

# SCIENCE, BEST QUOTES ON

Science is not a march toward truth. Rather, as the author John McPhee wrote in 1967, ‘science erases what was previously true.’ Every generation of scientists mulches under yesterday’s facts to fertilize those of tomorrow.

—Nathaniel Comfort

Albert Einstein came up with his theory of general relativity in 1915, revolutionizing the way we understand gravity and establishing the rules of space-time. A year later he predicted gravitational waves—ripples in the curvature of space-time that propagate as waves as they travel outward from a source like a black hole, transporting energy as gravitational radiation...‘The amazing thing about all this to me,’ says Northwestern astrophysicist Shane Larson, is that ‘Einstein had no reason to be thinking about this, but he did. There was no experiment to be done. There was no application to technology, no reason he had to work it all out other than his own pure curiosity about the way the universe was put together. And here we are 100 years later, finally able to do experiments where we can confirm that this crazy idea that Einstein had actually is the way the universe works. It’s awesome. It’s a testament to what our brains are capable of.’

—Stephanie Russell

Sometimes I think we’re alone in the universe, and sometimes I think we’re not. In either case the idea is quite staggering.

--Arthur C. Clarke

Millions saw the apple fall, but Newton was the one who asked why.

--Bernard Baruch

The universe is full of magical things patiently waiting for our wits to grow sharper.

--Eden Phillpotts

The simplest schoolboy is now familiar with truths for which Archimedes would have sacrificed his life.

--Ernest Renan

When you make the finding yourself—even if you’re the last person on Earth to see the light—you’ll never forget it.

--Carl Sagan

Somewhere, something incredible is waiting to be known.

--Carl Sagan

It's not that I'm so smart. It's that I stay with problems longer.

--Albert Einstein

The ultimate worth of a science is in how much good it can do in the world.

—B. F. Skinner

The surest sign that intelligent life exists elsewhere in the universe is that it has never tried to contact us.

--Bill Watterson

Water and air, the two essential fluids on which all life depends, have become global garbage cans.

—Jacques Yves Cousteau

The moment one gives close attention to any thing, even a blade of grass it becomes a mysterious, awesome, indescribably magnificent world in itself.

—Henry Miller

When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind: it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science.

--William Thomson

The most exciting phrase to hear in science, the one that heralds new discoveries, is not 'Eureka!' (I've found it!), but 'That's funny...'

--Isaac Asimov

We have not the reverent feeling for the rainbow that a savage has, because we know how it is made. We have lost as much as we gained by prying into the matter.

--Mark Twain

The mere formulation of a problem is far more essential than its solution, which may be merely a matter of mathematical or experimental skills. To raise new questions, new possibilities, to regard old problems from a new angle requires creative imagination and marks real advances in science.

—Albert Einstein

To mistrust science and deny the validity of the scientific method is to resign your job as a human. You'd better go look for work as a plant or wild animal.

--P. J. O'Rourke

The teaching of any science, for purposes of liberal education, without linking it with social progress and teaching its social significance, is a crime against the student mind. It is like teaching a child how to pronounce words but not what they mean.

--Vernon Carter

Man has mounted science, and is now run away with. I firmly believe that before many centuries more, science will be the master of man. The engines he will have invented will be beyond his strength to control. Some day science may have the existence of mankind in its power, and the human race may commit suicide by blowing up the world.

--Henry Adams

Numerical precision is the very soul of science.

--Sir D'Arcy Wentworth  
Thompson

Science has promised us truth—an understanding of such relationships as our minds can grasp; it has never promised us either peace or happiness.

--Gustav LeBon

The human mind is not capable of grasping the Universe. We are like a little child entering a huge library. The walls are covered to the ceilings with books in many different tongues. The child knows that someone must have written these books. It does not know who or how. It does not understand the languages in which they are written. But the child notes a definite plan in the arrangement of the books—a mysterious order which it does not comprehend, but only dimly suspects.

--Albert Einstein

Sunshine is a form of energy, and the winds and the tides are manifestations of energy. Do we use them? Oh, no; we burn up wood and coal, as renters burn up the front fence for fuel. We live like squatters, not as if we owned the property.

—Thomas Edison

Nothing is impossible. We merely don't yet know how to do it.

—Thomas Edison

I am not a scientist. I am an inventor. Faraday was a scientist. He didn't work for money. He said he hadn't the time. But I do. I measure everything I do by the size of a silver dollar. If it don't come up to that standard, then I know it's no good.

--Thomas A. Edison

OK, so what's the speed of dark?

—Steven Wright

Half the adults questioned in a recent poll did not know that it took one year for the Earth to orbit the Sun.

—Gerald Holton

When the man who knows all about the fruit fly chromosomes finds himself sitting next to an authority on Beowulf...there may be an uneasy silence.

--Brand Blanshard

All the mathematical sciences are founded on relations between physical laws and laws of numbers, so that the aim of exact science is to reduce the problems of nature to the determination of quantities by operations with numbers.

--James Clerk Maxwell

I may have made a straight A in physics, but I was panic-struck. Physics made me sick the whole time I learned it.

—Sylvia Plath

The scientist is not a person who gives the right answers, he's one who asks the right questions.

--Claude Lévi-Strauss

If you live you have to be going somewhere. You have to choose a direction. And science is completely impartial. It doesn't give a damn which way you go. It can invent the atom bomb but can't tell whether to use it or not. Science is like—well, it's like a flashlight in a totally dark room measuring two billion light-years across—and with walls that shift away from you as you go towards them. The flash can show you where your feet are on the floor; it can show you the furniture or the people close by; but as for which direction you should take in that endless room it can tell you nothing.

--Maxwell Anderson

The universe is an intelligence test.

--Timothy Leary

A drug is a substance which when injected into a guinea pig produces a scientific paper.

—Unknown

Advanced civilizations—if they exist—aren't breaking their backs to save us before we destroy ourselves.

--Carl Sagan

That's the good thing about science: it's true whether or not you believe in it.

—Neal deGrasse Tyson

Foam isn't classified as a liquid, a gas, or a solid. It's all three at the same time.

—Unknown

The universe is like a safe to which there is a combination, but the combination is locked up in the safe.

--Peter De Vries

We manipulate nature as if we were stuffing an Alsatian goose. We create new forms of energy; we make new elements; we kill crops; we wash brains. I can hear them in the dark sharpening their lasers.

--Erwin Chargaff

The construction of an analogue computer or a supersonic airplane is simple when compared to the mixture of space and evolutionary eons represented by a cell.

—Charles A. Lindbergh

Mathematics is the gate and key of the sciences ... . Neglect of mathematics works injury to all knowledge, since he who is ignorant of it cannot know the other sciences or the things of this world. And what is worse, men who are thus ignorant are unable to perceive their own ignorance and so do not seek a remedy.

--Roger Bacon

[Thomas Edison] ate at this desk and slept in a chair. In six weeks he had gone through the books, written a volume of abstracts, and made two thousand experiments...and produced a solution.

—Edward Hibberd  
Johnson

For centuries people believed that Aristotle was right when he said that the heavier the object, the faster it would fall to earth. Aristotle was regarded as the greatest thinker of all times and surely he could not be wrong. All it would have taken was for one brave person to take two objects, one heavy and one light, and drop them from a great height to see whether or not the heavier object landed first. But no one stepped forward until nearly 2,000 years after Aristotle's death. In 1589 Galileo summoned learned professors to the base of the leaning Tower of Pisa. then he went to the top and pushed off a ten-pound and a one-pound weight. Both landed at the same time. But the power of belief in the conventional wisdom was so strong that the professors denied what they had seen. They continued to say Aristotle was right.

—*The Executive  
Speechwriter*

A man should look for what is, and not for what he thinks should be.

—Albert Einstein

An inventor is a person who creates or designs something that did not previously exists, such as a vaccine or a blanket with sleeves.

—*TL;DR Wikipedia*

I think anybody would have to be with out common sense to think there weren't aliens. There are billions of planets, and I am convinced Earth is not the only one that's inhabited. It would be quite an ego trip to think that.

—Sabrina Lloyd

Some of the most poetic things I remember are classified these days under science when they should not be. For example, the way tadpoles in a Mason jar change into frogs. Watching such a miracle unfold is a different study from cutting up a frog to see how pulling his muscles makes his dead legs kick. Science may lead to reading all about frogs, but somehow knowing everything about frogs does not mean as much as having one for a pet, or hearing hundreds of them peeping in spring and a few old bullfrogs grunting in summer. Watching a caterpillar sew himself into a cocoon and then squeeze out and unfold into a butterfly will always be a beautiful mystery no matter how much scientists learn about biochemistry; and they would be wiser to admit as much instead of slamming their frustrated curiosity shut when their minds confront something logic cannot handle. It is fine for them to go on questioning and measuring and adding to our great treasure of knowledge, but stupid to think the only way of using the mind is in tracing out to nowhere each cobweb of cause and effect.

--Harry Behn

I cannot give any scientist of any age better advice than this: the intensity of a conviction that a hypothesis is true has no bearing over whether it is true or not.

—Peter Medawar

A theory has only the alternative of being right or wrong. A model has a third possibility: it may be right, but irrelevant.

—Manfred Eigen

The guy who invented the first wheel was an idiot. The guy who invented the other three, he was a genius.

—Sid Caesar

We have also arranged things so that almost no one understands science and technology. This is a prescription for disaster. We might get away with it for a while, but sooner or later this combustible mixture of ignorance and power is going to blow up in our faces.

—Carl Sagan

Your shadow is a confirmation that light has traveled nearly 93 million miles unobstructed, only to be deprived of reaching the ground in the final few feet thanks to you.

—Unknown

Say you were standing with one foot in the oven and one foot in an ice bucket. According to the percentage people, you would be perfectly comfortable.

—Bobby Bragan

Scientific progress is like mountain climbing: the higher you climb, the more you know, but the wider the vistas of ignorance that extend on all sides.

—Jack Miles

Nothing in biology makes sense except in the light of evolution.

—Theodosius  
Dobzhansky

One of the great problems of the world today is undoubtedly this problem of not being able to talk to scientists, because we don't understand science; they can't talk to us because they don't understand anything else, poor dears.

--Michael Flanders

Do not trust atoms. They make up everything.

—T-Shirt Slogan

The ultimate aim of all science is to penetrate the unknown. Do you realize we know less about the earth we live on than about the stars and the galaxies of outer space? The greatest mystery is right here, right under our feet.

--Walter Reisch

Archaeology is the peeping Tom of the sciences. It is the sandbox of men who care not where they are going; they merely want to know where everyone else has been.

--Jim Bishop

The fact that life evolved out of nearly nothing, some 10 billion years after the universe evolved out of literally nothing, is a fact so staggering that I would be mad to attempt words to do it justice.

--Richard Dawkins

Equipped with his five senses, man explores the universe around him and calls the adventure Science.

--Edwin Powell Hubble

The last thing a scientist would do is cling to a map because he inherited it from his grandfather, or because it was used by George Washington or Abraham Lincoln

--S. I. Hayakawa

When a distinguished but elderly scientist states that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong.

--Arthur C. Clark

Science has always promised two things not necessarily related—an increase first in our powers, second in our happiness or wisdom, and we have come to realize that it is the first and less important of the two promises which it has kept most abundantly.

--Joseph Wood Krutch

In art nothing worth doing can be done without genius; in science even a very moderate capacity can contribute to a supreme achievement.

--Bertrand Russell

The environment is everything that isn't me.

--Albert Einstein

Astronomers work always with the past; because light takes time to move from one place to another, they see things as they were, not as they are.

--Neale E. Howard

The great tragedy of Science—the slaying of a beautiful hypothesis by an ugly fact.

--Thomas Henry Huxley

In science the credit goes to the man who convinces the world, not to the man to whom the idea first occurs.

--Sir Francis Darwin

Look at cows and remember that the greatest scientists on earth have never discovered how to convert grass into milk.

--Michael I. PUPIN

When a man sits with a pretty girl for an hour, it seems like a minute. But let him sit on a hot stove for a minute—and it's longer than any hour. That's relativity.

--Albert Einstein

It is not enough that you should understand about applied science in order that your work may increase man's blessings. Concern for man himself and his fate must always form the chief interest of all technical endeavors, concern for the great unsolved problems of that organization of labor and the distribution of goods—in order that the creations of our mind shall be a blessing and not a curse to mankind. Never forget this in the midst of your diagrams and equations.

--Albert Einstein

The aim of science is to seek the simplest explanations of complex facts.

--Alfred North Whitehead

Science is simply common sense at its best—that is, rigidly accurate in observation, and merciless to fallacy in logic.

--Thomas H. Huxley

Men love to wonder, and that is the seed of science.

--Ralph Waldo Emerson

Science is a collection of successful recipes.

--P. Valery

We live in a Newtonian world of Einsteinian physics ruled by Frankensteinian logic.

--David Russell

And science, we should insist, better than any other discipline, can hold up to its students and followers an ideal of patient devotion to the search for objective truth, with vision unclouded by personal or political motive.

--Sir H. H. Dalt

The history of science is the only history which displays cumulative progress of knowledge, hence the progress of science is the only yardstick by which we can measure the progress of mankind.

--Laurence J. Peter

Science is facts; just as houses are made of stones, so is science made of facts; but a pile of stones is not a house and a collection of facts is not necessarily science.

--Henri Poincare

Weed—a plant whose virtues have not yet been discovered.

--Ralph Waldo Emerson

Put three grains of sand inside a vast cathedral, and the cathedral will be more closely packed with sand than space is with stars.

--Sir James Jeans

A science career for women is now almost as acceptable as being cheerleader.

--Myra Barker

The process of scientific discovery is, in effect, a continual flight from wonder.

--Albert Einstein

The most incomprehensible thing about the world is that it is comprehensible.

--Albert Einstein

Science is a collection of facts concerning natural objects or phenomena, arranged in good order, and made useful.

--William Temple  
Hornaday

Science is organized knowledge.

--Herbert Spencer

I just don't think nature is very tricky. I don't believe that one phenomenon or another is an enormous coincidence, or accident, or just happened to happen. Everything that is true is very simple, once we understand it. It's only complicated when we don't.

--Bernard Matthias

Biology is beginning to provide us with control over living matter—new drugs, new methods for fighting disease, new kinds of animals and plants. It is helping us also to a new intellectual outlook, in which man is seen not as a finished being, single lord of creation, but as one among millions of the products of an evolution that is still in progress.

--Julian Huxley

Science first gave man a sense of mastery over his environment, and hence over the future. By making the future seem malleable, instead of immutable, it shattered the opiate religions that preached passivity and mysticism.

--Alvin Toffler

The world of poetry, mythology, and religion represents the world as a man would like to have it, while science represents the world as he gradually comes to discover it.

--Joseph Wood Krutch

'Faith' is a fine invention  
For gentlemen who see;  
But microscopes are prudent  
In an emergency.

--Emily Dickinson

Every great advance in science has issued from a new audacity of imagination.

--John Dewey

Unless man can make new and original adaptations to his environment as rapidly as his science can change the environment, our culture will perish.

--Carl R. Rogers

The human race stands now on the threshold of a new frontier whose richness is a thousand times greater than that of the new western world of 500 years ago—that high frontier is—SPACE.

--Gerard O'Neill

Space is an infinite sphere whose center is everywhere and whose surface is nowhere.

--Cassius Jackson Keyser

Every science has for its basis a system of principles as fixed and unalterable as those by which the universe is regulated and governed. Man cannot make principles; he can only discover them.

--Thomas Paine

It is an error to imagine that evolution signifies a constant tendency to increased perfection. That process undoubtedly involves a constant remodeling of the organism in adaptation to new conditions; but it depends on the nature of those conditions whether the direction of the modifications effected shall be upward or downward.

--Thomas Henry Huxley

Gods are born and die, but the atom endures.

--Alexander Chase

The content of physics is the concern of physicists, its effect the concern of all men.

--Friedrich Durrenmatt

We have genuflected before the god of science only to find that it has given us the atomic bomb, producing fears and anxieties that science can never mitigate.

--Martin Luther King, Jr.

Man has wrested from nature the power to make the world a desert or to make the deserts bloom. There is no evil in the atom; only in men's souls.

--Adlai Stevenson

Science cannot now, and perhaps never will be able to, give us a complete account of our ultimate nature, or that of the physical environment in which we live.

--Harold J. Shapiro

Science is the systematic classification of experience.

--George Henry Lewes

Steam is no stronger now than it was a hundred years ago, but it is put to better use.

--Ralph Waldo Emerson

Science is only a tool. The harm or good it does depends on how men use it.

--Unknown

Science is an orderly arrangement of what, at the moment, seems to be facts.

--Unknown

Science can predict an eclipse of the sun many years in advance but cannot accurately predict the weather over the weekend.

--Unknown

A scientist is a person who can solve problems, not just a person crammed with information.

--Unknown

Scientific activity is the only one which is obviously and undoubtedly cumulative and progressive.

--George Sarton

Science: The Endless Frontier.

--Vannevar Bush

Science is the search for truth.

--Linus Carl Pauling

Science is the knowledge of many, orderly and methodically digested and arranged, so as to become attainable by one. The knowledge of reasons and their conclusions constitutes abstract, that of causes and their effects, and of the laws of nature, natural science.

--John Frederick William  
Herschel

Man is the interpreter of nature, science the right interpretation.

--William Whewell

In art, truth is a means to an end; in science, it is the only end.

--William Whewell

Science repulses the indefinite.

--Claude Bernard

The science of life is a superb and dazzlingly lighted hall which may be reached only by passing through a long and ghastly kitchen.

--Claude Bernard

True science teaches us to doubt and to abstain from ignorance.

--Claude Bernard

Science frees us in many ways...from the bodily terror which the savage feels. But she replaces that, in the minds of many, by a moral terror which is far more overwhelming.

--Charles Kingsley

No, a thousand times no; there does not exist a category of science to which one can give the name applied science. There are science and the applications of science, bound together as the fruit to the tree which bears it.

--Louis Pasteur

The highest object at which the natural sciences are constrained to aim, but which they will never reach, is the determination of the forces which are present in nature, and of the state of matter at any given moment—in one word, the reduction of all the phenomena of nature to mechanics.

--Gustav Robert Kirchoff

The general theory of evolution...assumes that in nature there is a great, unital, continuous and everlasting process of development, and that all natural phenomena without exception, from the motion of the celestial bodies and the fall of the rolling stone up to the growth of the plant and the consciousness of man, are subject to the same great law of causation—that they are ultimately to be reduced to atomic mechanics.

--Ernst Heinrich Haeckel

Science is the guide of action; that the truth which it arrives at is not that which we can ideally contemplate without error, but that which we may act upon without fear; and you cannot fail to see that scientific thought is not an accompaniment or condition of human progress, but human progress itself.

--William Kingdon  
Clifford

Science is built up with facts, as a house is with stones. But a collection of facts is no more a science than a heap of stones is a house.

--Jules Henri Poincare

Common sense is the very antipodes of science.

--Edward Bradford  
Titchener

The whole of science is nothing more than a refinement of everyday thinking.

--Albert Einstein

The quick harvest of applied science is the usable process, the medicine, the machine. The shy fruit of pure science is Understanding.

--Lincoln Barnett

Observatory, n. A place where astronomers conjecture away the guesses of their predecessors.

