A Paper Presented to the Thursday Club
By Norman E. Murray
February 8, 2007

A Matter of Degrees

Galileo Galilei was a bright young man. He was born in 1564, the same year that William Shakespeare was born and the year that Michelangelo died.

Galileo's father, a musician and wool trader, wanted his first-born to study medicine, a more lucrative profession than music. After four years of study at a Benedictine monastery, Galileo announced he planned to become a monk. He was pulled from the monastery and, in 1581, enrolled at the University of Pisa to study medicine, in accordance with his father's wishes.

His father may have wanted a physician, but Galileo's only real interest was in mathematics. Other studies bored him, he was frequently absent from classes, and *outspoken* to his professors – an impolitic attribute for a student of the times. He did earn a bit of fame by discovering the Law of the Pendulum. In observing a swinging chandelier, Galileo noted that even though each swing of a pendulum is shorter and shorter, each swing takes exactly the same amount of time to complete.

Despite his budding mathematical fame, *he never completed his degree*, leaving the University of Pisa as a college dropout. Ironically, he returned several years later under contract as an instructor. He was apparently recognized for his serious contemplation about the dimensions of Dante's Inferno, deducing, among other things, that Lucifer was 2,000 arm-lengths long.

While teaching at the University of Pisa, Galileo is reputed to have done his famous "heavy and light falling objects" experiment to determine if Aristotle's law about falling objects was correct – that is, heavy objects fall faster than lighter ones. After

being dropped together off the Tower of Pisa, different weight balls landed at the same time, disproving Aristotle's postulate. (Actually, this same experiment was done a few years earlier (*not* off the Tower of Pisa) by Simon Stevin, a Flemish mathematician, but he is better known for introducing the use of decimal fractions to European mathematics – and predicting decimal coinage, measures and weights.)

However, Galileo was apparently as rude and outspoken as a teacher as be had been as a student. When his three year contract at the University of Pisa was complete, it was not renewed.

He was able to obtain a position at the University of Padua, in the state of Venice, where he became an inventor out of necessity – as the oldest son, he had inherited the responsibility for his family (that is, his siblings, his children, and his mistress) and the financial debts that passed from his father. So, in 1596 he devised a military compass (to better aim cannonballs) which he modified in 1597 to be used for land surveying. He earned the money to pay his debts and support his lifestyle, and a reputation that drew students to the University.

In 1609, while in Venice on holiday, after only *hearing* that a Dutch spectacle maker had invented a device to make distant objects appear closer, within 24 hours Galileo devised a 3-power telescope. He refined it up to a 10-power spyglass which he brought and demonstrated to the Venetian Senate. They rewarded him by raising his salary and giving him honors and recognition. (The spyglass had great potential military value.)

It is this invention that led to Galileo's problems with the Holy Church, because very quickly he turned his invention toward the heavens, observing the moons of Jupiter, among other things. Repeated observations made him realize that these

satellites were rotating around Jupiter, not around the earth. If they didn't revolve around the Earth, maybe Copernicus was right about the Sun, not the Earth, being the center of the solar system.

(For over a decade, Galileo had been a convert to Copernicus' theory, but was afraid to go public for fear of derision, from both the public and Church. He related these fears in a letter to Johannes Kepler back in 1597. However, his telescopic findings apparently excited him enough, and gave him the added scientific data, to make his ideas public.)

Galileo hadn't published his findings about light and heavy objects falling, but he did publish "The Starry Messenger" in March of 1610, which was received with *public* acclaim and excitement. However, the Church developed a different viewpoint, despite some of the Church's mathematicians being in agreement with Galileo's findings.

Discussion and controversy escalated as some clergy accused Galileo of heresy for suggesting that the sun did not revolve around the earth. When Galileo argued that the bible was correct, but perhaps the interpretations were flawed, he may have angered the clerics – biblical interpretation was *their* domain, not some mathematician's.

