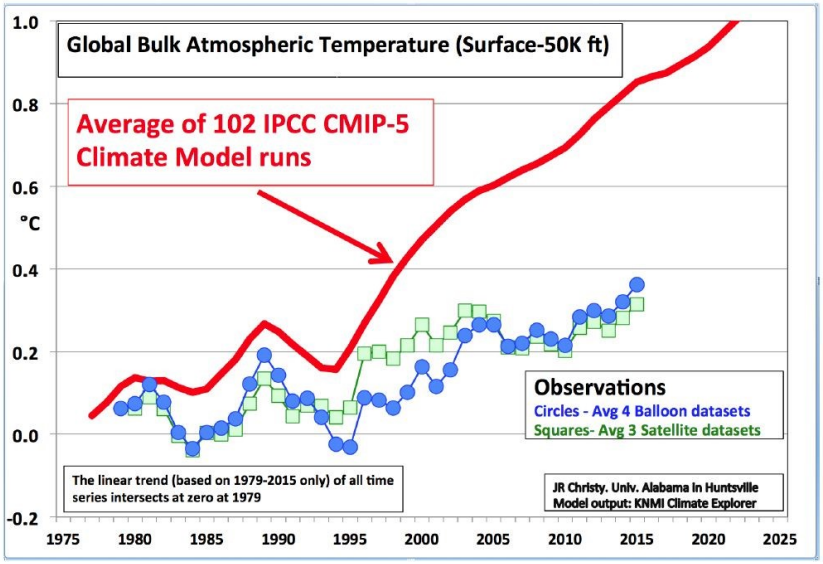

Figure 3. Comparison of data with computer projections (after J. Christy)

In that graph, the horizontal scale is time and the vertical scale is the rise in temperature since 1979, when satellites began reporting data. The green and blue dots are actual measurements from satellite and balloon data. The red line is the average of >100 computational models that tried to predict the temperature rise due to increasing CO_2. The discrepancy is stunningly obvious. The data is right; the models are wrong.

The red curve is an *average* over a "spaghetti plot" of all the models. It turns out there was *one* model that stayed near the bottom and matched the data; it came from Russia. Upon inquiry, it turned out that they had used a totally different input number for the reflectivity of clouds: the Russians' input parameter assumed that clouds

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strongly reflected incoming sunlight back into space, and only "trapped" a small amount of outgoing infrared radiation.

There is an important lesson here: the models are extremely *sensitive* to changes in the input parameters. That underlines a cornerstone scientific principle: "**Data Trumps Theory**."

There are many other studies (beyond those cited above by Nakamura and by Lindzen) that have likewise shown that CO_2 is ***not*** the "control knob" of temperature. Noteworthy is that by "the Right Climate Stuff Team," a coterie of former Apollo-program engineers, who did a heat-transfer analysis about how the planet cools. Other "climate skeptics" have examined the incoming sunlight, the spinning of the earth, the formation of afternoon clouds in the tropics, the spectrum of outgoing radiation at night, the conduction of heat (both upward and toward the poles), and other factors in the broad and complicated field of climate science.

The naïve correlation of CO_2 and temperature observed in the late 20th century is long gone. Roy Spencer, partner of John Christy in analyzing satellite data, has written a very short (60 page) booklet "An Inconvenient Deception" that carefully dismantles Al Gore's movies promoting global warming alarmism.

There is a "bottom line" to all this: Since CO_2 clearly does **not** drive the climate, there is no particular reason to limit our output of CO_2. The desire to "reduce your carbon footprint" or to stop using fossil fuels is totally unnecessary. That will surely come as a shock to many people who claim the label "environmentalist," but that ***is*** what the science shows. The climate will continue to change, as it always has, and mankind will adapt to it, as we always have.

There is no forthcoming climate catastrophe. Two books published in 2020 explain this reality in greater detail: "Apocalypse Never" by Michael Shellenberger, who was for decades a strident environmental activist, and "False Alarm" by Danish economist Bjorn Lomborg.

Way back in 1997, ITEST's founder Fr. Robert A. Brungs, S.J., wrote an essay "Kyoto and Population Control," in which he pointed out the hidden agenda of the "Kyoto Protocol" to limit CO_2: stifling economic growth in Africa by curtailing fossil fuel availability will reduce population growth. Over two intervening decades, amid promises of wind and solar power *manana*, that punitive and discriminatory agenda has largely succeeded. That will only stop when sound science replaces global warming mythology.