--Ambrose Bierce

Science has given to this generation the means of unlimited disaster or of unlimited progress. There will remain the greater task of directing knowledge lastingly towards the purpose of peace and human good.

--Sir Winston Churchill

Science is the attempt to make the chaotic diversity of our sense-experience correspond to a logically uniform system of thought.

--Albert Einstein

Science is nothing but trained and organized common sense.

--Thomas Henry Huxley

Let both sides seek to invoke the wonders of science instead of its terrors. Together let us explore the stars, conquer the deserts, eradicate disease, tap the ocean depths, and encourage the arts and commerce.

--John F. Kennedy

The means by which we live have outdistanced the ends for which we live. Our scientific power has outrun our spiritual power. We have guided missiles and misguided men.

--Martin Luther King, Jr.

If scientific discovery has not been an unalloyed blessing, if it has conferred on mankind the power not only to create but also to annihilate, it has at the same time provided humanity with a supreme challenge and a supreme testing.

--John F. Kennedy

People must understand that science is inherently neither a potential for good nor for evil. It is a potential to be harnessed by man to do his bidding.

--Glenn T. Seaborg

The true scientist never loses the faculty of amazement. It is the essence of his being.

--Hans Selye

Science is the great antidote to the poison of enthusiasm and superstition.

--Adam Smith

The truth is, that those who have never entered upon scientific pursuits know not a tithe of the poetry by which they are surrounded.

--Herbert Spencer

Science when well digested is nothing but good sense and reason.

--Stanislaus I of Poland

Science is the most intimate school of resignation and humility, for it teaches us to bow before the seemingly most insignificant of facts.

--Miguel de Unamuno

Science without religion is lame, religion without science is blind.

--Albert Einstein

The religion that is afraid of science dishonors God and commits suicide.

--Ralph Waldo Emerson

Only science can hope to keep technology in some sort of moral order.

--Edgar Z. Friedenberg

Nothing puzzles me more than time and space; and yet nothing troubles me less.

--Charles Lamb

The fairest thing we can experience is the mysterious. It is the fundamental emotion which stands at the cradle of true art and true science.

--Albert Einstein

Science is nothing but developed perception, interpreted intent, common sense rounded out and minutely articulated.

--George Santayana

The majority of thinkers agree that one of the important lessons of history is that in science there are no absolute guarantees. No matter how well founded a given belief may be, its truth cannot be established with ultimate certainty.

--George N. Schlesinger

The progress of science is strewn, like an ancient desert trail, with the bleached skeletons of discarded theories which once seemed to possess eternal life.

--Arthur Koestler

Science has promised us truth—an understanding of such relationships as our minds can grasp; it has never promised us either peace or happiness.

--Gustave Le Bon

Science is the knowledge of Consequences, and dependence of one fact upon another.

--Thomas Hobbes

The first law of ecology is that everything is related to everything else.

--Barry Commoner

For the first time in the history of the world, every human being is now subjected to contact with dangerous chemicals, from the moment of conception until death.

--Rachel Carson

If the school sends out children with a desire for knowledge and some idea of how to acquire and use it, it will have done its work.

--Sir Richard Livingstone

Resistance to science is born of fear. Fear, in turn, is bred by ignorance. And it is ignorance that is our deepest malady.

--Nobelist J. Michael

The trouble with facts is that there are so many of them.

--Samuel Crothers

It's not what you look at that matters, it's what you see.

--Henry David Thoreau

I just invent, then wait until people come around to needing what I've invented.

--R. Buckminster Fuller

Pollution is nothing but the resources we are not harvesting. We allow them to disperse because we've been ignorant of their value.

--R. Buckminster Fuller

I am often amazed at how much more capability and enthusiasm for science there is among elementary school youngsters than among college students.

--Carl Sagan

Our species needs, and deserves, a citizenry with minds wide awake and a basic understanding of how the world works.

--Carl Sagan

Science is a way of thinking much more than it is a body of knowledge.

--Carl Sagan

Skeptical scrutiny is the means, in both science and religion, by which deep thoughts can be winnowed from deep nonsense.

--Carl Sagan

Who are we? We find that we live on an insignificant planet of a humdrum star lost in a galaxy tucked away in some forgotten corner of a universe in which there are far more galaxies than people.

--Carl Sagan

Curiosity has its own reason for existing. Never lose a holy curiosity.

--Albert Einstein

The ones who search the most, are the ones who find the most.

--Unknown

The essence of life is statistical improbability on a colossal scale.

--Richard Dawkins

The theory of evolution by cumulative natural selection is the only theory we know of that is in principle capable of explaining the existence of organized complexity.

--Richard Dawkins

We're living beyond our means. We have developed a lifestyle that is draining the earth of its priceless and irreplaceable resources.

--Margaret Mead

I see nothing in space as promising as the view from a Ferris wheel.

--E. B. White

Very simple was my explanation and plausible enough—as most wrong theories are!

--H. G. Wells

Nothing is unthinkable, nothing impossible to the balanced person, provided it arises out of the needs of life and is dedicated to life's further developments.

--Lewis Mumford

Did you ever observe to whom the accidents happen? Chance favors only the prepared mind.

--Louis Pasteur

Benjamin Franklin was very lucky with his 'kite and key' experiment. The next two men who tried to duplicate it were killed by lightning.

--*G & W Electric  
Company*

The electric light bulb got its present shape because Thomas Edison accidentally dropped a screwdriver on an early light, knocking it out of its original shape and causing it to burn more brightly with increased power.

--*G & W Electric  
Company*

All men dream but not equally. Those who dream by night in the dusty recesses of their minds wake in the day to find that it was vanity, but the dreamers of the day are dangerous men, for they may act their dreams with open eyes to make it possible.

--T. E. Lawrence

The best way to have a good idea is to have lots of ideas.

--Linus Pauling

Writing in science class is also valuable because it provides students with a ready reference to use in class and when preparing for exams. It can give students experience in organizing materials, but it also encourages creativity. Finally, notebooks give teachers another way of assessing students' progress and understanding of science. There is another compelling reason for making writing a routine part of science class: a growing body of research documenting that when reading, writing, and science are connected in relevant ways, all three subjects benefit. science class can be the springboard for improved literacy, and those improvements eventually show up in high scores on standardized tests. Students from disadvantaged backgrounds have been shown to benefit from such programs to an even greater extent than do students as a whole.

--*ScienceLink* 2001

People think of the inventor as a screwball, but no one ever asks the inventor what he thinks of other people.

--Charles Kettering

The saddest aspect of life right now is that science gathers knowledge faster than society gathers wisdom.

--Isaac Asimov

Not all chemicals are bad. Without chemicals such as hydrogen and oxygen, for example, there would be no way to make water, a vital ingredient in beer.

--Dave Barry

Thus the metric system did not really catch on in the States, unless you count the increasing popularity of the nine-millimeter bullet.

--Dave Barry

I'm astounded by people who want to 'know' the universe when it's hard enough to find your way around Chinatown.

--Woody Allen

The secret to creativity is knowing how to hide your sources.

--Albert Einstein

You have to walk through the land leaving as little trace of yourself as possible.

--Josh Bernstein

Do not seek to follow in the footsteps of the men of old; seek what they sought.  
--Matsuo Basho

Magnetism, as you recall from physics class, is a powerful force that causes certain items to be attracted to refrigerators.  
--Dave Barry

As long as a branch of science offers an abundance of problems, so long it is alive; a lack of problems foreshadows extinction or the cessation of independent development.  
--David Hilbert

It is a truth very certain that, when it is not in our power to determine what is true, we ought to follow what is most probable.  
--René Descartes

There is one thing even more vital to science than intelligent methods; and that is, the sincere desire to find out the truth, whatever it may be.  
--Charles Pierce

If it's true that our species is alone in the universe, then I'd have to say that the universe aimed rather low and settled for very little.  
--George Carlin

If we knew what it was we were doing, it would not be called research, would it?  
--Albert Einstein

It should be possible to explain the laws of physics to a barmaid.  
--Albert Einstein

Most of the fundamental ideas of science are essentially simple, and may, as a rule, be expressed in a language comprehensible to everyone.  
--Albert Einstein

Most people say that it is the intellect which makes a great scientist. They are wrong: it is character.  
--Albert Einstein

Science is a wonderful thing if one does not have to earn one's living at it.  
--Albert Einstein

The grand aim of all science is to cover the greatest number of empirical facts by logical deduction from the smallest number of hypotheses or axioms.

--Albert Einstein

The man of science is a poor philosopher.

--Albert Einstein

To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science.

--Albert Einstein

Facts do not cease to exist because they are ignored.

--Aldous Huxley

How are you going to teach logic in a world where everybody talks about the sun setting, when it's really the horizon rising?

—Howard Whitley Eves

In God we trust; all others must bring data.

--W. Edwards Deming

A problem properly stated finds its own solution.

--Charles Le Corbusier

Research is what I'm doing when I don't know what I'm doing.

--Wernher von Braun

An inventor is simply a fellow who doesn't take his education too seriously

--Charles F. Kettering

In our youth we were promised flying cars. What did we get? 140 characters.

--Peter Thiel

Everyone is entitled to his own opinion, but not his own facts.

--Daniel Patrick  
Moynihan

One is not quite certain that creativeness in the arts, literature, and science functions best in an environment of absolute freedom. Chances are that a relatively mild tyranny stimulates creativeness.

--Eric Hoffer

If you look at the scientists who really make a difference, they think boldly. They're not afraid to question what they see.

--Taylor Wilson

In medicine, or in science, you go down a path and it turns out to be a dead end, you really made a contribution, because we know we don't have to go down that path again.

--Michael Bloomberg

It is even harder for the average ape to believe that he has descended from man.

--H. L. Mencken

The world will be here, with or without us, until the sun dies, 5 billion years hence. At that point, the sun's atmosphere will have expanded to engulf the entire orbits of Mercury, Venus, and Earth, which will have become charred embers spiraling, one by one, to the crucible that is the sun's core.

--Neil deGrasse Tyson

Calculating how much carbon is absorbed by which forests and farms is a tricky task, especially when politicians do it.

--Donella Meadows

Surely the immutable laws of the universe can teach more impressive and exalted lessons than the holy books of all the religions on earth.

--Elizabeth Cady Stanton

We may take it to be the accepted idea that the Mosaic books were not handed down to us for our instruction in scientific knowledge, and that it is our duty to ground our scientific beliefs upon observation and inference, unmixed with considerations of a different order.

--Asa Gray

Virtually every scientific area of inquiry began with a question or an insight from a philosopher. Democritus proposed the atom; Ionian philosophers invented what we now think of as the scientific method; Aristotle founded biology. In mathematics and physics, the metaphysical problems considered by Plato are still being debated.

--Rebecca Newberger  
Goldstein

Geologists have a saying —rocks remember.

--Neil Armstrong

Philosophy doesn't merely tell us about the subjective, leaving the objective world to science....The finest scientific thinking will always be driven and informed by the philosophical spirit. The grand forward push of human knowledge requires each of us to begin by trying to think independently, to recognize that knowledge is more than information, to see that we are moral beings who must closely interrogate both ourselves and the world we inhabit—to live, as Socrates recommended, an examined life.

--Clancy Martin

If you can't explain it simply, you don't understand it well enough.

--Albert Einstein

We are not going to be able to operate our Spaceship Earth successfully nor for much longer unless we see it as a whole spaceship and our fate as common. It has to be everybody or nobody.

--R. Buckminster Fuller

It might be arrogant to think that we're the only living creations in all of the solar systems that there are. Space is so vast.

--Jeri Ryan

If the universe is running down like a clock, the clock must have been wound up at a date which we could name if we knew it. The world, if it is to have an end in time, must have had a beginning in time.

--Dean Inge

Science is what we understand well enough to explain to a computer. Art is everything else we do.

--Donald Knuth

Science attempts to explain the mysteries of life, often by destroying the beauty of it.

--*Earth (The Book) A  
Visitor's Guide to  
the Human Race*

There are two kinds of statistics, the kind you look up and the kind you make up.

--Rex Stout

Pioneered by the ancient Greeks, developed by medieval Muslims, systematized in the Renaissance, perfected in the Enlightenment and patented by the Dupont Corporation, the scientific method improved on man's previous tradition: making shit up. The scientific method added the crucial step of experimentation, using real-world data to test a hypothesis that, if proven, would be accepted by scientists as a theory, which could then be used to get a grant, or in some cases, tenure.

--*Earth (The Book) A  
Visitor's Guide to  
the Human Race*

You see things; and you say 'Why?' But I dream things that never were; and I say 'Why not?'

--George Bernard Shaw

Science exists, moreover, only as a journey toward truth. Stifle dissent and you end that journey.

--John Charles Polanyi

A scientist is in a sense a learned small boy. There is something of the scientist in every small boy. Others must outgrow it. Scientists can stay that way all their lives.

--George Wald

We are probably nearing the limit of all we can know about astronomy.

--Simon Newcomb

The most wonderful discovery made by scientists is science itself.

--Jacob Bronowski

Wonder is what sets us apart from other life forms. No other species wonders about the meaning of existence or the complexity of the universe or themselves.

--Herbert W. Boyer

It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow.

--Robert H. Schuller

There is no greater joy that I have in my life than having an idea that's a good idea. At that moment it pops into my head, it is so deeply satisfying and rewarding...My nucleus accumbens is probably going nuts when it happens.

--Unknown Scientist

In the R&D business, we kind of lump people into two categories: inventors and engineers. The inventor is the kite kind of person. They have a zillion ideas and they come up with great first prototypes. But generally an inventor...is not a tidy person. He sees the big picture and...[is] constantly lashing something together that doesn't really work. And then the engineers are the strings, the craftsmen [who pick out a good idea] and make it really practical. So, one is about a good idea, the other is about...making it practical.

--Unknown Scientist

[On earthworms] It may be doubted whether there are many other animals which have played so important a part in the history of the world, as have these lowly organised creatures.

--Charles Darwin

Discovery consists of seeing what everybody has seen and thinking what nobody has thought.

--Albert Szent-Györgyi

Tell a man there are 300 Billion stars in the universe and he'll believe you. Tell him a bench has wet paint on it and he'll have to touch to be sure.

—W. C. Fields

If you are obliged to neglect any thing, let it be your chemistry. It is the least useful and the least amusing to a country gentleman of all the ordinary branches of science.

—Thomas Jefferson

An expert is a person who has made all the mistakes that can be made in a very narrow field.

--Niels Bohr

A person who has not made his great contribution to science before the age of 30 will never do so.

—Albert Einstein

Great discoveries and improvements invariably involve the cooperation of many minds. I may be given credit for having blazed the trail, but when I look at the subsequent developments I feel the credit is due to others rather than to myself.

—Alexander Graham  
Bell

Mistakes are the portals of discovery.

--James Joyce

It is the theory that decides what we can observe.

—Albert Einstein

The main purpose of science is simplicity and as we understand more things, everything is becoming simpler.

—Edward Teller

All science requires mathematics. The knowledge of mathematical things is almost innate in us. This is the easiest of sciences, a fact which is obvious in that no one's brain rejects it; for laymen and people who are utterly illiterate know how to count and reckon.

—Roger Bacon

Not only is the universe stranger than we think, it is stranger than we can think.

—Werner Karl  
Heisenberg

I meant exactly what I said: that we are saddled with a culture that hasn't advanced as far as science.

—Michelangelo Antonioni

Physical science has historically progressed not only by finding precise explanations of natural phenomena, but also by discovering what sorts of thing can be precisely explained. These may be fewer than we had thought.

—Steven Weinberg

I don't want to get technical or anything, but according to chemistry alcohol is a solution.

—*someecards.com*

Don't tell me the sky is the limit when there are footprints on the moon.

— Paul Brandt

One thing I have learned in a long life: that all our science, measured against reality, is primitive and childlike—and yet it is the most precious thing we have.

—Albert Einstein

AH—The element of surprise.

—T-Shirt Slogan

The most beautiful experience we can have is the mysterious. It is the fundamental emotion that stands at the cradle of true art and true science. Whoever does not know it and can no longer wonder, no longer marvel, is as good as dead, and his eyes are dimmed.

—Albert Einstein

One thinks of Charles Darwin as a cold scientist, but there was real passion there. He could stare for hours at an ant's nest, or a rose in a garden. In Wallerawang, he sat by himself, gazing at the dead platypus for hour after hour, thinking, 'It just doesn't make sense.' Why had God made the water rat for Europe and North America, and the platypus for Australia? It's terrifying, really.

—Chris Darwin

A theory is no more like a fact than a photograph is like a person.

—Edward W. Howe

Science has done more for the development of Western civilization in one hundred years than Christianity did in eighteen hundred years.

—John Burroughs

Though many have tried, no one has every yet explained away the decisive fact that science, which can do so much, cannot decide what it ought to do.

--Joseph Wood Krutch

Albert Einstein was a theoretical physicist who developed the mathematical equation cartoon characters write on a blackboard to show they're smart.

—*TL;DR Wikipedia*

Marie Curie was a Polish chemist whose pioneering research on and exposure to radioactivity gave her the superpower of dying 30 years before her time.

—*TL;DR Wikipedia*

At age 9. watching the stars come out in the dome of the Hayden Planetarium, was magical. Planetariums count as the first virtual reality experience. I grew up in the city and so I had no concept of the night sky until I visited the planetarium. I'm to the point where I'm pretty sure the universe chose me. I've been hooked ever since.

—Neil deGrasse Tyson

If there were a science of human beings it would be anthropology that aims at understanding the totality of experience through structural context.

—Wilhelm Dilthey

The human tendency to regard little things as important has produced very many great things.

—Georg C. Lichtenberg

Successful innovators recognize that discovery of great ideas come from looking at the same thing as everyone else and observing something different.

—Reed Markham

You see, every creature alive on the earth today represents an unbroken line of life that stretches back to the first primitive organism to appear on this planet; and that is about three billion years.

—George Wald

There's a way to do it better—find it.

—Thomas Edison

The universe extends beyond the mind of man, and is more complex than the small sample one can study.

—Kenneth L. Pike

I ask you to look both ways. For the road to a knowledge of the stars leads through the atom and important knowledge of the atom has been reached through the stars.

—Sir Arthur Eddington

There are only two ways to live your life. One is as though nothing is a miracle. the other is as though everything is a miracle.

—Albert Einstein

The greatest thing a human being ever does in this world is to see something. To see clearly is poetry, prophecy, and religion; all in one.

—John Ruskin

Science and art belong to the whole world, and before them vanish the barriers of nationality.

—Johann Wolfgang  
von Goethe

Happy the man who can search out the causes of things.

—Virgil

I am convinced that everything that is worthwhile in the world has been accomplished by the free, inquiring, critical spirit, and that the preservation of this spirit is more important than any social system whatsoever. But the men of ritual and the men of barbarism are capable of shutting up the men of science and of silencing them forever.

—Sinclair Lewis

The formulation of a problem is often more essential than its solution.

—Albert Einstein

Science is built up of facts, as a house is built of stones; but an accumulation of facts is no more a science than a heap of stone is a house.

—Henri Poincaré

Research is formalized curiosity. It is poking and prying with a purpose. It is a seeing that he who wishes may know the cosmic secrets of the world and they that dwell therein.