Ultimately Galileo was formally accused to the Inquisition. In 1616 he was found innocent of all charges, but he was cautioned not to teach the Copernican theory.

(It could have been much worse: in 1600, the year Shakespeare wrote *Hamlet*, one Giordano Bruno, after seven and one-half years in the dungeons and cells of the Inquisition, was burned at the stake for, in part, his teaching of the Copernican theory. Copernicus' great work, *Revolutions of the Heavenly Bodies*, was published in 1543 – but that was four decades after his revelations, for he feared the wrath of the Church.

He was literally on his deathbed when the first printed copy of his work was placed in his hands.)

Contradicting the established consensus or doctrine can be a risky business: Copernicus avoided it; Bruno paid with his life; Galileo dodged it – this time.

As Galileo pursued other mathematical interests, he began writing his works not as scientific papers, but as imaginary dialogues among three participants: the first, a brilliant proponent of the scientific argument; the second, an open-minded listener; and the third, a dogmatic and foolish detractor who ignored the evidence presented. This third one he named *Simplicio* – the simple one – a protector of consensus or doctrine, despite compelling evidence to the contrary.

When Galileo wrote "Dialogue on the Two Great Systems of the World", he got himself back in hot water – *this* dialogue was once again talking about the shunned Copernican system. It was a hit with the public, but not with the Church. In 1633, Pope Urban VIII ordered that Galileo be threatened with torture if he did not renounce the heresy that the earth revolved around the sun. (It is possible that the scientific presentation was not completely responsible for Galileo's prosecution – or persecution – but that the Pope was offended by the implication that *Simplicio* represented the Pope himself.)

Now age 70, Galileo did ultimately "abjure, curse, and detest" his Copernican views. His Dialogue and other books supporting his scientific findings were placed in the Church's *Index of Prohibited Books* – where they stayed as censored for nearly 200 years. On the bright side, Galileo's fame and reputation allowed him to be sentenced to "house arrest" until his death at age 79. (Interestingly, as the wheels turn *oh so slowly*, in 1992 Pope John Paul II formally and publicly cleared Galileo of any wrongdoing.)

Disputing the party line, contradicting the established doctrine, or questioning the proclaimed “consensus” can be a path fraught with personal and professional danger. But science is not about consensus – science is the antithesis of consensus. Science is about questioning and proving or disproving hypotheses.

When you’re told “*everybody* knows that such-and-such is true . . .”, that’s a good time to begin questioning the “such-and-such”. So let me move on, because this paper is not about Galileo. It’s about Global Warming and it’s about science versus consensus.

Let me start out by saying that Global Warming is real. This is not a paper to dispute the existence of Global Warming. It is with us and will come around every millennium or so, whether we like it or not. As sure as it’s warmer in summer than it is in the winter, our world goes through climate cycles.

Just one week ago, there was another story in our own *Buffalo News* proclaiming “Warming Blamed on Humans”, complete with a graph to support drastic warming in recent history that, certainly, could only be caused by human activities that are creating excessive CO_2 emissions that are trapping heat and warming our planet to an ecologically dangerous level.


FRIDAY, FEBRUARY 2, 2007

NATIONAL NEWS

Warming blamed on humans in report

An increasingly warmer planet

A panel of climate scientists is expected to predict an increase in temperatures of 2.5 to 10.4 degrees Fahrenheit by 2100.

Global temperature anomaly, compared to 1961-1990 mean

+0.5°C (+0.6°F)

1998 Warmest year on record

0

-0.5°C (-0.6°F)

1860 '80 1900 '20 '40 '60 '80 2000

Source: University of East Anglia, U.K.

Associated Press

Perhaps we could look at another graph, this one from the *Intergovernmental Panel on Climate Change (IPCC)*, the advisory body established by the United Nations' World Meterological Organization and Environmental Program.

