

## Resources for Understanding Issues Raised in *The Deniers* by Lawrence Solomon

Jay Gulledge, Ph.D.

### 1. **Causes of Climate Change**

A tutorial written by Jay Gulledge on how climate scientists have identified the causes of contemporary global warming: <http://www.pewclimate.org/docUploads/global-warming-science-brief-august08.pdf>.

### 2. **The Risks of Climate Change**

A book chapter by Jay Gulledge explaining why scientific uncertainty about future climate change translates into significant risks to society: <http://www.pewclimate.org/docUploads/Gulledge-Risks-Uncertainty-Aspen08.pdf>

### 3. **The ‘Hockey Stick’ Temperature Curve**

Jay Gulledge’s testimony about the Mann ‘hockey stick’ before the House Committee on Energy and Commerce, Subcommittee on Oversight and Investigations. This document explains the controversy, describes the development and purpose of the field of past climate reconstructions, and critiques the Wegman Report on the Mann ‘hockey stick’ study:

<http://republicans.energycommerce.house.gov/108/Hearings/07272006hearing2001/Gulledge.pdf>.

(NOTE: In his testimony, Gulledge refers to a pre-publication version of a peer-reviewed paper by Wahl & Ammann. This paper is now in print in the journal *Climatic Change*:

<http://www.springerlink.com/content/h483676101066104/fulltext.pdf>)

### 4. **Claim that Lack of Warming in Antarctica Conflicts with Global Warming**

This claim is a red herring because no one has ever claimed that Antarctica is warming and the reasons that it is not warming in spite of increasing greenhouse gas emissions are reasonably well understood. In spite of the lack of warming, there is contemporary climate change in Antarctica. Jay Gulledge explains the current state of knowledge about Antarctic climate change here:

<http://www.pewclimate.org/global-warming-basics/antarcticfactsheet>.

### 5. **Claim that Global Warming Stopped in 1998**

This claim is covered well by environment correspondent Mark Lynas at the *New Statesman*. This piece is also useful in that it is couched in terms of incorrect journalism on the subject:

<http://www.newstatesman.com/environment/2008/01/global-warming-lynas-climate>

### 6. **Quotes from a few of the most credible of Lawrence Solomon’s “Deniers”**

(bold text is emphasis added in this document)

#### Dr. Edward Wegman

- “We do agree with Dr. Mann on one key point: that [the hockey stick curve is] not the only evidence of global warming. As we said in our report, “In a real sense the paleoclimate results of [the hockey stick study] are essentially *irrelevant to the consensus* on climate change.” ... We certainly agree that modern global warming is real. ... We think it is time to put the ‘hockey stick’ controversy behind us and move on. Wegman testimony, pp. 6-7, July 27, 2006 (<http://energycommerce.house.gov/reparchives/108/Hearings/07272006hearing2001/Wegman.pdf>)

- “We note that according to experts at NASA’s JPL, the average ocean height is increasing by approximately 1 millimeter [sic] per year, half of which is due to melting of polar ice and the other half due to thermal expansion. The latter fact implies that the oceans are absorbing tremendous amounts of heat, which is much more *alarming* because of the coupling of ocean circulation to the atmosphere.” The Wegman Report: E.J. Wegman, D.W. Scott and Y.H. Said. 2006. Ad Hoc Committee Report On The ‘Hockey Stick’ Global Climate Reconstruction, p. 50 (<http://www.uoguelph.ca/~rmckitri/research/WegmanReport.pdf>)

## Dr. Richard Tol

Richard S.J. Tol (2008). The Social Cost of Carbon: Trends, Outliers and Catastrophes. *Economics: The Open-Access, Open-Assessment E-Journal*, Vol. 2, 2008-25. (<http://www.economics-journal.org/economics/journalarticles/2008-25>, pp. 9-10)