—Zora Neale Hurston

In the teaching of science, the art of thought should be taught; namely the art of forming clear conceptions applying to first-hand experience, the art of divining the general truths which apply, the art of testing divinations, and the art of utilizing general truths by reasoning to more particular cases of some peculiar importance. The thought which science evokes is logical thought. Now logic is of two kinds: the logic of discovery and the logic of the discovered.

—Alfred North  
Whitehead

The most inventive science comes in an environment in which brilliant independent thinkers have free rein to chase their most fanciful ideas, even if they fail.

—Florian Engert

If we can't explain why a cockroach decides to turn left, how can we explain why a human being decides to do something?

—Noam Chomsky

Even the lowliest insect is a spectacularly well-adapted instrument that's more complicated and more interesting than any computer. Wouldn't you like to know how its brain works?

—Florian Engert

Every failure is a kind of scientific necessity, leading away from what doesn't work to what does.

—Thomas Lassman

Science is not the truth. Science is finding the truth. When science changes its opinion, it didn't lie to you. It learned more.

—Internet Meme

All thinking begins with wonder.

—Socrates

The pure natural scientist is liable to forget that minds exist, and that if it were not for them he could neither know nor act on physical objects.

—Charles D. Broad

History has shown that extinction events happen on Earth. We need to establish a second independent biosphere for the future of humanity.

—Pat Troutman

The capacity to be puzzled is indeed the premise of all creation, be it in art or in science.

—Erich Fromm

Seeds of great discoveries are constantly floating around us, but they only take root in minds well prepared to receive them.

—Joseph Henry

No single achievement in science is possible without the painstaking work of the many hundreds who have built the foundation on which all new work is based.

—Polykarp Kusch

The best way to predict the future is to invent it.

—Alan Kay

The priest persuades a humble people to endure their hard lot, a politician urges them to rebel against it, and a scientist thinks of a method that does away with the hard lot altogether.

—Max Percy

For 50 years science fiction predicted that we would go into space. Almost no one predicted that we would retreat from it. I'm sometimes still astonished by that. We're looking at the future with trepidation and fear. There's been a general loss of faith in the world of tomorrow.

—George R. R. Martin

The jet stream is the controlling influence over the world's weather systems.

—Michael Fish

The pursuit of science leads only to the insoluble.

—Benjamin Disraeli

Pluto is officially classified as a 'dwarf' planet, but Stern [Alan] still calls it a planet—and who's going to stop him? 'Astronomers don't have a police force.'

—Elizabeth Quill

When I go outside at night and look up at the stars, the feeling that I get is not comfort. The feeling that I get is a kind of delicious discomfort at knowing that there is so much out there that I do not understand.

—Raymond Joseph Teller

The progress of the natural sciences in modern times has of course so much exceeded all expectations that any suggestion that there may be some limits to it is bound to arouse suspicion.

—Friedrich August von Hayek

Play is the highest form of research.

—Albert Einstein

A good scientist is a person with original ideas. A good engineer is a person who makes a design that works with as few original ideas as possible. There are no prima donnas in engineering.

—Freeman Dyson

Darwinism is not science at all. It is guesses strung together.

—William Jennings  
Bryan

In a very real sense, it will not be one man going to the moon, it will be an entire nation. For all of us must work to put him there.

—John F. Kennedy

It has become almost a cliché to remark that nobody boasts of ignorance of literature, but it is socially acceptable to boast ignorance of science and proudly claim incompetence in mathematics.

—Richard Dawkins

The proper study of Mankind is Man.

—Alexander Pope

In writing the history of a disease, every philosophical hypothesis whatsoever, that has previously occupied the mind of the author, should lie in abeyance.

—Thomas Sydenham

On March 13, 1781...the German-British astronomer William Herschel, while meticulously surveying the heavens, spied an object that turned out to be a new planet—later named Uranus. It proved to be about twice as far from the Sun as the farthest till-then-known planet, Saturn, was. So ingrained into human thinking had been the notion of the naked-eye planets as being all there was that it seemed a virtual intellectual earthquake to add a new, dim one to the list. It was the most famous astronomical discovery of its time and made Herschel, at a bound, the most famous astronomer the world had yet seen.

—Isaac Asimov

In the beginning the Universe was created. This has made a lot of people very angry and has been widely regarded as a bad move.

—Douglas Adams

Considering also that of all those who have hitherto sought for the truth in the sciences, it is been the mathematicians alone who have been able to succeed in... producing reasons which are evident and certain.

—René Descartes

Theory is splendid but until put into practice, it is valueless.

—James Cash Penney

As a conscious being I am involved in a story. The perceiving part of my mind tells me a story of a world around me. The story tells of familiar objects. It tells of colors, sounds, scents belonging to these objects; of boundless space in which they have their existence, and of an ever-rolling stream of time bringing change and incident. It tells of other life than mine busy about its own purposes.

As a scientist I have become mistrustful of the story. In many instances it has become clear that things are not what they seem to be. According to the storyteller, I have now in front of me a substantial desk; but I have learned from physics that the desk is not at all the continuous substance that it is supposed to be in the story. Is a host of tiny electric charges darting hither and thither with inconceivable velocity. Instead of being the solid substance, my desk is more like a swarm of gnats.

So I have come to realize that I must not put overmuch confidence in the storyteller who lives in my mind.

—Sir Arthur Eddington

We can never arrive at the real nature of things from the outside. However much we investigate, we can never reach anything but images and names. We are like a man who goes round a castle seeking in vain for an entrance and sometimes sketching the facades.

—Arthur Schopenhauer

Science seeks only the most generally useful systems of classification; these it regards for the time being, until more useful classifications are invented, 'true.'

—S. I. Hayakawa

For 2,000 years, there was an intuitive, elegant, compelling picture of how the world worked. It was called 'the ladder of nature.' In the canonical version, God was at the top, followed by angels, who were followed by humans. Then came the animals, starting with noble wild beasts and descending to domestic animals and insects. Human animals followed the scheme, too. Women ranked lower than men, and children were beneath them. The ladder of nature was a scientific picture, but it was also a moral and political one. It was only natural that creatures higher up would have dominion over those lower down.

—Alison Gopnik

We are built to conquer environment, solve problems, achieve goals, and we find no real satisfaction or happiness in life without obstacles to conquer and goals to achieve.

—Maxwell Maltz

Scientific knowledge is in perpetual evolution; it finds itself changed from one day to the next.

—Jean Piaget

I can see no reason why man will not presently give up all major beliefs, and simply surrender himself to what is perhaps the first principle of his own present state as a conscious creature—an insatiable curiosity.

—Conrad Aiken

A man ceases to be a beginner in any given science and becomes a master in that science when he has learned that he is going to be a beginner all his life.

—Robin G. Collingwood

Easterners commonly complain that there is no ‘weather’ at all in Southern California, that the days and the seasons slip by relentlessly, numbingly bland. That is quite misleading. In fact the climate is characterized by infrequent but violent extremes: two periods of torrential subtropical rains which continue for week and wash out the hills and send subdivisions sliding toward the sea; and twenty scattered days a year of the Santa Ana, which, with its incendiary dryness, invariably means fire.

—Joan Didion

Los Angeles weather is the weather of catastrophe, of apocalypse, and just as the reliably long and bitter winters of New England determine the way life is lived there, so the violence and the unpredictability of the Santa Ana affect the entire quality of life in Los Angeles, accentuate its impermanence, its unreliability. The wind shows us how close to the edge we are.

—Joan Didion

Darwin understood his own theory perfectly: It assumes that heritable variation occurs, but it does not depend on knowing where that variation comes from.

—Nathaniel Comfort

While this planet has gone cycling on according to the laws laid down by Copernicus, Kepler, and Newton, endless interpretations of heredity have been, and are being, evolved.

—Nathaniel Comfort

Science is not a collection of facts but a way of interrogating the world.

—Sharon Begley

Galileo versus the church fueled the myth that science and religion are natural enemies. But the universe doesn't become less spiritual as we understand it better; in fact, the poetry in scientific truths flourishes with deeper understanding.

—Adam Alter

It's possible to make a more profound contribution to society after you're dead than before. The ability to feel no pain is a kind of superpower that corpses, in the hands of science, can use to help make the world better. Also interesting, especially in military science, is the discomfort around their use in research. Even though they're dead—are bone and tissue and skin now—they still look like people. And we have a natural, if irrational, reluctance to 'harm' them.

—Mary Roach

We have a moral responsibility to protect the earth and ensure that our children and grandchildren have a healthy and sustainable environment in which to live.

—Jim Clyburn

My goal is simple. It is complete understanding of the universe, why it is as it is and why it exists at all.

—Stephen Hawking

The most important scientific revolutions all include, as their only common feature, the dethronement of human arrogance from one pedestal after another of previous convictions about our centrality in the cosmos.

—Stephen Jay Gould

Discoveries are often made by not following instructions, by going off the main road, by trying the untried.

--Frank Tyger

The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them.

--Sir William Bragg

Science is wonderfully equipped to answer the question 'How?' but it gets terribly confused when you ask the question 'Why?'

—Erwin Chargaff

It is better to know some of the questions than all of the answers.

--James Thurber

The difference between what the most and the least learned people know is inexpressibly trivial in relation to that which is unknown.

—Albert Einstein

Discovery is the ability to be puzzled by simple things.

—Noam Chomsky

The ability to ask the right question is more than half the battle of finding the answer.

—Thomas John  
Watson, Sr.

Mathematics is the bell-boy of all sciences.

—Unknown

Scientific jargon is superior slang.

--Sandra Raphael

The great scientific revolution of the 17th century was made possible by a set of new tools—the telescope, microscope, barometer. The tools and instruments that we have today make anything that we had even in 1950 look like toys by comparison.

—Joel Mokyr

I have learned to use the word ‘impossible’ with the greatest caution.

—Wernher von Braun

Philosophy of science without history of science is empty; history of science without philosophy of science is blind.

—Imre Lakatos

The telescope makes the world smaller; it is only the microscope that makes it larger.

—G. K. Chesterton

For millennia beyond computation, the sea’s waves have battered the coastlines of the world with erosive effect, here cutting back a cliff, there stripping away tons of sand from a beach, and yet again, in a reversal of their destructiveness, building up a bar or a small island.

—Rachel Carson

The one thing that helped students do well in all college science was having taken an advanced high school math class. That undermines a commonly held belief that math training is not particularly important or helpful for the study of biology.

—Rick Weiss

Heisenberg, Max Plank and Einstein, they all agreed that science could not solve the mystery of the universe.

—Harry Dean Stanton

Indeed, I would feel that an appreciation of the arts in a conscious, disciplined way might help one to do science better.

—Subrahmanyan  
Chandrasekhar

The theory of evolution is outstandingly the most important theory in biology.

—Mark Ridley

It's a shame that college students are asked to choose between the humanities and the sciences—as if the universe were knowable from just one perspective.

—Diane Ackerman

The more thoroughly I conduct scientific research, the more I believe that science excludes atheism.

—Lord Kelvin

We need a revolution in elementary school science. There is probably no other subject whose teaching is so at odds with its true nature. We have come to think of science as a grab-bag of esoteric facts and stunts—the periodic table, the innards of frogs, the way to make little hot plates out of tin cans and wire. Worse, we have also given students the impression that science is dry and arcane matter gleaned solely from the pages of a textbook. In three major studies, the National Science Foundation found that most science education follows the traditional practice: 'At all grade levels the predominant method of teaching was recitation (discussion) with the teacher in control, supplementing the lesson with new information (lecturing). The key to the information and basis for reading assignments was the textbook.' If science is presented like this, is it any wonder that children's natural curiosity about their physical world turns into boredom by the time they leave grade school—and into dangerous ignorance later on?

—William J. Bennett

Botany is the only thing about flowers that coeds dislike.

—Evan Esar

Science is a way of thinking, a way of understanding the world. The term ‘scientific method’ has fallen into disfavor among educators, perhaps because it conjures up images of a white-coated man hunched over a Petri dish. It ought to be restored. The scientific method is the method of thought, of reasoning, which applies not only to explorations of the physical universe but to all the realms of intellectual inquiry that require hypothesis, inference, and other tools of brainwork. As Bertrand Russell has explained: ‘A fact, in science, is not a mere fact, but an instance.’

—William J. Bennett

Take the sum of human achievement in action, in science, in art, in literature—subtract the work of the men above forty, and while we should miss great treasures, even priceless treasures, we would practically be where we are today....The effective, moving, vitalizing work of the world is done between the ages of twenty-five and forty.

--Sir William Osler

Seen only as a laundry list of theorems in a workbook, science can be a bore. But as a ‘hands-on’ adventure guided by a knowledgeable teacher, it can sweep children up in the excitement of discovery. Taught by the regular classroom teacher, it can illustrate the point that science is for everyone—not just scientists.

—William J. Bennett

Ignorance more frequently begets confidence than does knowledge: it is those who know little, and not those who know much, who so positively assert that this or that problem will never be solved by science.

—Charles Darwin

We should not teach children the sciences; but give them a taste for them.

—Jean-Jacques Rousseau

Scientific knowledge is in perpetual evolution; it finds itself changed from one day to the next.

—Jean Piaget

I propose that science be taught at whatever level, from the lowest to the highest, in the humanistic way. It should be taught with a certain historical understanding, with a social understanding and a human understanding in a sense of the biography, the nature of the people who made this construction, the triumphs, the trials, the tribulations.

—I. I. Rabi

A fool can look at the universe and see nothing, but the right man can look at a pinpoint, at a moth, at a cell and guess out the universe. That is the measure of the perceiving mind.

—John Ciardi

The general diffusion of knowledge and learning through the community is essential to the preservation of free government.

--Carl Becker

We have become increasingly and painfully aware of our abysmal ignorance. No scientist, fifty years ago, could have realized that he was as ignorant as all first-rate scientists now know themselves to be.

--Abraham Flexner

The saddest aspect of life right now is that science gathers knowledge faster than society gathers wisdom.

--Isaac Asimov

Imagination has brought mankind through the dark ages to its present state of civilization. Imagination led Columbus to discover America. Imagination led Franklin to discover electricity. Imagination has given us the steam engine, the telephone, the talking-machine, the automobile, for these things had to be dreamed of before they became realities. So I believe that dreams—daydreams, you know, with our eyes wide open and your brain machinery whizzing—are likely to lead to the betterment of the world. The imaginative child will become the imaginative man or woman most apt to invent, and therefore to foster, civilization.

—L. Frank Baum

Give me a place to stand and a lever long enough and I will move the world.

—Archimedes

Man's knowledge of science has clearly outstripped his knowledge of man. Our only hope of making the atom servant rather than master lies in education, in a broad liberal education where each student within his capacity can free himself from trammels of dogmatic prejudice and apply his educational accoutrement to besetting social and human problems.

--Harry Woodburn Chase

Results! Why, man, I have gotten a lot of results. I know several thousand things that won't work.

--Thomas A. Edison

Science is an active process that involves using physical skills, imagination, and creativity to tackle the usually ill-defined problems and events of the real world. In looking at our methods for assessing science learning in schools, however, we might think that what's most important in science is being able to choose the one correct answer for each question on a multiple-choice test. Assessing science through multiple-choice tests is like assessing Larry Bird's basketball skills by asking him to respond to a set of multiple-choice questions. We might find out something about Bird's knowledge of the facts of basketball, perhaps even something about his conceptual knowledge, but we certainly would not be able to measure the level of his playing skill.

—George E. Hein

For the wise man looks into space and he knows there are no limited dimensions.

—Lao Tzu

There's been an incredible censorship in America and throughout the world, but particularly in America where students aren't even allowed to critically think about evolution, the issue of origins; they are not allowed to hear other points of view; they are taught incorrectly about science and taught that evolution is fact.

—Ken Ham

Creationists have also changed their name ... to intelligent design theorists who study 'irreducible complexity' and the 'abrupt appearance' of life—yet more jargon for 'God did it.' ... Notice that they have no interest in replacing evolution with native American creation myths or including the Code of Hammurabi alongside the posting of the Ten Commandments in public schools.

—Michael Shermer

By no definition of any modern scientist is intelligent design science, and it's a waste of our students' time to subject them to it.

—Lawrence M. Krauss

We should teach the students, as well as executives, how to conduct experiments, how to examine data, and how to use these tools to make better decisions.

—Dan Ariely

Leaders in China and India realize that science and technology lead to success and wealth. But many countries in the West graduate students into the unemployment line by teaching skills that were necessary to live in 1950.

—Michio Kaku

Take a child & teach him physics his first 7 grades of education, I submit he'd excel to a savant-like level. Imagine adult focus for 7 yrs.

—Ace Antonio Hall

There was no room for dust devils in the laws of physics, as least in the rigid form in which they were usually taught. There is a kind of unspoken collusion going on in mainstream science education: you get your competent but bored, insecure and hence stodgy teacher talking to an audience divided between engineering students, who are going to be responsible for making bridges that won't fall down or airplanes that won't suddenly plunge vertically into the ground at six hundred miles an hour, and who by definition get sweaty palms and vindictive attitudes when their teacher suddenly veers off track and begins raving about wild and completely nonintuitive phenomena; and physics students, who derive much of their self-esteem from knowing that they are smarter and morally purer than the engineering students, and who by definition don't want to hear about anything that makes no fucking sense. This collusion results in the professor saying: (something along the lines of) dust is heavier than air, therefore it falls until it hits the ground. That's all there is to know about dust. The engineers love it because they like their issues dead and crucified like butterflies under glass. The physicists love it because they want to think they understand everything. No one asks difficult questions. And outside the windows, the dust devils continue to gambol across the campus.

—Neal Stephenson

Astronomy leads us to a unique event, a universe which was created out of nothing, one with the very delicate balance needed to provide exactly the conditions required to permit life, and one which has an underlying (one might say 'supernatural') plan.

—Arno Penzias

While many Christians might be skeptical of certain scientific theories (e.g., evolution vs. creation), portraying a Christian as one who 'does not believe in science' amounts to an egregious caricature. The scientific community is replete with Christians who believe that much of science can coexist with Biblical teachings.

—Jerry Jenkins, Tyler  
Moss and Brenda  
Janowitz

Science is for those who learn; poetry for those who know.

--Joseph Roux

If we have succeeded in adding to the basic understanding of our universe and ourselves, we will have made a contribution to the totality of human culture.

—Haldan Keffer Hartline

Books are the carriers of civilization. Without books, history is silent, literature dumb, science crippled, thought and speculation at a standstill. Without books, the development of civilization would have been impossible. They are engines of change (as the poet said), windows on the world and lighthouses erected in the sea of time. They are companions, teachers, magicians, bankers of the treasures of the mind. Books are humanity in print.

—Barbara W. Tuchman

Exploration really is the essence of the human spirit, and to pause, to falter, to turn our back on the quest for knowledge, is to perish.

—Frank Borman

The aim of science is to discover and illuminate truth. And that, I take it, is the aim of literature, whether biography or history... It seems to me, then, that there can be no separate literature of science.

—Rachel Carson

Sciences are the how, and the humanities are the why.

--George Lucas

I have no doubt that there is a common quality in science and in poetry—the quality of imagination. But I have no doubt either that...the imagination reaches us, reaches into us, in different ways in science and in poetry. In science it organizes our experience into laws on which we can base our actions in the future. But poetry is another mode of knowledge, in which we become one with the poet and enter directly into his and into all human experience.