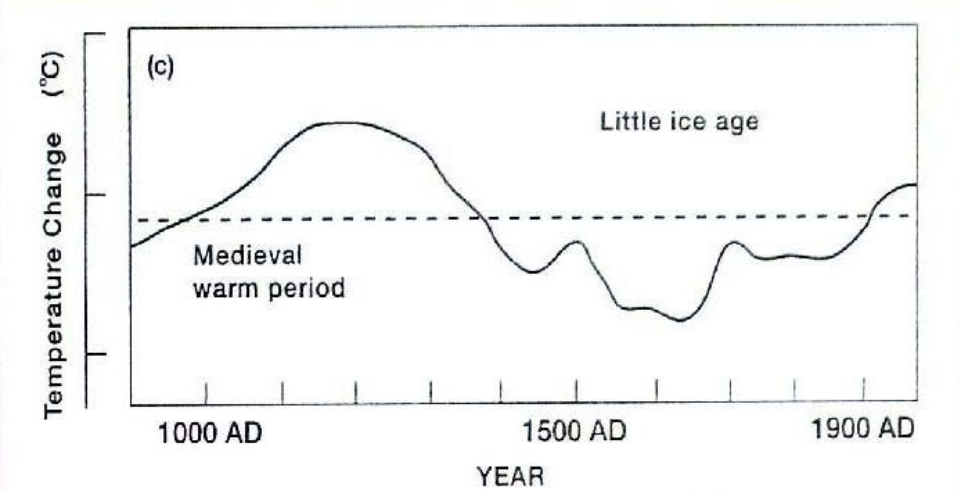


Figure 5.1. The Last 1,000 Years of Earth Temperatures from Tree Rings, Ice Cores, and Thermometers.
(Figure 22 in the IPCC's *Climate Change*, 1995.)

This graph from the IPCC shows the Earth's warming and cooling patterns for the past thousand years or so. This shows a cyclical pattern of warming, then cooling, then warming again.

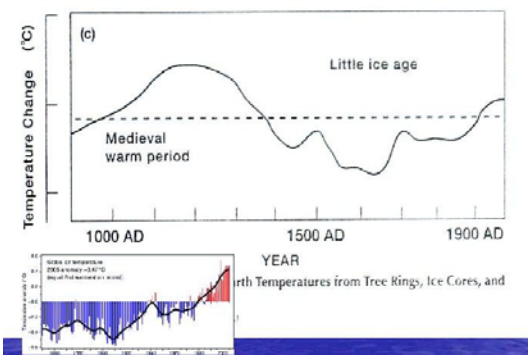
The most recent big cyclical events are known as the Medieval Warming period, from about 800 – 1300 AD, and the Little Ice Age, from about 1300 to 1850. From peak to trough, these cycles has been about 4°C / 7°F in magnitude, or about 2°C above or below the mean temperature for the total period.

It is during this Warming period that Erik the Red led the first settlers to Greenland. Around 1,000 AD, his son Leif went exploring in the more hospitable, less ice-bound northern seas and discovered land, new found land, in present-day Canada. Greenland became increasingly productive agriculturally, drawing increasing settlers from and trade with Scandinavia. Then, by the 1300's, declining temperatures and advancing glaciers made the land less hospitable and the growing seasons shorter. By

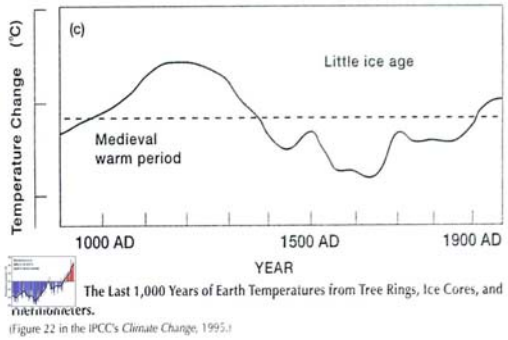
1500, the Norse population of Greenland disappeared.