- “Firstly, greenhouse gas emission reduction today is justified. Even the most conservative assumption lead to positive estimates of the social cost of carbon... The case for intensification of climate policy outside the EU can be made with conservative assumptions. One does not have to rely on speculation...
- Secondly, *the uncertainty is so large that a considerable risk premium is warranted.*”

Interview with climate economist Richard Tol in the German magazine *WirtschaftsWoche* (<http://www.wiwo.de/technik/wir-haben-genug-zeit-159878/>), as translated by B. Peiser ([http://sciencepolicy.colorado.edu/prometheus/archives/climate\\_change/000986interview\\_with\\_richa.html](http://sciencepolicy.colorado.edu/prometheus/archives/climate_change/000986interview_with_richa.html))

- “It will take 50 to 100 years to lower the emission of greenhouse gases to an agreeable level. In order to achieve this goal, soberness is demanded.”
- “*The situation is serious...* According to my computations the greenhouse effect can cause annual damage of around 0.5 per cent of global GDP. In the next century, when the impact of global warming will be felt fully, the damage could amount to two to four per cent [of global GDP], if nothing would be done about it.”
- We must do something and *should now begin...*
- “The results of the [2006] American elections will strengthen climate activists in the USA so that I envisage new concrete climate programmes in the next three years. The Chinese will follow suit in the next decade, not least because otherwise they will be threatened by *catastrophic environmental damage*. That will generate a huge drive.”
- “The means of my choice would be to raise world-wide taxes on emissions. But that is politically not feasible. Thus, emission trading remains as the second best solution. The state allocates certificates to businesses which - at the outset - permit them free emissions of carbon dioxide, as they do today, and without setting secondary costs. However, if they want to produce more, they must either produce more [energy] efficiently or buy from other businesses (which have reduced their carbon dioxide output) certificates at a kind stock exchange. Such a free market system helps the environment.”

## Duncan Wingham

The Science Show with Naomi Fowler: Antarctic ice flow and Arctic sea ice, April 7, 2007 (<http://www.abc.net.au/rn/scienceshow/stories/2007/1890777.htm>)

- Wingham on global warming: “The physics of global warming is pretty simple stuff. This is not rocket science... We see evidence all around us all the time now, so *it's happening; the sea level is going up, the Arctic is melting.*”
- Wingham on Antarctica: “It has become clear in the last decade that heat is indeed arriving at the Antarctic continent at depth in the ocean, and indeed we're starting to see the signs of that affecting the ice flow. But we also know that that heat is at least 200 years old because that's how long it takes to get there in the ocean, but it does signal to us that if we do keep heating the ocean then that heat will eventually get itself around Antarctica and we should be *worried* about it.
- Wingham on sea level rise: “It doesn't require a very big change in these ice sheets to produce a change in sea level which, in the scheme of things, is tiny, let us say a metre, but which has an enormous impact on the 8% of the world that lives within a metre of sea level. So even very small rates compared with some of the extremes we've seen in geological time would be *very painful things for us*, the human population, today.”

ESA Television (<http://television.esa.int/photos/EbS39931.pdf>)

- Wingham on Greenland: “The present situation is delicately poised, in Greenland there is plenty of information that the melting is accelerating and once Greenland starts to melt it will get lower, because it gets lower it'll get warmer there'll be more melt and once Greenland goes it won't come back because it will be too warm at sea level to do it. In Greenland I think *we're at the point of no return unless we stop the warming.*”
- Wingham on Arctic Sea Ice: In the arctic there's another Ice sheet but rather a different one, it's a very delicate thin layer of frozen sea water, and *global warming will probably destroy this almost completely in the next 70 years.* If we destroy that Ice cap then we'll change the ocean circulation and if we change the circulation we could change our climate, even in European latitudes we could change our climate.”

Shepherd & Wingham (2007) Recent Sea-Level Contributions of the Antarctic and Greenland Ice Sheets. *Science* 315:1529-1532.

