

Why Trust Science? Doug Hayhoe, November 2022, slightly revised April 2024

Science often carries recommendations of things we need to do: like change our lifestyle to mitigate climate change, or take a vaccine to reduce the risk of COVID. Should we trust what science tells us? It turns out that there are very good reasons we should.

For many years I served as the science coordinator for the Board of Education. I had the opportunity to spend time with many students as they discovered that they could do science themselves: it didn't have to be the teacher or a scientist in a documentary online.

One visit I'll never forget was to a Grade 3-4 class in the west end of Toronto. I was there to watch them try out a new hands-on science kit called *The Physics of Sound*. Equipment included tuning forks, bowls of water, wooden dowels, a stethoscope, and metal prongs for making xylophones, all designed to help them figure out where sound came from, and how it was transmitted and received. At the end, each small group of 9-year-olds shared what they'd discovered. Many had found that sound is caused by a vibrating source, a deduction they made by observing water sprayed by the ends of a vibrating tuning fork. They also found that sound travels better through wood than air. It also travels through water.

I was impressed! Here was a group of elementary students doing real science: studying nature, working collaboratively, and developing a consensus by sharing results. They trusted science because they'd observed and tested it themselves.

Science is developed by collaboration and consensus

Most of the observations the students made that day were not correct, and that's not unusual. The observations and deductions scientists make to learn how nature functions aren't always correct. Sometimes they make very human errors and mistakes: recording a number incorrectly or drawing a conclusion based on faulty data. Other times, their objectivity may be compromised by biases. The cost of running trials on a new drug may be funded by a pharmaceutical company wanting to manufacture the drug and research has shown that even if scientists are not directly influenced, the source of the funding can still exert indirect influence.¹ Or, since the cost of running human trials is so high, scientists may take a short cut by using too small a sample size for a trustworthy analysis.

The potential for error and bias is why the concept of peer review is central to the scientific endeavor. Scientists work in "communities of experts," who help, criticize, and examine each other's work collaboratively. When they publish their work, the journal editors invite other experts in that field to review the paper, usually anonymously. If the paper is published, any other scientist can evaluate their observations and critique their deductions and models. After repeated studies by independent research groups all begin to point in the same direction, a consensus starts to build that this new "idea" is what is how nature works.

¹ See ["Moderna flu vaccine delivers mixed results in trials"](#) for a discussion on the potential impact of investors on research.

In past centuries, many scientists worked mainly on their own. These included Kepler, Newton, and Faraday, whom I profile in other essays. They still submitted their discoveries to scientific communities, however, such as the Royal Society. Today, collective work has become very important, especially when complex equipment is being used to probe nature, such as the James Webb Space Telescope or the CERN particle physics laboratory. I still remember the 1995 discover of the “top quark,” the last of the basic elementary particles that make up protons and neutrons. Thousands of collaborators from all over the world had been involved. While most modern science doesn’t involve teams of this size, important discoveries are increasingly made by groups spread across countries and institutions.

Professor Naomi Oreskes of Harvard has recently emphasized the collaboration and consensus aspect of modern science, with its well-developed peer review process.² When people voice suspicions about important scientific results, her response is something like this: “It’s not plausible to think that hundreds or thousands of scientists from all different countries all have the same agenda to interpret their results in such a way that they support it.” Scientific consensus about how nature works is based not on opinion and conjecture, but on empirical evidence and proven theory. This gives us confidence.

What happens when people reject the scientific consensus?

Let’s go back to that Grade $\frac{3}{4}$ classroom. Imagine that in the student investigations, one group found different results from the others. They reported that sound does not travel as well through wood as through air, nor does it travel through water at all. Suppose that this group continued to disagree, even after the other groups repeated their investigations. Suppose, that when the class published its “Grade 3-4 Science Journal,” the one disagreeing group published their own journal, to show their results. What would you think?



Figure 1 Francis Collins

This is what has happened with the science of vaccine safety. Robert Kennedy Jr., the son of Bobby Kennedy, is a prominent anti-vaxxer. His foundation, the Children’s Health Defense Fund, has disseminated the views held by a few experts who maintain that COVID-19 vaccines are neither safe nor necessary. One of these is Michael Yeadon, former vice president at Pfizer. You may have heard of others who also take a stand against vaccinations. But the great majority of vaccine researchers agree with the government organizations that the risk of getting COVID is many times greater than any risks of adverse effects from getting vaccinated. The National Institutes of Health integrates results from all the best researchers around the world, always asking for repeatability, collaboration, and consensus. Its director through

COVID until the Fall of 2021, Francis S. Collins (Figure 1), is a committed Christian (see my essay, *Contemporary Scientists who Believe*.) There are many videos by Collins on his work on vaccines, for example, this three-minute video: [“Vaccine Questions and Answers.”](#)

² See Naomi Oreskes’s 2014 TED Talk, [“Why we should trust scientists,”](#) and her book *Why Trust Science* (Princeton University Press, 2019). Regarding research questioning the science of wearing masks, see Oreskes’s 2023 paper in *Scientific America*, [“What went wrong with a highly publicized COVID mask analysis?”](#)

Suppose you had a serious heart condition, and consulted a hundred expert cardiologists. Ninety-nine recommended you have a heart operation, while one counseled you not to. Instead, the last physician recommended you take an expensive medication from a company who had paid for his most recent grant. What would you do? I know my answer! Not having any expertise in cardiology, and knowing that these experts have all studied the subject for years, I would most likely go with the ninety-nine! Nevertheless, I also know that [many people still distrust science](#).