Research documented in the book Unstoppable Global Warming, by climate physicist S. Fred Singer and writer Dennis Avery, indicates that there has been cyclical warming and cooling occurring for hundreds of thousands of years, in roughly 1500 year full cycles. If this is true, it could make you wonder why we are getting hysterical and frightened about being in the current warming phase.

As noted in the chart that appeared in *The News,* since 1850 the earth has been warming, slowly and erratically, increasing almost 1.5°F to date, a little bit less than 1°C. There was a surge from 1850 to 1870, followed by mild cooling, then another surge from 1920 to 1940, cooling from 1940 to 1970, then the global climate resumed its warming trend.



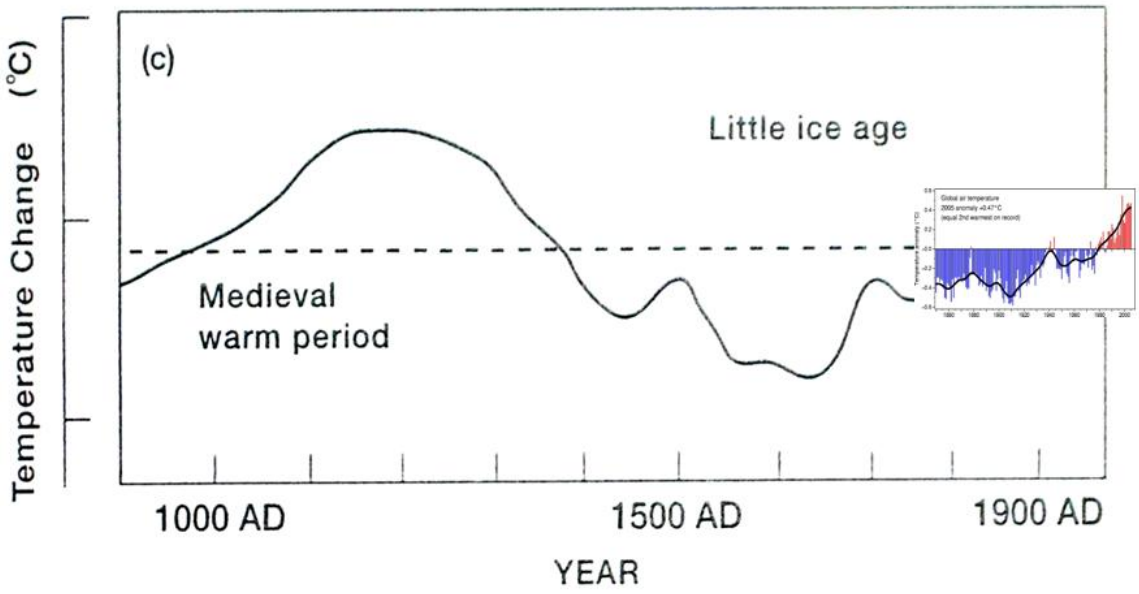
So, let's take this chart and add it to the climate cycle chart.



The Last 1,000 Years of Earth Temperatures from Tree Rings, Ice Cores, and thermometers.
(Figure 22 in the IPCC's *Climate Change*, 1995.)

Now we synchronize the scales for the two charts.

When you combine these two charts, you will see that the recent warming has taken us part way up through our current warming cycle, which is looking more and more like the Medieval Warming Period of a thousand years ago.



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And yet, it is almost impossible these days to pick up a newspaper or news magazine that doesn't have a significant story about the dangers of Global Warming and lays the blame on the human activities on our planet. It IS CONSENSUS: no reasonable person could disagree (and therefore any dissenters are unreasonable). Global warming skeptics who question the "consensus causes" have been equated with deniers of the Holocaust.

Today people are very busy, and all too many of us rely on quick, superficial media coverage our information. Global Warming is today's man-made catastrophe. You've read it, you've heard it on TV, and Al Gore has made a movie about a slide show about his certainty about it.

BUT WAIT . . . Do you remember the headlines and stories from the 1970's (at the end of that 30 year cooling period)?

