IAN PLIMER'S "HEAVEN & EARTH": Reflections on the climate denial movement.

Science is one of the more successful human endeavours – it would be perverse to argue about that. Not perfect, but very productive of both understanding and technical applications. Few people would want to live without its benefits. Yet it is also strangely unfamiliar. The way scientists do business; the sources of new knowledge, and the procedures for assessing and admitting it; the conduct of scientific controversy; the nature of certainty, and the way science proceeds with provisional understanding, and the way it becomes established – all this and much more about working science is a mystery to most people. And this state of affairs has consequences.

Sometime in the early 1990s a deliberate effort was begun to capture and divert the process of public information about climate change – specifically, to create and disseminate the false impression that there was little or no scientific certainty about the threat, and hence no grounds for urgent action. It has been remarkably successful. On the face of it, this should seem very strange. The scientific (even the political) consensus in 1992 was already strong (that, presumably was the stimulus for a political reaction) and it has only become stronger. Yet the targets of misinformation – the media, public & politicians – have swallowed enough nonsense to make meaningful political action very difficult indeed. How was this possible? How could it be that on a matter that so closely concerns the welfare of our immediate descendants, we've been fooled, like the Easter Islanders, into perverse choices that will guarantee their suffering? How could we be so gullible?

These were the kind of questions that came to me reading Ian Plimer's book, "Heaven & Earth". The author is a well-accredited professor of mining geology. He shows his familiarity with technical matters often enough in the book, and he seems to have a good head for detail – the book carries 2300 citations to the scientific literature. But it is a terrible scientific book. It fails to discriminate between good and bad evidence in the grossest manner – some of what is cited is complete rubbish and could easily be corrected by undergraduates. Its argument is sloppy in the extreme. Essentially it conforms to a common climate contrarian formula: *"The Earth isn't getting hotter – but if it is, then it's not caused by us; but if it is, then it's not due to* CO_2 *– but if it is, then it's not* <u>*our*</u> CO_2*; but if it is, then it won't do any harm – but if it does, we'll be able to handle it".*

This is confused enough, but it is delivered in an undeveloped state, in loosely connected sections. Its style is combative and opinionated, heavy with conviction. His big message is that everything has happened before (geologists know their history); we couldn't be messing up the atmosphere; CO_2 isn't dangerous, but beneficial; anyway it has been much higher before and nothing happened. Those who know their history, according to the author, will see that current trends have been misrepresented, and pose no threat whatsoever.

That's a lot of refutation for one book. So how does Plimer manage to throw away virtually *all* the work of all the specialists in the various climate sciences in 400 pages? That's what I wanted to understand. It seemed to me that if I could follow his enterprise far enough to see that, I might be able to understand how the climate denial project has succeeded as far as it has, and what it might take to shake ourselves

free of it. So in this review I'll try to do two things – in section I I'll set down some thoughts on climate denial stimulated by reading this book; and in the next section give a more detailed account of its failure as a scientific book – which, at the very beginning, the author proclaims it to be. If you want to see my warrant for any judgements made in the first part, look for it in the second.

What sort of book is it?

If, as I try to make clear in the following section, this only pretends to be a scientific book, then what is it? Well, the author tells us himself in his introduction (p28). It is a manifesto, written to persuade three dinner guests, and anyone else "with an open mind" that the scientific case for anthropogenic climate change is a fraud. Now of course it can be polemical and still be scientific. But is it? To consider this, we must first be clear what Plimer has undertaken to do. The case he wants to demolish has been built up over decades by hundreds of very careful investigators working in a dozen different fields of enquiry (until recently there was no such thing as a discipline of climate science). It has many strands of observation and argument, and as the enterprise has matured, they have had a pronounced tendency to converge on a single result: *human activity has altered the atmosphere enough to guarantee a hotter future, with consequences more or less predictable, most of them very troubling*.

Ian Plimer, who has never worked on any climate problem, and is therefore just as much an amateur as you or I, calmly promises to refute *all* this work. Everything. In the course of the book, not even the best-established finding is left alone. Now it's important to understand that this is <u>not</u> a scientific thing to do. No scientific controversy ever works like this. Fruitfully criticizing the work of another scientist might entail questions of competence, but normally it is about methods, interpretations, technical stuff, statistical problems, observational errors, measurements and so on. But for Plimer's comprehensive refutation to work, he has to find ALL the patient, gifted and dedicated researchers he disagrees with, and their entire body of work, incompetent.

Imagine if he had decided to do this to, say, virology. Suppose he wanted to persuade us that viral diseases are caused by magnetism, with everything that implied for diagnosis, prevention and therapy. We'd rightly insist that a body of knowledge accumulated diligently over 50 years, no matter how imperfect or incomplete, requires extraordinary proof to discard it. Well, that's how we ought to respond to Plimer's book. I'm sorry to say we haven't. While knowledgeable scientists have assessed it very critically, it's selling rather well, been favourably reviewed by some journals that should know better, and the denial business has lauded it as a triumph. Be that as it may, the simple fact that this author claims victory, not over a scientific issue, but over an entire scientific enterprise, tells us that his project is not really scientific at all. That conclusion is safe no matter how many footnotes he includes.

But could he, after all, be the originator of a genuine scientific revolution, knowing something others have overlooked, and refuse to concede? To answer this, we have to look at what's in the book. To do the job, his arguments must be cogent – that is, they need to demonstrate consistency with what is known for certain already; the evidence he cites must be accredited – that is, it ought to be obtainable by anyone seeking it by appropriate methods; there should be testable predictions, so that experiments or

conceivable future observations can confirm what is hypothesised. On these tests, the book fails miserably. It probably doesn't even make the starting line. Instead of the powerful insights and well-developed compelling arguments that would be required to accomplish his big project, there is just lots of worthless stuff – a long, loosely bound series of accusations drawn from a curious array of sources.

Some of it is re-cycled garbage – standard fare in the denial literature; some is junk science, the work of crackpots; some is plain misinterpretation; some is deliberate deception; some appears to be the fruit of real and serious ignorance. All of it is motivated by a transparent and ever-present desire – to humiliate and discredit his opponents. If the book is a stew of bad ideas and poor arguments, then its seasoning is Plimer's hatred of the people who disagree with him – a destructive, relentless passion which seems to be the book's real motivating force. There is no love of truth here, and despite the author's avowal, no commitment to scientific rigour. There is instead, a harsh and venomous negativity concentrated on those scientists and advocates who have been especially effective communicators. Does being a work of passion mean it can't be scientific? In my view it does. Let me try and explain.

The basic findings of climate science about the climate change threat are easy enough to summarize.
1. Human activity (especially combustion of fossil fuels) has injected enough greenhouse gases into the atmosphere to induce warming.
2. The predicted warming (despite shortcomings in our knowledge of all the processes involved) is very likely to be a severe problem for human societies.
3. The probable pace of change means that if we are to have any chance of mitigating adverse effects, we should act now.
Some of the discoveries that lie behind these findings are the result merely of learning how to measure things (global temperature, atmospheric gases, ocean currents, *etc*) better than we could before. Some are due to the application of new technologies to old problems (radio-isotope clocks; satellite remote sensing; improving computer modelling, *etc*). Some came from the discovery of completely new sources of climate data (especially the search for evidence of past and ancient climate states). Some has been the result of the patient and semi-intuitive work of synthesizing strands of evidence from various investigations into productive hypotheses which become platforms for further inquiry.

