Mass Extinction: Opinion and Politics
What Can We Learn From the Past? How to Survive the Next One?

Welcome to Quest and welcome to the present Epoch, the Holocene. We will be referring to the distant past covering over 580 M years, and you'll want to recall that a Geologic Epoch is a measure of time --- shorter than an **Era** or **Period** but longer than an **Age**. We are in the most recent 2.6 M years of the **Cenozoic Era** called the **Quaternary Period.** In that period, the **Pleistocene Epoch** preceded our present **Holocene Epoch** that began about 12,000 years ago, more or less, at the end of the **Paleolithic ice age**. We are now in an ice age (the last of five) and we are in a roughly 5000-year stretch of interglacial global warming. So far, sea levels have risen roughly about 115 feet, before and during the Bronze Age, during which the climate has been unusually stable save for a Medieval warm period around 1100 and a Little Ice Age around 1400 both lasting 2 to 3 hundred years, again more or less.

We are going to talk about mass extinction, and that means we will need to consider a variety of calamitous causes: super volcanoes and asteroids, and some lesser threats: glaciation and tectonic plate movement, and frightening animals, the most threatening being us humans. And before we review the essential science let's hear some illuminating threats, all of them dire.

Here are some alarming extinction predictions:

- From the *Journal of Science Advance*: We are in the midst of the Sixth Great Extinction. The current rate of species extinction is 100 times the background rate of the previous 5 great extinctions . The background extinction rate, incidentally references the pre-human natural extinction rate of species, without pretending to have an accurate species count.
- From the World Wildlife Fund: "We may be losing up to 100,000 species per year . . ."
- And within that predictive range of from 100 to 100,000, we have *National Geographic* at 1000, *Endangered Species International* at 10,000, and *The Futurity Organization* quite

certain that human existence is threatened by the Sixth Great Extinction requiring a million-year recovery.

All very bad news, I'm afraid. No point in making family arrangements, as it seems McCombs' won't be around for the ceremony. But, don't we need more information and some definitions?

For our purposes, Extinct is forever, gone, nada, dead, zip and no exception for Mastodon DNA frozen in a glacier. An Extinction Event is different however; it is a term for "biotic crisis" a decrease in numbers, including a decrease in abundance or diversity of a life form or life forms in general. It thus becomes recognizing a process of prolonged duration: don't forget the time factor. We cannot imagine 100,000 years, let alone 3 billion years. Nyasssauruses, dinosaurs the size of Labrador Retrievers, did not romp and play with Tyrannosaurus Rex who followed them by 150 million years. In geology and evolution, a thousand or a million years is a rounding error.

And taxonomy: We need names for things that have died. These are the groupings: Biota (Life), Three Domains (Acytota ---e.g. viruses; Cytota---bacteria; and Eukarya which includes everything else: fungus, plants and animals (includes us, humans.) Then Kingdoms, Phyla, Class, Order, Family, Genus, Species and Sub-Species. And so, for humans: Our Phylum, Chordate; Class, Mammal; Order, Primate; Family, Hominid (humans, apes, chimps;) Our Genus, Homo; and Species, Homo sapiens. Note that species designation requires two words and subspecies, three words. There are no living sub-species of humans.

If we eliminate poliovirus, is that extinction? How about a virus that mutates nearly every year, like Influenza? How many species of bacteria are there---some say 10 million. But wait! There's More! as goes the T.V. trope. Others say none---that bacteria should be grouped by nucleotide characteristics because they defy definition used for species. A working definition for species: distinctly different kinds of organisms, similar individuals capable of exchanging genes or interbreeding.

One must remember also that scientists do not agree on how life is classified. An example from Stanford University: The Yellow-rumped

Warbler has a yellow throat (No questions on that, please) and the eastern Myrtle Warbler a white throat, two appearances that for a while identified them as different species---until they were observed hybridizing, Bird Language for saying they were getting it on. Thus each is now a mere sub species.

