

12 Settled Science

Every time I hear the term "settled science" I think, "You're not doing it right." History is packed with examples of a "settled" science that was upended:

- The Ptolemaic universe was the only thing going, even with its strange epicycles to explain the retrograde motion of the planets, from 100 AD until Copernicus introduced a sun-centered solar system and Tycho Brahe and Johannes Kepler proved it by 1619.
- Alchemy reigned as the only science of matter for 2000 years before Boyle said experiment trumped everything (1662) and then Lavoisier demonstrated it (1778), creating chemistry. And now our society is addicted to practical chemistry (though there are strong signs we are heading back into the abyss of theory-confirming observation).
- Creationism was completely settled until Lyle and then Darwin proposed alternatives.
- The physicists in the late 1890's thought they had nailed down the physical laws completely, then Einstein's relativity theories upended most of Newtonian physics, and just after, quantum theory upended the rest of physics and all of chemistry.
- Darwin was settled science until Haldane in 1957 did the math behind speciation and found far more time was needed to generate enough mutations to create a new species than we had.



Settled Science

My point here is that science is never settled. It can't be. And bad things happen when you think that science is settled. The alchemists record observations that when a metal rusts, it gains mass. But the theory of Plato and Aristotle used to explain alchemy didn't accept that rusting would gain mass, so the observation was ignored or sometimes discounted as being poorly observed. That's just one example. We have a very long history of good observations being ignored because they didn't fit current theories until someone is brave enough to say, "screw the theory, it's wrong."

So when anyone says "settled science" you know there will follow a series of ignored observations that current theory doesn't explain, and no one will go looking for the better theory. He haven't had a new theory since the 1970's. Many new ideas are called theories, but they are nothing more than hypotheses, or just guesses.

The first person to challenge a settled theory was Petrus Ramus (Peter Rami in the vernacular) who published a thesis in 1536 titled, *Everything Aristotle Said Was Wrong*. He was killed for publishing it by a fan of Aristotle.

So celebrate those who broke from "settled science" and found something new; but don't worship them and think what they did was the new "settled science." No science is settled. Dogma might be, but never science.



Consensus Science

Consensus science is when scientists agree on something. It's a political term, as all scientists know that theories are ephemeral and therefore faith in them is ill-placed, thus no scientist ever "believes" anything. Instead we allow others to prove their case, and when they can't, or don't, only *then* can beliefs enter in among the less-disciplined. There is no room in science for beliefs; it's just not part of anything we do, other than believe the primary data of other scientists (and hence the harsh punishment when we discover a scientist has lied) and that they are reporting it honestly.

The consensus isn't about proof, because when proof is sufficient it's just there and no one thinks to ask scientists if they believe it, it has been proven. The problems arise when a hypothesis isn't proven. Theories are the consequence, or should be the consequence, of a ton of experimentation, testing of all supporting hypotheses, and a vast array of predictions that are all proven unwaveringly correct. In our media most theories have never risen to that level. Hypotheses, guesses based on a minimum of observations, are called theories by the media in hopes of being taken as a theory. Hypotheses are unreliable, untried, unproven, little more than semi-informed guesses. If you are gullible, you are free to believe a hypothesis is the truth. This is where consensus science is found: among the gullible scientists.

“ We have many studies in teaching, for example, in which people make observations and they make lists and they do statistics, but they do not thereby become established science, established knowledge. They are merely an imitative form of science.... The result of this pseudoscientific imitation is to produce experts, which many of you are - experts. You teachers who are really teaching children at the bottom of the heap, maybe you can doubt the experts once in a while. Learn from science that you must doubt the experts. As a matter of fact, I can also define science another way: Science is the belief in the ignorance of experts.

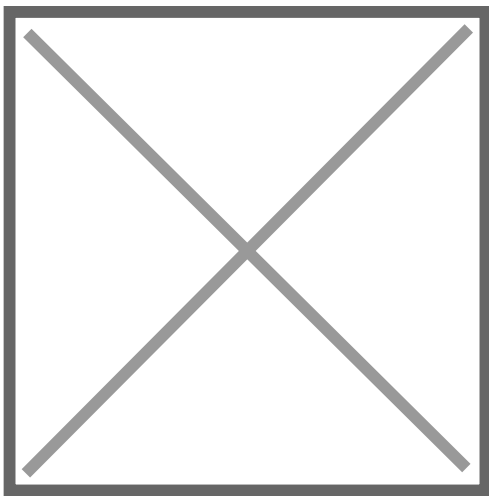
Richard Feynman *The Pleasure of Finding Things Out*, p. 187, 1999

One reason I study alchemy is to experience this gullibility in the writings of the alchemists, to see how they justify their beliefs, or dodged unexplained or contradictory observations. And when I watch for those same sorts of arguments and justifications in modern science I see them all over, in chemistry, but more often in the softer sciences.