Anyone who wants to challenge this work must do it bit by bit, showing how each and every achievement is defective. Realistically, this isn't possible – not just because one lifetime wouldn't be long enough, but because there is far too much perfectly sound stuff here. When Louis Pasteur first proposed the theory of infectious disease by micro-organisms, many physicians scoffed; but to scoff now would be absurd. There is just not enough room for doubt. Well, it's like that for most of what is now known about the climate problem. What people like Plimer do is exploit the real uncertainties that exist in the business of prediction, and our imperfect state of knowledge about the complexities in Earth's climate systems to make it look as if everything were no better than guesswork. That is why he rubbishes computer models so much. But it's not the reason he attacks other scientists so mercilessly. Doing that only works for him if he can convince us they are bad people – liars, cheats & crooks – which is what he tries to do from beginning to end.

Is this a ruse, or does he really think his opponents are crooks? You have to make up your own mind, but for what it's worth, I'm certain that expresses his real conviction. This is the way I see it. If some scientist disagrees with some part of another's work, but cannot bring himself to respect the person while arguing the issue, we know (absolutely) that his problem is not scientific at all, but personal, or ideological, or emotional, or psychotic, or something. The scientific issues stand apart, but if they cannot be adjudicated without abuse, insinuations and insult, we know they haven't been addressed at all. That's my view at any rate.

Perhaps I can best convey the feel of Plimer's attitude to opponents by using the example of the IPCC, which has 49 entries in the book's index – every one of them critical. Here is a sample:
P19: IPCC personnel are incompetent "environmental activists".
P21: Ben Santer (co-author) is attacked for falsifying the 1996 Report.
P91: IPCC knowingly published false data (the hockey stick graph) in 2001.
P101: IPCC fails to take account of solar influence on climate.
P112: IPCC models fail to include the effects of clouds.
P192: IPCC modelling on the relation of warming and extinction is incompetent.
P208: IPCC grossly underestimates natural CO_2 outgassing.
P233: IPCC doesn't understand the Milankovitch theory of climate forcing.
P286: IPCC falsely claims, contrary to evidence, that glaciers & ice caps are melting.
P315: IPCC estimates of future sea-level rise are completely mistaken.
P365: IPCC doesn't understand the greenhouse effect.
P381: "IPCC computer models have no bearing on reality" – *ie* they produce lies.
P388: To make their models work IPCC rejects measurements in favour of guesswork.
P390: IPCC falsely claims the 1990s to be the hottest decade.
P391: The 2007 Report used false data to show warming.
P413: IPCC ignores major natural sources of CO_2.
P419: IPCC suspiciously ignored chemical CO_2 assays because they don't show the desired rising trend.
P421: IPCC ignores "numerous known sinks of CO_2.
P423: IPCC reported falsely on the residence time of CO_2 in the atmosphere.
P432: IPCC "dismisses the role of cosmic radiation creating low-level clouds" and "promotes conclusions based on complex computer models that use dubious assumptions, incomplete data and a poor understanding of how the planet operates."
P437: IPCC is manipulated by "green groups" which have "scientifically misled and deceived politicians and their advisors."
P444: IPCC is controlled by a coterie: "A new Lysenko has arisen in climate circles".
P450: IPCC suppresses dissent the way religious fundamentalists do.

That should be enough to show that in Plimer's view, this group is not just in error, but incompetent, devious and corrupt, with an undeclared political agenda. I don't know if ranting like this reminds you of anything, but I was strongly reminded of another context as I read the book, wondering about its real motives. But before getting to that, let me say something about the IPCC for a bit of perspective. This body is far from perfect – few of its participants would argue about that. But it wasn't created to be perfect, merely to do a job, and a very necessary one. In 1989 it seemed that science had something important to say about the possibility of future climate change;

but because the science of climate was fairly new, and its findings came from many disciplines, and because they usually needed interpretation, the World Meteorological Organization convened a sort of giant committee (actually a set of committees of practicing scientists) to draft consensus statements on the state of knowledge from time to time.

The intended audience for these reports was policy-makers and the public, but they have been well used by scientists in related fields, journalists, teachers and many others. They are nothing if not conservative (in a scientific, not a political sense – despite what Plimer and other critics say, IPCC reports are scrupulously non-political); superbly detailed and authoritative. The IPCC is not a bureaucratic empire, nor an ideological cabal, and certainly not a sinister agency with secret political agendas. It is an *ad hoc* conference of working scientists trying to communicate as unambiguously as possible what its practitioners are discovering about Earth's climate. If only other scientific disciplines (clinical science and therapeutics, for example) could do the same. Plimer's paranoid abuse of these people tells us nothing at all about their work, but a lot about their accuser. So what is Plimer's problem?

In a fascinating essay in *New Republic* in 2008, Sam Tanenhaus explains the character of one of the strands of post war American political conservatism. People who felt very disturbed by 60s & 70s radicalism founded a reactionary movement whose *modus operandi* is what Tanenhaus calls "the politics of hate" – a negative ideology, vaguely revanchist, but precise in its condemnation of the liberation ideologies of the radical 70s, including environmentalism. These ideologues, in a strange way, know better what they want to destroy than what they wish to create or conserve; are more passionate about the evil of their perceived enemies than about the details of their own program. Whenever I am in the United States I can see exactly what he means.

When Plimer says (p23) "The IPCC is clearly an ascientific political organization in which environmental activists and government representatives are setting the agenda for a variety of reasons including boosting trade, encouraging protectionism, adding costs to competitors and pushing their own sovereign barrow" he is being utterly irrational. The only evidence for this assertion is their holding opinions opposite to his own. Likewise when he says (p442) "There are close parallels between Lysenko [the stereotype of political pseudo-science] and the global warming movement", the proposition is deranged. When he demonises Al Gore, the creator of *An Inconvenient Truth*, trivialises James Hansen (Director of the Goddard Centre for Space Studies, a highly respected scientist and a fearless climate advocate), and vilifies Michael Mann (co-author of the "hockey-stick" reconstruction of millennial temperatures) he is simply venting personal spleen which has nothing whatsoever to do with an assessment of their work.

It seems to me that what unites these various invectives is just the kind of negative view of the political universe that Tanenhaus described. Perhaps further reflection will bring another and kinder interpretation, but for now, I'm satisfied that this is a political book – or rather a pseudo-political one, since its political premises are chimerical. Confirmation might perhaps be found in the fact that Plimer's admirers seem to share his passion equally with his version of the facts.

There is another strange impression one gets from the book. It often seems incredible that a senior academic could have written the things he wrote. The abuse of procedure is so flagrant (borrowing and misrepresenting unacknowledged graphics; citing sources for things they do not say); his judgement in the use of evidence is so irregular; his views on scientific matters often so eccentric, that one has a sense that the author has been afflicted with some kind of blindness. This odd tunnel vision is, for me, one of the strongest impressions of the book. For instance, in his discussion of carbon dioxide and the atmosphere he pursues the phantom of denial erratically from place to place, without noticing the multitude of well-established facts that lie in his way. He uses long-discarded arguments just as if nobody had ever done anything to refute them before; he worries at the finished work of Keeling and his successors, as if he had no idea how futile this is; he provides a naïve account of the greenhouse effect which a bright high school student could correct. It is difficult to believe his successful career in geology could have been conducted this way, so one suspects something about this subject has deprived him of judgement – whether the heat of conviction or something else you may decide for yourself.