--J. Bronowski

Poetry is a way of life. It is as much a way of knowing as is science, and the kind of knowledge it vitalizes, stores, and makes available is forever beyond the range of science. It is rather for poetry to instruct science if humanity is to be rescued from its own pushbuttons.

--John Ciardi

Religious concerns about the meaning and purpose of human life are accommodated to science in different ways. Catholics and liberal Protestants accept the general picture of human evolution, with God having some role in the process. At the other extreme, fundamentalists vie to substitute their interpretation, called 'creation science.'

Scientists, having wrested their discipline from ecclesiastical control, resist mixing religious ideas into science classroom content. Most consider 'creation science' in-

herently religious. Yet many believers, fundamentalist or not, see in any science that leaves God out a science that opposes religious belief.

Educators cannot look to the courts for permanent resolution of these impasses. As Edward Larson explained in *Trial and Error* (Oxford 1985), ‘A lasting legal victory on the issue of evolutionary teaching await[s] a verdict of popular opinion on evolution—while that verdict [is] itself at least partially dependent on the content of public instruction.’ Because of the influence teaching has in swaying public opinion and law, any legal victory is likely to be temporary and subject to challenge.

Since, even-without consensus, education must proceed, the American Scientific Affiliation produced *Teaching Science in a Climate of Controversy*. This...booklet helps teachers distinguish religious questions from scientific ones, treat students’ religious convictions with respect, and still teach science with integrity and openness. Presented that way, evolutionary science is no threat to believers in divine creation.

—Walter Hearn

To the scientist there is the joy in pursuing truth which nearly counteracts the depressing revelations of truth.

—H. P. Lovecraft

The engineer is concerned to travel from the abstract to the concrete. He begins with an idea and ends with an object. He journeys from theory to practice. The scientist’s job is the precise opposite. He explores nature with his telescopes or microscopes, or much more sophisticated techniques, and feeds into a computer what he finds or sees in an attempt to define mathematically its significance and relationships. He travels from the real to the symbolic, from the concrete to the abstract. The scientist and the engineer are the mirror image of each other.

—Gordon Lindsay Glegg

We humans are prisoners of our limbs and minds. We see galaxies but cannot reach them. We can conceive of nuclear fusion, yet we have trouble doing sums in our heads. The computer is the tool that can set us free.

--Jean-Louis Gasse

The humanities are the flower that blossoms on top of the ‘stem.’ (Science, Technology, Engineering, Math.)

--John Lithgow

Mathematics is the queen of the sciences, and number theory the queen of mathematics.

--Carl Friedrich Gauss

There exists a passion for comprehension, just as there exists a passion for music. That passion is rather common in children, but gets lost in most people later on. Without this passion there would be neither mathematics nor natural science.

--Albert Einstein

There cannot be a language more universal and more simple, more free from errors and obscurities...more worthy to express the invariable relations of natural things (than mathematics). It interprets (all phenomena) by the same language, as if to attest the unity and simplicity of the plan of the universe, and to make still more evident that unchangeable order which presides over all natural causes.

--Joseph Fourier

As are the crests on the heads of peacocks, as are the gems on the hoods of cobras, so is mathematics at the top of all sciences.

--*The Yajurveda*  
(c. 600 B.C.)

It may well be doubted whether, in all the range of science, there is any field so fascinating to the explorer – so rich in hidden treasures – so fruitful in delightful surprises – as Pure Mathematics.

--Lewis Carroll

In mathematics we find the primitive source of rationality; and to mathematics must the biologists resort for means to carry out their researches.

--Auguste Comte

Every new body of discovery is mathematical in form, because there is no other guidance we can have.

--Charles Darwin

What science can there be more noble, more excellent, more useful for men, more admirably high and demonstrative than mathematics.

--Benjamin Franklin

The infinite! No other question has ever moved so profoundly the spirit of man.

--David Hilbert

Mathematics is the cheapest science. Unlike physics or chemistry, it does not require any expensive equipment. All one needs for mathematics is a pencil and paper.

--George Polya

Considering also that of all those who have hitherto sought for the truth in the sciences, it is been the mathematicians alone who have been able to succeed in... producing reasons which are evident and certain.

—René Descartes

If in other sciences we should arrive at certainty without doubt and truth without error, it behooves us to place the foundations of knowledge in mathematics.

--Roger Bacon

Mathematics is an essential component of the scientific method (data collection and observation and hypotheses are sustained by relevant mathematical models) and mathematics is the language in which the Natural Physical World is written (as Galileo once said). Can anyone imagine physics without numbers, or without derivatives, integrals, equations, tensors, geometrical figures, etc.? Physics would be a barren field of study based on verbal statements with no precision. All the exact sciences are important, but they all need and use mathematics.

—Emad Noujeim

The merit of painting lies in the exactness of reproduction. Painting is a science and all sciences are based on mathematics. No human inquiry can be a science unless it pursues its path through mathematical exposition and demonstration.

--Leonardo da Vinci

The most beautiful thing we can experience is the mysterious. It is the source of all true art and science.

--Albert Einstein

Art is I, science is we.

--Claude Bernard

The function of Art is to disturb. Science reassures.

--George Braque

Art is more godlike than science. Science discovers; art creates.

—John Opie

It's not a ladder we're climbing, it's literature we're producing.... We cannot possibly leave it to history as a discipline nor to sociology nor science nor economics to tell the story of our people.

--Nikki Giovanni

I am sorry to say that there is too much point to the wisecrack that life is extinct on other planets because their scientists were more advanced than ours.

--John F. Kennedy

Reason, observation, and experience—the Holy Trinity of Science.

--Robert G. Ingersoll

Science is built of facts the way a house is built of bricks; but an accumulation of facts is no more science than a pile of bricks is a house.

--Henri Poincaré

Scientific discovery consists in the interpretation for our own convenience of a system of existence which has been made with no eye to our convenience at all.

--Norbert Wiener

Science cannot stop while ethics catches up—and nobody should expect scientists to do all the thinking for the country.

--Elvin Stackman

Science is the attempt to make the chaotic diversity of our sense-experience correspond to a logically uniform system of thought.

--Albert Einstein

As both the Mercury and Apollo programs have shown, our science and technology are so powerful that, if an intense effort is made, we can do almost anything we want in say, ten years—provided we are not in conflict with the laws of nature.

--Hannes Alfvén

Life exists in the universe only because the carbon atom possesses certain exceptional properties.

--James Jeans

Is dishwater dull? Naturalists with microscopes have told me that it teems with quiet fun.

--G. K. Chesterton

Science is the ascertainment of facts and the refusal to regard facts as permanent.

--Unknown

Yesterday's dreams are today's science.

--Unknown

Today, our enormous investment in science and research is our evidence of our faith that science can not only make man richer—but science can make man better.

--Lyndon B. Johnson

Let both sides seek to invoke the wonders of science instead of its terrors. Together let us explore the stars, conquer the deserts, eradicate disease, tap the ocean depths.

--John F. Kennedy

Does science leave no mystery? On the contrary it proclaims mystery where others profess knowledge. There is mystery enough in the universe of sensation and in its capacity for containing those little corners of consciousness which project their own products, of order and law and reason, into an unknown and unknowable world. There is mystery enough here, only let us clearly distinguish it from ignorance within the field of possible knowledge. The one is impenetrable, the other we are daily subduing.

--Karl Pearson

What the world needs is a fusion of the sciences and the humanities. The humanities express the symbolic, poetic, and prophetic qualities of the human spirit. Without them we would not be conscious of our history; we would lose our aspirations and the graces of expression that move men's hearts. The sciences express the creative urge in man to construct a universe which is comprehensible in terms of the human intellect. Without them, mankind would find itself bewildered in a world of natural forces beyond comprehension, victims of ignorance, superstition and fear.

--Isador I. Rabi

Science has not yet mastered prophecy. We predict too much for the next year and yet far too little for the next ten.

--Neil A. Armstrong

Science has promised us truth—an understanding of such relationships as our minds can grasp; it has never promised us either peace or happiness.

--Gustav LeBon

True science teaches, above all, to doubt and be ignorant.

--Miguel de Unamuno y  
Jugo

Biological sciences will in the end take the lead, for without life, there is no science.

--Jacques Cousteau

The banker asks, 'how much?' The scientist asks, 'how come?'

--Unknown

Science is always wrong. It never solves a problem without creating ten more.

--George Bernard Shaw

There is beauty in space, and it is orderly. There is no weather, and there is regularity. It is predictable ... Everything in space obeys the laws of physics. If you know these laws and obey them, space will treat you kindly. And don't tell me man doesn't belong out there. Man belongs wherever he wants to go.

--Wernher Von Braun

Science is nothing but perception.

--Plato

The science of today is the technology of tomorrow.

--Edward Teller

It stands to the everlasting credit of science that by acting on the human mind it has overcome man's insecurity before himself and before nature.

--Albert Einstein

All the arts and sciences have their roots in the struggle against death.

--Saint Gregory of Nyssa

Every scientific fulfillment raises new questions; it asks to be surpassed and outdated.

--Max Weber

I have seen the science I worshipped, and the aircraft I loved, destroying the civilization I expected them to serve.

--Charles A. Lindbergh

It was through the Second World War that most of us suddenly appreciated for the first time the power of man's concentrated efforts to understand and control the forces of nature. We were appalled by what we saw.

--Vannevar Bush

We must embark on a bold new program for making the benefit of our scientific and industrial progress available for the improvement and growth of underdeveloped areas.

--Harry S. Truman

Science frees us in many ways...from the bodily terror which the savage feels. But she replaces that, in the minds of many, by a moral terror which is far more overwhelming.

--Charles Kingsley

Now my suspicion is that the universe is not only queerer than we suppose, but queerer than we can suppose....I suspect that there are more things in heaven and earth than are dreamed of in any philosophy.

--J. B. S. Haldane

Man is one of the toughest of animated creatures. Only the anthrax bacillus can stand so unfavourable an environment for so long a time.

--H. L. Mencken

There is something fascinating about science. One gets such wholesome returns of conjecture out of such a trifling investment of fact.

--Mark Twain

Science becomes dangerous only when it imagines that it has reached its goal.

--George Bernard Shaw

I have no more faith in men of science being infallible than I have in men of God being infallible, principally on account of them being men.

--Noël Coward

It has become appallingly obvious that our technology has exceeded our humanity.

--Albert Einstein

New discoveries in science...will continue to create a thousand new frontiers for those who would still adventure.

--Herbert Hoover

Any astronomer can predict an eclipse of the sun years in advance, but cannot forecast the weather over the weekend.

--Unknown

Aristotle discovered all the half-truths which were necessary to the creation of science.

--A. N. Whitehead

In science, probably ninety-nine percent of the knowable has to be discovered. We know only a few streaks about astronomy. We are only beginning to imagine the force and composition of the atom. Physics has not yet found any indivisible matter, or psychology a sensible soul.

--Lincoln Steffens

What is a scientist?...We give the name scientist to the type of man who has felt experiment to be a means guiding him to search out the deep truth of life, to lift a veil from its fascinating secrets, and who, in this pursuit, has felt arising within him a love for the mysteries of nature, so passionate as to annihilate the thought of himself.

--Maria Montessori

Space is there, and we're going to climb it, and the moon and the planets are there, and new hopes for knowledge and peace are there.

--John F. Kennedy

Modern man...strides about the globe in scientific splendor, matter in one hand, energy in the other, proclaiming his conquest of the elements. But once back from the campaign, he hasn't the faintest idea of what to do with all this technological plunder.

--Van Cleve Morris

The natural history of science is the study of the unknown. If you fear it, then you're not going to study it, and you're not going to make any progress.

--Dr. Michael E. DeBakey

A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.

--Max Planck

There is a tendency in the 20th century to forget that there will be a 21st century science, and indeed a 30th century science, from which vantage points our knowledge of the universe will appear quite different. We suffer, perhaps from temporal provincialism, a form of arrogance that has always irritated posterity.

--J. Allen Hynek

A declaration that 'science has discovered' has been for Americans a final judgment to which there is no court of appeal.

--David F. Musto

One of the most pernicious falsehoods ever to be almost universally accepted is that the scientific method is the only reliable way to truth.

--Richard H. Bube

The same system that produced a bewildering succession of new-model, style-obsolete autos and refrigerators can also produce an endless outpouring of new-model, style-obsolete science.

--Harvey Wheeler

We are in danger of killing ourselves with our scientific knowledge at a time when we are stripped of the comfort of our religious beliefs. That's quite a situation.

--Will Durant

The stone age may return on the gleaming wings of science.

--Winston Churchill

Scientists have reduced the number of calamities we can blame on God.

--John Leonard

Scientists: Peeping Toms at the keyhole of eternity.

--Arthur Koestler

Most scientists play to a very narrow constituency of their own peers. It assures the quality of their work, but it does tend to keep them less sensitive to the needs of society as a whole.

--Bruce Murray

Sometimes it is suggested that since scientists and engineers have made the bombs, insecticides, and autos, they ought to be responsible for deciding how to deal with the resultant hazards....This approach would...force us to rely on the moral and political wisdom of scientists and engineers, and there is no evidence that I know of that suggests they are better endowed in this respect than other people.

--Barry Commoner

We especially need imagination in science. It is not all mathematics, not all logic, but it is somewhat beauty and poetry.

--Maria Mitchell

Science is joy. It is not just something for an isolated, remote elite. It is our birthright.

--Carl Sagan

If you go into science, you must realize you are doing it for your own interest, not glory or fame....you must think science is most important.

--Samuel C. C. Ting

Scientists must go beyond what is taught in the textbook, and they must think independently. Also, they cannot hesitate to ask questions, even when their view may be unpopular.

--Samuel C. C. Ting

The time will come when diligent research over long periods will bring to light things which now lie hidden. A single lifetime, even though entirely devoted to the sky, would not be enough for the investigation of so vast a subject....And so this knowledge will be unfolded only through long successive ages. There will come a time when our descendants will be amazed that we did not know things that are so plain to them...Many discoveries are reserved for ages still to come, when memory of us will have been effaced. Our universe is a sorry little affair unless it has in it something for every age to investigate...Nature does not reveal her mysteries once and for all.

--Seneca, 1st Century

It is not from space that I must seek my dignity, but from the government of my thought. I shall have no more if I possess worlds. By space the universe encompasses and swallows me up like an atom; by thought I comprehend the world.

--Blaise Pascal

The known is finite, the unknown infinite; intellectually we stand on an islet in the midst of an illimitable ocean of inexplicability. Our business in every generation is to reclaim a little more land.

--T. H. Huxley

Probably all the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was first breathed....There is grandeur in this view of life...that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.

--Charles Darwin

We do not ask for what useful purpose the birds do sing, for song is their pleasure since they were created for singing. Similarly, we ought not to ask why the human mind troubles to fathom the secrets of the heavens....The diversity of the phenomena of Nature is so great, and the treasures hidden in the heavens so rich, precisely in order that the human mind shall never be lacking in fresh nourishment.

--Johannes Kepler

Do there exist many worlds, or is there but a single world? This is one of the most noble and exalted questions in the study of Nature?

--Albertus Magnus

I would rather understand one cause than be king of Persia.

--Democritus of Abdera

Curiosity is an intellectual virtue -bestowed upon those who are very observant. Any science and most other disciplines are driven by questions, and creative thinkers are not afraid of inappropriate questions. Good researchers in every field are inspired by a spirit of inquiry. An earmark of intelligence is curiosity framed with a question.

—Michael Wynne Sellars

Stars scribble in our eyes the frosty sagas,  
The gleaming cantos of unvanquished space.

--Hart Crane

To what purpose should I trouble myself in searching out the secrets of the stars,  
having death or slavery continually before my eyes?

--Anaximenes, 600 B. C.

Man is a complex being: he makes deserts bloom—and lakes die.

--Gil Stern

Science is organized curiosity.

—Julian Huxley

Science is a little like the air you breathe—it is everywhere.

--Dwight D. Eisenhower

Scientists...use knowledge primarily to generate more knowledge.

—Walter Vincenti

[An engineer's] invention causes things to come into existence from ideas, makes world conform to thought; whereas science, by deriving ideas from observation, makes thought conform to existence.

—Carl Mitcham

In science it often happens that scientists say, 'You know that's a really good argument; my position is mistaken,' and then they would actually change their minds and you never hear that old view from them again. They really do it. It doesn't happen as often as it should, because scientists are human and change is sometimes painful. But it happens every day. I cannot recall the last time something like that happened in politics or religion.

—Carl Sagan

I believe very strongly, and have fought since many years ago—at least over 30 years ago— to get architecture not just within schools, but architecture talked about under history, geography, science, technology, art.

—Richard Rogers

We need to stop looking to politicians to make our world better. Politicians don't make the world a better place. Everything that's ever made the world a better place has come from inventors, engineers, scientists, teachers, artists, builders, philosophers, healers, and people that choose love over hate.

—Don Freeman

We haven't found many very old rocks on Earth because our planet's surface is constantly renewed by plate tectonics, coupled with erosion.

—Robert Duncan

In science, if you know what you are doing you should not be doing it.

—Richard Hamming

At the fourth grade level, girls at the same percentages of boys say they're interested in careers in engineering or math or astrophysics, but by eighth grade that has dropped precipitously.

—Chelsea Clinton

We are more dependent on science and engineering than at any other time in history. However, there is plenty of evidence that far too many people are scientifically illiterate, often having been put off science at school.

—Robert Winston

Reporters are not scientific. They do not follow scientific methods. They write to sell, not to educate. The scientist is not concerned with what sells. He is concerned with the truth. He undertakes years of painstaking study to arrive at an understanding of intricate natural processes that most people could never presume to comprehend . You would do well to listen to science and ignore the nonsense that is printed in the newspapers.

—D. W. Gregory

If evolution really works, how come mothers only have two hands?

--Milton Berle

As an experiment for his high-school science fair in 1964, a 17-year-old San Diego boy named Randy Gardner stayed awake for 264 hours. That is 11 days. Since 1964, the standards for science-fair safety have changed.

—James Hamblin

If God had wanted us to be concerned for the plight of the toads, he would have made them cute and furry.

—Dave Barry

Furthermore, the sphericity of the Earth is proved by the evidence of our senses, for otherwise lunar eclipses would not take such forms; for whereas in the monthly phases of the moon the segments are of all sorts—straight, gibbous, and crescent—in eclipses, the dividing line is always rounded. Consequently, if the eclipse is due to the interposition of the Earth, the rounded line results from its spherical shape.

--Aristotle

If we begin to diligently care for the environment, it will greatly improve human health.

—Lailah Gifty Akita

Nutrition matters for everybody, but you can't major in it at Harvard. Most top scientists go into other fields. Most of the big studies were done 30 or 40 years ago, and most are seriously flawed. The food pyramid that told us to eat low fat and enormous amounts of grains was probably more a product of lobbying by Big Food than real science; its chief impact has been to aggravate our obesity epidemic. There's plenty more to learn: we know more about the physics of faraway stars than we know about human nutrition. It won't be easy, but it's not obviously impossible: exactly the kind of field that could yield secrets.

—Peter Thiel

If you start any large theory, such as quantum mechanics, plate tectonics, evolution, it takes about 40 years for mainstream science to come around. Gaia has been going for only 30 years or so.