Now at last to address avoiding mass extinction, the assigned topic of this report: When was the first mass extinction and when was the last? For lack of illustrative evidence from prior to 500 Million Years Ago (Mya,) we can agree that the first mass extinction was that of the Ediacarans that arose during a warm period that followed the Gaskiers glaciation about 580 million years ago, but prior to the Cambrian period of about 540 mya when life forms exploded in number. The earliest life on Earth consisted of single celled microorganisms that lived, largely in planktonic form, floating about in oceans for more than 3 billion years, more or less. Some of these microbes evolved to capture light through photosynthesis and to produce the first pollutant, a toxic byproduct called oxygen that was poisonous to many microbes that had lived in an oxygen-free environment---some lived, some died. We know of the Ediacarans from their imprints---discs, tubes, fronds and quilted mattresses---preserved only in sand and ash, as they did not have shells or skeletons. They were sessile, fixed in place, and lived, according to scientists, in tranquility, in relative warmth between glaciations, the ancient equivalent of Fort Wayne retirees in Naples, immobile because of traffic on Interstate 75.

But not all was tranquility! Only 60 million years later, evolution brought about the Kingdom of Animals, creatures able to move spontaneously, and the newcomers survived by eating other life forms. They so changed the environment that the Ediacarans, as they became food, could not survive The new organisms, able to harness the increased energy from oxygen became, according to Doctor Simon Darrock of Vanderbilt University, ecosystem engineers, capable of altering their environments. And so, the Ediacarans provide us with a climate facilitated, critter driven method of extinction that parallels our current Holocene Extinction.

From this example, it is clear that the drivers of mass extinction are twofold: climate and critters. Climate will affect food sources and

habitat. Other critters will compete for habitat and kill competitors. There is no better theft of habitat than Homo sapiens. But, is this truly the Sixth Great Extinction?

To answer, matters of science come into play, mandatory knowledge for those who would call themselves Questors. The bulk of them have to do with climate---including the science of modeling. These are not necessarily items you'll hear from news media. If you expect nuance from politicians, you'll expect to lose weight drinking Diet Coke

1. **Modeling and Ranges**: When one creates a model of climate, each known factor and stand-in for an unknown factor has a range of possibility. Results are skewed by data selections. The resulting data is weighted by algorithmic assumptions that can create apparent trends, upward or downward. For one's peers to judge the projection, they must have full access to original data, formulae and computer software.
2. **Scientific method**: "Skepticism is the mark of the educated mind," said John Dewey. Everything is open to question. In science, medicine for example, one does not make a diagnosis then dig in to defend and belittle one's colleagues---the current battle style in the climate wars.
3. **Tectonic plates**: We need general knowledge of tectonic plate theory, but plate movements and land location are minor factors in this epoch. There is no longer a Pangea and no open water between N. and S. America.
4. **Ocean Currents**: A cold ocean absorbs CO2 and a warm ocean releases CO2 much as when a 7up bottle is opened and warmed. Ocean currents both warm and cool air. Thus the ocean is both a sump and a transporter of energy. If CO2 increases cause climate warming, the ocean then releases even more CO2 after the fact.
5. **Glaciations**: Periodic changes in glaciation occur every 15,000 to 100,000 years, the 100,000-year cycle being the most reliable. Glaciations last for long periods followed by more rapid interglacial warming periods such as we are now in. Thus, we are in a warming period between glaciations but technically still in an ice age.