Another, more sinister feeling came from the book – something which it shares very much with the whole climate denial enterprise. It's the feeling of frustrated political purpose. We are incredibly fortunate to live in a democracy with liberal institutions and checks on executive power. It is very easy to forget how much struggle and hard work has been invested to make it so, yet there is no shortage of recent examples to remind us that the framework of a liberal state is something that must be nurtured and renewed if it is to survive. I found myself wondering, while reading Ian Plimer's book, how he and his party would proceed in the event they were in a position to make climate policy and deal with dissent. From the evidence of the book it can hardly be doubted that the scientists refuted therein would be persecuted. (While climate deniers *were* in government during the recent US administration, there were systematic attempts to distort, suppress and punish scientists and their work.)

There is an irony here – though not one that should surprise us. One of Plimer's repeated plaints is that his opponents have co-opted the political process for ideological gain. But that is precisely what his book promises as revenge. If climate scientists are even partly right in their estimate of the threat that looms for our grandchildren, then the most urgent thing we have to do is to learn how to put aside our ancient habits of partition and opposition, and figure out ways to act as a human family. It doesn't make any difference if your instinct tells you this is impossible – we will be obliged to make the attempt for our descendants' sake just the same - because the problem these scientists have discerned is simply beyond our reach otherwise. That's what makes the deniers' intolerant and bellicose tactics so disturbing. By insisting on finding enemies where there are none, this group is reasserting an atavistic prejudice against open and participatory governance that, in our present circumstances is about the most foolish and dangerous thing you could do.

PART TWO
IAN PLIMER'S ARGUMENT: an assessment of "Heaven and Earth"

Since *Heaven and Earth* is not a logically structured argument, but a diatribe, it isn't possible to answer its propositions with a counter-argument. The book isn't structured by argument at all, but is divided into chapters titled *History; The Sun; Earth; Ice; Water; and Air.* At the end, there is a further chapter devoted to revealing more of the author's personal convictions. The chapter contents don't fit into these containers very well, and the arrangement is a bit like an untidy filing cabinet; so rather than review the book under these categories, I'll try to show Plimer's procedure by first defining his targets – the main propositions of the science of anthropogenic climate change – then look at the missiles he aims at them, and what damage (if any) he has been able to inflict.

Before beginning on the list, however, I want to pin down a couple of the book's underlying sources of prejudice. A reader unaware of these would certainly become confused. Reading this is a bit like wandering in a hall of mirrors - it is a very deceptive book because the author purveys a large quantity of dodgy proposals in an authoritative lecture-room style, all the while reminding us of his scientific credentials and the depravity of his opponents. Even scientific discrimination is sometimes not enough to tell if he is serious.

1. There is a sort of refrain in the background of this book, endlessly re-stated like a malfunctioning record - the geologist's reminder that a long view of Earth's history makes everything unsurprising. All the things we are told to worry about have happened before, without dire consequences. Now of course it is true that Earth has a long history and seen vast changes. We know quite a bit about this story and are learning more of it all the time. But no one in the climate science business has the smallest problem with this idea. It is simply uncontroversial. What Plimer wants to insinuate by repeating it so often is that present climate changes must be part of it.

In other words, he is going for what he considers the weak link in the science of anthropogenic climate change - the arguments used to link cause and effect. We need to be clear that this is indeed an issue - attributing cause in any scientific endeavour is always in the end, a matter of judgment - but his *prima facie* dismissal of ALL the work that has been done to demonstrate the link between human activity and climate change is pure prejudice. He never attempts to get to grips with any of this work, anywhere in the book, but instead repeats his contempt for "computer models" again and again.

So if you are reading the book, you can grant Plimer his big point - that the world has been hotter and colder, and coated by more CO_2 before - but not his specious one that *therefore* humans cannot be changing the climate. His insistence on this fallacy is actually pretty strange: it is so clearly mistaken. For instance, here he is on page 10.

"If we humans are warming the planet now, how do we explain alternating cool and warm periods during the current post-glacial warming?"

This is a bit like asking, "If we humans killed off the Dodo, how do we explain the extinction of the dinosaurs?" It is a logical *non-sequitur*. Utter nonsense.

2. Plimer appears to be obsessed with the idea that climate scientists know nothing about Earth-science (geology). Sometimes he even seems to be saying that they've suppressed, rather than ignored this science because it is inconvenient for them.

"To reduce modern climate change to one variable (CO_2) or, more correctly, a small proportion of one variable (i.e. human-produced CO_2) is not science, especially as it requires abandoning all we know about planet Earth, the sun and the cosmos. Such models fail." [p11]

This is a very odd thing to say, not least because many of the most accomplished people working on climate problems are trained in Earth-science, but also because of the strange notion that "modern climate change" has been "reduced" to something as insignificant as anthropogenic CO_2. An unjaundiced reading of the history of this scientific program shows that interest in the properties of atmospheric CO_2 began in the 19th century and developed over a century or more. The first suggestions that humans might be adding enough CO_2 to the air to make a difference to the climate were made before 1900. The idea has had plenty of ups and downs on the road to maturity, but it is now as solid as anything known about the Earth-atmosphere system, and not the least bit controversial.

One is inclined to think that Plimer is just repeating the oft-heard complaint of many ignorant climate deniers that CO_2 could not possibly mess up the climate because the air contains so little of it; or that human activity is too puny to do the same. Be that as it may, his logic is again the victim of a prior conviction.

3. Plimer insists throughout the book that what is called 'climate science' is not really science at all, but a politically driven program – "a process where authorities balance volumes of opinions. That's it. A phenomenon is now scientifically proven because various authorities and some scientists say so. Evidence now no longer matters. … Climate science lacks scientific discipline. Studies of the Earth's atmosphere tell us nothing about future climate." [p15]

To anyone familiar with the climate sciences, this is the most incredible rubbish. The first part of his complaint is directed at the IPCC, something he seems to regard with loathing. The second expresses his view that the working scientists are in some way phoneys or dupes – not real scientists at all. They don't understand their subject, or the proper methods of conducting scientific enquiries, and they are fixed on unjustified conclusions arrived at beforehand. This sounds crazy, but it's not. Plimer makes it necessary by taking on an impossible task. The only way he can claim that an entire scientific enterprise is wrong is to persuade us that its practitioners aren't really scientists.

His problem with the way science is done doesn't seem to be restricted to climate science, but is a part of a bigger gripe about the intrusion of authority into life, a loss of discipline in intellectual pursuits, hostile political agencies, and neglect of his own study – the old-fashioned geology. For all I know, he may be right in much of this, but even if we were to grant him everything, it wouldn't make the slightest difference to his need to demonstrate with superior evidence, the truth of what he's asserting.

When he tries to provide his readers with an account of real scientific method, as he does, for example, on p14, and in the final chapter, where he discusses the "vernalization" of science, he betrays both naivety and prejudice. Likewise when he obsessively derides climate modeling as worthless in passages like the following, he reveals the most elementary ignorance about the enterprise he is criticizing. There are dozens like these.

"The extensive reliance by global warmers on computer models impresses those with little scientific training." [p15]

"A model is not real. Models are not evidence. Models with simulations, projections and predictions prove nothing. All a model shows is something about the model itself and the modelers, normally their limitations." [p15]

"Models tell us more about the self-regulating undisclosed interests of groups than they do about present or future climate." [p439]

There's something visceral about his prejudice against the science of climate modeling. Its sources we cannot know, because he doesn't tell us, but the distorting effects on his judgment are as clear as can be. The fact is, the study of modeled climate states has been absolutely indispensible to advancing our understanding of these complex systems. To announce that models cannot match the complexity of the real world is hardly news – besides, nobody, least of all the professionals who work with them every day, ever claimed otherwise. If the planetary climate system were something one could use for routine controlled experiments, we wouldn't need to simulate it in computer programs nearly as much. But it isn't. As our knowledge has grown, so the models have acquired sophistication; as computers have become more powerful, models can simulate more complexity. Despite what Plimer and others say, this science has been getting better for decades, and has done remarkable things.