Related reading:
Human Influence on Climatic Change
by Benjamin F. Abell, *ITEST Bulletin*, Spring 2011
https://faithscience.org/wp-content/uploads/2019/03/ITEST-Bltn-42-2.pdf

Kyoto and Population Control
by Fr. Robert A. Brungs, S.J.
https://faithscience.org/wp-content/uploads/2019/03/BRUNG005.pdf

What Becomes of Carbon Dioxide?

by Gordon Fulks

To the question "Where does the carbon dioxide we produce go?" most people will reply "into the atmosphere." That is true initially, but not for very long.

Keep in mind that there's no such thing as a *tag* on human-produced CO_2. Mother Nature treats all carbon dioxide molecules alike.

A cornerstone of the argument calling for restrictions on the release of man-made CO_2 (from burning fossil fuels, cement production, or otherwise) is that the CO_2 stays in the Earth's atmosphere for a very long time (centuries) and traps heat from the Sun, thereby causing an ever-increasing global warming. Wikipedia calls it "the most significant long-lived greenhouse gas in Earth's atmosphere." **None of that is true.**

Carbon dioxide is a greenhouse gas, but far less consequential to our climate than water vapor. Greenhouse gases do not "trap heat." Nothing "traps heat." Greenhouse gases merely slow its departure. We need a constant source of heat from the sun to stay warm. This is simple science that most knowledgeable scientists support.

What is controversial is how long man-made CO_2 remains in the atmosphere. Modern measurements of the atmospheric concentration are taken high up on a mountain in Hawaii (Mauna Loa). They are used as the world standard and show CO_2 rising from about 318 parts per million (ppm) in 1960 to 415 ppm today. Long before the Mauna Loa measurements became available, the CO_2 concentration was estimated at about 280 ppm from ice core reconstructions and 300 to 400 ppm from chemical measurements and other techniques.

Since the observed increase can be vaguely correlated with the Industrial Revolution and

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therefore human release of CO_2, the presumption has been that ***all*** of the increased CO_2 was caused by our actions. Closer inspection of the data uncovers a different reality. The Earth's massive *Carbon Cycle* that supports all life is much larger and more active than most realize.

Although there are many carbon reservoirs, we generally simplify the picture to just four and talk about "carbon" rather than "carbon dioxide." While we humans derive ALL of our carbon structure from atmospheric CO_2, we rely on plants to remove it from the atmosphere via photosynthesis and then consume the plants (or animals that have consumed the plants) to grow.

We are part of a giant ***biosphere*** that involves every life form on this planet, every plant and every animal. The total carbon in the biosphere is estimated at 2,000 gigatons (GtC). For reference, one gigaton is 1Gt = 10^{15} grams = 10^{12} kg = one billion metric tons. By contrast, the ***atmosphere*** contains only about 900 GtC, which is equivalent to a CO_2 concentration of 415 ppm.

Our oceans contain the greatest amount of CO_2 and greatest amount of mobile heat on this planet. That is why they have such an enormous impact on the carbon cycle and on our climate. Most people are aware of El Niños that drive up the global temperature, when the sea surface warms slightly in the Pacific Ocean off of Peru.

The ***sea surface*** (the top 100 meters) contains an estimated 1,000 GtC, while the deep oceans contain a staggering 38,000 GtC. The deep oceans are the graveyard for atmospheric CO_2. That is where it becomes solid rock and unable to participate in the carbon cycle until geological processes over millions of years (*Plate Tectonics*) bring it back to the surface as limestone.

The ultimate arbiter in science,
robust experimental data,
proved the IPCC theory wrong.

While these reservoirs of carbon are in quasi-equilibrium, they still trade vast amounts of carbon every year. This is obvious from the life cycle of both plants and animals. Much life on this planet lives less than a year, from the leaves on trees to small creatures. When they die, they quickly decompose back to CO_2 to become available for new life the next Spring. This yearly cycling is clearly seen in the CO_2 concentration measured on Mauna Loa. Longer lived animals like humans can live a century, and the longest living trees can live tens of centuries. A weighted average lifespan might be 20 years. That means that the entire biosphere has to recycle through atmospheric CO_2 every 20 years at a rate of 100 GtC per year. The ocean surface is thought to exchange a similar amount of carbon with the atmosphere, namely 100 GtC per year.

We can get a better estimate of the residence time of CO_2 in the atmosphere by looking at the excess radioactive C-14 that was created by atmospheric nuclear weapon testing prior to the Test Ban Treaty of 1963. When testing ceased, the amount of C-14 fell exponentially with half of it gone in roughly ten years, as it leaked into the biosphere and ocean surface. This dramatically falsified the *Bern Model* used by the *United Nations Intergovernmental Panel on Climate Change* (UN IPCC) where they insisted that human CO_2 remains in the atmosphere for centuries.