"The threat of a new ice age must now stand alongside nuclear war as a likely source of wholesale death and misery for mankind."
Nigel Calder, *International Wildlife*, June '75

"The rapid cooling of the earth since World War II is also in accord with the increased air pollution associated with industrialization and an exploding population."
Reid Bryson, "Environmental Roulette", 1971

"[t]he world's climatologists are <u>agreed</u> . . . Once the freeze starts it will be too late."
Douglas Colligan, *Science Digest*, 1975

And even as late as 1992 in *Newsweek*:

"The advent of a new ice age, scientists say, appears to be guaranteed. The devastation will be astonishing."
Greg Easterbrook, "Return of the Glaciers", *Newsweek*, 11-23-92

NOW "scientists say" that mankind's activities have been and are the cause of devastating Global Warming – this is "anthropomorphic climate change" – which will drive species to extinction and flood the world. THIS, man-made Global Warming, is now the *real* Truth.

Do you remember your George Orwell … 1984? "Eurasia is the enemy. Eurasia has *always* been the enemy." Today man-made Global Warming is the danger – it has *always* been the danger.

Doomsayers are always with us, and it is doomsday scenarios that get the most attention. It doesn't matter if their predictions never come true; very little future attention is given to the validity of the predictions.

Paul Ehrlich is one who has made his fortune being a professional doomsayer. His global disaster is always just over the horizon, just around the bend. In 1968 he predicted that:

"*In the 1970's and 1980's hundreds of millions of people will starve to death in spite of any crash programs embarked upon now.*"

In 1969 he predicted:

"*Hundreds of millions of people will soon perish in smog disasters in New York and Los Angeles …*
the oceans will die of DDT poisoning by 1979 …
the U.S. life expectancy will drop to 42 years by 1980 due to cancer epidemics."

This guy still gets invited for cocktail parties and serious interviews. Where have you ever read *in-depth reporting* about his <u>failed</u> predictions like you read back when he made them?

Ehrlich erred in using static projection for his statistics. He took relatively short-term trends, or narrow ranges of factors, and projected them into the future as if there were no other factors and counter-forces which interact with the trends he presented.

Now we're faced with the same kind of short-term, imaginative disaster predictions concerning Global Warming, and a media that is all too happy to report it all as "consensus" and denigrate skeptical scientists whose research and experimentation tell them a different story. Dr. Richard Lindzen, the MIT Alfred P. Sloan professor of meteorology, flatly stated, "Skepticism is <u>essential</u> to science – consensus if foreign."

In April 2006, *Time* magazine's story "Be worried, Be Very Worried" touted the virtual melt-down of planet Earth, and portrayed the scenarios as being all but inevitable. That sells a lot more magazines that a story titled "Global Temperature Expected to Increase by 1° by year 2150".

In science, and in sound judgment, we are supposed to get our convictions from the data, not get data to fit our convictions (although that <u>*is*</u> human nature). Experimental studies determine whether or not A causes B. Observational studies can note that A and B were both observed, so I am free to conclude that A caused B, … or

that B caused A, whichever is in alignment with my beliefs. In Freakonomics, a very interesting book, the underlying principle is that correlation is not proof of causation – that you often have to look deeper for the cause that leads to the effect.

I want to use the final part of this paper to look at the Greenhouse Theory and the CO_2 levels in the atmosphere – perhaps the most vilified component of the "greenhouse gases" since the banning of CFC's. 97% of the CO_2 in the atmosphere is naturally occuring, 3% is man-made. CO_2 levels have been increasing … but why? And does it matter? Man-made CO_2 is increasing – but the U.S. is sinking (sequestering) more carbon that it is emitting – one of the benefits of increasing forestlands year after year.

So, CO_2 levels are increasing and the planet is getting warmer. Is this correlation or is it causation? Because A occurs and B occcurs, does A cause B? Or does B cause A? Or are they simply coincident?