4. I said before that it is easy to get confused by this book. After struggling with confusion myself, I'm certain this is an intended consequence of Plimer's method. One needs to be quite clear what the author is attempting – the demolition of a perfectly well established major scientific conclusion, not by producing a well-founded set of counter arguments, but by deception. He uses four techniques to attack his opponents:

- Ignoring all evidence that doesn't suit him;
- Insinuating that key evidence is defective;
- Personally attacking people with opposing views;
- Disguising pseudo-scientific nonsense with jargon.

It is this last practice which is most likely to cause a mistaken assessment of the work in an unwary reader. The book's bombastic style seems to be deliberately

calculated to create a false impression of competence – to make the reader forget that this author is not a practitioner in the field he is attacking, but an amateur.

A bit of reflection, however, and one can see why this was pretty much inevitable in such a book. The author has no real weapons for his enterprise, so he must be disingenuous in as many ways as he can manage. 'Scientific bluster' was always going to be one of them. There is a curious irony here. In 1994 Plimer wrote a book about religious fundamentalism. He remains very critical of irrationality, and having decided that the "global warming movement" is a form of fundamentalism, accuses its "adherents" repetitively of the very sins that are so plentiful in his book. You can get a good idea of how he uses this rhetorical trickery here.
http://www.realclimate.org/index.php/archives/2009/08/plimers-homework-assignment/#more-930

5. The last thing I want to say about the book's background has to do with that sense of weird blindness that recurs very often. There are places where he uses data that are altered or misrepresented, as in *Fig 3* on p25; *Fig 4* on the following page; *Fig 15* on p131; *Fig 14* on p126; *Fig 11* on p 89; *Fig 48* on p 374, and many more, where it is impossible to believe he did not know what the true facts were. Understanding why a man of Plimer's accomplishments would mangle evidence in this way is, for me, genuinely puzzling, until you digest what he says about the motives of his opponents. So you can get a feel for his views on this, here is a sample from his final chapter.

"Human-induced global warming is an unproven scientific hypothesis yet it has become an article of scientific dogma. The peer review process in climatology research is controlled by the secular equivalent of the Collegium Romanum, the IPCC. They in turn are answerable to the Inquisition, the global warming fundamentalists …" [p463]

"Global warmers are uplifted by believing that they have a mission to save the world." [p440]

"With the theory in tatters, it is no wonder that they defend their political dogma with religious zeal." [p448]

"Rabid environmentalism embraces the hallmarks of fundamentalist Christianity." [p465]

"The environmental religion embraces anti-human totalitarianism." [p466]

"The filling of a spiritual vacuum by environmentalism creates an ever greater spiritual vacuum." [p467]

"The environmental romantics hate industry, love Nature, idealize peasant life, believe capitalism is wicked, think people in modern society lead shallow depraved lives and have forgotten the true value of things …" [p468]

Now it may be, for all I know, that the environmental movement warrants every criticism Plimer directs at it – but even if that were the case it would have no effect whatsoever on the truth or falsehood of climate change science, a question that rests on the evidence produced by practicing scientists and nothing else. Not on what you might think of their consensus committee, or

any personal antagonisms, or your distaste for their politics, or your views on the spiritual predicament of modern souls, or any of the other preoccupations that saturate Plimer's polemic. When all is said and done, this is probably the most important thing a reader should know about the book – that it is a work of propaganda. It is most certainly *not* the critically disciplined book promised.

Plimer's project

To the extent Professor Plimer's book is about a scientific argument, it is aimed at a conclusion reached by scientists from a dozen or so disciplines over the last 50 years or more. It might conveniently be summarized in four propositions thus:

- The world has been warming for about a century, and will continue to warm under current conditions;
- All or most of the warming is caused by human activities (mainly burning fossil fuels, land clearing and other industrial practices) increasing the atmospheric greenhouse effect;
- The resulting warming, and the altered atmosphere is very likely to have a number of serious consequences for human societies and other living things;
- If there is an opportunity to fix this, it will have to be done quickly.

Here are Plimer's counter-propositions:

- There has been modest warming during the twentieth century, and also cooling – neither is anything to worry about; both are entirely natural, and have historical precedents which make them unexceptional;
- Since 1998 there has been a global cooling trend;
- The main cause of warming has been a change in the output of the sun, but also changes in cloud behaviour due to cosmic rays;
- Human-produced greenhouse gases do not cause warming;
- The contribution of human activity to increasing atmospheric CO_2 is insignificant;
- There will be no future anthropogenic warming, or any dire consequences;
- Any future *natural* warming will be beneficial;
- Proposals to take preventive action on global warming are useless and unnecessary.

In what follows I try to give an idea of how Plimer goes about his task. As I'm not an expert, and the book has been expertly refuted before, I'll refer you to places where you can see how people who know their stuff deal with Plimer's case. But you should be able to get a feel for the quality of his work from these notes. Here are some places where you'll see what real scientists think of the book.

http://bravenewclimate.com/2009/04/23/ian-plimer-heaven-and-earth/
http://scienceblogs.com/deltoid/2009/04/the_science_is_missing_from_ia.php
http://www.complex.org.au/tiki-download_file.php?fileId=91
http://www.guardian.co.uk/environment/georgemonbiot/2009/jul/09/george-monbiot-ian-plimer
http://www.theaustralian.news.com.au/story/0,,25433059-5003900,00.html

http://www.realclimate.org/index.php/archives/2009/08/plimers-homework-assignment/#more-930

1. Twentieth century warming has been modest by historical standards.

What is Plimer denying with this claim? The research Centres that monitor global climate have been doing this work for many years, have accumulated enormous experience and expertise, and independently generate records that substantially agree: the world has warmed about 0.8C during the 20th century. The record shows a continuously rising trend 1900 to about 1940, then a halt (in the northern hemisphere, a slight reverse) then a resumption after about 1978. This is completely unambiguous. There really are no rational grounds for disputing the record – no better one exists. Making a running estimate of global (as distinct from regional or local) temperature is a highly specialized work. There are plenty of problems, but in the decades these scientists have been doing it, most of them have been pretty well worked out. The room for error is not very large.