- “After a century of polar exploration, the past decade of satellite measurements has painted an altogether new picture of how Earth's ice sheets are changing. As global temperatures have risen, so have rates of snowfall, ice melting, and glacier flow. Although the balance between these opposing processes has varied considerably on a regional scale, data show that *Antarctica and Greenland are each losing mass overall.*”
  - “...the view that the changing sea-level contribution of the Antarctic and Greenland ice sheets in the 21st century will be both small and negative as a result of accumulating snow in Antarctica ... *is now uncertain.*”
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## Post-debate Follow-up

### I. The IPCC Process

#### Number of authors and reviewers on the IPCC report

In the debate, Lawrence Solomon and I both misstated the number of authors and reviewers involved in the IPCC report. I have copies of the IPCC report. After the debate I manually counted 1279 authors names in the authors lists. However, the report is comprised of three working groups (i.e. three separate report volumes with three separate lists of authors) and there is overlap in the authors among the three groups. Hence, the actual number of unique authors is less than 1279. Using the same approach, I counted 2275 reviewer names, but again there is overlap across the three working group reports so the number of unique reviewers is somewhat less.

Mr. Solomon erred on another aspect of the IPCC process when he claimed that the IPCC does not reveal the identity of the report's reviewers. I was able to count them because the list of reviewer names and affiliations is published in the IPCC reports themselves, which are freely available on the Internet.

Although I do not have time to go through and eliminate author and reviewer redundancy across the three reports, any member of the public may do so if they have the time and interest. The full IPCC report is freely available on the Internet. The following links lead directly to the appendices in the reports that list both the contributors (i.e. authors and editors) and the reviewers:

- Working Group I (physical climate science):  
<http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-annexes.pdf>
- Working Group II (Impacts and adaptation):  
<http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-app.pdf>
- Working Group III (climate change mitigation):  
Authors: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-annex3.pdf>  
Reviewers: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-annex4.pdf>

#### IPCC Transparency

Mr. Solomon used his claim of nondisclosure of the reviewers' identities to accuse the IPCC of lacking transparency. By following the links above, any member of the public can verify that this claim is untrue, as the reviewers names and affiliations are listed in each report volume.

Mr. Solomon also claims that the IPCC does not release its data (Chapter 5), but its data are publicly available on the Internet here: <http://www.ipcc-data.org/>.

Mr. Solomon also claims that reviewer comments are commonly ignored (Chapter 5). However, every reviewer comment submitted to the IPCC is archived and publicly available on the internet, members of the audience can see whether the IPCC responded or not. The web site for Working Group I reviewer comments is here: <http://hcl.harvard.edu/collections/ipcc/>. For instance, one can type in the name of Vincent Gray, Solomon's denier who complained that the IPCC ignored his comments, and see what it comes up with.

The IPCC also publicly documents its methods...

<http://www.ipcc.ch/ipccreports/methodology-reports.htm>

...and archives summaries of all of its expert meetings:

<http://www.ipcc.ch/ipccreports/supporting-material.htm>

## II. "...the layman must rely on the argument from authority."

—L. Solomon, *The Deniers* (p. 7)

### ***The Deniers Breaks Its Own Rules***

In *The Deniers*, Lawrence Solomon lays out his approach to assessing the scientific debate: "...I follow a few rules. The most important is that I do not attempt to settle the science myself. ... For the most part, the layman must rely on the argument from authority, including a **careful sifting of the credibility of the authorities and the relevance of their expertise to their particular claims for which they are advanced as witnesses**" (*The Deniers*, p. 7; emphasis added). But Mr. Solomon repeatedly breaks his own rules.

During the debate, Solomon asserted that "one of the world's leading experts in polar ice is Syun Akasofu at the University of Alaska." This assertion prefaced a several-minute long description of a theory that is unique to Dr. Akasofu. This theory holds that the dramatic warming trend that has occurred in the arctic in recent decades is part of the warming trend out of the Little Ice Age (LIA) since the 18<sup>th</sup> century. Others have suggested this possibility but have been stymied by the fact that recent warming is much more rapid than earlier periods of warming, suggesting that more than just a rebound is going on recently. Dr. Akasofu suggests a new explanation for this more rapid warming in recent times—a combination of two warming signals: the LIA rebound plus an independent natural cycle he calls the "multidecadal oscillation."