The ultimate arbiter in science, ***robust experimental data***, proved the IPCC theory wrong.

This means that the relatively small amount of CO_2 (10 GtC) that humans put into the atmosphere every year (from burning fossil fuels, manufacturing cement, and breathing) mixes rather quickly into the biosphere and ocean surface as well as the atmosphere. Hence it contributes to a very slow rise in all the reservoirs, not merely in the atmosphere.

To see if our addition of 10 GtC/year can account for the rising CO_2 concentration measured on Mauna Loa, we need to look at how much we have put into the atmosphere since the beginning of measurements on Mauna Loa in 1960. That is about 400 GtC. But the measurements show an increase of only 200 GtC in 60 years. That means at least half must have leaked out. In fact far more did. We know that all the CO_2 in the atmosphere has recycled several times through the biosphere and ocean surface in 60 years. In other words, most of our contribution has been well mixed.

With the total size of the readily accessible carbon reservoirs about 4,000 GtC and our contribution 400 GtC, we are responsible for about 10% of the 900 GtC in the atmosphere or only 40 ppm. Rigorous computations (Berry, 2020) show that the real number is only 33 ppm.

The bottom line is that humans are small players in the natural carbon cycle and even smaller players in the Earth's climate. Mother Nature overwhelmingly drives everything.

Gordon J. Fulks, PhD is an astrophysicist, originally from the University of Chicago Laboratory for Astrophysics and Space Research. Dr. Fulks is an unpaid advisor for several organizations, including the *Heartland Institute* and the *CO_2 Coalition*.

Faulty Forecasts and False Climate Narrative Hold Nations Hostage

By Vijay Jayaraj

The United States is the only major Western country that is not part of the *Paris Climate Accord*, which seeks to restrict and reduce fossil fuel consumption across the world. But the country is not immune from the impacts of the restrictive energy policies the agreement imposes on its trade partners. One of those is my own country, India.

India imports large amounts of coal, oil, and natural gas from the USA, mostly to generate affordable power for its electric grid. That grid must grow rapidly to meet the needs of over 1.3 billion people. Over 300 million of them -- comparable to the whole U.S. population -- currently have no electricity. But they need it desperately for their health and their escape from severe poverty.

The justification for reducing fossil fuel use is the claim that climate change will create havoc in the future unless we reduce our greenhouse gas (GHG) emissions. But this claim is not as black and white as the mainstream media and politicians make it out to be. In fact, data on temperature suggest that the claim is exaggerated and tends to be informed by incorrect interpretations from faulty models.

The Never-Ending Problem with Models

The Paris Climate Accord and other major climate recommendations from the United Nations are strictly based on the guidelines provided by Assessment reports produced by a climate wing known as the *Intergovernmental Panel for Climate Change* (IPCC). The IPCC uses forecast data processed by a large set of computer climate models to arrive at the policy recommendations in its assessment reports.

Among them are forecasts from the *Coupled Model Intercomparison Project* (CMIP), which consists of 100 distinct climate models, run by leading modelling groups across the world. Their predictions drive the IPCC's reports. In 2013, the IPCC fifth assessment report (AR5) featured climate models from CMIP5[1] (fifth generation).

But the forecasts from these models proved wrong. They exaggerated the temperature trend[2] and differed markedly from temperature data derived from ground based thermometers; sensors on weather balloons, aircraft, ships, and buoys; satellite remote sensing; and "re-analyses" -- the latter integrating the input of many different data sources.

Yet, political appointees in charge of determining climate and energy policy around the world used these forecasts to justify international climate agreements like the Paris Accord. And they do not stop with that.

The upcoming IPCC sixth assessment report (AR6), forecast for release in 2021, features forecasts from CMIP6. But the CMIP6 models are turning out to be no better than CMIP5 models. In fact, in CMIP6 they're worse! Senior climatologist Dr. Roy Spencer has observed[3] that the "CMIP6 models are showing 50% more net surface warming from 1979 up to April 2020 (+1.08ºC) than actual observations from the ground (+0.72ºC)."

Beyond doubt, comparing both CMIP5 and CMIP6 forecasts to official HadCRUT temperature data sets[4] reveals a very old story: models are always way off the mark[5], and - suspiciously - always in the same direction, namely, upward, in predicting real-world temperatures.

So, not only were we lied to about the climate, we are going to be misled again by the next IPCC assessment report. And with more extreme false forecasts, there will be calls for more restrictive energy policies.

It is quite astonishing how the unelected politicians at the UN can convince and persuade global leaders to adopt climate policies that are based on unscientific conclusions from faulty models.