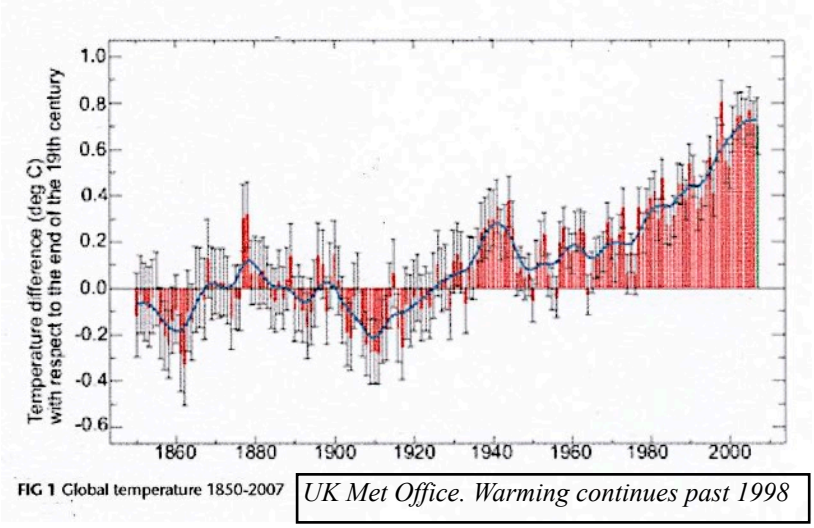
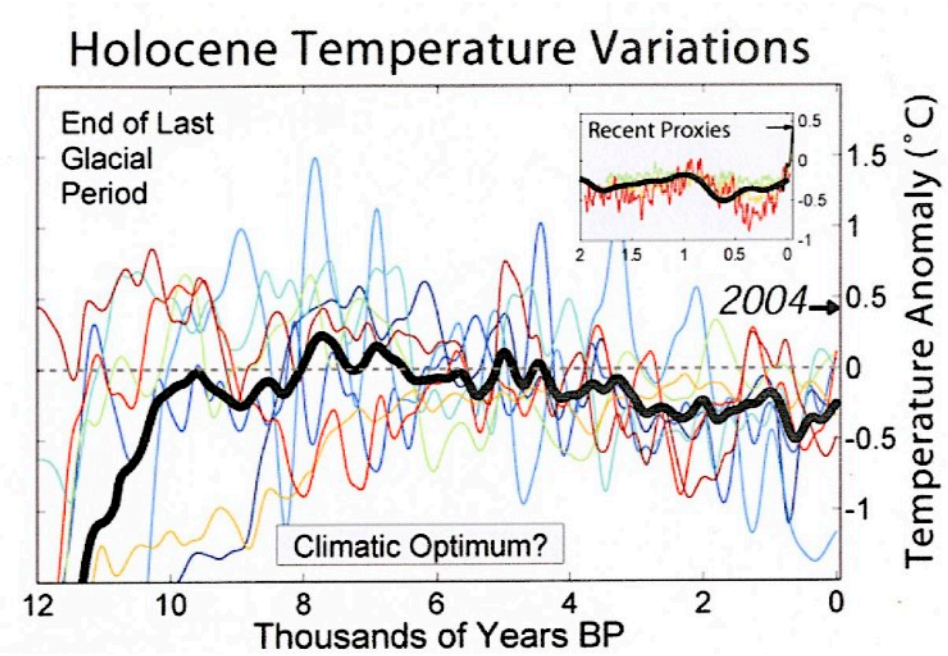


FIG 1 Global temperature 1850-2007 *UK Met Office. Warming continues past 1998*

So Plimer's claim is a big one. How does he uphold it? Well, he attempts two things: one is to tell a story that modern warming is completely unexceptional (he gives multiple instances of warmer times during the Holocene, even in historical times); and he denies that the temperature records (instrumental and proxy) are telling us the truth. How does he do this? First, he gives a very biased account of the 'hockey stick' controversy, ignoring all the work that has since confirmed it [p87 *et seq*], then he provides a rather confused and inaccurate account of the reliability of instrumental temperature monitoring, leaning heavily on the tired argument that warming is mostly an illusion due to uncorrected 'urban heat island effect'. [p376 *et seq*] What strikes one as remarkable is that while Plimer appears to be well informed about the published work of any number of contrarians, he is extraordinarily unaware of the work of anyone who disagrees with him. This isn't a book where you'll find any scientists' work carefully or imaginatively criticized – more like a catalogue of grievances. You won't get any idea from this book of the large amount of high quality work that goes on in hundreds of labs, steadily building our knowledge of Earth's climate system. Instead you get hints that there is just an incestuous group of rogues cooking up lies for their political allies. It is an insane view of what is going on.



Reconstruction of global temperature for the Holocene. The black line represents the mean for included studies. The broken horizontal line is the mid-twentieth century mean. The inset is an enlargement of the most recent 2 millennia; on both graphs, the global mean temperature for 2004 is indicated by the arrow. Note that the trend of these studies shows an early Holocene optimum at about 8000yrs BP and a slow cooling until the 20th century. On this evidence, twentieth century warming is clearly anomalous. [Global Warming Art]

Looking closer, perhaps we should start with *Figure 3* [p25]. Like many diagrams in the book, this one is given without any acknowledgement of its source. It is supposed to show the global temperature climbing from 1975 to 1998 to about 0.2C above the 1940 peak, then leveling. It has the decline from 1940 to 1975 emphasized in order to show that there was no relation between CO_2 emissions and temperature for the century. This graph has been taken from the contrarian documentary *The Great Global Warming Swindle*, which was itself a swindle full of half truths, distortions and nonsense. When challenged about the veracity of this figure, the program's producer retracted it, substituting more accurate data. Ian Plimer has used the uncorrected version, which falsifies the shape of the warming since 1979. Both versions together with the GISS data which was distorted to make them are given by Barry Brook here: http://bravenewclimate.com/2009/04/23/ian-plimer-heaven-and-earth/

Page 26 contains a graph *[Fig 4]* of two temperature records from 2002 to 2008, showing what looks like a decline. Also on the graph is the upward trend of CO_2. Plimer offers this short sample as proof that temperature and carbon dioxide are unrelated (of course it is no such thing). The effect of this graph is due to its being truncated precisely where it has been. If the HADCRU data had been used in their entirety, they would have shown the warming trend continuing. This is a straightforward case of deception, since Plimer must have been in possession of all of the facts.

On page 89, Plimer tries to persuade us that the world really was a lot warmer in the middle ages, one of his favourite claims – one which he says is corroborated by "hundreds of previously validated studies". It is not. In fact

every worthwhile study shows that, at the most, the peak global temperature for this intermittently warm period (c.900 – 1350AD) was about where it was in 1900. Again, the graph *[Fig 11]* has no attribution & no explanation of the data source. It was drawn by Hubert Lamb and published in 1965, as a qualitative study of reconstructed temperatures for the region of central England. Lamb was one of the first able meteorologists to be seriously interested in past climates, and would have been the first to admit that his study was imprecise by today's standards – and has no relevance to global temperature. Nonetheless, Plimer shamelessly misrepresents it as part of his vicious attack on the lead author of the 'hockey stick' study of 1999, Michael Mann.

This brings me to one of the ugliest things about this book – its relentless use of personal vilification. When Mann's original study (a proxy reconstruction for temperatures back to 1400AD, using mainly tree rings) was published in 1998, it didn't attract too much attention from non-scientists; but when his 1999 update for the millennium, used in the IPCC 2001 report, was roundly criticized by a couple of statisticians in partisan fashion a couple of years later, it started a furore which, as far as climate deniers are concerned, hasn't finished. Mann has been attacked viciously, as he is in this book, accused of dishonesty, scientific and even criminal fraud [p97], professional misconduct and incompetence. Plimer uses this episode (through selective quotation from the Wegman committee report) to make his case that climate scientists work as a coterie, assisting each other to make false findings and uphold their fraudulent claims about global warming.