6. **Heliosphere**: The effect of the suns energy and cosmic rays extends far into our solar system and affects climate in short and long cycles.
7. **Milankovitch Earth-Orbital Cycles**: The 41,000-year tilt cycle will cause our North Pole, in 12,600 years, to move away from Polaris to point at Vega. Additionally there is the 22,000-year wobble cycle and the 100,000-year (plus) eccentricity cycle. These factors determine how much solar energy reaches Earth and thus are major determinates of ice ages.
8. **Atmosphere**: Atmospheric gasses (CO2, CO, Methane, Nitrogen & Sulfur oxides, isoprene etc.) and water vapor (clouds,) affect absorption and reflection of the sun's energy. Water vapor and clouds exert far the strongest of these effects and sadly we have no direct measure of these from the past. Isoprene is newly studied, a sun-on-ocean produced gas that cools climate and may help explain the current 18-year pause in warming despite rapidly rising CO2.
9. **Volcanic activity**: This is particularly important as it relates to at least two previous extinctions. If the Yellowstone caldera were to erupt, as it should soon in geologic terms, we would see massive disruption, cooling and perhaps an ice age.
10. **Asteroid collisions**: Large impacts in Siberia and Yucatan are known to have caused disastrous changes in climate, also relating to effects of impact on volcanic activity as far away as western India.
11. **Carbon Cycle**: All of Earth's CO2 was produced over billions of years by volcanic emissions creating CO2 levels in the range of 2000 parts per million; current levels approach 400 ppm. The 2000 level is ideal for plant life and was responsible for the carboniferous age that left 100-meter thick levels of plants to form coal before there were fungi that could degrade lignin. Plants and animals reduce CO2 naturally and at times too effectively.
12. **Evolutionary change**: Usually growth of one species at the expense of competing species; involves food and habitat.
13. We will not address the Tropospheric profile, solar variability, Plasma streams, Albedo reflection coefficients, and the like, but they are important.

We quickly recognize these complex factors in order to highlight that both stock market and climate predictions are problematic because of large numbers of variables. Thus, what we presume to be predictions are merely projections; they are hypotheses, based on assumptions using chosen data points.

Since the first extinction, there have been many small extinctions but (generally accepted) five major extinctions .

1: About **439** million years ago (Mya) the **Ordovician-Silurian** extinction occurred due to a drop in sea levels as glaciers formed killing 25 percent of marine Families and 60 percent of marine Genera.

#2: About **364** Mya, the **Late Devonian extinction** took place through another glaciation event on Southern Pangea, killing 22 percent of marine Families and 57 percent of marine Genera.

#3: About **251** Mya, the Earth's worst mass extinction, the **Permian-Triassic** extinction, due to a asteroid landing in Siberia and a volcanic eruption killed 53 percent of marine Families, 84 percent of marine Genera, and an estimated 70 percent of land Species, totaling 95 percent of all Species.

#4: About **200** Mya during the last 18 million years of the Triassic period, the **End Triassic** extinction killed 22 percent of marine Families and 52 percent of marine Genera and was most likely caused by massive floods of lava. .

#5: Finally about **65** Mya, the **Cretaceous-Tertiary** extinction killed16 percent of marine Families, 47 percent of marine Genera, and 75% of Species. All dinosaurs but avian species disappeared. It is thought to have been aggravated, if not caused, by impact of several-mile-wide asteroid on the Yucatan Peninsula, however some scientists believe that this mass extinction was caused by gradual climate change due to volcanic eruptions of lava from the Deccan Traps of west-central India near present day Mumbai.

By now you've noticed that our Holocene Extinction, while real, needs more disaster and more importantly a lot more time to become what

has been hyped as "the greatest ever." Counts of threatened extinction are high, perhaps inflated, today in part because both species and sub-species are listed, but also because so many habitats are shrinking. However, to be a major extinction, whole Families and Genera must die off. The political furor over the threatened Spotted Owl focused on that subspecies', relatively small habitat while excluding its more widely dispersed species members, Southern California and Mexican Spotted Owls. The wise owls had a talented public relations agent who boosted donations to the Sierra Club resulting in 6 years of Federal litigation that placed 23 million acres under protected land management.