The mainstream media have also played their part. Public perception on climate change has been heavily influenced by biased coverage on the climate issue, with no major attention to the huge discrepancies between the model forecasts and real-world observations.

It is not clear how much faultier the projections will become by the time the new assessment report is finally released. But one thing is clear: energy sectors across the globe are being held hostage by pseudo-scientific interpretations from the United Nations' flagship climate wing.

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Vijay Jayaraj (M.S., Environmental Science) is the Research Associate for Developing Countries for the Cornwall Alliance for the Stewardship of Creation. He currently lives in Udumalpet, India.

The Flaw in Relying on Worst-Case-Scenario Climate Model

By Ross McKitrick

Whenever you read a media story about how we're heading toward climate catastrophe if we continue operating "business as usual" -- i.e., if we don't slash carbon emissions -- the reports are almost always referring to a model simulation using RCP8.5. And you can bet that nowhere in the story will they explain that RCP8.5 is an implausible worst-case scenario that was never meant to represent a likely base case outcome, or that scientists have begun castigating its usage as a prediction of a doomed business-as-usual future.

The term RCP8.5 refers to a greenhouse gas emissions scenario often used by scientists for climate model projections. You might never have heard of RCP8.5 but you have definitely heard of forecasts based on it. Listening to the politicians who make the strongest pleas for radical climate action, it is clear that their fears for the future are driven by RCP8.5 scenarios, yet it is also clear that they have no idea what it is or what is wrong with it.

RCP stands for "Representative Concentration Pathways," or projections of how much carbon dioxide (CO_2) will accumulate in the atmosphere due to fossil fuel use over the coming century. *The United Nations' Intergovernmental Panel on Climate Change* (IPCC) generated a set of four RCP scenarios a decade ago, attaching to each a number indicating how much "radiative forcing" (a measure of global warming potential) each one generates. RCP2.6 refers to a benign, low-end emission scenario with correspondingly minimal radiative forcing. In the middle are RCP4.5 and RCP6.0, and at the top end is RCP8.5, a scorcher that predicts historically unprecedented increases in global CO_2 emissions.

To appreciate how implausible RCP8.5 is, consider its coal use trajectory. From the 1920s to the year 2000, global coal consumption stayed between 15 and 20 gigajoules (GJ) *per capita*, peaking at 20 in 1960, falling back to 15 by 2000, then rising to about 23 earlier this decade with the sudden industrialization of China and India. Groups like the *International Energy Agency* expect it will gradually return to the 15-20 GJ *per capita* range by 2040.

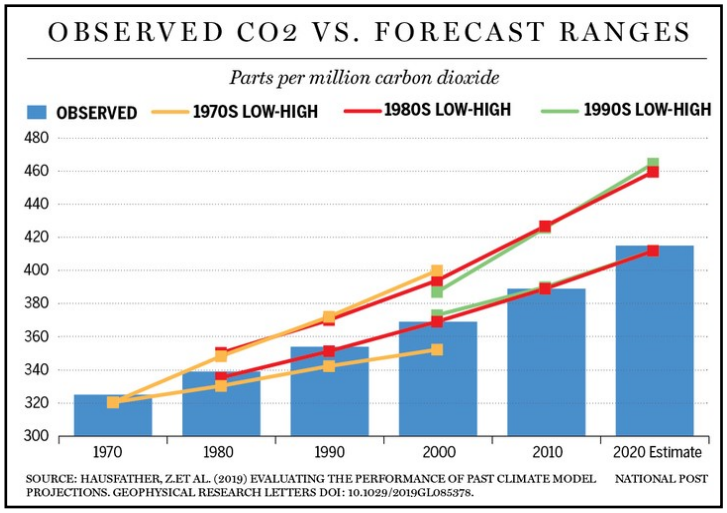
The RCP8.5 scenario offers a different outcome. Instead of a return to normal, it projects coal use will rise to about 30 GJ by 2040, 45 GJ by 2060 and 70 GJ by 2100. No one seriously believes this is even possible, including people who use RCP8.5 in their climate simulations.

It gets worse. A recent study[1] by Matthew Burgess of the University of Colorado *et al*., which is currently available in preprint form, pointed out that RCP8.5 doesn't even make sense in its own modelled reality. It projects so much economic growth that today's poor countries will be richer in 2100 than the wealthiest countries are today (which would be nice if it happened), but they will also experience so much warming that they become uninhabitable wastelands. How can both be true?

RCP8.5 was created as an outlier; an improbable worst-case scenario, not a likely business-as-usual forecast. Yet countless scientists and economists have been using it as one. You know how the game works: feed RCP8.5 into a climate model, observe the catastrophe, then call it the "likely" scenario if we don't cut emissions.