So, return with me to high school physics and chemistry. The solubility of gases in a liquid is inversely proportional to the temperature of the liquid. That is, the warmer a liquid is, the less gas that is able to be contained by the liquid. If a cold can of soda stands open all day at room temperature, it will taste "flat" because the CO_2 has been released from it due the increasing temperature. Boiled water tastes "flat" because all the oxygen *gas* has been removed by heating.

The oceans of the world are full of CO_2. If the planet *is* in a warming cycle, CO_2 is naturally being released from the oceans of the world. If the oceans are getting warmer, even by a single degree, they will release more CO_2 into the atmosphere. More warming results in more CO_2. So, is cyclical Global Warming *causing* an increase in "greenhouse gases"?

Second, why doesn't the Greenhouse Theory explain the temperature changes of the past 150 years? Most of the warming occurred before 1940, before the greater increase in human-generated CO_2 in the atmosphere. Then, interestingly, as industries ramped up and committed some of our worst environmental sins, the global climate cooled from 1940 to 1970. After that, coincident with the improvement in pollution controls and the reduction of auto and industrial emissions, the global climate resumed its warming trend. This runs counter to the Greenhouse Theory, but is in accord with cyclical climate changes.

Third, for the past 200,000 years, CO_2 has apparently been a *lagging* indicator of global warming, not a leading or causal factor. Ice core samples taken during the past 15 years have shown that temperature and CO_2 levels have tracked closely together during the last three glacial ice ages – with CO_2 changes *lagging* the temperature changes. This goes back to the common sense model of the oceans holding more CO_2 when they are colder and releasing more when they are warmer.

We have heard many stories about the melting of the polar ice caps due to the "greenhouse effect" and the inevitable rise in sea levels. The Greenhouse Theory dictates that temperatures will rise faster in the polar regions due to man-made CO_2 emissions. Al Gore postulates a devastating *twenty foot rise* in sea levels. (A 2005 National Academy of Sciences-collaborated report estimates a *worst-case* scenario of 35", and the IPCC's 2001 report predicts somewhere in the 3" – 29" range.)

For flooding purposes, melting of the Arctic ice doesn't concern me as much – if you melt floating ice, it doesn't change your water level. What about the Antarctic? All that ice melting off the huge land mass would have a signifcant impact on sea levels.