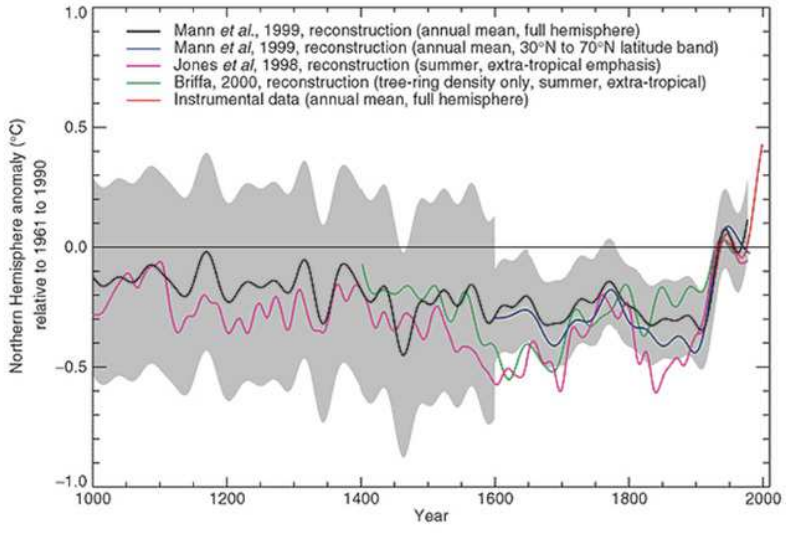
To repeat, the Permian-Triassic Extinction only **251** Mya killed 57% of Families and 83% of Genera and nearly 90% of Species. It is likely that more than 99% of all species that have existed on earth are extinct. The 2006 count of extinct species during our Holocene Epoch to date is 905 from the International Union for Conservation of Nature, the IUCN Red List . The total species count of mammals is thought to be 5500; the count of vertebrates 66,000. The total count of all insect species on earth about 5 M (2.6 – 7.8) with perhaps 40% being beetles. The estimate of plant species is 400,000 plus or minus 25%. These wide ranges tell us that no one knows an accurate species count.

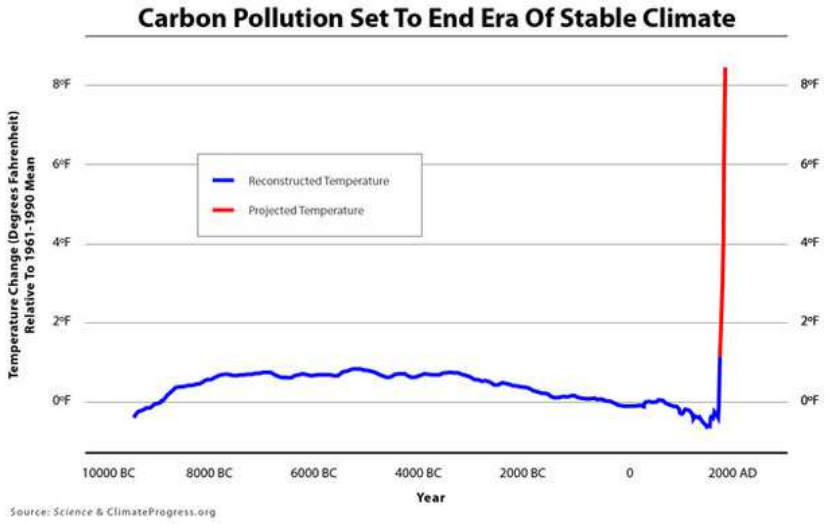
If you believe, as the WWF suggests, we are killing 100,000 species per year, you must be counting bacteria. It is merely too early to say whether the very real Holocene extinction will rank among the top five---unless climate alarmists are correct in saying that disaster is imminent. And so we must consider climate. Let's look at the comments from spokesmen from two sides, Alarmists and Skeptics. How long before a tidal wave engulfs New York City?

Michael Mann, PhD and climatologist of Penn State University, in 1998 used then-new statistical techniques to construct an eigenvector-based climate field graph of projected global temperature change alleging to show that human generated CO2 was the cause of warming. This was a graph called "the hockey stick" because of its parabolic rise, projecting immediate temperature increases parallel to rising CO2. It was revised several times and by 2001, became a feature of a United Nations, IPCC, Committee report. Skeptics complained that Dr. Mann had not provided his data sources, his full data set , his formulae, or his software during the entire 6 years in which he adjusted the graph to great acclaim. They

also complained of the absence of factors in the computer model, aerosols, biologic processes, chemical reactions, and of artificial smoothing of past volatility. The war of words became increasingly bitter, leading to a lawsuit by Mr. Mann alleging defamation. Such mathematics are complex, and skeptics using variations in sampling created less alarming alternative graphs said better to display past temperature data. Mann's smoothing of the previous 900 years based heavily on tree ring studies, gave the appearance of less volatility than skeptics believe existed---much warmer when corn grew in Greenland and lower when freezing temperatures brought the little ice age to Europe and North America. Conclusions have become even more difficult since 1997, because CO2, aided by human contributions, has continued to climb for 18 years while temperatures have not as is confirmed by NASA tropospheric recordings. Following 1997, global temperatures flattened with slow or no global warming while revealing definite regional hot and cold spots. Skeptics call this: **the pause**.