—James Lovelock

As the journalist Nina Teicholz has demonstrated, lots of food companies have paid for research that supported their parochial concerns. (Vegetable-oil producers, for example, helped to prosecute the case against saturated fat through groups like the Wesson Fund for Medical Research.) ‘There has been a lot of bad science in the field of nutrition and many ‘big Tobaccos,’ Teicholz wrote.

—Daniel Engber

Scientific literacy is a rather noble ideal. Achieving it, however, is problematic thanks to our tribal brains. If science is equated with knowledge, then communicating facts, figures, and theories should be a way to increase the public’s level of engagement with it. However, this boils down to the authority distributing the information. Who do you listen to when there are conflicting sources? Our brain’s desire for certainty and its tendency to evaluate new information based on social clues means anybody painted as an expert, who sounds confident, shares our values and flatters our expectations, is more likely to win over our opinion...regardless of the scientific merits of their argument.

—Mike McRae

Tact and diplomacy are fine in international relations, in politics, perhaps even in business; in science only one thing matters, and that is the facts.

—Hans Eysenck

Electricity is actually made up of extremely tiny particles called electrons, that you cannot see with the naked eye unless you have been drinking.

—Dave Barry

In 2012, only 14% of women entering university for the first time elected to pursue a science-related field of study, contrasted with 39% of men entering university in the same year.

—Ximena Rojo

Less than 5% of girls, on average, contemplate pursuing a STEM career.... And in their professional lives, women often face obstacles such as harassment.

—Ximena Rojo

According to the concept of transformational evolution, first clearly articulated by Lamarck, evolution consists of the gradual transformation of organisms from one condition of existence to another.

—Ernst Mayr

Inventions reached their limit long ago, and I see no hope for further development.

—Julius Frontinus  
(1st century A.D.)

Enzymes are things invented by biologists that explain things which otherwise require harder thinking.

—Jerome Lettvin

One common argument for species discovery is that a newly identified plant or animal may one day prove invaluable to humans. For instance, the antiretroviral AZT, which turned AIDS from a deadly global pandemic into a manageable disease, was derived from an obscure Caribbean coral reef sponge discovered in 1949. This utilitarian argument is not, however, what motivates the expedition scientists. They do not expect their new species to provide the cure for cancer or the next biofuel. ‘Probably 99 percent of species on earth have no direct impact on our affairs,’ says [Piotr] Naskrecki. But naturalists are driven to discover them anyway for the same reason space scientists work to discover new planets: ‘We want to know what’s out there.’

—Richard Conniff

A branch of science called cognitive ethology has been making efforts to understand the inner worlds of animals—their emotional, moral and intellectual lives.

—Alex Shoumatoff

I hire only people with high-reactive temperaments as research assistants. They’re compulsive; they don’t make errors.

--Jerome Kagan

Creationists make it sound as though a ‘theory’ is something you dreamt up after being drunk all night.

—Isaac Asimov

There is no greater impediment to progress in the sciences than the desire to see it take place too quickly.

—Georg C. Lichtenberg

We won't have a society if we destroy the environment.

--Margaret Mead

Psychologists often assume that there is a special cognitive ability—a psychological secret sauce—that makes humans different from other animals. The list of candidates is long: tool use, cultural transmission, the ability to imagine the future or to understand other minds, and so on. But every one of these abilities shows up in at least some other species in at least some form. [Frans] De Waal points out various examples, and there are many more. New Caledonian crows make elaborate tools, shaping branches into pointed, barbed termite-extraction devices. A few Japanese macaques learned to wash sweet potatoes and even to dip them in the sea to make them more salty, and passed that technique on to subsequent generations. Western scrub jays 'cache'—they hide food for later use—and studies have shown that they anticipate what they will need in the future, rather than acting on what they need now.

—Alison Gopnik

The separation of psychology from the premises of biology is purely artificial, because the human psyche lives in indissoluble union with the body.

—Carl Jung

To the intelligent man with an interest in human nature it must often appear strange that so much of the energy of the scientific world has been spent on the study of the body and so little on the study of the mind.

—Edward Thorndike

Nothing is so dangerous to the progress of the human mind than to assume that our views of science are ultimate, that there are no mysteries in nature, that our triumphs are complete and that there are no new worlds to conquer.

—Humphry Davy

Most of us equate technological development with progress. Archaeologists, however, judge technologies not by their novelty, but by their impact on all aspects of life. By that criteria, recent technological advances may ultimately prove a failure. They not only are devastating our climate and environment, [Bill] Schindler says; they have given us weapons that could destroy the world as we know it. '*Homo erectus* was around for almost 2 million years,' he adds. 'We've been here for 200,000 years. There is no way we are going to be around for 2 million years unless we radically change our behavior.'

—Richard Schiffman

People today have thoroughly domesticated themselves. Early humans, by contrast, had to be much more inventive, adept at problem-solving, and subtly attuned to changes in the natural environment. Their need to cooperate made them socially connected, as people nowadays are desperate to be [think Facebook]. Early humans may even have been smarter than us: Cro-Magnons had larger brains than we do today. (Some scientists believe our ancestors needed extra brain power to negotiate tough environmental challenges. Others connect the decline to an overall decrease in body mass since the end of the last ice age.)

—Richard Schiffman

A 2015 study published in *Science* confirmed that computer science and certain other fields, including physics, math, and philosophy, fetishize ‘brilliance,’ cultivating the idea that potential is inborn. The report concluded that these fields tend to be problematic for women, owing to a stubborn assumption that genius is a male trait.

—Liza Munday

[Shelley] Correll says, ‘I worked with one company that insisted that the best way for good ideas to emerge was to have people on teams screaming their ideas at each other. When you watch these teams work, they literally scream at each other and call each other names. They believe this dynamic is essential to scientific discovery—absolutely essential. I said, ‘Could you at least say you disagree with someone without saying you think they are an idiot?’”

There’s a term for the screaming-and-name-calling approach to scientific discovery. It’s called ‘constructive confrontation,’ and it was pioneered by the company that helped give silicon Valley its name. That would be Intel, maker of the silicon chip.

—Liza Munday

That the way to achieve higher standards of living for all is through science and technology, taking advantage of better tools, methods and organization.

—Charles E. Wilson

In early adolescence girls’ IQ scores drop and their math and science scores plummet....girls lose their resiliency and optimism, become less curious, and are less inclined to take risks in early adolescence. They become more differential, self-critical, and depressed....the great unhappiness many girls feel about their bodies, noting that women have been increasingly sexualized and objectified, their bodies ‘marketed to sell tractors and toothpaste.’...the pressures girls have always faced are intensified....There is more divorce, chemical addiction, casual sex, and violence against women....girls can be themselves and grow into healthy adults....Girls can be saved by a good school, a good teacher, or a meaningful activity.

—Mary Pipher

In the past, when people killed too many animals or over-harvested plants, they saw the impact on the world. But today, living apart from nature, we do not see the results of our food and energy choices.

—Richard Schiffman

A universe that came from nothing in the big bang will disappear into nothing at the big crunch. Its glorious few zillion years of existence not even a memory.

—Paul Davies

I have steadily endeavored to keep my mind free so as to give up any hypothesis, however much beloved (and I cannot resist forming one on every subject), as soon as the facts are shown to be opposed to it.

--Charles Darwin

No scientist can be continuously aware of...remote possible consequences of his labors; in fact the long goal is so remote that if he kept his eye on it he would become hopelessly discouraged over the half inch of progress his own life's work will represent. But it was the vision of this which first made him choose his curious career, and it is an emotional sense of the great structure of scientific knowledge to which his little grain will be added which drives him along.

--Oliver La Farge

In man's technological progress, therefore, it required tens of centuries to arrive at the idea of scientific planning and checking. Man made his latest great step forward when he said, 'Just what is it I want to do?' and then tested his results to see if he had attained his object. In this way he discovered that planning could unlock the previously unknown.

--Ruth Benedict

Name the greatest of all the inventors. Accident.

--Mark Twain

I have heard a student censured for working out his own idea before learning all that others had done on the subject. But he was right; one may know too much, especially at first. The time for exhaustive reading is when you have worked out your own ideas with some fullness and in a spirit of discovery.

--Charles Horton  
Cooleyre

It is often wonderful how putting down on paper a clear statement of a case helps one to see, not perhaps the way out, but the way in.

--A. C. Benson

Accustom yourself to the roughest and simplest scientific tools. Perfect as the wing of a bird may be, it will never enable the bird to fly if unsupported by the air. Facts are the air of science. Without them a man of science can never rise. Without them your theories are vain surmises. But while you are studying, observing, experimenting, do not remain content with the surface of things. Do not become a mere recorder of facts, but try to penetrate the mystery of their origin. Seek obstinately for the laws that govern them.

--Ivan Pavlov

Remember that science claims a man's whole life. Had he two lives they would not suffice. Science demands an undivided allegiance from its followers. In your work and in your research there must always be passion.

--Ivan Pavlov

Scholars do not always read the scientific literature carefully. Science is not a perfectly objective process. Dogma and prejudice, when suitably garbled, creep into science just as easily as into any other human enterprise, and maybe more easily since their entry is unexpected.

--William Broad and  
Nicholas Wade

It is the lone worker who makes the first advance in a subject: the details may be worked out by a team, but the prime idea is due to the enterprise, thought and perception of an individual.

--Sir Alexander Fleming

There is only one proved method of assisting the advancement of pure science—that of picking men of genius, backing them heavily, and leaving them to direct themselves.

--James Bryant Conant

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

The real scientist...is ready to bear privation and, if need be, starvation rather than let anyone dictate to him which direction his work must take.

--Albert Szent-Gyorgyi

The shrewd guess, the fertile hypothesis, the courageous leap to a tentative conclusion—these are the most valuable coin of the thinker at work.

--Jerome Seymour  
Bruner

The scientist values research by the size of its contribution to that huge, logically articulated structure of ideas which is already, though not yet half built, the most glorious accomplishment of mankind.

--Sir Peter Brian  
Medawar

People in general have no notion of the sort and amount of evidence often needed to prove the simplest matter of fact.

--Peter Mere Latham

Observation is a passive science, experimentation an active science.

--Claude Bernard

The civilized man has a moral obligation to be skeptical, to demand the credentials of all statements that claim to be facts.

--Bergen Evans

There must be no barriers for freedom in inquiry. There is no place for dogma in science. The scientist is free, and must be free to ask any question, to doubt any assertion, to seek for any evidence, to correct any errors.

--J. Robert Oppenheimer

Nothing has such power to broaden the mind as the ability to investigate systematically and truly all that comes under thy observation in life.

--Marcus Aurelius

In science we are really good at disproving things and are very poor at proving things. Theories like the Theory of Relativity go on and on because no one can think of anything better.

--Richard Zayre

Nobel Prize-winning physicist Richard Feynman chided graduate students who would begin work on a problem in a normal way by checking what had already been done. That way, he told them, they would give up the chance of finding something original.

--James Gleick

The great scientists, as all great men, have not been concerned with fame. The joy of achievement that comes from finding something new in the universe is by far their greatest joy. A great research scientist is constantly discovering new things in his field. This is his reward. He knows how to spend long years in preparation and long hours in investigation, with no thought of public honor or reward.

--William P. King

My mother made me a scientist without ever intending to. Every other Jewish mother in Brooklyn would ask her child after school: So? Did you learn anything today? But not my mother. 'Izzy,' she would say, 'did you ask a good question today?' That difference—asking good questions—made me become a scientist.

--Isidor Isaac Rabi

The man of science does not discover in order to know; he wants to know in order to discover.

—Alfred North  
Whitehead

The individual source of the statistics may easily be the weakest link. Harold Cox tells a story of his life as a young man in India. He quoted some statistics to a Judge, an Englishman, and a very good fellow. His friend said, 'Cox, when you are a bit older, you will not quote Indian statistics with that assurance. The Government are very keen on amassing statistics—they collect them, add them, raise them to the nth power, take the cube root and prepare wonderful diagrams. But what you must never forget is that every one of those figures comes in the first instance from the *chowty dar* [chowkidar] (village watchman), who just puts down what he damn pleases.'

--Josiah Stamp

There are sadistic scientists who hasten to hunt down error instead of establishing the truth.

--Marie Curie

The feeling of 'aha, that's it,' which accompanies the clothing of a situation with meaning, is emotionally very satisfying, and is the major charm of scientific research, of artistic creation, and of the solution of crossword puzzles. It is why the intellectual life is fun.

--Hudson Hoagland

Since one must publish to get grants, and promotion in many institutions hinges on the size of the grants, publication and grants rather than discovery become the goals in the laboratory.

--Ernest Borek

If I have seen further than others, it is by standing on the shoulders of giants.

--Isaac Newton

In questions of science the authority of a thousand is not worth the humble reasoning of an individual.

--Galileo Galilei

I have seen many phases of life; I have moved in imperial circles, I have been a Minister of State; but if I had to live my life again, I would always remain in my laboratory, for the greatest joy of my life has been to accomplish original scientific work, and, next to that, to lecture to a set of intelligent students.

—Jean-Baptiste Dumas

A report released by the *Partnership for a New American Economy* and the *Partnership for New York City* predicts that by 2018, there will be 800,000 science, technology, engineering, and mathematics (STEM) jobs in the United States that require a master's degree or higher—and only around 550,000 American-graduates with this training.

—Marvin Ammori

We know that to compete for the jobs of the 21st century and thrive in a global economy, we need a growing, skilled and educated workforce, particularly in the areas of science, technology, engineering and math. Americans with bachelor's degrees have half the unemployment rate of those with a high school degree.

—Mark Pocan

We pray that every field of science may contribute in bringing happiness—not disaster—to human beings.

—Kenichi Fukui

The creek that was once a fishery for Atlantic salmon, a swimming hole for kids, and a focal point of community life now runs as brown as chocolate milk. Allied Chemical and its successors deny any role in the formation of the mudboils. They claim it was an act of God. What kind of God would that be?

—Robin Wall Kimmerer

By 2018 there will be more than two million open jobs in STEM (science, technology, engineering, math) professions, but only 19 percent of current college degrees are in STEM fields. Even worse, 75 percent of students that do well in science and math decide to not pursue STEM in college. If we want to remain a global leader, we have to develop more interest in these topics. One way to do that is to show students that coding ties into nearly everything we do. And to do that, we need to incorporate programming into the curriculum.

—Ellen Ullman

Those who would legislate against the teaching of evolution should also legislate against gravity, electricity and the unreasonable velocity of light, and also should introduce a clause to prevent the use of the telescope, the microscope and the spectroscope or any other instrument of precision which may in the future be invented, constructed or used for the discovery of truth.

—Luther Burbank

Today, nothing is unusual about a scientific discovery's being followed soon after by a technical application: The discovery of electrons led to electronics; fission led to nuclear energy. But before the 1880's, science played almost no role in the advances of technology. For example, James Watt developed the first efficient steam engine long before science established the equivalence between mechanical heat and energy.

—Edward Teller

Discoveries big and small might have been made a lot sooner if someone had just said 'You can' instead of 'You can't'

—Unknown

Science is the one human activity that is truly progressive. The body of positive knowledge is transmitted from generation to generation.

—Edwin Powell Hubble

Modern technology  
Owes ecology  
An apology.

—Alan M. Eddison

I have a chemistry degree. Of course I have problems.

—Unknown

You know more about how the universe works than Aristotle, Galileo, and Isaac Newton combined.

—Unknown

The most important of my discoveries have been suggested to me by my failures.

--Sir Humphrey Davy

It often happens that an unsuccessful experiment may produce an excellent observation. There are, therefore, no unsuccessful experiments.

--Claude Bernard

If I find 10,000 ways something won't work, I haven't failed.

--Thomas Edison

An inventor fails 999 times, and if he succeeds once, he's in. He treats his failures simply as practice shots.

—Charles Kettering

War is the science of destruction.

--John S. C. Abbott

Emotion, however righteous, can be the enemy of analysis.

—Robert D. Kaplan

Dalton's records, carefully preserved for a century, were destroyed during the World War II bombing of Manchester. It is not only the living who are killed in war.

—Isaac Asimov

Hydrogen is the most common element in the universe, and has the potential to become an inexpensive source of energy for neighborhoods, light and heavy duty vehicles, and industry.

—Charlie Dent

Wonder if there is life on another planet? Let's suppose there is. Suppose further, that only one star in a trillion has a planet that could support life. If that were the case, then there would be at least 100 million planets that harbored life.

—Ben Sweetland

To see the world for a moment as something rich and strange is the private reward of many a discovery.

—Edward M. Purcell

Any living cell carries with it the experience of a billion years of experimentation by its ancestors.

—Max Delbruck

An archaeologist is the best husband any woman can have: the older she gets the more interested he is in her.

--Agatha Christie

Great scientific discoveries have been made by men seeking to verify quite erroneous theories about the nature of things.

—Aldous Huxley

The greatest discoveries of science have always been those that forced us to rethink our beliefs about the universe and our place in it.

—Robert L. Park

Today the theory of evolution is about as much open to doubt as the theory that the earth goes round the sun.

—Richard Dawkins

The human face is powered, depending on how you count them, by between 23 and 43 muscles, many of which attach to the skin, serving no obvious function for survival. An alien examining a human specimen in isolation wouldn't know what to make of them. Tugging on the forehead, eyebrows, lips and cheeks, the muscles broadcast a wealth of information about our emotional state, level of interest and alertness. It is a remarkably efficient means of communication—almost instantaneous, usually accurate, transcending most language and cultural barriers.

—Jerry Adler

Hitherto man had to live with the idea of death as an individual; from now onward mankind will have to live with the idea of its death as a species.

--Arthur Koestler

In August 1939, Albert Einstein sent a letter to President Franklin D. Roosevelt suggesting that an atomic bomb was possible and that Germany might be trying to build one. This was the first step in moving nuclear energy from esoteric science to the front of public consciousness.

—Michael Peskin

After all we could get on very happily if aviation, wireless, television and the like advanced no further than at present....The sum of human happiness would not necessarily be reduced if for ten years every physical and chemical laboratory were closed and the patient and resourceful energy displayed in them transferred to the lost art of getting on together and finding the formula for making both ends meet in the scale of human life. Much, of course, we should lose by this universal scientific holiday...but human happiness would not necessarily suffer.

--Edward Arthur  
Burroughs

Skepticism is what science is all about.

—Chris Allen

There is a fourth fundamental state of matter that appears naturally: plasma. Though the other three forms are more common on earth, plasma is the most common state of matter in the universe—it's what stars are made of. Like gases, plasmas have no fixed shape or volume; but unlike gases, which are electrically neutral, plasmas are positively charged. That charge allows plasmas to behave in ways guesses can't. The glow of a neon sign? That's plasma at work, as is the image on your plasma TV screen.

—Katya Vines

Today there breathes no man who can master more than a little portion of the plant world....Sir Joseph Dalton Hooker, in his prime, could recognize on sight ten thousand species, because he had collected and identified everywhere....A fair-to-middling student is glad to recognize on sight two thousand kinds of plants, and he easily goes rusty without constant practice.

--McDonald Culross  
Peattie

Man masters nature not by force but by understanding.

--Jacob Bronowski

The whole secret of the study of nature lies in learning how to use one's eyes.

