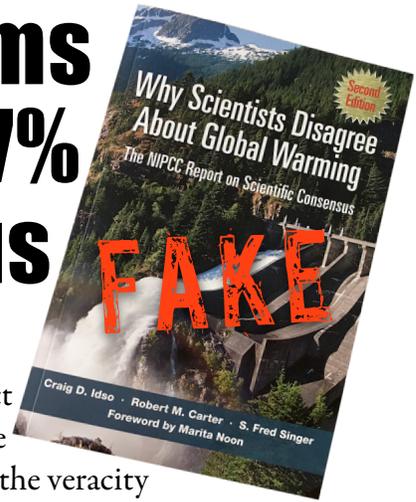


Heartland's Claims Against the 97% Climate Consensus



The Heartland Institute recently mailed tens of thousands of teachers a booklet entitled *Why Scientists Disagree About Global Warming*. This booklet took issue with the frequently cited figure that 97% of scientists agree that Earth's climate is changing and human activities are largely responsible.

Heartland writes:

Despite the oft-stated claim that '97 percent of scientists agree,' scientists actually disagree, profoundly and on many points. Their disagreements are on display in almost countless articles in scientific journals and books.

And:

Probably the most widely repeated claim in the debate over global warming is that '97 percent of scientists agree' that climate change is man-made and dangerous. This claim is not only false, but its presence in the debate is an insult to science.

What are teachers to think? Who has the facts? How is the 97% figure determined?

This article seeks to help teachers understand the truth of this issue. The truth is that Heartland:

- Distorts every aspect of this issue
- Lies about the veracity of the 97% figure
- Does this to obscure an important fact: an overwhelming majority of actual climate scientists know that climate change is real, and that humans are causing it

Where Does the "97%" Come From?

When scientists are ready to report their findings, they undergo a rigorous process known as peer-review. They submit the write-up of their data and conclusions to a scientific journal, which then subjects it to "peer-review". The journal sends the manuscript out to two or three scientists with expertise in that specific area of research. The scientists review the manuscript and provide the journal with advice on whether the research was carried out properly, the conclusions are justified and the results are of interest. The reviews are anonymous, ensuring that reviewers can be frank. Only if the reviews are

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positive, and only after the authors have addressed any major concerns raised by the reviewers, is the paper published. Many papers are rejected, requiring the authors to do additional experiments to resolve reviewers' questions. All of the papers discussed below went through this peer-review process in reputable scientific journals.

One of the first studies looking at the scientific consensus on climate change was Naomi Oreskes' paper, "The Scientific Consensus on Climate Change," published in *Science* in 2004. This paper examined the abstracts of 928 papers published in scientific journals between 1993-2003; the papers were selected because they contained the keywords "climate change."

Oreskes placed the papers into six categories, ranging from "explicit endorsement of the consensus position" to "rejection of the consensus position." She found that 75% of the papers explicitly or implicitly endorsed the consensus. Another 25% took no position. Tellingly, according to Oreskes, "none of the papers disagreed with the consensus position."

Oreskes' conclusion: consensus in the scientific literature was at or near 100%.

Doran and Zimmerman (2009) next examined the consensus issue through a survey of geoscientists. This web-based survey focused on two questions:

1. When compared with pre-1800s levels, do you think that mean global temperatures have generally risen, fallen, or remained relatively constant?
2. Do you think human activity is a significant contributing factor in changing mean global temperatures?

"The answer to the question about whether 'human activity is a significant contributing factor' to climate change is likely the first appearance of the 97% consensus figure."

From a wide range of geoscience disciplines, over three thousand scientists responded to the survey. Ninety percent answered yes to the first question, and 82% affirmed the second. Within this group, those who had listed

their expertise as climate science and who had published recently about climate change were much more likely to respond affirmatively. For question one, 96.2% answered yes, and for question two, 97.4%.

The answer to the question about whether "human activity is a significant contributing factor" to climate change is likely the first appearance of the 97% consensus figure.

The Heartland Institute does not accept this. From their booklet:

There is no survey or study showing 'consensus' on any of the most important scientific issues in the climate change debate.

Doran and Zimmerman (2009) is a survey and Oreskes (2004) is a study. Both were published in peer-reviewed scientific journals. Both found remarkable agreement

among actual climate scientists. Clearly, then, on this issue Heartland is either embarrassingly misinformed or brazenly lying.

Anderegg (2010) followed next with an examination of a more select group of climate scientists. After identifying 1,372 climate researchers, Anderegg limited the group to researchers who had published a minimum of 20 climate science papers. The resultant 908 scientists were further ranked by total number of climate publications. Of the 50 most prolific climate change researchers, 48 out of 50 agreed that the climate is changing and human activities are responsible (96%). Among the top 100, 97 agreed with the scientific consensus. (97%).

And among the top 200, only 5 disagreed with the consensus, meaning that 97.5% agreed.

The work of Anderegg (2010) strongly supports the 97% consensus figure, and does so by focusing on those with the most credibility to speak on the issue: active, publishing climate researchers.

Anderegg (2010) additionally found that researchers with fewer than 20 publications on climate constituted about 80% of the group unconvinced by the evidence for climate change. In other words, the vast majority of self-styled climate skeptics have not “published extensively in the peer-reviewed climate literature.”

“The Heartland Institute acts as if they alone know the truth of what’s happening to our climate.”

In 2013, a paper by Cook et al., “Quantifying the consensus on anthropogenic global warming in the scientific literature,” was published in the journal *Environmental Research Letters*. This work expanded the Oreskes’ study by examining the abstracts of 11,944 climate papers from 1991 to 2011.