By any standard, Dr. Akasofu is an eminent scientist. He is a space physicist—an astronomer—and is recognized as a leading authority on the physics of the aurora borealis (the northern lights). This phenomenon occurs in space far above the Earth's atmosphere and does not affect the climate. In the debate, when I pointed out that Dr. Akasofu is an aurora expert, not a climatologist, Mr. Solomon said that Dr. Akasofu "considers himself an expert on more than the aurora borealis." But on his web site Dr. Akasofu says, "Since I am not a climatologist, all the data presented in my *Notes on Climate Change* can be found in papers and books published [by other scientists] in the past; that is why I do not want to publish *Notes on Climate Change* as a paper in a professional journal."<sup>1</sup>

"Notes on Climate Change" is a short series of comments and papers Dr. Akasofu has penned and posted on his personal web page at the University of Alaska; they are not published and the author states that he has does not want to submit them to a professional journal. It is one of these self-posted "Notes on Climate Change" that Mr. Solomon cites in his book as his sole source for Dr. Akasofu's views about Arctic climate change. An updated version of the paper is available.<sup>2</sup>

(Side note: Mr. Solomon cites similarly "self-published" pieces from several of the other deniers he profiles; you can identify these by looking at the endnotes in Mr. Solomon's book. Although it is conceivable that some or all of these self-posted articles contain valid assessments of climate science, it is equally conceivable that they do not. How would a layman or perhaps even a scientist in an unrelated field know the difference?)

Notwithstanding this self-published article, Dr. Akasofu has an outstanding track record of publishing in peer-reviewed professional journals. On the web site of the International Arctic Research Center, the institution Akasofu founded and ran until his retirement in 2007, there is a database of peer-reviewed publications by the institute's faculty. The database can be searched for papers authored by an individual faculty member and a search for <Akasofu> brings up a list 26

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<sup>1</sup> <http://people.iarc.uaf.edu/~sakasofu/climate.php>

<sup>2</sup> [http://people.iarc.uaf.edu/~sakasofu/little\\_ice\\_age.php](http://people.iarc.uaf.edu/~sakasofu/little_ice_age.php)

articles.<sup>3</sup> Among the 26 are two papers related to climate, only one of which is a research paper; the other is a comment published in a professional society newsletter.

Those 26 articles are not a complete list of Akasofu's publications; his web site says that "Dr. Akasofu has published more than 550 professional journal articles." The most comprehensive database of peer-reviewed scholarly literature is the ISI Web of Knowledge, a professional service to which most large research institutions subscribe. I have access via my faculty appointment at University of Wyoming and use it as my primary tool for probing the academic literature. The database lists 527 publications for Dr. Akasofu from 1956 to 2008, so the vast majority of his publications are recorded in this database. I conducted several keyword searches to see how many of those papers relate to climatology: <climate>, <ice>, <arctic>, <warming>, <temperature>. The first four keywords brought up a single paper—the same climate-related research paper I found on the International Arctic Research Center's web site. The last keyword (temperature) brought up the same paper plus two others; both of the additional papers were about the temperature of the plasma stream in the aurora borealis, not about climate. So it appears that Dr. Akasofu has published only one professional paper on any aspect of climate in five decades of scientific research.

