

The President's Column (Fall, 2007)

“BEYOND WHETHER”

Regular readers will recall that in the Spring President's column I discussed the possibility that our ability to recognize a truly “catastrophic” geological event – one that would leave a significant mark on the geological record – might be limited by our perspective of three score years and ten and overall vulnerability to geologically minor one-offs that, although cosmically immaterial, leave a mark on the soul of humanity. This led me in turn, with a couple of stimuli detailed below, to muse on the ongoing catastrophe of global warming.

I mean, it is a catastrophe...right? You quite literally don't need to open a newspaper these days to read about it, as it's all over the front page. In fact, you don't even need to go to the popular press. The title of this essay is taken from the header of the “Investment Intelligence” bulletin that accompanied my March bank statement, which read in full “Climate Change: Beyond Whether”. Now, aside from the fact that I was pleasantly surprised to find out that my bank has a sense of humour seldom in evidence in their financial dealings with me, it also struck me that those four words really sum up the point we seem to have arrived at in the view of the media, the most vocal portions of the scientific community, and at least some world governments. There is no question. The evidence all points to it. Our models are all quite conclusive. Look, it's happening all around you. The polar bears are starving. The...whoa up there my man. Rewind. Let's just think about all of that. After all, we are scientists. We owe it to ourselves and to our communities to look out for the facts, to understand the differences between data and interpretation, and, particularly as earth scientists who study sedimentary systems (in the final analysis, the real barometers of long-term “climate change”), think about and understand the geological context of the present state of the planet.

Clearly, in the space allotted to me here by our eagle-eyed secretary and Keeper-of-The-Newsletter, I am NOT going to provide any answers. Nor should I, as I'm as confused as a budgie by the whole thing. But what I am committed to, and what I hope I can persuade you gentle reader also to commit to, is to take the scientific path, to oppose the BS on both sides of the fence, and to be an advocate for science over witch-hunting and pseudo-science.

At this point, I would like to acknowledge the two people who inspired me to address this rather contentious subject. Firstly, Dr Jonathan Bujak, a palaeobotanist who works on the data from the 2004 IODP ACEX (Arctic Coring Expedition) drill sites on the Lomonosov Ridge in the Central Arctic, and who will present his results as a keynote speech at the 2nd Conference on Arctic Geology, Resources and Environment, associated with the 5th International Conference on Arctic Margins (Bujak, 2007). I was fortunate enough to have a preview of his presentation in Houston, and it was heavy on facts and observations, with interpretations based solidly on those facts. This contrasts strongly with my other inspirational writer, Mr Al Gore, who wrote the following in an article in the New York Times (Gore, 2007):

“Consider this tale of two planets. Earth and Venus are almost exactly the same size, and have almost exactly the same amount of carbon. The difference is that most of the carbon on earth is in the ground...and most of the carbon on Venus is in the atmosphere. As a result, while the average temperature on earth is a pleasant 59 degrees, the average temperature on Venus is 867 degrees. True, Venus is closer to the Sun than we are, but the fault is not in our star; Venus is three times hotter on average than Mercury, which is right next to the sun. It's the carbon dioxide”.

Aside from the ham-fisted Shakespearean misquote lending an air of intellectual preciousness, the misuse of science in this paragraph is decidedly mischievous, and is an object lesson in how facts (the average temperature of a planet, orbital diameter) can be twisted into a sensational story with an unmistakable but unspoken implication (if we keep pouring carbon into our atmosphere, we will end up just like Venus). This is bad journalism in its lack of objectivity, and even worse science...the comparison of the average temperature of a planet with no appreciable atmosphere and a surface temperature varying from minus 297 to plus 800 and that of one with an atmosphere comprising 96% carbon dioxide

and strong atmospheric circulation assuring that the average is indeed average is quite meaningless. As, indeed, is the wonderful factoid that the “average temperature” of planet earth is 59 degrees.

Jonathan Bujak’s presentation, in contrast, presents a series of facts on current atmospheric carbon dioxide content, current planetary glaciation, oceanic circulation and continental disposition, and compares this with the geological record, noting the feedback loops and general controls. He then discusses the occurrence of the fossil *Azolla* in the arctic cores, and draws an inference between that and the changing levels of atmospheric carbon dioxide in the early Eocene. The point I wish to draw is that the facts can be presented objectively, and inferences drawn, without reference to drama or specious comparisons. The salient fact presented that I wanted to reiterate is that of the atmospheric content of carbon dioxide over the past 55 million years. We are all used to seeing the “hockey stick” of atmospheric carbon dioxide content over the past thousand years (Figure 1):