Closing the discussion, he says, "Mother nature does not obey computer models and ideology." [p99] Only a few sentences before, he commits a bare-faced misrepresentation by claiming, "the UK's Meteorological Office has now confirmed a fall in average global temperatures since 1998". You can see for yourself the UK Met Office position on this lie by visiting: http://www.metoffice.gov.uk/climatechange/guide/downloads/Your%20Guide_Facts_The%20Big%20Picture_pdf.pdf

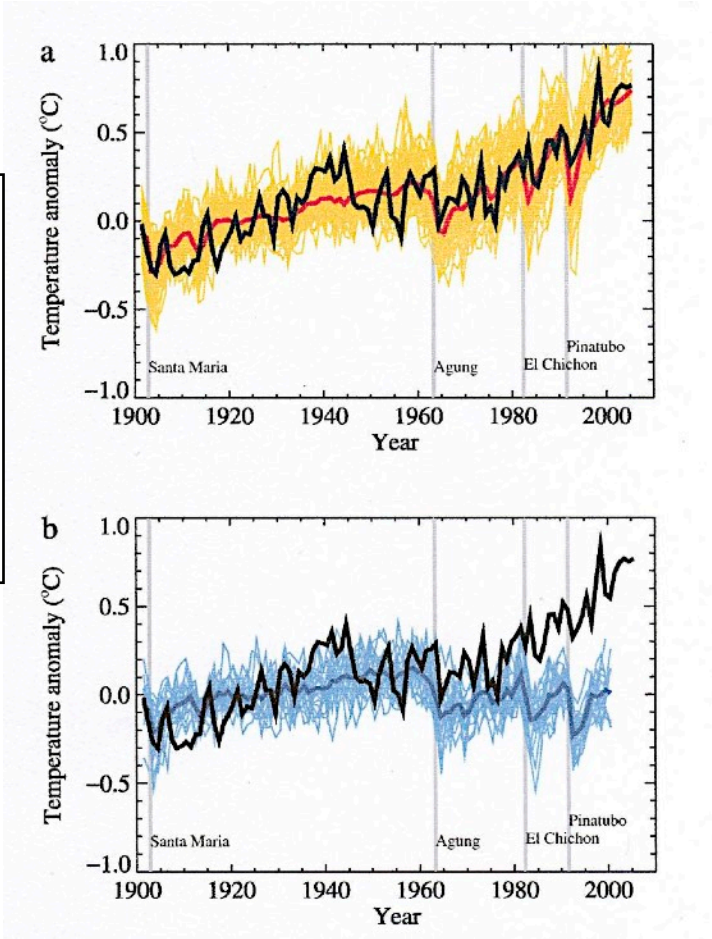
I am not in a position to assess Ian Plimer's account of climate history. He spends quite a bit of his 'history' chapter recounting various historical and pre-historical and geological past climate changes. Yet I had the feeling, that, if it is as reliable as his tale of the Mediaeval Warm Period (WMP) it may not be a very good guide. That can be left for others to decide. While the main venom of his denial of late 20th century warming is directed at the 'hockey stick' and its author, he gives a very curious account of how global temperatures are actually measured [p376-388].

2. What warming there has been is due to natural causes.

In the nature of things, demonstrating that something causes something else is only a probable inference. In other words, both in everyday life and in science, we attribute causes on the basis of an estimate of likelihood. We can't do anything else – that's what causes are about. So when Plimer denies that greenhouse gases cause current warming, he is denying the validity of a body of work which focuses specifically on this question – how probable is it that the

observed warming (which he also denies) has that cause? Again, because of the way the world is, we only get a few chances to run 'natural' experiments (volcanic eruptions, for example provide one-off opportunities to match observation with theory, and are eagerly studied). That's why it's necessary to study climate simulations – simplified models of climate – in order to understand how physical processes work, to quantify estimates of unobserved effects, to search for unanticipated phenomena, and to make predictions. And to look for patterns that match those that would be expected from anthropogenic warming.

A large amount of very productive research has been done (detection and attribution studies), the result of which has been to increase our confidence in the causal connection to a point at which virtually all those who understand the science believe it to be beyond doubt. Not Ian Plimer. To make a case that warming is due to something else, he has to dismiss the work that's been done, and find another culprit. His is the sun, which, not surprisingly, he finds the IPCC has unaccountably neglected.



This figure [IPCC 2007 Ch 9; p684] is an example of an attribution study showing the effect of adding anthropogenic forcing to an ocean/ atmophere general circulation model (AOGCM) in the top panel; compared to natural forcings alone, in the lower one. In both, temperature observations are the bold black line. Agreement between the climate simulation and either observation or past records is the primary test of validity

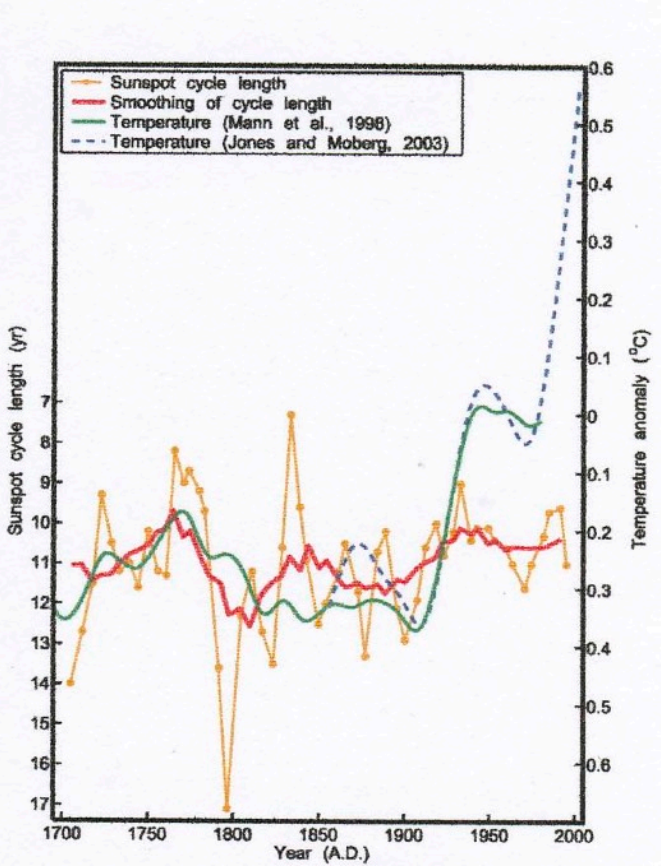
The claim that warming in the 20th century is caused by the sun is by no means new. Various authors, some well informed, some not, have attempted to make the case from time to time. They all falter on the test of evidence. There simply is none. All the reliable records of sunspots and estimates of solar flux show no relation to mean global temperature. Nor would one expect it. This question has been closely studied before and the order of change in solar irradiance due to the sunspot cycle is far too small to have the effect Plimer claims.

On page 126 he provides a strange graph. *[Fig 14]* In the caption he says, "Times of high sunspot numbers are times of prosperity with excess grain and

relatively low grain prices whereas times of low sunspot activity are times of crop failure and relatively high grain prices." But the graph has been falsified. Tim Lambert showed that it came originally from a graphic of the relation of *solar insolation*, not sunspot frequency; that the scales are incorrectly shown, and that two cycles are meaningless as a demonstration of such a relationship. *Figure 15* [p131] is just as misleading. It cuts off the data at its right side, so as to appear to show something about sunspots which in fact it does not. You can see the correction of this spurious data here:

http://www.ofcomswindlecomplaint.net/FullComplaint/p53.htm

A fairly clear summary of the reasons the sunspot argument doesn't work can be found here: http://stephenschneider.stanford.edu/Publications/PDF_Papers/DamonLaut2004.pdf



This graphic, from the paper cited below (Damon & Laut; Eos 85, 2004) shows better the relation between sunspots and temperature. Whatever inference one wants to make about this between 1700 & 1900, the anomalous character of 20th century temperature is obvious.

3. The world has been cooling since 1998.

This claim can only be upheld by falsifying the data in some way. Every one of the records produced by global climate monitoring research Centres shows the opposite – that global mean temperatures have continued to rise past the 1998 El Nino peak, at the trend rate of 0.1C per decade. Because of La Nina conditions during the last decade, there have been regional cooling events, especially the north Pacific, but high latitude warming has continued, particularly in the Arctic and subarctic, and all of its effects on ice sheets and glaciers, storm severity, precipitation, the oceans and biosphere.