Skepticism in Science

From its founding, scientists were skeptical. Coming from a background of Aristotelian and Church authority, the early natural philosophers (as they styled themselves then, science having a different meaning to them than it does to us), the founders of the first scientific society, the Royal Society of London, wanted skepticism hard-baked into their method. Their motto, *Nullium in verba*, "Take no one's word for it," was wisely chosen. The purpose of the Society was to generate fact, abundantly witnessed by doing all experiments in their presence, as the only reliable thing. Everything that anyone said about the fact was up to them and was, as they established, temporary. All scientific conclusions are temporary. That one thing, the temporary nature of science, was the great advance that made science and the technological revolution possible.

Anyone who denies the temporary nature of science is denying the most basic tenet of science. "Settled science" denies science, and should be abandoned.



How to tell the difference between proven science and hypothetical science

When the theory comes before the evidence in the presentation, it's a hypothesis and is thus unbelievable. Robert Boyle in 1650 recognized this as a major flaw in natural philosophy, requiring a theory to explain the observations. That's never how it works, and he made a very distinct point of not allowing that to happen in his observations of the vacuum.

The existence of the vacuum was a major point of contention since the ancient Greek philosophers argued it. The Atomists, who said all matter was made of minute triangles of matter, needed the absence of matter in some space to allow for motion; Plato and Aristotle had a different view of matter which did not require empty space, so they argued for the impossibility of a vacuum. Nineteen-hundred years later when Torricelli made a barometer in 1643 the great debate was re-begun as to what was in the space at the top vacated by the mercury. Since it was enclosed in glass and not accessible, everyone was left to argue anything they wanted (a hallmark of hypothesis territory: inaccessible data). Some argued for a vacuum, most supported some sort of matter being present. Robert Boyle said, essentially, screw the philosophy, let's just put the barometer in a chamber and pump out the air and see what happens. The mercury level dropped,

supporting the idea of a vacuum. Thomas Hobbes, philosopher, went ape. He said that the air displaced when the mercury fell into the dish below needed to go somewhere so it went up through the mercury to occupy the void. Boyle said who cares what explanation you give it, it just happened, which drove Hobbes crazy. Hobbs had the consensus on his side, and he was arguing from the science that had been settled for 1900 years. And Hobbes was dead wrong.

Boyle was so clear-headed about the primacy of data that he set forth the scientific laws of witnesses, people who could not be duped and who could attest to the veracity of the observations. A few good scientists of notable reputation would serve, or a roomful of such men was better, or better yet, describe your work so well and accurately (with great humility and honesty) that the reader felt he was there and feels himself to be a witness. Reproducibility, Boyle said, was rarely done, even by the original experimenter, and is thus a mute witness.

Always start with the data, and never let it leave your focus. I made the [climate series](#) of posts here to point out that when your data becomes suspect, all the hypotheses and theories supported by that data die instantly. Settled science and consensus science are nothing other than simplistic ways to keep unsupported hypotheses alive. Let them die.

“ Science alone of all the subjects contains within itself the lesson of the danger of belief in the infallibility of the greatest teachers in the preceding generation...When someone says, “Science teaches such and such”, he is using the word incorrectly. Science doesn’t teach anything; experience teaches it. If they say to you, “Science has shown such and such”, you might ask, “How does science show it? How did the scientists find out? How? What? Where?” It should not be “science has shown” but “this experiment, this effect, has shown”. And you have as much right as anyone else, upon hearing about the experiments—but be patient and listen to all the evidence—to judge whether a sensible conclusion has been arrived at...The experts who are leading you may be wrong...I think we live in an unscientific age in which almost all the buffeting of communications and television-words, books, and so on—are unscientific. As a result, there is a considerable amount of intellectual tyranny in the name of science...Science alone of all the subjects contains within itself the lesson of the danger of belief in the infallibility of the greatest teachers of the preceding generation.

Richard Feynman quoted in <https://lemire.me/blog/2020/07/12/science-is-the-belief-in-the-ignorance-of-experts/>