What is Science?

Some Definitions of Science

Definitions by goal and process:

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1. the systematic observation of natural events and conditions in order to discover facts about them and to formulate laws and principles based on these facts. 2. the organized body of knowledge that is derived from such observations and that can be verified or tested by further investigation. 3. any specific branch of this general body of knowledge, such as biology, physics, geology, or astronomy.

Academic Press Dictionary of Science & Technology

Science is an intellectual activity carried on by humans that is designed to discover information about the natural world in which humans live and to discover the ways in which this information can be organized into meaningful patterns. A primary aim of science is to collect facts (data). An ultimate purpose of science is to discern the order that exists between and amongst the various facts.

Dr. Sheldon Gottlieb in a lecture series at the University of South Alabama

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Science involves more than the gaining of knowledge. It is the systematic and organized inquiry into the natural world and its phenomena. Science is about gaining a deeper and often useful understanding of the world.

from the Multicultural History of Science page at Vanderbilt University.

Science consists simply of the formulation and testing of hypotheses based on observational evidence; experiments are important where applicable, but their function is merely to simplify observation by imposing controlled conditions.

Robert H. Dott, Jr., and Henry L. Batten, *Evolution of the Earth* (2nd edition)

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 . . .As a matter of fact, I can also define science another way: Science is the belief in the ignorance of experts.

Richard Feynman, Nobel-prize-winning physicist,
in *The Pleasure of Finding Things Out*
as quoted in *American Scientist* v. 87, p. 462 (1999).

Definitions by contrast:

To do science is to search for repeated patterns, not simply to accumulate facts.

Robert H. MacArthur, *Geographical Ecology*

A modern poet has characterized the personality of art and the impersonality of science as follows: Art is I; Science is We.

Claude Bernard (1813-1878), Physiologist and "the father of modern experimental medicine"

Poetry is not the proper antithesis to prose, but to science. . . . The proper and immediate object of science is the acquirement, or communication, of truth; the proper and immediate object of poetry is the communication of immediate pleasure.

Samuel Taylor Coleridge (1772-1834), *Definitions of Poetry*

Fiction is about the suspension of disbelief; science is about the suspension of belief.

James Porter, UGA Ecology Professor, as quoted by Steve Holland

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Religion is a culture of faith; science is a culture of doubt.

Richard Feynman, Nobel-prize-winning physicist

Not quite definitions, but critical statements:

As a practicing scientist, I share the credo of my colleagues: I believe that a factual reality exists and that science, though often in an obtuse and erratic manner, can learn about it. Galileo was not shown the instruments of torture in an abstract debate about lunar motion. He had threatened the Church's conventional argument for social and doctrinal stability: the static world order with planets circling about a central earth, priests subordinate to the Pope and serfs to their lord. But the Church soon made its peace with Galileo's cosmology. They had no choice; the earth really does revolve around the sun.

Stephen J. Gould, *The Mismeasure of Man*

The fuel on which science runs is ignorance. Science is like a hungry furnace that must be fed logs from the forests of ignorance that surround us. In the process, the clearing that we call knowledge expands, but the more it expands, the longer its perimeter and the more ignorance comes into view. . . . A true scientist is bored by knowledge; it is the assault on ignorance that motivates him - the mysteries that previous discoveries have revealed. The forest is more interesting than the clearing.

Matt Ridley, 1999
Genome: the autobiography of a species in 23 chapters, p. 271.

There is no philosophical high-road in science, with epistemological signposts. No, we are in a jungle and find our way by trial and error, building our roads behind us as we proceed. We do not find sign-posts at cross-roads, but our own scouts erect them, to help the rest.

Max Born (1882-1970), Nobel Prize-winning physicist,
quoted in Gerald Holton's *Thematic Origins of Scientific Thought*

The stumbling way in which even the ablest of the scientists in every generation have had to fight through thickets of erroneous observations, misleading generalizations, inadequate formulations, and unconscious prejudice is rarely appreciated by those who obtain their scientific knowledge from textbooks

James Bryant Conant (1893-1978), *Science and Common Sense*

I think that we shall have to get accustomed to the idea that we must not look upon science as a "body of knowledge", but rather as a system of hypotheses, or as a system of guesses or anticipations that in principle cannot be justified, but with which we work *as long as they stand up to tests,* and of which we are never justified in saying that we know they are "true" . . .

Karl R. Popper (1902-1994), *The Logic of Scientific Discovery*

The real purpose of the scientific method is to make sure Nature hasn't misled you into thinking you know something you don't actually know.

Robert M. Pirsig, *Zen and the Art of Motorcycle Maintenance*

We [scientists] wouldn't know truth if it jumped up and bit us in the [rear end]. We're probably fairly good at recognizing what's false, and that's what science does on a day-to-day basis, but we can't claim to identify truth.

Dr. Steven M. Holland, University of Georgia Geology Professor

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Two Illustrative Stories:

A scientist describing for radio broadcast an exciting moment in a baseball game:
Diaz swings a bat, which is apparently made of wood and has no evidence of modifications contrary to baseball rules. He strikes the ball thrown by Johnson, who had not been observed to scratch, scuff, wet, or otherwise modify that ball. The ball is traveling through the air and may pass over the outfield wall on the fly. Yamoto, the right fielder, heads back to the right field wall, but slows as he reaches the warning track and slumps his shoulders. I believe the ball has passed over the right field wall, and fans seated in the right field bleachers are scrambling as if to retrieve the ball. Meanwhile, the first base umpire has run into right field and is now waving one hand over his head in a circular motion. My own personal observation of the ball's flight, Yamoto's behavior on the warning track, the fans' behavior, and the umpire's signal all lead me to conclude that Diaz has hit a home run and that, if he travels around the bases and touches each base to the satisfaction of the umpires, his team will be credited with a run.

A carpenter, a school teacher, and scientist were traveling by train through Scotland when they saw a black sheep through the window of the train.

"Aha," said the carpenter with a smile, "I see that Scottish sheep are black."

"Hmm," said the school teacher, "You mean that some Scottish sheep are black."

"No," said the scientist glumly, "All we know is that there is at least one sheep in Scotland, and that at least one side of that one sheep is black."