Let me be clear—there is nothing wrong with Dr. Akasofu branching into climate change as a secondary interest. I am ecologist whose core expertise is in the biological cycling of greenhouse gases between land ecosystems and the atmosphere, but I have dabbled in research on hurricanes. As a consequence, I am conversant on the climatology of hurricanes, but I am no hurricane expert and would object to being called one. Similarly, Dr. Akasofu's scholarly track record and his own statements regarding his expertise make it unreasonable to describe him as "one of the world's leading experts in polar ice" as Mr. Solomon did. Solomon said it was "not seemly" for me to dismiss Dr. Akasofu's authority as a 'witness' on Arctic ice, but his own criterion bears repeating: "...the layman must rely on the argument from authority, **including a careful sifting of the credibility of the authorities and the relevance of their expertise to their particular claims for which they are advanced as witnesses.**"

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Let's carefully sift the credibility of another of Mr. Solomon's deniers. Solomon advances Dr. Vincent Gray as an authority on surface temperature trends. Dr. Gray has a Ph.D. in physical chemistry and spent decades in the employment of the Coal Research Association of New Zealand, Inc., studying the properties of New Zealand coal. Again, I grant that people can make solid contributions outside of their fields and it is possible that Dr. Gray has developed a credible scholarly sideline in climatology. I investigated his scholarly track record to test this possibility.

*The Deniers* says that Dr. Gray has published 100 scientific papers (p. 59) but does not say how many of them relate to climate. When I entered Dr. Gray's name into the Web of Knowledge database, 21 papers came up, one of which had a connection to climate. Here is a sampling of papers that span Dr. Gray's career, including the single climate paper:

- Gray, V.R. 1949. Discontinuous flow phenomena in gelatine gels. *Nature* 164:584-585
- Gray, V.R., Whelan, P.F. 1955. Quick Moisture Method for Coal. *Chemistry & Industry* 6:126-128.
- Gray, V.R. 1980. Graphical methods for determination of the mineral-matter-free properties of coal and the mineral matter-ash ratio. *Fuel* 59: 551-556.
- Gray, V.R. 1988. The role of explosive ejection in the pyrolysis of coal. *Fuel* 67:1298-1304.
- Gray, V. 1998. The IPCC future projections: are they plausible? *Climate Research* 10: 155-162.

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<sup>3</sup> <http://www.iarc.uaf.edu/publications/allpubs.php?author=akasofu&year=-1&display=list&full=true&pg=-1>

Like Dr. Akasofu, Dr. Gray appears to have published one scholarly article related to any aspect of climate in six decades of scientific work, and that paper is now a decade old. But what about the 79 claimed publications that were not recorded in the Web of Knowledge database? When I searched for Dr. Akasofu's publications in the same database, it reported 527 papers—about 95 percent of his 550 claimed papers. For Dr. Gray, only 21 percent of the claimed 100 publications are recorded in this database. There are many kinds of publications that are not indexed in Web of Knowledge, but the vast majority of papers published in peer-reviewed scientific journals are indexed there. Most of the 79 missing publications are therefore not likely to be peer-reviewed scientific papers unless they appeared in obscure journals that the climatology community does not read or referee. Many of the missing publications could be industry reports. In Dr. Gray's case, any industry reports would likely have been related to coal properties rather than to climatology. I imagine that Dr. Gray has published letters to the editor and opinion pieces in the scientific and popular press, but these do not qualify as scholarly publications. If Mr. Solomon has a list of Dr. Gray's scholarly publications, then perhaps he can make that list public and clear up the discrepancy.

### **Variation on a Theme**

In an interesting twist on his theme of witness authority, Mr. Solomon says that his deniers generally accepted the consensus view for topics outside of their own expertise, but rejected the consensus view within their areas of expertise. The implication, of course, is that no single area of climate science is settled because the relevant experts disagree with the “central dogma.” I will put aside the logical fallacy of this device—i.e. where did the central dogma come from in the first place? Instead, I will focus on Mr. Solomon's violation of his own criteria regarding the argument from authority.