Cook et al. (2013) found that 66.4% of the abstracts did not directly state a position on anthropogenic climate change. Thirty-two point six percent endorsed it, and 1.0% rejected it or were uncertain.

Cook et al. (2013) then focused in on the papers that had expressed a position on climate change. Of this group, 97.1% endorsed the idea of human-caused global warming. For the third time the 97% consensus number appeared.

In 2014, a paper entitled “Scientists’ Views About Attribution of Global Warming” by Verheggen et al. was published in *Environmental Science and Technology*. This involved a 35-question survey of 1868 scientists. When Verheggen et al. (2014) narrowed these respondents to those with at least ten climate-related publications, agreement about the role of anthropogenic greenhouse gases was 90%.

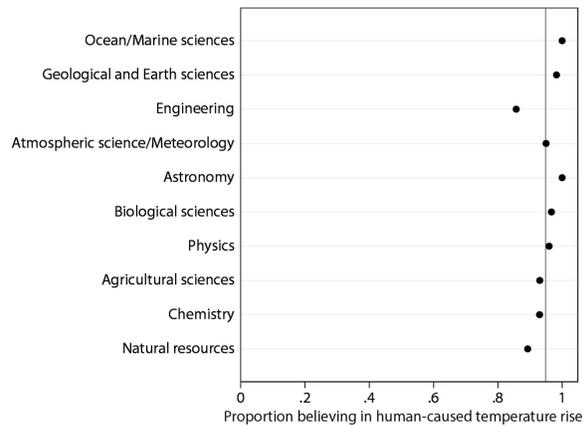
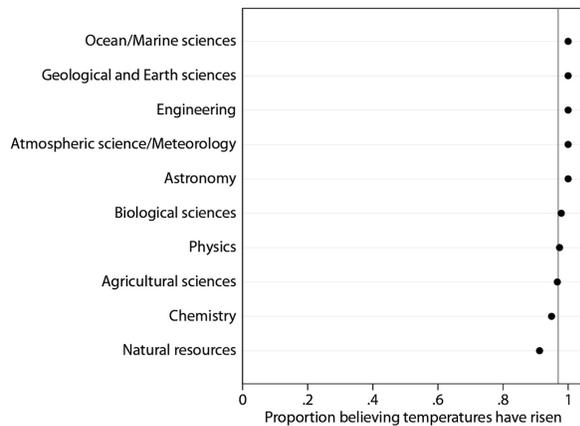
Stenhouse et al. (2014) surveyed 1,854 members of the American Meteorological Society, some of whom had previously expressed views on climate change at odds with the scientific consensus (Schweizer et al. 2011). Not all meteorologists and climatologists are active researchers and those

without scientific publications were less likely to be convinced about human contributions to global warming (59 and 65%, respectively). Among those who published on climate change, the response rose to 93% agreement about anthropogenic global warming. As with Anderegg (2010), whether or not scientists were actively researching and publishing in the field of climate science strongly correlated with their agreement about the reality of anthropogenic climate change.

Carlton et al. (2015) examined how “The climate change consensus extends beyond climate scientists” in a paper in

Environmental Research Letters. Noting that previous work had determined active research strongly correlated with agreement about anthropogenic climate change, Carlton et al. (2015) sought to assess how climate science, and its principal conclusions, were perceived by science researchers across a wide range of disciplines. As the graphs show, the survey results show that scientists working outside obvious climate research overwhelmingly accept the climate change research community's scientific conclusions about anthropogenic climate change.

Climate change beliefs by academic discipline



from Carlton et al. (2015)

Does Consensus Matter in Science?

Scientific conclusions are not, of course, determined by surveys, nor does consensus alone constitute scientific evidence. What matters is data. Data must be the ultimate arbiter of scientific conclusions.

The Heartland Institute acts as if they alone know the truth of what's happening to our climate. In sharp contradiction to the judgments of legions of active scientists, who publish thousands of research papers and have worked their entire careers on this topic, Heartland claims to know better. Heartland must have some pretty impressive data to back up these extraordinary claims.

But when asked to reveal these data, Heartland and associated climate denialists miserably fail.

If there really were a vigorous debate among scientists over the validity of anthropogenic climate change, then where are the hundreds of published peer-reviewed papers opposing anthropogenic climate change? If there really were groundbreaking discoveries—for example, significant expansion of polar ice, a trend toward earlier first frost or later frost-free dates, or a leveling off or decline of CO₂ levels—then surely Heartland would be heralding the research papers announcing these findings. Instead, what we hear is silence.

Or perhaps not quite silence. For what Heartland lacks in data and evidence, they make up for in loud public relations events, such as their recent mailing to tens of thousands of K-12 teachers. The proffered booklet, *Why Scientists Disagree About Global Warming*, spends a lot of time attacking the 97% consensus number. As we have seen, the 97% consensus number is robust and comes from many different papers using many different approaches. We invite you to examine the papers for yourself (they are linked at the end of this article).

“Their arguments have no place in a science classroom.”

It could be that the 97% have it all wrong, but if this was the case, science has a way of self-correcting. Science allows for contrarian positions to be met with vigorous debate. If climate denialists truly had evidence and data, they could persuade through peer-reviewed journals and at scientific conferences. There is a legitimate way within the process of science—instead of sneaking past the scrutiny of peer-review by mailing directly to teachers—for them to prove their case. They just don't do this. Perhaps they admit to themselves their work would never pass peer review. More likely, they have already determined their position, and no new research or data will influence their views. This is the very antithesis of science and the definition of denialism. Their arguments have no place in a science classroom.

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