Graphs below show alarming projections vs. current measurements of temperature, plus comments on limits of modeling.





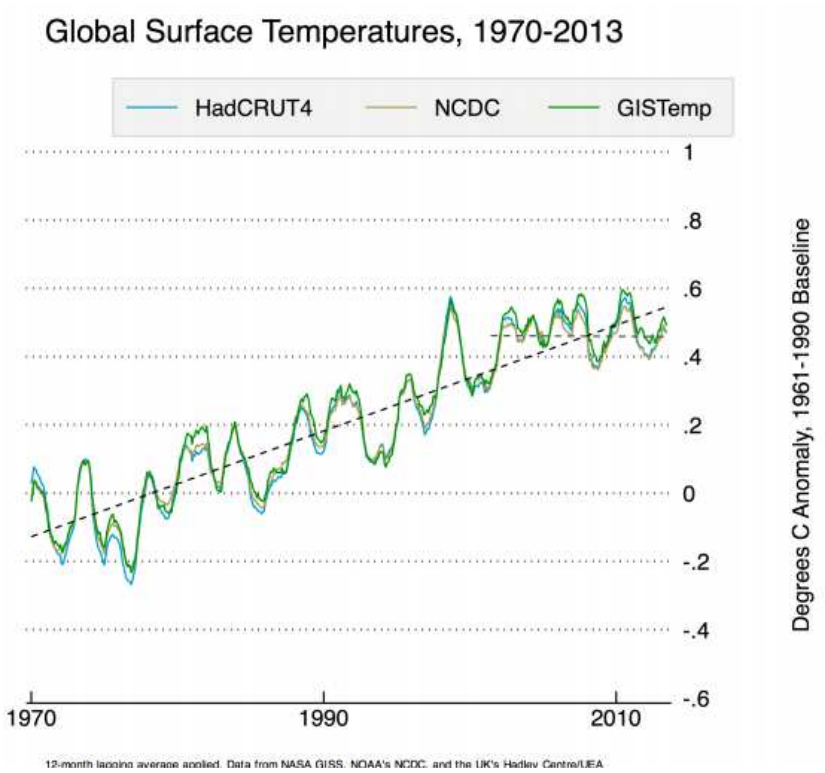
From: Global Climate Models & Their Limitations:

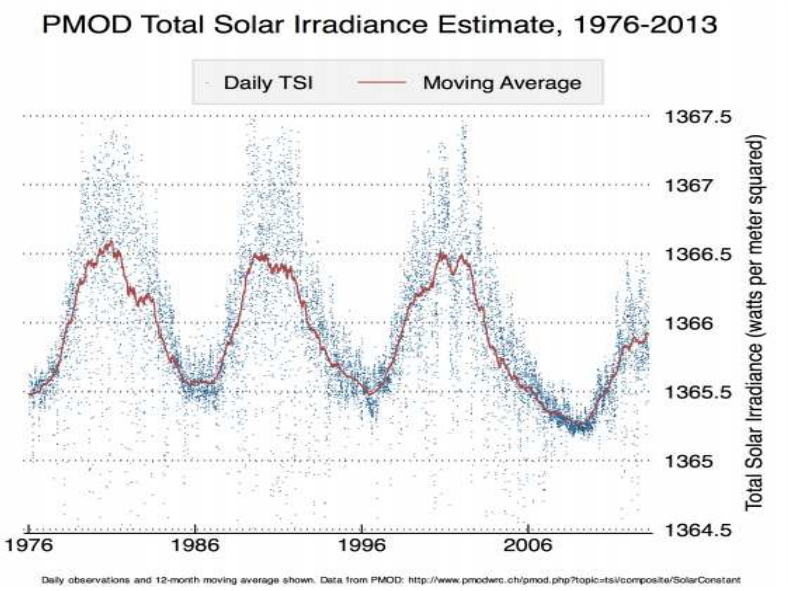
Note first the wide grey band of variation, a range of possibility that surrounds the solid lines. And notice little suggestion of a wide range of temperatures between 900 AD and 1800 AD, without spike or trough that is proportional to the projected future spike.