For further discussion of this see here:

http://www.cgd.ucar.edu/cas/ace/presentations/easterling.pdf

http://www.metoffice.gov.uk/climatechange/guide/downloads/Your%20Guide_Facts_The%20Big%20Picture_pdf.pdf

Plimer uses a graph on p374 (*Fig 48*) to demonstrate this claim. It is one of the instances of deliberate deception. The graph only shows what he wants

because the short section he reproduces has been excised from the longer record to which it belongs. If he had given 50 years instead of 14, the rising trend would have been visible.

4. The greenhouse gases produced by humans do not cause warming.

To make it clear what Plimer is doing here, I have to say something about the greenhouse effect and the way it works. You can see a much better explanation of both the effect, the story of its discovery and development of our understanding on Spencer Weart's excellent site, "*The Discovery of Global Warming*" at http://www.aip.org/history/climate/co2.htm

Of the early investigators of the greenhouse phenomenon, John Tyndall seems to have understood it best. He wrote that adding CO_2 to the air is like adding to the height of a dam wall. That was in the 1860s. About the turn of the 19th century, however, laboratory work on CO_2 had given rise to the conviction that the gas absorbed radiation in such a way that it would become 'saturated' at a fairly low concentration, and so could not be a major influence on the climate. It followed that adding it to the atmosphere would have little or no effect. This belief, based on a mistaken interpretation of these experiments, retarded further understanding for some decades & it wasn't until the 1950s that the true situation was worked out.

Earth radiates infra-red (IR) photons. On their way through the atmosphere, they encounter gas molecules; those capable of capturing them (the greenhouse gases) are energized by the interaction, and then either transfer kinetic energy to nearby molecules (heating), or re-radiate another photon, which may travel up, down or sideways. The quantity of radiation that is thus 'trapped' in the atmosphere is the cause of atmospheric (and ultimately terrestrial and ocean) warming. However, the atmosphere is also the source of Earth's radiative losses – at its upper limits, IR photons that make it all the way through are lost to space. But as the lower layers warm, the height of this cold, radiating layer rises; and the total number of energized molecules rises correspondingly. The 'saturation' effect that so impressed investigators a century ago in the lab, in the real atmosphere never occurs.

Now it's important to realize that this story is a piece of physical science that is now fully worked out. Many details of how warming is affected by complex processes are still not completely understood – but the theoretical basis of the greenhouse effect is not one of them. So how does Ian Plimer get around this in order to deny that rising CO_2 concentrations are going to make things hotter? Well, interestingly, he repeats the erroneous beliefs of a hundred years ago, that a little CO_2 is enough to soak up the radiation that can be captured; adding more has no effect.

"The efficiency of the CO_2 trap is essentially insensitive to the amount of CO_2 in the atmosphere. … If the current atmospheric content of 380 ppmv were doubled to 760 ppmv, there would be a miniscule impact on the radiation balance and the temperature." [p366]

"The role (*sic*) of greenhouse gases is to cool the atmosphere through radiating energy to space." [p369]

"The greatest impact of CO_2 is in the first 100 ppmv in the atmosphere. " [p372]

"Carbon dioxide in the atmosphere operates like a curtain on a window. If you want to keep out light, add a curtain. A second curtain makes little difference, a third curtain makes even less difference, and a fourth curtain is totally ineffectual. CO_2 operates the same way. Once there is about 400 ppmv CO_2 in the atmosphere, doubling or tripling of the CO_2 content has little effect on atmospheric temperature because CO_2 had adsorbed (*sic*) all the infra-red energy it can adsorb." [p374]

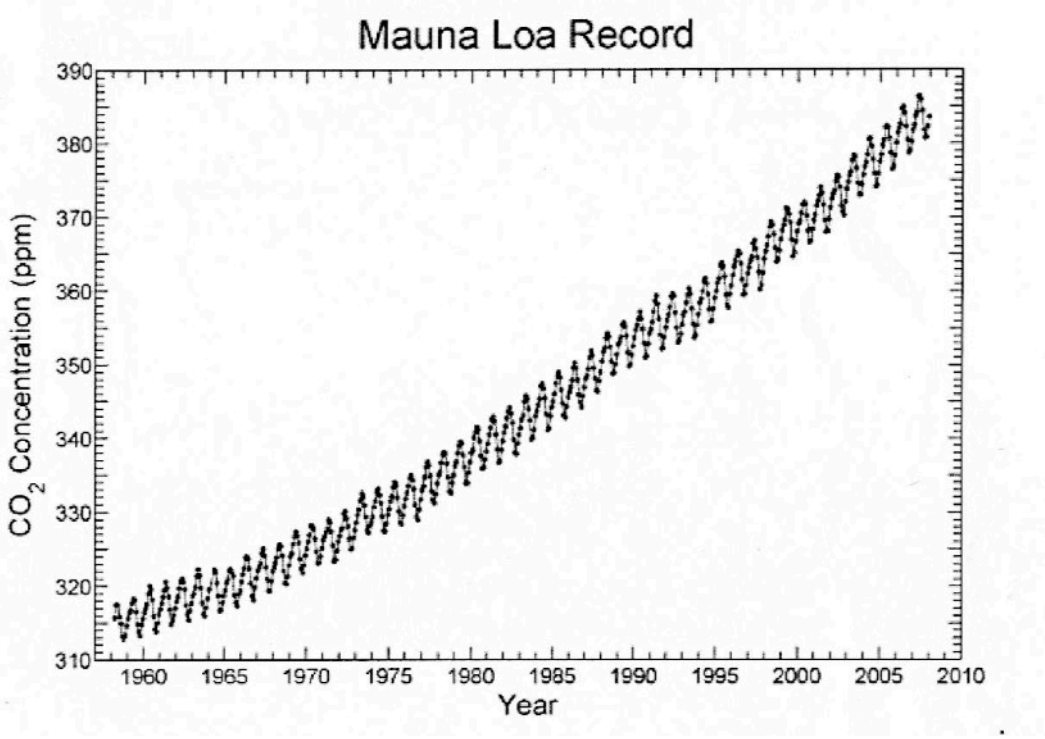
Nobody familiar with atmospheric science will recognize this bizarre account. One can only wonder how Plimer came to be convinced of it. Needless to say, he doesn't hesitate to tell us that the scientists who contribute to IPCC reports don't understand the greenhouse effect. Their false conclusions are therefore due to ignorance, as well as malice.

5. Human activity does not contribute significantly to CO_2 rise, which is mainly caused by volcanoes and other natural processes.