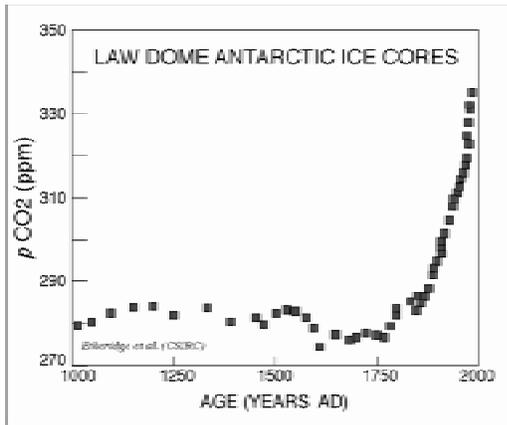


Figure 1: The Carbon Dioxide “Hockey Stick”

This graph, with the startling increase in carbon dioxide since the beginning of the industrial revolution has been used as conclusive proof that anthropogenic carbon dioxide driving the trend, and so is solely responsible for global warming. Models based on this curve predict that it can only get “worse”. But what is the geological, rather than socio-historical, context of these data?

If it is plotted “geologically”, with time vertical, and then pushed back by use of other ice cores to half a million years or so (Figure 2), we see a series of cycles developed, reflecting glacial and interglacial periods:

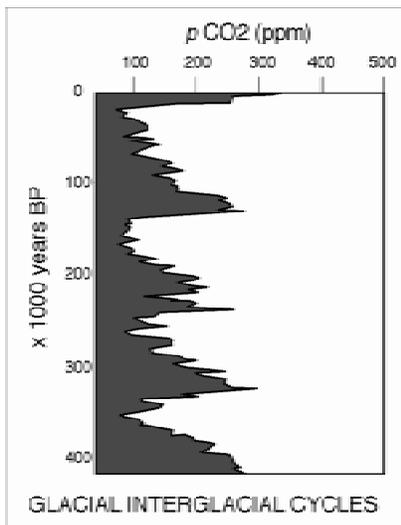


Figure 2: Glacial/Interglacial correlation with Carbon Dioxide in the Atmosphere

In this context, the entirety of “settled” human history has occurred through a rapidly-increasing carbon dioxide concentration, so to what degree is the current spike entirely “down to us”?

In the same article as quoted above, Mr Gore makes the (again, entirely factual, as seen in the graph) point that over the past million years, the atmosphere has never had a greater concentration than 300ppm “until the beginning of the coal boom”. Factual, yes, but contextual, very definitely not. Given the cyclic behaviour shown in this diagram, it really is not clear (to me at least) whether we are still on the way up, or about to go down.

Pushing the trend further back by use of other geochemical proxies for carbon dioxide content, we see the following:

Mid-Oligocene to mid-Miocene values were stable in the region of 600ppm (Figure 3).

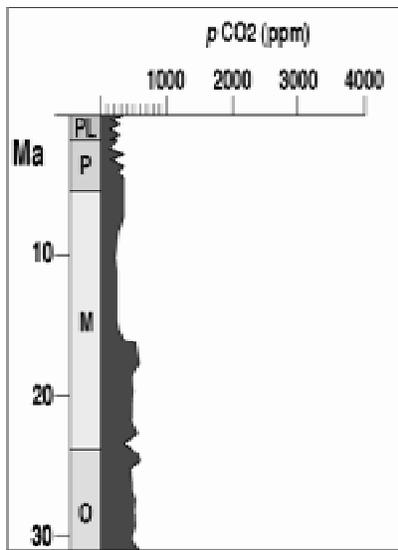


Figure 3: Mid Oligocene to Present Day Carbon Dioxide levels.

In the early Oligocene, the values fell from around 1200ppm to 600ppm (Figure 4), coincident with the onset and development of full Antarctic glaciation

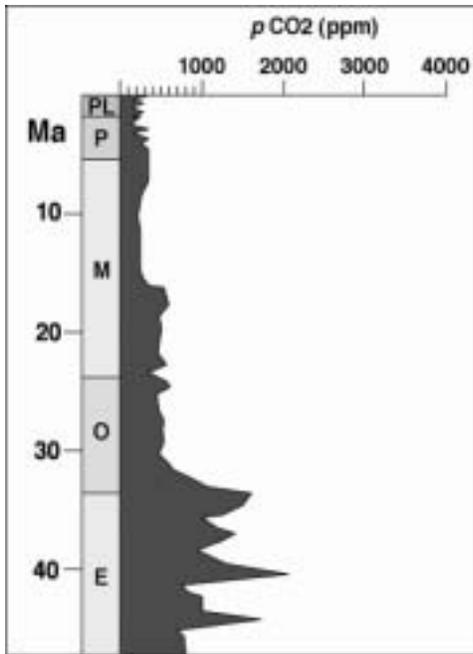


Figure 4: Mid-Eocene to Present Day Carbon Dioxide Levels.