One hundred-forty principles of forecasting have been enumerated in a handbook for researchers, rules that must be observed in order to make valid and useful forecasts.
(Principles of Forecasting: A Handbook for Researchers and Practitioners, edited by J. Scott Armstrong, Kluwer Academic Publishers, 2001.)
Green and Armstrong found the IPCC violated "Principle 1.3 Make sure forecasts are independent of politics." The two authors write, "This principle refers to keeping the forecasting process separate from the planning process. . . .

Prof. Freeman Dyson, professor of physics at the Institute for Advanced Study at Princeton University and one of the world's most eminent physicists, said the models used to justify global warming alarmism are "full of fudge factors" and "do not begin to describe the real world."

The Pause in Global Warming: http://static.berkeleyearth.org/memos/examining-the-pause.pdf





Above: Notice the flattening of warming in the last 17 years. The most recent trough in solar activity could play a role in depressing short-term trends, and the overall decline in total solar irradiance (TSI) in recent years relative to past solar cycles may be a small contributing factor in the decadal-scale pause. As the MET Office explains, "There is no doubt that the declining phase of the 11-year cycle of total solar irradiance has contributed to a reduction in incoming energy over the first decade of the 21st century, but still not enough to explain the pause in global surface temperature rise."

Researchers continue to explore reasons for the pause with ideas that range from increased deep ocean absorption of CO2, to isoprene cooling, to decreases in solar radiation. Alarmists have collected ocean water from different locations, contending that this new data negates the findings of satellite tropospheric decreases, claiming that air temperatures do not support the presence of a pause.

Dr. Patrick Moore, PhD Ecologist is co-founder of *Green Peace*; he left that BOD when as he said, "I was the only one of fifteen remaining with a science education, and they decided that humans were the enemy of the Earth" instead of seeking a way for humans to live in harmony with the Earth. His 2015, recent speech sums up many skeptical arguments:

- The contention that human emissions are now the dominant influence on climate is simply a hypothesis, rather than a universally accepted scientific theory.
- CO2 is the building block of all life on earth. Were CO2 to fall to as low as 180 ppm, all plants would die as would we.
- Most of the recent rise is caused by human activity plus oceanic out-gassing, but CO2 is not the only driver of climate or else past correlations would match, and they do not.
- Water is the most important greenhouse gas, and its variations are not properly represented in the hockey stick reconstruction.
- We are dealing with the carbon cycle: The past 150M years has seen a steady drawing down of CO2 from the atmosphere by about 90%. Today at 400 ppm of CO2 there are 850 billion tons of Co2 in the atmosphere down from 15,000 billion tons 500 million years ago. The oceans contain 38,000 billion tons of CO2, 45 times that of the air. Fossil fuels removed CO2 short of 10,000 billion tons. But the truly stunning number is the amount of

carbon that has been sequestered by planktons from the atmosphere and turned into carbonaceous rocks, a quadrillion tons, 10 with 14 zeros. The average temperature at the high was 16 C degrees higher than now, and all of our ancestors survived.

- On the present course, without human production, we would reduce CO2 to dangerous levels in 2 million years, the blink of an eye.
- The driving force for glaciation remains the Malankovitch cycle. Whether we can prevent glaciation by human CO2 production is open to question.
- Politically the IPCC is conflicted. They have the mission to discover the human effect of CO2 and if they find little effect, their jobs are over. They have a mandate to find disaster. The UN is conflicted because of eagerness for transfer of wealth, paying third world nations not to use coal. Politicians are conflicted in their goals for re-election, regulation and control. Scientists are conflicted by being funded by Government, or not being funded.

A Quote by Nobel Prize Winner For Physics, Ivar Giaever: "I am a skeptic…Global warming has become a new religion." "The ocean has risen 20 cm per hundred years for the last 300 years. And to be sure you understand that, I will repeat it. There is no unusual rise in sea level."