The question of man versus volcanoes is another one that is easy to encounter in the contrarian literature. As far as I can tell, there is nothing to dispute – the calculations used to assess how much gas is emitted by volcanoes in an average year (the actual amount varies a lot from time to time, as you'd expect) have been well worked out – it is well under 1% of the amount emitted by humans. Plimer vigorously disputes this by claiming that the IPCC is negligent, has omitted to account for submarine volcanoes and other tectonic sources, and that the (isotopic) techniques used to differentiate anthropogenic sources of atmospheric carbon are misinterpreted. You can see a discussion of this issue here. http://scienceblogs.com/illconsidered/2006/02/volcanos-emit-more-co2.php

Plimer claims that CO_2 only survives a short time in the atmosphere before being removed by natural processes. This conflicts with the orthodox account that the gas remains for centuries. Again, it is hard to know how to explain his perversity. While it is true that the average residence time of a molecule in the air is of the order of 4-5 years after it has been injected there, its entry into one of the carbon 'sinks' does not end its atmospheric career. Far from it. The sinks are part of a dynamic 'carbon cycle', which ensures that carbon is exchanged between the atmosphere, ocean, soil and organisms many times before it is sequestered in rocks, and thus fairly permanently removed. The effective atmospheric lifetime of emitted anthropogenic CO_2 is of the order of many centuries. It's a mystery how he could not know this. For a discussion of the issue, see David Archer's paper here. http://geosci.uchicago.edu/~archer/reprints/archer.2008.tail_implications.pdf

If there is a single icon that captures the reality of human-induced atmospheric change it must be CD Keeling's graph of the inexorable rise of



The complete record of continuous CO_2 measurements begun by Charles Keeling in 1958. This is probably the most unambiguous piece of evidence in climate science, due to the fastidious approach of Keeling to its collection and the observatory's attention to detail. Notwithstanding, Ian Plimer tells his readers that it should not be taken at face value. This biased approach to perfectly good evidence which just happens not to suit his case is precisely what he so resents in his 'opponents'.

atmospheric CO_2 from 1958 to the present. Along the way it has recorded the effects of volcanoes and cyclical events like El Ninos, but it doesn't falter – every single year is higher than the one before, by an amount which has more than doubled over those 50 years. No data set is more thoroughly accredited. It is backed by similar records from Barrow in the Arctic, New Zealand, Tasmania, and the South Pole. The observatory scientists in Hawaii, where it is recorded are as scrupulous as any could be. Yet Plimer writes that this record should not be trusted, and only concedes that the rising trend in CO_2 concentration is "possible", but exaggerated.

He insinuates that Keeling forgot to account for gases venting from the Hawaiian volcanoes; he discusses the laborious chemical assay method called Pettenkofer, routinely used for atmospheric measurements before the 1950s, and alleges that Keeling's spectroscopic technique is "unvalidated" – that is, it's results cannot be relied on. He tells us that the Mauna Loa data has been "edited" – that is, all numbers that do not fit the rising trend were excised – this is another way of alleging fraud. He produces, on page 420, a graph (*Fig 52*) showing CO_2 assays for the period 1812 to 1961, done by the Pettenkofer technique, showing "great variability", the "high values" of which, he says, have been "rejected by the IPCC", while they adopted the lowest values.

It seems incredible he should not know that it was this very feature of "great variability" that got Charles Keeling started on CO_2 in the first place, and that as a result, he showed, for the first time that properly collected samples would give consistent concentrations, and therefore the gas was well mixed in the

global atmosphere. What he does not say, is that the CO_2 estimates in his graph were taken from different places and that it has long been known that local variations can be very large (assays up to 1500ppmv have been obtained in central Paris). Plimer apparently wants his readers to understand that this is evidence of historical variability of *global* CO_2, when it is nothing of the sort.

6. There is no threat of future harmful warming. If natural warming does happen, it will be beneficial. So will any future rise in CO_2.

Because the atmosphere contains several greenhouse gases which do not act independently, but in complex interactions, working out exactly how hot it will get after a certain addition of CO_2 has turned out to be a very challenging problem. There is little point in trying to say how much warming is due to CO_2 alone, and how much to other factors, because the system changes as a whole. The biggest *indirect* effect of raising atmospheric CO_2 is the amplification of heating due to the induced rise in water vapour. This in turn alters the behaviour of clouds, which can cause heating or cooling, depending on their exact properties, and also changes in precipitation patterns. Another order of complexity concerns the behaviour of carbon reservoirs and the dynamics of exchanges between these and the atmosphere. The ocean, the biggest of the 'sinks' turns out to be a very complicated chemical stew, something which wasn't appreciated not so long ago, and some of the long-term effects on this system of raising atmospheric CO_2 are still being worked out.

A further complication (one which is derided by Plimer, but which has enormous potential to produce unexpected consequences) is the existence of numerous 'feedbacks' in the Earth systems that affect and are affected by climate change. Practicing scientists often speak of "tipping points" in public discussions when referring to this aspect of the way the system works. The idea is that the climate is not an inherently stable state, but an 'equilibrium' one, rather easily perturbed, typically reponding by a lurch into some other state. The evidence for this came first from Greenland ice cores, but has now been found in many places. It is as solid as anything; nobody in climate science doubts any longer that the climate system has this character.

Plimer's position, however, is curious. He is certainly aware that climate states can change fast (the paleoclimate record on this is indubitable), but he refuses to accept the notion that such changes can be casued by triggering the switch from one equilibrium condition to another. The idea is completely unremarkable in the study of dynamic systems; he offers no convincing alternative mechanism for rapid change (there is none), but, perhaps because the words are associated with Al Gore, or for some other reason, he rejects it.

> "Tipping points are a non-scientific myth" [p148]

He has a strange doctrine concerning the relation between temperature and human fortunes which is best given in his own words:

"The history of time shows us that depopulation, social disruption, extinctions, disease and catastrophic droughts take place in cold times and life blossoms and economies boom in warm times." [p9]

As far as I can see, he admits of no exceptions to this law, so he finds that the Medieval warming was "a wonderful time for life on Earth, while the Little ice age was "not a good time to live." Now these are examples of half-truths converted into nonsense by over-generalization. Of course warm weather has benefits (agriculture expanded in northern Europe in the middle ages, just as he says) but the same influence brought devastating mega-drought to the Americas and probably northern Asia. Warmth is neither good nor bad - it just has consequences.

In similar vein, he celebrates carbon dioxide as the bringer of life.

"Carbon is more basic to life that sex. ... It is plant food, and it drives the whole food chain." [p411]

Yes to this. But Plimer's implied conclusion that we can't have too much of this good thing is ridiculous. His conviction on this (as far as I can make it out) is a mixture of the idea that more CO_2 will make plants grow bigger and faster, and outrage that we might have to pay for curtailing emissions.

"To refer to 'carbon pollution' is ascientific political spin. To tax, ration and control the basic element of life is a micro-management of human freedom." [p411]

There are many places in the book where he denies that there is any relation at all between atmospheric CO_2 and the temperature. It follows he would be unconcerned about the rising Keeling curve (even if he allowed its truth), but he also denies that sea-level will rise, ice will melt, or any of Earth's inhabitants inconvenienced in any way. He takes the threat of extinction in his stride.

"There is a constant turnover of life by extinction, which creates environments for new species. Extinction is normal. Conservation of species is contrary to Nature." [p149]

He gives no indication that he is aware of the extraordinary modern rise in the background extinction rate, plausibly linked to human ecological impacts, or the well founded claims that it will rise steeply under expected climate change. One feels that even if he were, he'd prefer non-intervention.

See New Scientist special edition for good articles on several of these issues.

http://www.newscientist.com/article/dn11655-climate-myths-higher-co2-levels-will-boost-plant-growth-and-food-production.html

7.Action on climate change is unwarranted and unwise.

Needless to say, Plimer opposes any political action whatsoever to mitigate, restrain or correct our forward plunge into an uncertain and worrying climate future. I won't linger on this point, except to say that, in a way, this belief of his may well be the most obnoxious and damaging of them all. It depends on

how many people take him seriously, and whether they can have the effect they desire on the Copenhagen talks later this year and any others that might follow. It is a rather gloomy reflection that a book like this can be written and find readers, and that people with Plimer's views are still treated as if they had something useful to say. Worse is knowing that our granchildren's experience on Earth will be so much affected by them. That's why I thought it worth the trouble of reviewing it. No reason less urgent would have been enough. I hope if you've read this far you've learned a bit about the problem - enough to be a sceptic's sceptic.

John Price. September 2009.