--George Sand

How many times it thundered before Franklin took the hint! How many apples fell on Newton's head before he took the hint! Nature is always hinting at us. It hints over and over again. And suddenly we take the hint.

--Robert Frost

Nothing which we can imagine about Nature is incredible.

--Pliny the Elder

By nature's kindly disposition, most questions which it is beyond man's power to answer do not occur to him at all.

--George Santayana

We ought for our own good to have access to nature and knowledge of it. To my mind, it is monstrous that any child should grow up without some acquaintance with nature, and above all I would say without an opportunity for intimate knowledge of some individual plants and animals.

—J. B. S. Haldane

The scientist does not study nature because it is useful; he studies it because he delights in it, and he delights in it because it is beautiful. If nature were not beautiful, it would not be worth knowing, and if nature were not worth knowing, life would not be worth living.

--Henri Poincaré

We shall never understand the natural environment until we see it as a living organism. Land can be healthy or sick, fertile or barren, rich or poor, lovingly nurtured or bled white. Our present attitudes and laws governing the ownership and use of land represent an abuse of the concept of private property.... Today you can murder land for private profit. You can leave the corpse for all to see and nobody calls the cops.

—Paul Brooks

Nature has...some sort of arithmetical-geometrical coordinate system, because nature has all kinds of models. What we experience of nature is in models, and all of nature's models are so beautiful. It struck me that nature's system must be a real beauty, because in chemistry we find that the associations are always in beautiful whole numbers—there are no fractions.

—Richard Buckminster  
Fuller

We still do not know one thousandth of one percent of what nature has revealed to us.

--Albert Einstein

Education has been thought of as taking place mainly within the confines of the classroom, and school buildings have been regarded as the citadels of knowledge. However, the most extensive facility imaginable for learning is our environment. It is a classroom without walls, an open university for people of all ages offering a boundless curriculum with unlimited expertise. If we can make our environment comprehensible and observable, we will have created classrooms with endless windows on the world.

--R. S. Worman

Conservation means the wise use of the earth and its resources for the lasting good of men.

—Gifford Pinchot

An extraordinary amount of arrogance is present in any claim of having been the first in inventing something.

—Benoit Mandelbrot

The sciences are not sectarian. People do not persecute each other on account of disagreements in mathematics. Families are not divided about botany, and astronomy does not even tend to make a man hate his father and mother. It is what people do not know, that they persecute each other about. Science will bring, not a sword, but peace.

--Robert G. Ingersoll

Improving upon nature is the very essence of plant breeding, and so it goes to the heart of one of the central debates of the human condition: the relationship between humanity and nature and the degree to which the human race has a right (or indeed a responsibility) to change plant life for its own ends.

--Noël Kingsbury

Botany, n. The science of vegetables—those that are not good to eat, as well as those that are. It deals largely with their flowers, which are commonly badly designed, inartistic in color, and ill-smelling.

--Ambrose Bierce

Botany is the art of insulting flowers in Greek and Latin.

--Alphonse Karr

There's nothing colder than chemistry.

—Anita Loos

Botany is the science in which plants are known by their aliases.

—Unknown

Botany—the science of the vegetable kingdom, is one of the most attractive, most useful, and most extensive departments of human knowledge. It is, above every other, the science of beauty.

— Sir Joseph Paxton

A root, a stem, a leaf, some means of capturing sunlight and air and making food—in sum, a plant. The green substance of this earth, the chlorophyll, is all summed up in the plants. Without them we perish, all of us who are flesh and blood.

—Hal Borland

If we estimate dignity by immediate usefulness, agriculture is undoubtedly the first and noblest science.

—Samuel Johnson

The science and art of agriculture depend upon chemistry and botany.

--Edward Thorndike

Because nitrous oxide [released by nitrate-fertilised soil] is 296 times stronger than CO<sub>2</sub> at global warming and methane [cow farts] is about 26 times as potent as CO<sub>2</sub>, the combined greenhouse effect of our livestock worldwide is greater than the sum total of all the cars, trains, busses, trucks, ships, airplanes and jets.

--Thom Hartmann

Meat production is one of the leading causes of climate change because of the destruction of the rainforest for grazing lands, the massive amounts of methane produced by farm animals and the huge amounts of water, grain and other resources required to feed animals.

—Jane Velez-Mitchell

Botany I rank with the most valuable sciences, whether we consider it's subjects as furnishing the principal subsistence of life to man & beast, delicious varieties for our tables, refreshments from our orchards, the adornments of our flower-borders, shade and perfume of our groves, materials for our buildings, or medicaments for our bodies.

--Thomas Jefferson

Students have to learn content, including geography, dates, and political contexts. But books can put a human face on historical events. That [ability] is the greatest power of integrating literature with social studies, science, math, and history.

—Joan Ruddiman

We know more about the movement of celestial bodies than about the soil underfoot.

—Leonardo da Vinci

Charles Robert Darwin, the great English scientist, after years of patient study, published a book of 236 pages dealing exclusively with earthworms. In this volume, *The Formation of Vegetable Mould through the Action of Worms*, he makes it clear that Nature apparently created the earthworm to be an improver of the soil and to aid the growth of plants. Indeed, he goes so far as to make this statement: ‘Without the work of this humble creature, who knows nothing of the benefits he confers upon mankind, agriculture, as we know it, would be very difficult, if not wholly impossible.’

—John Edwin Hogg

Think of the fierce energy concentrated in an acorn! You bury it in the ground, and it explodes into a giant oak! Bury a sheep, and nothing happens but decay!

--George Bernard Shaw

Breakthrough technology results from two distinct activities that generally require different environments—invention and innovation. Invention is typically the work of scientists and researchers in laboratories, like the transistor, developed at Bell Laboratories in the 1940s. Innovation is an invention put to commercial use, like the transistor radio, sold by Texas Instruments in the 1950s. Seldom do the two activities occur successfully under the same roof. They tend to thrive in opposite conditions; while competition and consumer choice encourage innovation, invention has historically prospered in labs that are insulated from the pressure to generate profit.

—Derek Thompson

School is disappointing. If science is exciting and art is exhilarating, the schools and universities have achieved the not inconsiderable feat of rendering both dull. As every scientist and poet knows, one discovers both vocations in spite of, not because of, school. It takes years to recover from the stupor of being taught Shakespeare in English Lit and Wheatstone’s bridge in Physics.

—Walker Percy

Physics is the universe’s operating system.

—Steven R Garman

Science does not know its debt to imagination.

—Ralph Waldo Emerson

The search for extra terrestrial intelligence (SETI) is often derided as a kind of religious mysticism, even within the scientific community. Nearly a quarter century ago, the United States Congress defunded America's SETI program with a budget amendment proposed by Sen. Richard Bryan of Nevada, who said he hoped it would 'be the end of Martian-hunting season at the taxpayer's expense. That's one reason it is China, and not the United States, that has built the first world-class radio observatory with SETI as a core scientific goal.

SETI does share some traits with religion. It is motivated by deep human desires for connection and transcendence. It concerns itself with questions about human origins, about the raw creative power of nature, and about our future in this universe—and it does all this at a time when traditional religions have become unpersuasive to many. Why these aspects SETI should count against it is unclear. Nor is it clear why Congress should find SETI unworthy of funding

—Ross Andersen

No civilization on Earth has a longer continuous tradition of astronomy than China, whose earliest emperors drew their political legitimacy from the sky, in the form of a 'mandate of heaven.' More than 3,500 years ago, China's court astronomers pressed pictograms of cosmic events into tortoiseshells and ox bones. One of these 'oracle bones' bears the earliest known record of a solar eclipse. It was likely interpreted as an omen of catastrophe, perhaps an ensuing invasion.

—Ross Andersen

The quality of its research varies a great deal. According to one study, even at China's most prestigious academic institutions, a third of scientific papers are faked or plagiarized. Knowing how poorly the country's journals are regarded, Chinese universities are reportedly offering bonuses of up to six figures to researchers who publish in Western journals.

—Ross Andersen

Dartmouth College employs computer learning techniques in a very broad array of courses. For example, a student can gain a deep insight into the statistics of Mendelian genetics in an hour with the computer rather than spend a year crossing fruit flies in the laboratory.

--Carl Sagan

The thing about science is that it's an accurate picture of the world.

—Jonathan Miller

Teacher: Donald, what is the chemical formula for water?

Donald: H I J K L M N O.

Teacher: What are you talking about?

Donald: Yesterday you said it's H to O.

—Internet Meme

Technology is not to be confused with science. Science is what the universe, macrocosm, and microcosm, consists of—stars, planets, galaxies, cells, atoms, particles. Technology is tools, machines, power, instrumentation, processes, techniques. Science is knowledge discovered, and being discovered, by man. Technology is knowledge created, and being created by man.

—J. C. Gies

Though science and technology act as an integrated system, they are not synonymous in meaning. Science is a way of knowing; it is a breeder of new knowledge. Scientists who pursue knowledge for its own sake are motivated by their curiosity to learn how and why nature behaves as it does. Their satisfaction arises from discovering new facts, formulating new theories, and developing predictive laws that their peers consider significant in advancing a science discipline. The results of scientific research are judged on the basis of their integrity, not their usefulness in practical ways...

Technology, on the other hand, is a process that seeks new uses of knowledge. Technologists work with a definite purpose in mind, such as designing a more fuel-efficient airplane, an intelligent robot, improved cancer therapy, safer roads for travel, synthetic insulin, and communication satellites in outer space. The work of the technologist responds to industrial and social needs and whatever product or process people might find useful.

—Paul D. Hurd

Specialized meaninglessness has come to be regarded, in certain circles, as a kind of hallmark of true science.

—Aldous Huxley

As an orangutan cannot embrace higher mathematics or comprehend the architecture and operation of a computer, we humans—so good at loudly proclaiming our intelligence and applauding our own doltish displays of cerebral gymnastics—cannot begin to understand the true structure and functioning of the Universe.

--John Rachel

Either we are alone in the Universe or we are not. Both are equally terrifying.

--Arthur C. Clarke

Science and technology are the engines of prosperity. Of course, one is free to ignore science and technology, but only at your peril. The world does not stand still because you are reading a religious text. If you do not master the latest in science and technology, then your competitors will.

--Michio Kaku

As 1968 began, Paul Ehrlich was an entomologist at Stanford University, known to his peers for his groundbreaking studies of the co-evolution of flowering plants and butterflies but almost unknown to the average person. That was about to change. In May, Ehrlich released a quickly written, cheaply bound paperback, *The Population Bomb*. Initially it was ignored. But over time Ehrlich's tract would sell millions of copies and turn its author into a celebrity. It would become one of most influential books of the 20th Century—and one of the most heatedly attacked.

The first sentence set the tone: 'The battle to feed all of humanity is over.' And humanity had lost. In the 1970s, the book promised, 'hundreds of millions of people are going to starve to death.' No matter what people do, 'nothing can prevent a substantial increase in the world death rate.'

—Charles C. Mann

Today, nothing is unusual about a scientific discovery's being followed soon after by a technical application: The discovery of electrons led to electronics; fission led to nuclear energy. But before the 1880's, science played almost no role in the advances of technology. For example, James Watt developed the first efficient steam engine long before science established the equivalence between mechanical heat and energy.

--Edward Teller

Science affects the average man and woman in two ways already. He or she benefits by its application driving a motor-car or omnibus instead of a horse-drawn vehicle, and being treated for disease by a doctor or surgeon rather than a witch.

—J. B. S. Haldane

Children are born true scientists. They spontaneously experiment and experience and re-experience again. They select, combine, and test, seeking to find order in their experiences—'which is the mostest? which is the leastest?' They smell, taste, bite, and touch-test for hardness, softness, springiness, roughness, smoothness, coldness, warmness: they heft, shake, punch, squeeze, push, crush, rub, and try to pull things apart.

—R. Buckminster Fuller

Scientific thought, then, is not momentary; it is not a static instance; it is a process.

—Jean Piaget

Without imagination we can go nowhere. And imagination is not restricted to the arts. Every scientist I have met who has been a success has had to imagine.

—Rita Dove

Science shows us truth and beauty and fills each day with a fresh wonder of the exquisite order which governs our world.

—Polykarp Kusch

Technology means the systematic application of scientific or other organized knowledge to practical tasks.

—John Kenneth  
Galbraith

[William] Vogt, born in 1902, laid out the basic ideas for the modern environmental movement. In particular, he founded what the Hampshire College population researcher Betsy Hartmann has called ‘apocalyptic environmentalism’— the belief that unless humankind drastically reduces consumption and limits population, it will ravage global ecosystems. In best-selling books and powerful speeches, Vogt argued that affluence is not our greatest achievement but our biggest problem. If we continue taking more than the Earth can give, he said, the unavoidable result will be devastation on a global scale. Cut back! Cut back! was his mantra.

[Norman] Borlaug, born 12 years after Vogt, has become the emblem of ‘techno-optimism’—the view that science and technology, properly applied, will let us produce a way out of our predicament. He was the best-known figure in the research that in the 1960s created the Green Revolution, the combination of high-yielding crop varieties and agronomic techniques that increased grain harvests around the world, helping to avert tens of millions of deaths from hunger. To Borlaug, affluence was not the problem but the solution. Only by getting richer and more knowledgeable can humankind create the science that will resolve our environmental dilemmas. Innovate! Innovate! was his cry.

—Charles C. Mann

Computers are getting smarter all the time. Scientists tell us that soon they will be able to talk to us. (And by ‘they’, I mean ‘computers’. I doubt scientists will ever be able to talk to us.)

—Dave Barry

Many people think trees grow so big from soil and water, but this is not true. Trees get their mass from the air. They gobble up airborne carbon dioxide and perform an act of chemical fission by using the energy from sunshine... Essentially, trees are made of air and sunshine.

--Ned Hayes

I'm a scientist at UC Berkeley—a card-carrying true believer in liberal Enlightenment values. Imagine that I meet a bright young woman in a small town in Wisconsin or Alabama, and that I want to persuade her to become a scientist like me. 'Listen, science is really great!' I say. 'We scientists care about truth and reason and human flourishing. We include people from every country and culture. And our values have transformed the world. For thousands of years before the Enlightenment, the speed limit was the pace of a fast horse, and children died all the time. Now ideas move at the speed of light, and a child's death is an unthinkable tragedy. Democracy has eclipsed tyranny, prosperity has outpaced poverty, medicine has routed illness, individual liberation has uprooted social convention. Come join us!' The young woman replies, 'That sounds fantastic! But there's just one thing. I love this town. I have a boyfriend who also wants to be a scientist, and I'd like to get married and have a bunch of kids here soon. My parents are looking forward so much to being grandparents, and my own grandparents need me to look after them. My family and friends are all nearby, and I'd like my kids to live in my community and take part in the same traditions I grew up with. Can I do that and be a scientist too?'

The honest answer? 'If you join us, the chances are very slim that you'll end up living in your hometown. You'll move around from place to place unpredictably, from college to graduate school to postdoc research to professorship, until you're 40 or so. You'll be separated from your partner for long stretches of time. You'll have to wait to have kids, and you may not have them at all. If you do, they almost certainly won't be able to grow up with their grandparents. But there's always Skype.'

—Allison Gopnik

Once it arrives, general AI will begin taking jobs away from people, millions of jobs — as drivers, radiologists, insurance adjusters. In one possible scenario, this will lead governments to pay unemployed citizens a universal basic income, freeing them to pursue their dreams unburdened by the need to earn a living. In another, it will create staggering wealth inequalities, chaos and failed states across the globe. But the revolution will go much further. AI robots will care for the elderly—scientists at Brown university are working with Hasbro to develop a 'robo-cat' that can remind its owners to take their meds and track down their eyeglasses. AI 'scientists' will solve the puzzle of dark matter; AI-enabled spacecraft will reach the asteroid belts, while on Earth the technology will tame climate change, perhaps by sending massive swarms of drones to reflect sunlight away from the oceans. Last year, Microsoft committed \$50 million to its 'AI for Earth' program to fight climate change.

—Stephan Talty

Whether you are an astronomer or a life scientist, geophysicist, or a pilot, you've got to be there because you believe you are good in your field, and you can contribute, not because you are going to get a lot of fame or whatever when you get back.

—Alan Shepard

The fear of the never-ending onslaught of gizmos and gadgets is nothing new. The radio, the telephone, Facebook - each of these inventions changed the world. Each of them scared the heck out of an older generation. And each of them was invented by people who were in their 20s.

--Daniel H. Wilson

One ought to be ashamed to make use of the wonders of science embodied in a radio set, the while appreciating them as little as a cow appreciates the botanic marvels in the plants she munches.

--Albert Einstein

The problem here is that a civilization that is 1000 light years away doesn't know we exist. They don't know that we have radio telescopes here on Earth because they see Earth as it was 1,000 years ago. Nothing can travel faster than light, so however good their instruments they can't see in affect the future. So there is no particular reason they should be sending us messages at this time.

--Paul Davies

The further conquest of space will make it possible, for example, to create systems of satellites making daily revolutions around our planet at an altitude of some 40,000 kilometers, and to assure universal communications and the relaying of radio and television transmissions. Such an arrangement might prove more useful, economically, than the construction of radio relay systems over the whole surface of the earth. The great accuracy of movement of these satellites will provide a reliable basis for solving navigational problems

--Sergei Korolev

You could power the entire United States with about 150 to 200 square kilometers of solar panels, the entire United States. Take a corner of Utah... there's not much going on there, I've been there. There's not even radio stations.

--Elon Musk

No great advance has been made in science, politics, or religion without controversy.

—Lyman Beecher

Science may set limits to knowledge, but should not set limits to imagination.

—Bertrand Russell

Discovery consists of seeing what everybody else has seen and thinking what nobody else has thought.

—Albert-Szent-Gyorgyi

Any impatient student of mathematics or science or engineering who is irked by having algebraic symbolism thrust upon him should try to get along without it for a week.

—Eric Temple Bell

I'd give Charles Darwin videotapes of 'Geraldo,' 'Beavis and Butt-head' and 'The McLaughlin Group.' I would be interested in seeing if he still believes in evolution.

—Dean Koontz

Many people don't realize how much science is involved in the quality control of the food and beverages they consume. Winemaking is essentially guiding the biological process of turning grape juice into wine. During this process, winemakers closely monitor the chemical reactions that take place with analyses involving the acidity level, microbiological activity and flavor/aroma compounds.

—Gloria Barnum

There are 19th-century accounts of North America's only native parrot species from places as far-flung as Nebraska and Lake Erie, though even then the noisy flocks were in decline. 'In some districts, where twenty-five years ago they were plentiful, scarcely any now are to be seen,' John James Audubon warned in 1831. The last Carolina parakeet in captivity, a male named Incas, died at the Cincinnati Zoo in 1918. But the species may squawk again: Today geneticists and conservation biologists often mention the bird as a candidate for 'de-extinction,' the process of recreating a vanished species—or at least an approximation of it—from preserved genetic material. De-extinction projects are already underway for the passenger pigeon and the woolly mammoth. (The latter project of adding mammoth DNA to the Asian elephant genome is further along.)

—Ben Crair

One hundred years ago, 16 percent of the babies born in this country died before age 5. Imagine telling our great-grandmothers, 'Today babies don't die.' They'd think, 'How in the world did that come about?' Well, it came about because of science and behavior change.