A popular thought exercise has been going around for the last 6 or so years: what if we straightaway burned all of our fossil fuels, then what? Calculations vary but sea levels would continue to rise as they have in the past, plus added rise caused by higher CO2 and ice melting ---some say a total of fifteen feet, alarmists say six times that---and the temperature would increase 8 degrees, maybe more. This would be expected to happen gradually and these effects would be seen in 1000 to 10,000 years more or less. A Google search on this topic will find several reports on the data with polar conclusions. One slant reports that we have plenty of time while another forecasts humankind dying in the heat. It would seem we have a bit of a wait. Maybe we would have time to have gone nuclear.

Well, you get the picture. One needs to read carefully, to allow for bias and to evaluate opinions based on complete data and complex statistics. The choice is important. In California, this September, by a margin of

two votes, the California Assembly rejected a bill that would have required the state to achieve 80% reduction in Co2 by 2050: 80 by 50. In other words, future Californians were asked to emit less carbon dioxide than do current residents of North Korea, with loss of jobs and lowered standard of living. So, be thinking of unintended consequences before riding a bandwagon.

Finally quotes from scientists from only yesterday: (a longer list is at the link "quotes.")

Quote by Leonardo da Vinci: "Anyone who conducts an argument by appealing to authority is not using his intelligence; he is just using his memory."

Quote by Galileo: "In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual."

My summary: Legislation is passed through addressing a crisis. Some serious problems are not crises and should be addressed thoughtfully without financial incentive. There was, for a while, such a discussion, but it turned to politics and polarization. To quote WSJ columnist Holman Jenkins, the climate movement made an "ill-advised turn toward frantic exaggeration, false certainty and vilification of anybody who raises scientific caveats."

Sunlight is the best sanitizer. Ample time exists openly to discuss the pause in warming, to address the effects of a carbon tax and to save selected habitats. We did not save the passenger pigeon, we cannot save the habitat of the tiger, but the raccoon will do nicely and should our homes become tumbledown shells, they will be occupied by cockroaches.

Footnotes and Links

Editor's Note:
When you receive my paper, it will differ from the luncheon talk in that I will include more supporting data and references for those who have forgotten their high school studies. Also the growth of social media and decline of print journalism has placed most commentary, especially arguments, into blogs and websites in addition to traditional sources of reference science journals.
Because today, encyclopedia, dictionaries and even newspapers have non-print editions that are available only online through Internet, one often must provide sources by providing links, and I have done that wherever possible. Additionally, the digital version of this paper will have hyperlinks in addition to footnotes. Many Journal references are not available through ordinary library access without Faculty appointment.
Government and media find addressing climate change, nee global warming, an urgent matter while skeptics do not. In references below, it is my hope that you will find good reason to be concerned about mass extinction, and by presenting some views of skeptics (politically Right and politically Center) find reason to continue to ask questions about the severity and especially timing of climate change.

Page 1: "stable" http://www.sciencemag.org/content/278/5341/1257.short

P1: extinctions: http://advances.sciencemag.org/content/1/5/e1400253.full

P1: World Wildlife Fund:
http://wwf.panda.org/about_our_earth/biodiversity/biodiversity/

P1: *National Geographic:*
http://news.nationalgeographic.com/news/2014/05/140529-conservation-science-animals-species-endangered-extinction/

P1: *Endangered Species International:*
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P1: *The Futurity Organization:*
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Page 2: *National Geographic*:
http://news.nationalgeographic.com/news/2012/12/121205-oldest-dinosaur-found-tanzania-science-archaeology/

P 2: Wait, There's More!:
http://tvtropes.org/pmwiki/pmwiki.php/Main/ButWaitTheresMore

P 2 Example from Stanford:
https://web.stanford.edu/group/stanfordbirds/text/essays/Species_and_Speciation.html

Page 3: that of the Ediacarans:
http://rspb.royalsocietypublishing.org/content/282/1814/20151003

Page 4: Modeling and Ranges:
http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470289430.html

Page 4: Glaciations: the most reliable:
http://www.sciencedaily.com/releases/2013/08/130807134127.htm

P 5: **Milankovitch Earth-Orbital Cycles:**
http://www.eoearth.org/view/article/154612/