Even these numbers were low compared to the stable levels that preceded them in the Palaeocene and early Eocene, when they fell precipitously from the 3600ppm which appears to have been the Cretaceous “greenhouse norm” to as low as 600ppm prior to the period of instability in the middle Eocene to early Oligocene (Figure 5):

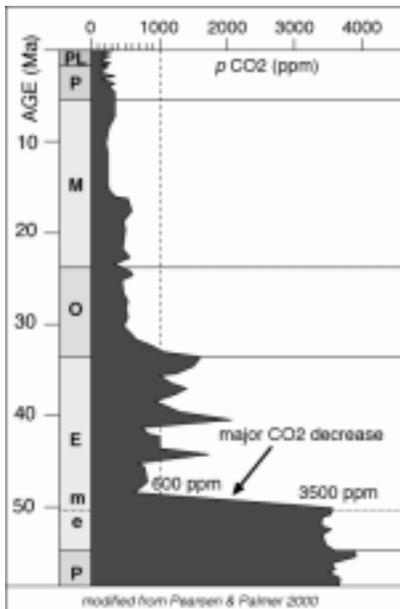


Figure 5: Late Palaeocene to Present Day Carbon Dioxide Levels.

The thrust of Dr Bujak’s research conclusions is an interpretation of the coincidence of an organic-rich early/middle Eocene facies in the Lomonosov cores dominated by only one fossil-type (the flora *Azolla*) with the marked and very rapid reduction in atmospheric carbon dioxide. It is an elegant

theory, but rather than steal his thunder, I urge you to look up the data/papers for yourselves (for example Brinkhuis *et al.* 2006).

The salient take-away for me from these data is that current levels of atmospheric carbon dioxide are not geologically unusual, and that there are many controlling factors in addition to the release of “greenhouse” gases by human activity. Taking the long view, maybe it is hubristic to think that we alone are responsible for the changes we see around us, and maybe even more so to think that we can control or reverse them? Were I in a position to provide political advice in this context, I would be strongly urging that rather than (or in addition to) trying to do that, I would be putting in place long-range plans to deal with the consequences. But that, of course, would require planning beyond the effective life of any given politician today, and would require acknowledgement that they may be powerless in the face of change of such magnitude, so maybe I’ll stick to editorialising with my own constituency!

As a final note, I should clarify that I personally am not among those who reject outright the idea that the planet is warming, and that elements of that change may be anthropogenic. My position is probably best described as “agnostic” (technical word for “sitting on the fence”!). This stance, as I said at the beginning, behoves me to understand the context in which the change is taking place, to look on both sides of the fence as it were, and to speak out with facts in the face of some of the wild-eyed speculation and predictions of imminent doom that some would propagate. And I would urge all of you who value science over story-telling, and interpretation over posturing, to do the same.

This will be my last contribution to the newsletter as President of the section, as my term expires at the end of the year. It has been an honour to carry the torch for a year, and I am deeply indebted to my colleagues on the Executive Committee and the Trustees of the Foundation for bearing with my cavalier attitude to Roberts Rules and what at times was a rather dilatory response to my scheduled duties. They have carried me through, and I will be handing over the reins of power to Janok Bhattacharya and his soon-to-be-elected committee safe in the knowledge that we are as strong and purposeful as ever.

My remaining duties are to provide some introductory remarks and support for the section at our two remaining annual conference events. The first of these is the GCAGS-GCSSEPM Annual Convention “Exploring the Third Coast” in Corpus Christi (October 21st to 23rd). One of the highlights there will be the GCSSEPM luncheon talk by our National President Dr Mary Kraus, who will speak on the topic of “Using multiple paleosol proxies to interpret paleoclimate change: The Paleocene-Eocene Thermal Maximum in Wyoming”, which will provide an interesting and informative view on precisely the topic of the to the essay above! Then, on December 2nd to 5th in Houston, we have the 2007 Bob F Perkins Research Conference “The Paleogene of the Gulf of Mexico and Caribbean Basins: Processes, Events and Petroleum Systems”. Given the current wave of exploration activity in both basins, this will be a very timely and appropriate meeting, and I urge you to book early to avoid disappointment!

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Brinkhuis, H., *et al.*: Episodic Fresh Surface Waters in the Eocene Arctic Ocean. *Nature*, **441**, pp. 606 – 609.

Bujak, J., 2007: The Azolla Story: Implications for Eocene super-greenhouse to icehouse change and the deposition of potentially Arctic-wide petroleum source rocks. Keynote address, 2nd Conference on Arctic Geology, Resources and Environment, Tromsø.

Gore, A., 2007: Moving Beyond Kyoto. *New York Times*, Sunday July 1st, Op-Ed.