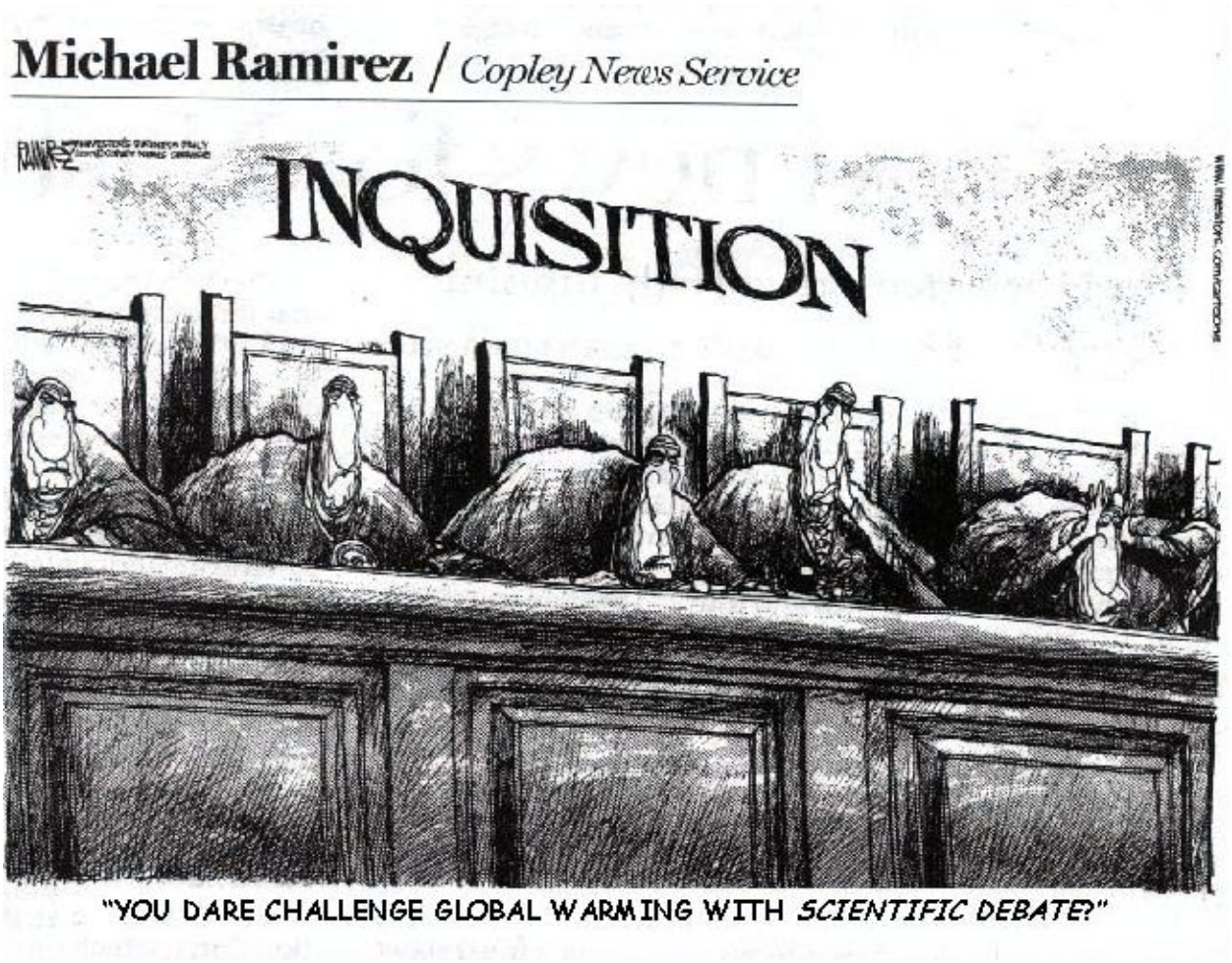
The Antarctic peninsula, the thin finger of land that reaches out toward South

America, is about 3-4% of Antarctica and has been getting warmer for the past 10 or 15 years. The recorded temperatures are running as much as 1° higher than they were fifty years ago.

However, the other 96% of Antarctica has actually been cooling slightly, only fractions of a degree, but cooling nonetheless. This is again in direct contradiction to the Greenhouse Theory. Numerous agencies, universities, and organizations have independently studied and or measured this phenomenon, but where is the media reporting?

Why don't disparite theories and research results get presented and debated in the media for all to consider? Well, there is now a self-proclaimed consensus that man-made Global Warming is occuring and will be the cause of ecological armageddon. Other points of view are not welcome. CBS's Scott Pelley, in defense of his February 2006 *60 Minutes* story on Global Warming, said, "There comes a point in journalism where striving for balance beomes irresponsible."

The Weather Channel's most prominent climatologist is advocating that broadcast meteorologists be stripped of their scientific certification if they express skepticism about predictions of manmade catastrophic global warming. Heidi Cullen, who hosts the weekly global warming program "The Climate Code," is advocating that the American Meteorological Society revoke their "Seal of Approval" for any television weatherman who expresses skepticism that human activity is creating a climate catastrophe.



Science is, at its best, about balance, about skepticism, about testing, about reporting, and about having your results challenged. It is not about popularity, doctrine, or consensus. But personal and professional lives and reputations are at stake, grants for scientific studies and images of universities are at risk for those who will not adhere to the the politically correct “consensus of the day”.

I look forward to revisiting this topic, Global Warming, in future years, to see if it is still a *cause celebre* or has become another unreported catastrophe that never happened.