To support this twist on the authority theme, Mr. Solomon said that Dr. Duncan Wingham—a real expert on polar ice—“merely states that in the one area he knows something about—the polar regions—the doubts are immense. It is not possible to attribute melting here to manmade causes with any degree of confidence” (p.46). Mr. Solomon references Dr. Wingham's statements about Antarctica, which Wingham says is losing ice but not because of global warming. This interpretation is mainstream in the climatology research community and does not contradict the scientific consensus on global warming.<sup>4</sup> More important, Mr. Solomon completely misses Wingham's point that the current net loss of ice from Antarctica, caused by 200-year-old warm water in the ocean, demonstrates that global warming is of concern for what it will do to Antarctic ice in the future:

- **Wingham on Antarctica:** “It has become clear in the last decade that heat is indeed arriving at the Antarctic continent at depth in the ocean, and indeed we're starting to see the signs of that affecting the ice flow. But we also know that that heat is at least 200 years old because that's how long it takes to get there in the ocean, *but it does signal to us that if we do keep heating the ocean then that heat will eventually get itself around Antarctica and we should be worried about it.*”<sup>5</sup> (emphasis added)
- **Wingham on sea level rise:** “It doesn't require a very big change in these ice sheets to produce a change in sea level which, in the scheme of things, is tiny, let us say a metre, but which has an enormous impact on the 8% of the world that lives within a metre of sea level. So even very small rates compared with some of the extremes we've seen in geological time would be *very painful things for us*, the human population, today.”<sup>1</sup> (emphasis added)

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<sup>4</sup> For an explanation, see <http://www.pewclimate.org/global-warming-basics/antarcticfactsheet>

<sup>5</sup> <http://www.abc.net.au/rn/scienceshow/stories/2007/1890777.htm>

Mr. Solomon calls Dr. Wingham an expert on “the polar regions” (p. 46), but then only cites his position on Antarctica. The Earth has two polar regions. What does Dr. Wingham say about the northern polar region—the Arctic?

- **Wingham on global warming and the Arctic:** “The physics of global warming is pretty simple stuff. This is not rocket science... We see evidence all around us all the time now, so it's happening; the sea level is going up, the Arctic is melting.”<sup>1</sup>
- **Wingham on Greenland:** “The present situation is delicately poised, in Greenland there is plenty of information that the melting is accelerating and once Greenland starts to melt it will get lower, because it gets lower it'll get warmer there'll be more melt and once Greenland goes it won't come back because it will be too warm at sea level to do it. In Greenland I think we're at the point of no return unless we stop the warming.”<sup>6</sup>
- **Wingham on Arctic Sea Ice:** “In the Arctic there's another Ice sheet but rather a different one, it's a very delicate thin layer of frozen sea water, and global warming will probably destroy this almost completely in the next 70 years. If we destroy that Ice cap then we'll change the ocean circulation and if we change the circulation we could change our climate, even in European latitudes we could change our climate.”<sup>2</sup>

Not only does Mr. Solomon misrepresent Dr. Wingham's position on global warming, he deprives his readers of the serious warning that Dr. Wingham has issued: “if we do keep heating the ocean then ... *we should be worried about it*” because it could result in “*very painful things for us.*” (emphasis added)

### **Legwork Required**

Above, I undertook a “careful sifting” of the credentials of two of Mr. Solomon's deniers and found that neither of them passes Mr. Solomon's own test of “the relevance of [his] expertise to [his] particular claims...” (*The Deniers*, p. 7). I also found that Mr. Solomon misrepresented the position of a real expert—Dr. Duncan Wingham—choosing statements out of context that conveniently supported a predetermined position and discarding other statements that revealed Dr. Duncan's true views about climate change and exposed the folly of Mr. Solomon's position.

Perhaps it is because I am a scientist and all scientists are true skeptics (not the same thing as a denier), but I have a distaste for “the argument from authority.” When I teach university students, I tell them not to accept what I say uncritically. I am there only to guide them to ask meaningful questions and equip them to answer those questions for themselves. Until they test their own understanding, they have no way of verifying what I teach them.

Good students do their own legwork. Readers who earnestly seek to understand the climate change debate must do the same.

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<sup>6</sup> <http://television.esa.int/photos/EbS39931.pdf>