—Laura Carstensen

Science literacy is the artery through which the solutions of tomorrow's problems flow.

—Neal deGrasse Tyson

I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the sea-shore, and diverting myself in finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean lay all undiscovered before me.

—Sir Isaac Newton

An understanding of the natural world and what's in it is a source of not only a great curiosity but great fulfillment.

—David Attenborough

A group of prehistoric primates, cleverer than most, noticed that river banks and seashores produced much better food than did arid grasslands, so they descended from their treetops and acquired waterfront property.

Over time, through the exquisite magic of evolution, these apes evolved an upright stance, allowing them to stand in the water and freeing up their hands to crack shellfish. Eventually they also lost their body hair, developing instead a thick layer of subcutaneous fat (to keep warm in the water.) They learned to swim.

And they became—us. Or so the theory goes.

—Dinty W. Moore  
(Humorist)

Trees look like people. They are social creatures, caring for one another, communicating, learning, trading goods and services; despite lacking a brain, trees are 'aware.' After borers attack a sugar maple, it emits insecticides that warn its neighbors, which respond by intensifying their own defenses. When the roots of two Douglas firs meet underground, they fuse, joining vascular systems; if one tree gets ill, the other cares for it. The chopping down of a tree causes those surrounding it to weaken, as if in mourning.

—Patricia Westerford

There are trees that flower and fruit directly from the trunk. Bizarre kapoks forty feet around with the branches that run from spiky to shiny to smooth, all from the same trunk. Myrtles scattered throughout the forest that all flower on a single day. Bertholletia that grow piñata cannonballs filled with nuts. Trees that make rain, tell time, that predict the weather. Seeds in obscene shapes and colors. Pods like daggers and scimitars. Stilt roots and snaking roots and buttresses like sculpture and roots that breathe air. Solutions run amok. The biomass is mad.

—Patricia Westerford

Most achievements in science are to a certain degree group efforts.

—Willard Libby

Most Americans do not understand the perils of climate change—or of deforestation, clear-cutting, habitat loss. But those who perpetuate the disinformation campaigns, including the administrator of the *Environmental Protection Agency*, the House and Senate majority leaders, and the president of the United States, likely do. It is easier, politically, to claim scientific murkiness than to tell the truth: they value their self-interest over the condition of the world their grandchildren will grow up in. Whether this self-interest is venal or foolish is irrelevant. It's human nature. And that raises a more difficult question: not whether we should take action, but how to come to terms with the fact that our species has proved itself incapable of doing so.

— Nathaniel Rich

Science says 'We must live,' and seeks the means of prolonging, increasing, facilitating and amplifying life, of making it tolerable and acceptable.

—Miguel de Unamuno

Unless one is a religious fundamentalist and believes that man was created in the image and likeness of God, it is foolish to believe that human beings are exempt from biological classification and the laws of evolution that apply to all other life forms.

—J. Philippe Rushton

The earliest known fire occurred about 420 million years ago—we know this from charcoal fragments found in Wales—but at that time there wasn't a lot of vegetation, so the fire probably wasn't extensive. Trees appeared 50 million years later, but the atmospheric oxygen levels then were low—fire needs at least 17 percent oxygen in the atmosphere. So it's probably not until 350 million years ago that you got what we now call forest fires.

—Anna Diamond

Facts are not science—as the dictionary is not literature.

—Martin H. Fischer

Anyone who is not shocked by quantum theory has not understood it.

—Niels Henrik David  
Bohr

Science is the greatest creative impulse of our time. It dominates the intellectual scene and forms our lives, not only in the material things which it has given us, but also in that it guides our spirit.

—Polykarp Kusch

I think the prime reason for existence, for living in this world, is discovery.  
—James Dean

It is wrong always, everywhere, and for anyone, to believe anything upon insufficient evidence.

—William Kingdon  
Clifford

Conservation means the wise use of the earth and its resources for the lasting good of men.

—Gifford Pinchot

Evolution is cleverer than you are.

—Old Saying

Imagination is at the heart of everything we do. Scientific discoveries couldn't have happened without imagination. Art, music, and literature couldn't exist without imagination. And so anything that strengthens imagination, and reading certainly does that, can help us for the rest of our lives.

--Lloyd Alexander

In all the sciences except Psychology we deal with objects and their changes, and leave out of account as far as possible the mind which observes them.

—Charles D. Broad

In scientific work, those who refuse to go beyond fact rarely get as far as fact.

—Thomas Huxley

A theory can be proved by experiment; but no path leads from experiment to the birth of a theory.

—Manfred Eigen

I don't like to say bad things about paleontologists, but they're really not very good scientists. They're more like stamp collectors.

—Luis Alvarez

Feverish competition in academia coupled with the need to curry favor with colleagues—in order to get published, get tenure, or get grant money—rewards timid research at the expense of maverick undertakings.

—Adrian Currie

Science is the poetry of reality.

—Richard Dawkins

I've come loaded with statistics, for I've noticed that a man can't prove anything without statistics.

—Mark Twain

People have laughed at all great inventors and discoverers.

—John Sladek

Physics has the cutest words.

—Sherry Stringfield

According to the *Bureau of Labor Statistics*, employment opportunities in food, agriculture, renewable natural resources and environment occupations are expected to grow more than 5 percent between 2015 and 2020. Demand is highest for plant and food scientists, sustainable biomaterials specialists, water resources scientists and engineers, precision agriculture specialists, and farm-animal veterinarians.

—Madhu

Krishnamurthy  
(2018)

To inspire more students of color to pursue STEM, we have to redefine what excellent STEM instruction and curriculum look like. Instead of lectures and labs that are disconnected from everyday reality, students need to 'remix the content they've internalized' to create solutions for real people. This remixing involves developing an understanding of what problems can and cannot be solved with technology, learning how to source the necessary tools and work on a team, and discerning scope and scale. New models of learning need to be co-created by educators with the students and communities they serve. It's nuanced, time-intensive work, and requires that more people engage in better conversations.

—Wisdom Amouzou

Heavier-than-air flying machines are impossible.

—Lord Kelvin (1895)

Hardly anything in science is for keeps. Ideas change as data accumulate. If future evidence causes me to change my mind again, that's okay. That's how the scientific method works, always revising what we thought we knew, eventually casting aside the emotional hoopla, and ultimately granting us not a measure of truth so much as a better approximation of reality.

—Eric J. Chaisson

Migration is an energy-intensive endeavor; when geese fly together, each one cuts air resistance for the ones behind it. Flying point requires more energy—the heart rate of trailing birds is about 15 percent slower—so the birds take turns doing it. By switching frequently between leading and trailing positions, the birds get where there're going more quickly.

—Autumn-Lynn  
Harrison

I grew up in Brooklyn, New York...a city neighborhood that included houses, lamp-posts, walls, and bushes. But with an early bedtime in the winter, I could look out my window and see the stars, and the stars were not like anything else in my neighborhood. [At age 5] I didn't know what they were. [At age 9] my mother ... said to me, 'You have a library card now, and you know how to read. Take the streetcar to the library and get a book on stars.' ... I stepped up to the big librarian and asked for a book on stars. ... I sat down and found out the answer, which was something really stunning. I found out that the stars are glowing balls of gas. I also found out that the Sun is a star but really close and that the stars are all suns except really far away I didn't know any physics or mathematics at that time, but I could imagine how far you'd have to move the Sun away from us till it was only as bright as a star. It was in that library, reading that book, that the scale of the universe opened up to me. There was something beautiful about it. At that young age, I already knew that I'd be very happy if I could devote my life to finding out more about the stars and the planets that go around them. And it's been my great good fortune to do just that.

—Carl Sagan

Jupiter guards secrets about the early solar system. It grabbed most of the leftovers after the Sun formed. When we want to go back and try to understand how the planets were made—where the stuff that made us came from—Jupiter represents that first step.

—Scott Bolton

Researchers have proven, scientifically, that humans are all one people. The color of our ancestors' skin and ultimately my skin and your skin is a consequence of ultra-violet light, of latitude and climate. Despite our recent sad conflicts here in the U.S., there really is no such thing as race. We are one species—each of us much, much more alike than different. We all come from Africa. We all are of the same stardust. We are all going to live and die on the same planet, a Pale Blue Dot in the vastness of space. We have to work together.

—Bill Nye

If anybody says he can think about quantum physics without getting giddy, that only shows he has not understood the first thing about them.

—Niels Bohr

[Presently, science undergraduates] do not learn to write clearly and briefly, marshalling their points in due and aesthetically satisfying order, and eliminating inessentials. They are inept at those turns of phrase or happy analogy which throw a flying bridge across a chasm of misunderstanding and make contact between mind and mind.

—Sir William Bragg

Pluto didn't even orbit ONCE around the sun between the time it was discovered and the time it was declassified as a planet. Pluto was discovered thanks to an observatory in Flagstaff, Arizona, back in 1930. It was heartbreakingly demoted in 2006. Because of its distance from the sun, Pluto takes 248 Earth-years to orbit the sun just once. That means it didn't even get halfway around during the time it was being called a planet.

—Andy Golder

A new body of research has emerged that's transformed our image of Neanderthals. Through advances in archaeology, dating, genetics, biological anthropology and many related disciplines we now know that Neanderthals not only had bigger brains than sapiens, but also walked upright and had a greater lung capacity. These ice age Eurasians were skilled toolmakers and big-game hunters who lived in large social groups, built shelters, traded jewelry, wore clothing, ate plants and cooked them, and made sticky pitch to secure their spear points by heating birch bark. Evidence is mounting that Neanderthals had a complex language and even, given the care with which they buried their dead, some form of spirituality. And as the cave art in Spain demonstrates, these early settlers had the chutzpah to enter an unwelcoming underground environment, using fire to light the way....they were the mental equals of sapiens and sophisticated enough to imagine, innovate, absorb influences, reinvent them and incorporate that knowledge into their own culture. [João Zilhão says] Sure, there were physical differences between Neanderthals and modern humans, but Neanderthals were humans, and in terms of basic things that make us different, there was no difference.

—Franz Lidz

Facts are stubborn. You have to accept them the way they are. Science is not about telling people 'I told you so,' it's about different people coming to the same conclusion. It's a collective endeavor. The mistake you cannot make is to judge the past through the eyes of the present. Judge the past on its own terms.

—João Zilhão

I used to think that top environmental problems were biodiversity loss, ecosystem collapse and climate change. I thought that thirty years of good science could address these problems. I was wrong. The top environmental problems are selfishness, greed and apathy, and to deal with these we need a cultural and spiritual transformation. And we scientists don't know how to do that.

—Gus Speth

The track record of expert forecasters—in science, in economics, in politics—is as dismal as ever.

—David Epstein

The greatest threat to our environment is the belief that someone else will save it.

—Robert Swan

An hour spent in the library is worth a month in the laboratory.

—Unknown

A hump-back whale...which is far from being the largest of its kind, needs a ton of herring in its stomach to feel comfortably full—as many as five thousand individual fish. Each herring, in turn, may well have six or seven thousand small crustaceans in its own stomach, each of which contains as many as one hundred and thirty thousand diatoms. In other words, some four hundred billion yellow-green diatoms sustain a single medium-sized whale for a few hours at the most.

—N. J. Berrill

The seas are mankind's last frontier on this planet. For ages, islanders that we are, we have treated the great waters as little more than hunting grounds for fishermen, highways for ships. Now we are awakening to see that invisible beneath the waves lies a vast, virgin territory every bit as challenging as outer space and infinitely more promising of economic reward. Man at last has the scientific capability and technical mastery to meet the challenge, and his growing need for food, water, minerals, power and weather control gives him solid reasons for doing so.

—Leonard Engel

How is it possible that the most intellectual creature to ever walk the planet Earth is destroying its only home?

—Jane Goodall

Knowledge of the oceans is more than a matter of curiosity. Our very survival may hinge on it.

—John F. Kennedy

Without data, you are just another person with an opinion.

--Andreas Schleicher

Engineers make bridges.  
Artists make paintings.  
Scientists make rockets.  
But teachers make them all.

—Internet Meme

Saturn's rings are one of the most fantastic structures you can see in the solar system. Just as if you find a pyramid, it looks so grand, so spectacular. You want to know who built it and how it was built and why it was built. The same applies to Saturn's rings.

—Hsiang-Wen Hsu

It is important to note early that women's historically subordinate 'place,' in science (and thus their invisibility to even experienced historians of science) was not a coincidence and was not due to any lack of merit on their part. It was due to the camouflage intentionally placed over their presence in science.

—Margaret Rossiter

A 2013 paper, 'The Matilda Effect in Science Communication,' reported that both men and women judged research papers by men to be stronger than those by women, and both men and women showed preference for the male authors as possible future collaborators.

—Susan Dominus

Eli Whitney merely manufactured the cotton gin after being given very specific directions by its actual inventor, Catharine Littlefield Greene....'Every part of the world felt the influence of this woman's ideas,' wrote [Matilda Joslyn] Gage. If Greene did not take out a patent for the invention, Gage said, it was because 'to have done so would have exposed her to the ridicule and contumely of her friends and a loss of position in society, which frowned upon any attempt at outside industry for woman.'

—Susan Dominus

Sophisticated genomic analyses of ancient human remains—which can determine when populations merged, split or were isolated—show that the forebears of Native Americans became isolated from other Asian groups around 23,000 years ago. After that period of genetic separation, the most parsimonious explanation is that the first Americans migrated into Alaska well before 15,000 years ago, and possibly more than 20,000 years ago.

—Eske Willerslev

Early one morning in 1877, in his (Thomas Edison's) newly established lab in Menlo Park, New Jersey, he was playing with a diaphragm—a cup-shaped device with a thin metal bottom, which vibrated as Edison shouted into it. Edison thought if he attached a needle to that metal bottom, he could record his words' vibrations on a soft surface. An assistant built a small cylindrical device to spin a scroll of wax paper beneath the tip of the needle. Edison bellowed 'Mary Had a Little Lamb' into the mouthpiece, and the needle etched his utterances into the wax paper, creating a retraceable record of the poem. 'On pulling the paper through the second time,' his assistant Charles Batchelor wrote, the vibrations passed back through the needle and out through the mouthpiece, and 'we both of us recognized we had recorded the speech.' As far as we know, this was the first time in history that a human being listened to a recorded sound.

—Derek Thompson

When history passes its final verdict on John D. Rockefeller, it may well be that his endowment of research will be recognized as a milestone in the progress of the race....Science today owes as much to the rich men of generosity and discernment as the art of the Renaissance owes to the patronage of Popes and Princes. Of these rich men, John D. Rockefeller is the supreme type.

—Winston Churchill

From time to time, a new picture of outer space changes our understanding of the universe and our place in it. One hundred years ago, astronomers captured the light of stars behind the sun during a total solar eclipse, proving that the sun had bent the starlight and validating Albert Einstein's new theories of gravity. In 1923, Edwin Hubble captured a pulsing star within the Andromeda Galaxy on a glass photographic plate, revealing for the first time that galaxies exist beyond our own Milky Way. By the 1960s, astronomers in New Jersey had detected radiation from the Big Bang, now called the Cosmic Microwave Background, marking the edge of the observable universe—though they didn't know what they were seeing at first.

—Jay Bennett

An axiom in archaeology is that the earliest discovered site is almost certainly not the first place of human habitation, just the oldest one archaeologists have found so far.

—Fen Montaigne

Modern physics has definitely decided in favor of Plato. In fact the smallest units of matter are not physical objects in the ordinary sense; they are forms, ideas which can be expressed unambiguously only in mathematical language.

—Werner Heisenberg

What refutes science:  
—Better science

What doesn't refute science:  
—Your feelings  
—Your religion  
—Your favorite politician  
—Your half-baked opinion after watching two YouTube videos.  
—Internet Meme

I often find ornithologists killing and dissecting birds, botanists uprooting and classifying flowers, and lepidopterists running pins through moths yet struggling. Whenever I come across a scientist plying his trade I am always so happy and content to be merely a nature-lover, satisfied with what I can see, hear, and record with my cameras.

—Gene Stratton-Porter  
(1910)

It was Thoreau who in writing of the destruction of the forests exclaimed, "Thank heaven they cannot cut down the clouds." Aye, but they can!...If men in their greed cut forests that preserve and distill moisture, clear fields, take the shelter of trees from creeks and rivers until they evaporate, and drain the water from swamps so that they can be cleared and cultivated, they prevent vapor from rising. And if it does not rise, it cannot fall. Man can change and is changing the forces of nature. Man can cut down the clouds.

—Gene Stratton-Porter  
(1910)

I never felt the need of scientific knowledge, have never felt it. A young man who wants to succeed in business does not require chemistry or physics. He can always hire scientists.

—John D. Rockefeller

Science and technology multiply around us. To an increasing extent they dictate the languages in which we speak and think. Either we use those languages, or we remain mute.

—J. G. Ballard

There is language going on out there—the language of the wild. Roars, snorts, trumpets, squeals, whoops, and chirps all have meaning derived over eons of expression... We have yet to become fluent in the language—and music—of the wild.

—Boyd Norton

In 1970, levels of common air pollutants were about 73 percent higher than they are today, and the automobile was the main culprit.

—Kate Wheeling

We need invertebrates but they don't need us. If human beings were to disappear tomorrow, the world would go on with little change....But if invertebrates were to disappear, I doubt that the human species could last more than a few months. Most of the fishes, amphibians, birds and mammals would crash to extinction about the same time. Next would go the bulk of the flowering plants and with them the physical structure of the majority of forests and other terrestrial habitats of the world. The earth would rot.

—Edward O. Wilson

It's pretty nice in the tropics—North American songbirds warm up down there, eating fruits, berries and nectar. But they get the urge to migrate back for one reason: insects, which provide essential protein to newly hatched chicks. The densely populated tropics don't have enough insects to feed both the year-round species and the migratory birds. Northbound songbirds time their return to coincide with an explosion of food resources back home....In northern forests, the birds face less competition and use the long summer days to gather food for their chicks.

—Anna Diamond

From Jennifer Ackerman's *The Bird Way: A New Look at How Birds Talk, Work, Play, Parent, and Think*, I learned that birds such as the vinous-throated parrot-bill and the black Jacobin hummingbird make sounds beyond our range of hearing, while the mating displays of male black manakins feature a 'high-speed somersault' so fast that humans can see it only in slowed-down video. Birds see colors that we never will, and distinguish among colors that look the same to us. Writing about how they interpret a wall of foliage as 'a detailed three-dimensional world of highly-contrasting individual leaves,' Ackerman laments that she has tried to see what birds see, but humans just can't differentiate among the greens.

—Jenny Odell

Birds...process images more than twice as fast as humans do....birds have learned to use human civilization for food and shelter (for example, memorizing the schedule of garbage trucks).

—Jenny Odell

Ackerman [Jennifer] writes that veeries, a type of North American thrush, can anticipate hurricanes months in advance, adjusting their nesting and migration schedules accordingly—but the way they do it is a 'deep mystery.'

—Jenny Odell

Scrub jays are nesting five to 12 days earlier than they did 100 years ago, probably to align with plant and insect cycles affected by climate change. Some birds in urban areas have ramped up nighttime singing in response to increased daytime noise, and birds living in loud places have shifted the pitch of their songs higher in order to be heard. Of course, behavioral flexibility can go only so far. In September 2019, Science published findings that North America had lost close to a third of its birds in the past 50 years. One of birds' broadest responses to human behavior, it turns out, has been to vanish.