A more realistic business-as-usual scenario would look much more like the low end of the RCP range. If you run a model with one of those, the future looks far less worrisome, the policy agenda is far less urgent and your study is far less likely to get any media attention. Which may be why so many modelers prefer using RCP8.5. But last fall, in a commentary in *Nature* magazine[2], climate experts Zeke Hausfather and Glen Peters scolded their colleagues for misleading the public this way, and distorting the policy debate in the process.

Exaggerated emission forecasts are nothing new. Another recent analysis[3] compiled CO_2 concentration forecasts from the 1970s onward. The figure below is based on their data. In the '70s, scientists made CO_2 projections through 2000. Reality came in near the bottom end. And from the '80s on, reality came in right at the bottom end.



For at least 30 years, when the IPCC and others have issued emission scenario ranges, the bottom end has always been the most realistic path and the rest has been exaggerated, yet the upper end gets all the media and academic attention. RCP8.5 takes this distortion to new heights.

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The purpose of global climate policy is to get us from the dangerous upper end of the forecast range down to the safe bottom end. But what users of climate projections need to understand is that we are already there. In fact, we never left it. We don't need to kill the global economy to get onto an emissions path we've always been on. If we want to avoid the RCP8.5 future scenario all we have to do is stop feeding it into climate models, because that's the only place it exists.

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Ross McKitrick is a professor of economics at the University of Guelph and a senior fellow of the Fraser Institute. This article is condensed from the *Financial Post* on 23 June 2020: https://financialpost.com/opinion/ross-mckitrick-the-flaw-in-relying-on-a-worst-case-scenario-climate-model

Three New Shocking Climate-Related Publications

There are three important things going on in 2020 that represent a surprising turn-around in the public forum regarding Environment/climate change issues.

First there was the movie "Planet of the Humans" made by Michael Moore, a film producer who has long been the "darling of the left." To the great dismay of his Greenie pals, Moore's movie repudiates the commonplace beliefs fostered by the environmentalists, showing that in fact, building wind & solar power seriously despoil the planet. Second is the book "False Alarm" by Danish economist Bjorn Lomborg, who explains why the many predicted catastrophes are not going to happen. (See my book review of "False Alarm" [1].) Third is the book "Apocalypse Never" by Michael Shellenberger.

"Apocalypse Never" is exceptional in that Shellenberger is a guy who for many years was a totally devout Greenie, a major leader of the environmental cause; but he has now seen the error of his ways. Of course now he is considered a heretic by the green establishment. But the things he states in "Apocalypse Never" need to be widely disseminated to the general public.

Of interest is a book review of "Apocalypse Never." [2] Here is an example of a few lines from it:

"Perhaps what is most revolutionary about Shellenberger's book is his call for a new, more human-centered, environmentalism. In contrast to the green movement's jihad against material progress, he suggests that only by making people more affluent will they be able to afford the environmental redress that the planet, in fact, needs."

Really, most of the strident orthodoxy of the "global warming alarmists" is associated with the zealotry of the secular religion of environmentalism. For too many people, that secular religion has become the substitute for the religion they used to have. Of course, I'm strongly opposed to that secular religion. One aspect of it is that they say humans are bad, they want to reduce the human population, and they really like abortion as a means to that end. But there are many other negative aspects beyond that. They are actually doing great harm to impoverished Africans by trying to keep them in poverty, telling them that a little wind or solar power here and there will be sufficient to meet their needs. But the squalor that so many Africans suffer is because they don't have big power plants generating electricity via fossil fuels or nuclear power.

Paul Dreissen, a speaker at our 2009 ITEST Conference, strongly made that point about African deprivation. Dreissen calls it "Eco-Imperialism." Major financial sources (World Bank, etc.) will not loan money to African applicants for anything but "renewable" generators of electricity. [3]

We are currently taking note of the fifth anniversary of Pope Francis' Encyclical *Laudato Si*, which deals with environmental matters. Elsewhere the Pope has frequently talked about the urgent need to alleviate poverty. That's an important Christian duty. But *Laudato Si* doesn't make that association. The disconnect is obvious when we recognize the technological fact (as all economists do) that a source of plentiful and reliable electricity is essential for a developing nation to rise out of poverty.

As Shellenberger writes, people need to become more affluent in order to afford environmental controls. It's just plain wrong for the western elites to tell Africans they'll have to get along on just wind and solar power. But that's what the UN and international bankers are doing. The Pope should be condemning that financial strategy, because it forces people to remain in poverty.

— Tom Sheahen

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