

Science In Quotes

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This week I am devoting my column to a selection of quotations, mostly from well-known scientists, to illustrate their conceptions of the nature of science.

'What we have to learn to do, we learn by doing'.
Aristotle (384-322 BC), the Greek philosopher who advocated reason and moderation. Until the scientific revolution of the 16th and 17th centuries his influence on Western philosophy and science was so enormous he was simply called The Philosopher.



Aristotle

'Give me but one firm place on which to stand, and I will move the earth'. **Archimedes (287-212 BC)**, the Greek mathematician, speaking of the lever.

'In questions of science the authority of a thousand is not worth the humble reasoning of a single individual'. **Galileo Galilei (1564-1642)**. Italian mathematician, astronomer and physicist, who began the modern scientific revolution that sounded the death knell for much traditional authority.

'History celebrates the battlefields whereon we meet our death but scorns to speak of the ploughed fields whereby we live. It knows the names of the kings' bastards, but cannot tell us the origin of wheat.'
Henri Fabre (1823-1915). French entomologist.

'No scientist is admired for failing in the attempt to solve problems that lie beyond his competence. The most he can hope for is the kindly contempt earned by the utopian politician. If politics is the art of the possible, research is the art of the soluble. Both are immensely practical minded affairs.'
Peter Medawar (1915-1987). British immunologist. Shared Nobel Prize 1960.

'Nevertheless, paradigm changes do cause scientists to see the world of their research engagements differently. Insofar as their only recourse to that world is through what they see and do, we may want to say that after a revolution scientists are responding to a different world.'
Thomas Kuhn (1922-), US historian and philosopher of science who showed that cultural and social

conditions affect the direction of science. He contends that scientific knowledge is relative, depending on the particular theoretical framework (paradigm) dominant at the time. Paradigms are so powerful, e.g. Darwinism, they are uncritically accepted by most scientists until a scientific revolution establishes a new paradigm.

'The crocodile cannot turn its head. Like science, it must always go forward with all-devouring jaws.' **Peter Kapitza (1894-1984)**. Soviet physicist - shared Nobel Prize 1978.

'It's (science) effectiveness is almost inevitable because it narrows the possibility of refutation and failure. Science begins by saying it can only answer this type of question and ends by saying these are the only questions that can be asked. Once the implications and shallowness of this trick are fully realised, science will be humbled and we shall be free to celebrate ourselves once again.' **Bryan Appleyard**, journalist and writer. Quotation from his influential book 'Understanding the Present'.

'True science thrives best in glass houses where everyone can look in. When the windows are blacked out, as in war, the weeds take over; when secrecy muffles criticism, charlatans and cranks flourish'. **Max Perutz (1914-)**, Austrian born biochemist. Shared 1962 Nobel Prize for X-ray crystallography of haemoglobin.



Max Perutz

'Unanimity of opinion may be fitting for a church, for the frightened or greedy victims of some myth, or for the weak and willing followers of some tyrant. Variety of opinion is necessary for objective knowledge.' **Paul Feyerabend (1924-1994)**. Austrian-born US philosopher of science.

'Discovery consists of seeing what everyone has seen and thinking what nobody has thought.' **Albert Szent-Gyorgyi (1893-1986)**. Hungarian biochemist. Nobel Prize 1937 in Physiology or Medicine.

'Genius is one per cent inspiration and ninety-nine percent perspiration.' **Thomas Edison (1847-1931)**. US inventor and scientist. He had over 1000 patents.



'Science is wonderfully equipped to answer the question 'How?' but it gets terribly confused when you ask the question 'Why?' **Erwin Chargaff (1905-1993)**. Czech-born biochemist who calculated the chemical composition of DNA.

Thomas
Edison

'No entry to Jews and Members of the German Physical Society.' **Philip Lenard (1862-1947)**. German physicist. Nobel Prize 1905. He spent the later years of his life reviling Einstein and Jewish scientists. The quotation is the notice he posted on his office door. Being a brilliant scientist does not immunise one against bigotry.

'I sometimes ask myself how it came about that I was the one to develop the theory of relativity. The reason, I think, is that a normal adult never stops to think about the problem of space and time. These are things which he has thought of as a child. But my intellectual development was retarded, as a result of which I began to wonder about space and time only when I had already grown up'. **Albert Einstein (1879-1955)**. German born physicist who formulated the theories of relativity. Nobel Prize for Physics 1921.

'I do not know what I may appear to the world, but to myself I seem to have been only a boy playing on the sea-shore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.' **Isaac Newton (1642-1727)**. English physicist and mathematician who laid the foundation of modern physics. Newton was not a humble man, but, this beautiful quotation is a notable exception.



Isaac Newton

'A theory with mathematical beauty is more likely to be correct than an ugly one that fits some experimental data. God is a mathematician of a very high order, and He used very advanced mathematics in constructing the universe'. **Paul Dirac (1902-1984)** British physicist who worked on quantum mechanics. Shared Nobel Prize in 1933.

'Operationally, God is beginning to resemble not a ruler but the last

fading smile of a cosmic Cheshire cat'. **Julian Huxley (1887-1975).**
English biologist.

'Science without religion is lame, religion without science is blind.'
Albert Einstein.

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