P 5: Isoprene cooling:
http://pubs.acs.org/doi/abs/10.1021/acs.est.5b02388

Unraveling New Processes at Interfaces: Photochemical Isoprene Production at the Sea Surface

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P 5: Volcanic: Previous extinctions:
https://www.washingtonpost.com/news/speaking-of-

science/wp/2014/12/11/did-a-massive-volcanic-eruption-in-india-kill-off-the-dinosaurs/

P 5: Asteroid collisions:
http://www.sciencemag.org/content/350/6256/76

P 5: Carbon Cycle: Earth's CO2: http://scijinks.jpl.nasa.gov/atmosphere-formation/ and
http://www.planetforlife.com/co2history/ (IPCC graph)
http://wattsupwiththat.com/2013/06/04/dr-vincent-gray-on-historical-carbon-dioxide-levels/ (counter opinion)

P 5: Competing Species, Darwin: evolutionary:
http://www.amazon.com/The-Origin-Species-Anniversary-Edition/dp/0451529065

Page 6: Five Major Extinctions:
http://www.britannica.com/science/extinction-biology

P 6: Ordovician-Silurian extinction: drop in sea levels:
http://hannover.park.org/Canada/Museum/extinction/ordcause.html

P 6: Pangea: Devonian extinction:
http://www.scotese.com/moreinfo6.htm

P 6: Deccan traps lava and gas:
https://www.washingtonpost.com/news/speaking-of-science/wp/2014/12/11/did-a-massive-volcanic-eruption-in-india-kill-off-the-dinosaurs/

Page 7: Count of Extinct Species: Wiki:
https://en.wikipedia.org/wiki/Timeline_of_extinctions

P 7: IUCN Redlist endangered species:
http://www.iucnredlist.org/about/introduction

P 7: Species count mammals:
http://www.currentresults.com/Environment-Facts/Plants-Animals/number-species.php

P 7: Species count (2nd) plants (see also above):
https://www.bgci.org/policy/1521/

P 7: Accurate Species Count: difficulties and pitfalls: beetles:
http://www.pnas.org/content/112/24/7519.full.pdf
Page 7: Hockey Stick Graph: critics:
https://books.google.com/books?id=DJxlzuOdK2IC&pg=PA66&lpg=PA66&dq=1500+scientists+few+trained+in+climate&source=bl&ots=v-fQC2vKYM&sig=aVpxGE2pYqx69cutYalvuLdCsW8&hl=en&sa=X&ved=0CE4Q6AEwBzgUahUKEwivgPK0hNnIAhVKVD4KHe67CNs#v=onepage&q=1500%20scientists%20few%20trained%20in%20climate&f=false

P 7: Hockey Stick, Parabolic: Proponent view:
http://www.theatlantic.com/technology/archive/2013/05/the-hockey-stick-the-most-controversial-chart-in-science-explained/275753/

Page 7: Dr. Mann: his formulae: critics of portrayal of past:
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P 7: Computer Model: Global Climate Models and Their Limitations:
NIPC Report: pp. 8 - 16
http://www.nipccreport.org/reports/ccr2a/pdf/Chapter-1-Models.pdf

Page 7: 6 years of Federal litigation:
http://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1130&context=delpf

Page 8: The Pause in Global Warming:
http://static.berkeleyearth.org/memos/examining-the-pause.pdf

Page 10: Dr. Moore, co-founder Green Peace, 2015 Speech:
http://www.thegwpf.com/28155/

Page 11: Nobelist in Physics, Ivar Giaever:
http://www.climatedepot.com/2015/07/06/nobel-prize-winning-scientist-who-endorsed-obama-now-says-prez-is-ridiculous-dead-wrong-on-global-warming/

Page 11: Burn all of fossil fuel, then what? : http://theconversation.com/if-we-burned-all-fossil-fuels-would-any-of-antarcticas-ice-survive-47343

Page 12: 80% reduction by 2050: http://www.wsj.com/articles/how-to-lower-u-s-living-standards-1442876463

Page 12: Quotes from skeptics: http://www.c3headlines.com/quotes-from-global-warming-critics-skeptics-sceptics.html