Science is developed by scientists studying God's book of nature

As Christians, we have another reason to trust science: one that may surprise many people. We trust science because we know that what scientists are studying was created by God. Not all scientists are conscious of that. Most scientists, however, are drawn to their work through a sense of curiosity, passion, and/or concern. They're amazed at the galactic structures revealed by the latest telescope, entranced by the changing rock patterns seen as we dig deeper into Earth's surface, fascinated by new chemical compounds being created, and deeply worried about the impact humans are making on this world. While they may not think of God in their work, they appreciate both the continuity of things in nature, its unity and "natural laws," as well as its great diversity.

James Clerk Maxwell was a scientist who loved studying God's book of nature. His work in 1865 on electromagnetism and the speed of light, was the foundation on which Einstein built relativity. When Maxwell set up the Cavendish Laboratory in Cambridge, where many scientists later won the Nobel Prize, he had a Bible verse in Latin placed over the entrance: "Great

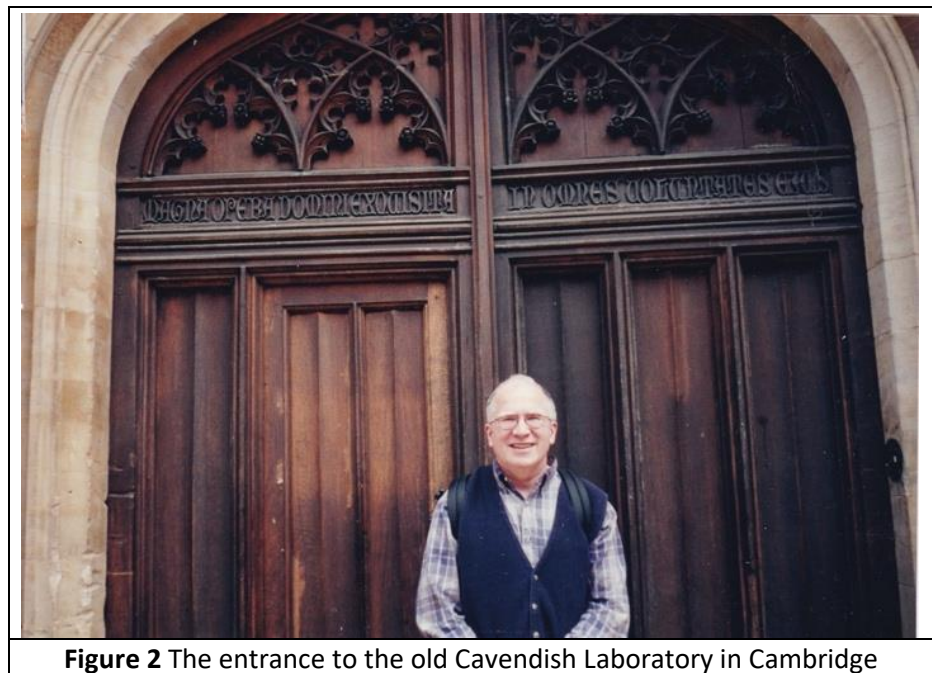


Figure 2 The entrance to the old Cavendish Laboratory in Cambridge

are the works of the Lord; they are studied by all those who delight in them" (Psalm 111:2). It filled me with awe to stand at this same entrance, when I visited Cambridge some years ago, as I thought about the Victorian physicists delighting in God's works (Figure 1).³

³ When the new university physics laboratory at Cambridge was built in 1973, the scientists decided to put the same verse over its doorway, [this time in English](#).

Science leads to new products and technologies that benefit us as God intended

In addition to its intrinsic value, science also has practical worth. Take a minute to reflect on your automobile. If you drove it this week, you took for granted that it would start up and work properly. That's because you trusted the experience of hundreds of thousands of scientists, engineers, and technologists who worked for a hundred years on perfecting it.⁴

In the Bible, when the apostle Paul appealed to the farmers in Lystra to turn to the living God, he reminded them that God “has not left himself without testimony: He has shown kindness by giving you rain from heaven and crops in their seasons; he provides you with plenty of food and fills your hearts with joy” (Acts 14:17). Paul was not ignorant of the agricultural technology these pagans depended on, much of it based on good science developed over millennia. He himself would have made good use of any new tent-making technology that came along. But he reminded them that it ultimately came from a good God.

Conclusion

I believe that God intended people, made in his image, to be involved in scientific investigation and development for our benefit. In 2 Timothy 1:7 (KJV) Paul says that God has given us the gift of a “sound mind” and for millennia humans have been using that mind to make sense of the world around them. Scientists who are Christians believe that God reveals himself through nature, and that it's beneficial to study it. Those who are not Christians are also studying God's book of nature, even if they don't recognize it. In addition, both Christian and non-Christian scientists do their work collaboratively, subjecting themselves to the consensus of experts in their field. This gives confidence that we can trust science.

⁴ This example was suggested by Naomi Oreskes, in her 2014 TED Talk, footnote 2.