

# Science, truth, and language: Communicating with non-science and public audiences

May 30 2011

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How many times do we hear that some scientific view is "only theory" or that it is "not proven"? The hidden implication is that if we have not "proven" the case, then we do not know anything for certain about it, and any idea is as good as any other. A recent and vivid example of this problem is the ongoing argument in the popular media about global warming. Do we need to be absolutely certain before we take action?

These same issues and doubts come up in university [science classes](#) for non-science students, and in public lectures with scientific themes. The problem, described by McMaster University [astronomer](#) William Harris at this week's CASCA 2011 meeting in Ontario, Canada, boils down to a misunderstanding about the way science really works. Contrary to the way it is often portrayed in public, science is not about "proving theories". An effective way to discuss these issues is to imagine a continuous line stretching from "totally right" at the top, to "totally wrong" at the bottom. Any scientific idea, hypothesis, or theory can be located somewhere on that line. If it has a lot of evidence supporting it, it lies near the top (for example, that the Earth is round; or that Newton's [laws of motion](#) are correct; or that DNA is the basis of the [genetic code](#)). Old ideas that were disproven sit at the bottom of the line (for example, that dinosaurs coexisted with [early humans](#), or that the Sun revolves around the Earth).

A new scientific idea just beginning to be explored sits somewhere in the middle of the line. As more evidence comes in and our tools for interpretation get better, we might find that the idea is wrong

("disproven") and it immediately drops to the bottom of the line. But with luck, we might find that it agrees with a lot of evidence and so our confidence in the idea grows. Over time, it might move upward into a full-fledged body of knowledge that is much more secure.

Another way to think about this line is to ask how much you would bet that a given scientific idea or theory is right. We literally bet our lives that Newton's laws are right, but we wouldn't be quite that confident in a new and untested statement. The key to understanding science is the role played by constant testing and real-world evidence.

Provided by McMaster University

Citation: Science, truth, and language: Communicating with non-science and public audiences (2011, May 30) retrieved 19 April 2024 from <https://phys.org/news/2011-05-science-truth-language-non-science-audiences.html>

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