—Jenny Odell

Almost two-thirds of human diseases originate in animals. Measles, first described in the ninth century, is thought to have come from cattle. HIV most likely leapt into our world via monkeys and apes in the 20th century. The most terrifying epidemics of the past generation—West Nile virus, SARS, MERS, Ebola—began when an animal pathogen found its way into a human.

—Maryn McKenna

We don't value our ignorance enough. Ignorance is really good to have if it's combined with curiosity, and scientists are professional curiosity machines. We should all imitate that as much as possible.

—Alan Alda

One of the most basic things I've tried to do is give people a greater understanding of how science works—the importance of evidence, the importance of many trials, of rigorous studies, and the idea that we learn only a little bit at a time. No single study is the end-all answer for everything. Making people aware of that process helps increase appreciation and respect for science, and that helps us make informed decisions for our families and ourselves.

—Alan Alda

There are pockets of people who still think science is just another opinion. That mindset puts us all in danger, because it can infect people across the country. So, I'm very concerned about the casual attitude many people have toward science.

—Alan Alda

'How long do you think our species will last?' Scientists tell me the average species, when you factor in dinosaurs and fruit flies and everything, lasts about 2 million years. So, my question is: Do you think we'll be lucky enough to be average? If we're not careful, we can kill each other off. And if we're not smart enough to take care of what nature has in store for us, who knows how long we'll last?

—Alan Alda

Why don't carnivorous mammals choke on feathers and fur? Eating small prey means consuming a lot of fur, feathers and difficult-to-digest tissues. These are called 'animal fiber,' explains Mike Maslanka, head of nutrition sciences at the National Zoo, and, in some measure, they're actually good for the digestive tract of the carnivore. As animal fiber makes its way through the digestive tract, microbes partially ferment it. That contributes to the carnivore's dietary energy and possibly helps create a healthier digestive system.

—Anna Diamond

The greatest invention of the nineteenth century was the invention of the method of invention.

—Alfred North  
Whitehead

China has spent all but a few centuries of its 5,000 year history at the vanguard of information technology. Along with Sumer and Mesoamerica, it was one of three places where writing was independently invented, allowing information to be stored outside the human brain. In the second century A.D., the Chinese invented paper. This cheap, bindable information-storage technology allowed data—Silk Road trade records, military communiqués, correspondence among elites—to crisscross the empire on horses bred for speed by steppe nomads beyond the Great Wall. Data began to circulate even faster a few centuries later, when Tang-dynasty artisans perfected woodblock printing, a mass-information technology that helped administer a huge and growing state.

—Ross Andersen

Ever look up at night and feel small? Don't. Instead feel large. Atoms in our bodies trace to the remnants of exploded stars. We are Stardust. We are alive in the universe. And the universe is alive within us.

—Neil deGrasse Tyson

There is no such thing as useless knowledge in...research. Ideas may come to us out of order in point of time. We may discover a detail of the facade before we know too much about the foundation. But in the end all knowledge has its place.

—Simon Flexner

Science today owes as much to the rich men of generosity and discernment as the art of the Renaissance owes to the patronage of Popes and Princes.

—Winston Churchill

A natural silence longer than 15 minutes is rare in the United States and all but gone in Europe. Even remote wilderness areas and national parks are frequently crisscrossed by jets, shrinking the average noise-free interval to less than five minutes during daylight hours.

This noise pollution is harming animals. A study last fall at Queens University Belfast found that human-made sounds threaten the feeding, migration and communication of more than 100 species of mammals, birds, fish, reptiles and amphibians. But noise pollution is also bad for our own health. It can lead to high blood pressure, heart disease, heart attacks, stress and insomnia. In 2011, the World Health Organization concluded that 340 million Western Europeans (roughly equivalent to the U.S. population) lost at least one million years of healthy life each year because of traffic-related noise.

—Pete McBride

While German used to be taken by science-oriented people, the feeling now is, if something worthwhile is not done in English, it will be translated into English.

—Charles W. Stansfield

Beliefs which are inconsistent with established scientific knowledge—such as the idea that the sun actually moves across the sky during the day—have variously been called ‘misconceptions’, ‘alternative conceptions’, ‘pre-conceptions’, ‘alternative frameworks’ and ‘naive beliefs’. To appreciate that the sun’s movement is apparent rather than real, requires an understanding that it is the Earth’s rotation which is responsible for what is seen. Students, therefore, must become less dependent on their own perceptions and make more use of scientific concepts.

—Jane Dove

Seagrasses are the forgotten ecosystem. Swaying gently beneath the surface of the ocean, seagrasses are too often out of sight and out of mind, overshadowed by colorful coral reefs and mighty mangroves. But they are among the most productive natural habitats on land or sea.

—Ronald Jumeau

Multiple studies have shown that providing children with nature-based experiences reduces the frequency of ADHD symptoms in both the immediate and longer terms. Another study found that children who received science instruction outdoors learned more than those who received it only in a classroom. Yet despite what we know about nature’s positive impact on mental health, attention span, academic outcomes, physical fitness, and self-regulation, outdoor time is too often seen as a quirky and marginal add-on, rather than as central to the learning process itself.

—Erika Christakis

Unlike seaweeds (which are algae, not plants) and corals, seagrasses are terrestrial immigrants. When the largest dinosaurs were in their heyday, these grasses drifted from dry land into the sea. They have changed little since then. Like land grasses, they grow leaves, roots, rhizomes, veins and flowers. Their modest adaptations to the marine environment include aquatic pollination, neutrally buoyant seeds that can drift with the current before settling, and leaves that manage saltwater. These adaptations have led seagrasses to cover some 116,000 square miles of the world's ocean floors, along every continent except Antarctica. Typically preferring depths of less than ten feet, most seagrasses are modest in height, but some can reach 35 feet long, such as the showy, ribbonlike *Zostera caulescens*, which grows off the coast of Japan.

—Katherine Harmon  
Courage

The planets all orbit the Sun in the same plane because of the way the Sun formed. About 4.5 billion years ago, a massive cloud of dust started contracting as gravity pulled its parts toward the center. This dust cloud rotated slowly at first but sped up as it contracted, in such the same way that a figure skater spins more quickly when she pulls her arms closer to her body. (This law of physics, which makes things spin faster as they contract, is called angular momentum.) The faster rotation flattened the cloud into a pancake, with the Sun at the center and planets forming within that plane. Planetary systems around other stars tend to form in a similar way.

—David DeVorkin

The Forest Service had once implemented a plan to reduce the population of bark beetles with pesticide—only to find that the pesticide killed off the beetles' predators even more effectively than it killed the beetles. The intervention resulted in more beetles than before.

—Peter Turchin

At its best, science is a self-correcting march toward greater knowledge for the betterment of humanity. At its worst, it is a self-interested pursuit of greater prestige at the cost of truth and rigor.

—Ed Yong

No American is more closely associated with peanuts than George Washington Carver, who developed hundreds of uses for them, from Worcestershire sauce to shaving cream to paper. But our insatiable curiosity for peanuts, scholars say, has obscured Carver's greatest agricultural achievement: helping black farmers prosper, free of the tyranny of cotton.

—Emily Moon

In 1848, the Prussian government sent a young physician named Rudolf Virchow to investigate a typhus epidemic in Upper Silesia. Virchow didn't know what caused the devastating disease, but he realized its spread was possible because of malnutrition, hazardous working conditions, crowded housing, poor sanitation, and the inattention of civil servants and aristocrats—problems that require social and political reforms. 'Medicine is a social science,' Virchow said, 'and politics is nothing but medicine in larger scale.'

—Ed Yong

People cited violation of the First Amendment when a New Jersey schoolteacher asserted that evolution and the Big Bang are not scientific and that Noah's ark carried dinosaurs. This case is not about the need to separate church and state; it's about the need to separate ignorant, scientifically illiterate people from the ranks of teachers.

—Neil deGrasse Tyson

Science is the key to our future, and if you don't believe in science, then you're holding everybody back. And it's fine if you as an adult want to run around pretending or claiming that you don't believe in evolution, but if we educate a generation of people who don't believe in science, that's a recipe for disaster. We talk about the Internet. That comes from science. Weather forecasting. That comes from science. The main idea in all of biology is evolution. To not teach it to our young people is wrong.

—Bill Nye

Science replaces private prejudice with public, verifiable evidence.

—Richard Dawkins

I don't think science is hard to teach because humans aren't ready for it, or because it arose only through a fluke, or because, by and large, we don't have the brainpower to grapple with it. Instead, the enormous zest for science that I see in first-graders and the lesson from the remnant hunter-gatherers both speak eloquently: A proclivity for science is embedded deeply within us, in all times, places, and cultures. It has been the means for our survival. It is our birthright. When, through indifference, inattention, incompetence, or fear of skepticism, we discourage children from science, we are disenfranchising them, taking from them the tools needed to manage their future.

—Carl Sagan

What I love about science is that as you learn, you don't really get answers. You just get better questions.

—John Green

We need acts of restoration, not only for polluted waters and degraded lands, but also for our relationship to the world. We need to restore honor to the way we live, so that when we walk through the world we don't have to avert our eyes with shame, so that we can hold our heads up high and receive the respectful acknowledgment of the rest of the earth's beings.

—Robin Wall Kimmerer

I'm often asked by parents what advice can I give them to help get kids interested in science? And I have only one bit of advice. Get out of their way. Kids are born curious. Period. I don't care about your economic background. I don't care what town you're born in, what city, what country. If you're a child, you are curious about your environment. You're overturning rocks. You're plucking leaves off of trees and petals off of flowers, looking inside, and you're doing things that create disorder in the lives of the adults around you.

And so then so what do adults do? They say, 'Don't pluck the petals off the flowers. I just spent money on that. Don't play with the egg. It might break. Don't....' Everything is a don't. We spend the first year teaching them to walk and talk and the rest of their lives telling them to shut up and sit down.

So you get out of their way. And you know what you do? You put things in their midst that help them explore. Help 'em explore. Why don't you get a pair of binoculars, just leave it there one day? Watch 'em pick it up. And watch 'em look around. They'll do all kinds of things with it.

—Neil deGrasse Tyson

I don't have an issue with what you do in the church, but I'm gonna be up in your face if you're gonna knock on my science classroom and tell me they've got to teach what you're teaching in your Sunday school. Because that's when we're gonna fight!

—Neil deGrasse Tyson

Got a 2.4 GPA my first semester in college. Thought maybe I wasn't cut out for engineering. Today I've landed two spacecraft on Mars, and designing one for the moon. STEM is hard for everyone. Grades ultimately aren't what matters. Curiosity and persistence matter.

—Ben Cichy

I would teach how science works as much as I would teach what science knows. I would assert (given that essentially, everyone will learn to read) that science literacy is the most important kind of literacy they can take into the 21st century. I would undervalue grades based on knowing things and find ways to reward curiosity. In the end, it's the people who are curious who change the world.

—Neil deGrasse Tyson

Reading about scientific principles or having a teacher explain them is frequently not enough. Cause and effect are not always obvious, and it may take an experiment to make that clear. Experiments help children actually see how the natural world works.

Scientific explanations sometimes conflict with the way students may suppose that things happen or work. For example, most students would probably think that a basketball will fall faster than a ping-pong ball because the basketball is larger and heavier. Unless a teacher corrects this intuitive assumption by having the students perform an experiment and see the results, the students will continue to trust their intuition, even though the textbook or the teacher tells them the effect of gravity on both objects is exactly the same and that both will reach the floor at the same instant.

—U.S. Department of  
Education—*What  
Works*

All instruments searching for intelligent life are pointed away from Earth.

—Internet Meme

We do not know space. We do not see it, we do not hear it, we do not feel it. We are standing in the middle of it, we ourselves are part of it, but we know nothing about it.

—M. C. Escher

When I heard the learn'd astronomer;  
When the proofs, the figures, were ranged in columns before me;  
When I was shown the charts and the diagrams, to add, divide, and measure them;  
When I, sitting, heard the astronomer, where he lectured with much applause in the lecture-room,  
How soon, unaccountable, I became tired and sick;  
Till rising and gliding out, I wander'd off by myself,  
In the mystical moist night-air, and from time to time,  
Look'd up in perfect silence at the stars.

—Walt Whitman

Everyone has learning difficulties, because learning to speak French or understanding relativity is difficult.

—Mark Haddon

The human body essentially recreates itself every six months. Nearly every cell of hair and skin and bone dies and another is directed to its former place. You are not who you were last November.

—Donald Miller

The man of science has learned to believe in justification, not by faith, but by verification.

—Thomas Henry Huxley

Astronomy is perhaps the science whose discoveries owe least to chance, in which human understanding appears in its whole magnitude, and through which man can best learn how small he is.

—G. C. (Georg Christoph)  
Lichtenberg

In A.D. 536, known as the worst year to be alive, one of Iceland's volcanoes exploded, and darkness descended over the Northern Hemisphere, bringing summer snow to China and starvation to Ireland.

—Peter Brannen

Even those who do not, or cannot, avail themselves of a scientific education, choose to benefit from the technology that is made possible by the scientific education of others.

—Richard Dawkins

Science is an attempt, largely successful, to understand the world, to get a grip on things, to get hold of ourselves, to steer a safe course. Microbiology and meteorology now explain what only a few centuries ago was considered sufficient cause to burn women to death.

—Carl Sagan

Surveys suggest that some 95 percent of Americans are 'scientifically illiterate.' That's just the same fraction as those African Americans, almost all of them slaves, who were illiterate just before the Civil War—when severe penalties were in force for anyone who taught a slave to read. Of course there's a degree of arbitrariness about any determination of illiteracy, whether it applies to language or to science. But anything like 95 percent illiteracy is extremely serious.

—Carl Sagan

I'd like to widen people's awareness of the tremendous timespan lying ahead—for our planet, and for life itself. Most educated people are aware that we're the outcome of nearly 4bn years of Darwinian selection, but many tend to think that humans are somehow the culmination. Our sun, however, is less than halfway through its lifespan. It will not be humans who watch the sun's demise, 6bn years from now. Any creatures that then exist will be as different from us as we are from bacteria or amoebae.

—Martin Rees

Every scientific discipline—biology, chemistry, physics—heavily uses computational methods and tools. Computer coding is how scientists deal with large and small amounts of data.

—Michael Horn

Traffic is...a significant source of air pollution, which has been shown to increase blood pressure, lower oxygen levels in your blood and provoke inflammation....Studies indicate that even low concentrations of fine particulate matter in the air can increase the risk of cardiac arrest, and long-term exposure can age blood vessels prematurely and lead to a faster calcium buildup in the coronary arteries.

—Nicole Pajer

J. Nathan Matias...argues that algorithms are totally unlike any other product devised by human beings. 'If you buy a car from Pennsylvania and drive it to Connecticut,...you know that it will work the same way in both places. And when someone else takes the driver's seat, the engine is going to do what it always did.' Algorithms, by contrast, change as human behavior changes. They resemble not the cars...but something more like the bacteria in our intestines, living organisms that interact with us.

—Anne Applebaum and  
Peter Pomerantsev

In 1666 we had the great plague. Cambridge University was shut down and a 23-year-old boy was sent home, and he saw an apple fall on his estate. And then he realized that the laws that control an apple are the same laws that control the moon. So the epidemic gave Isaac Newton an opportunity to sit down and follow the mathematics of falling apples and falling moons. But of course there was no mathematics at that time. He couldn't solve the problem so he created his own mathematics.

—Michio Kaku

Soon we'll have the Webb telescope up in orbit and we'll have thousands of planets to look at, and that's why I think the chances are quite high that we may make contact with an alien civilisation. There are some colleagues of mine that believe we should reach out to them. I think that's a terrible idea. We all know what happened to Montezuma when he met Cortés in Mexico so many hundreds of years ago. Now, personally, I think that aliens out there would be friendly but we can't gamble on it. So I think we will make contact but we should do it very carefully.

—Michio Kaku (2021)

Most of the damage we cause to the planet is the result of our own ignorance.

—Yvon Chouinard

Almost out of nothing, out of an era of witchcraft and sorcery, he [Isaac Newton] comes up with the mathematics of the universe, he comes up with a theory of almost everything. That's incredible. Einstein piggybacked on Newton, using the calculus of Newton to work out the dynamics of curved spacetime and general relativity. They are like supernovas, blindingly brilliant and illuminating the entire landscape and changing human destiny. Newton's laws of motion set into motion the foundation for the Industrial Revolution. A person like that comes along once every several centuries.

—Michio Kaku

I feel very strongly indeed that a Cambridge education for our scientists should include some contact with the humanistic side. The gift of expression is important to them as scientists; the best research is wasted when it is extremely difficult to discover what it is all about ... It is even more important when scientists are called upon to play their part in the world of affairs.

—Sir William Bragg

The standard explanation of the madness of crowds is ignorance: a mediocre education system has left the populace scientifically illiterate, at the mercy of their cognitive biases, and thus defenseless against airhead celebrities, cable-news gladiators, and other corruptions from popular culture.

—Steven Pinker

Max Planck was told by a professor not to go into Physics because 'almost everything is already discovered.' But that was okay with Planck, who said he didn't want to discover anything, he just wanted to learn the fundamentals. He then went on to originate quantum theory and win a Nobel Prize.

—Internet Meme

Paul Valéry, the French poet and essayist, claimed, 'It takes two to invent anything.' One person constructs a rough idea and a second refines it, compensates for its inadequacies and inconsistencies.

—Eric Weiner

Around 65–70,000 years ago, a very small number, perhaps a single band, crossed over from Africa into the southern Arabian peninsula. It is amazing that despite all their superficial differences, all non-Africans are descendants of this tiny group of wanderers.

—Sanjeev Sanyal

Muslim scholars excelled at practical learning such as geography, astronomy, and medical practice, as well as mathematics (including inventing algebra). What they did not do, however, was develop science, in the sense of explanations of why the physical world works the way it does. This highlights the second difference between orthodox Muslim thinkers, such as al-Ghazali, and the Condemnations of 1277. Islam teaches that Allah directly controls everything and can do as he pleases with the world. Seeking explanations of physical processes was thus either not possible or inappropriate.

—Glenn S. Sunshine

The discoveries of Copernicus and Galileo in astronomy, of Columbus in geography, of William Gilbert in magnetism, and of Harvey of the circulation of the blood reinforced the significance of science and of nature in contrast with books.

—Harold A. Innis

Ever since liquid water existed on the earth, the boundaries of water and land have eternally changed, and we may assert that the outlines of continents and islands have never remained for an hour, nay, even for a minute, exactly the same. For the waves eternally and perpetually break on the edge of the coast, and whatever the land in these places loses in extent, it gains in other places by the accumulation of mud, which condenses into solid stone and again rises above the level of the sea as new land. Nothing can be more erroneous than the idea of a firm and unchangeable outline of our continents, such as is impressed upon us in early youth by defective lessons on geography, which are devoid of a geological basis.

—William Scott-Elliot

Studies have shown that games outperform textbooks in helping students learn fact-based subjects such as geography, history, physics, and anatomy, while also improving visual coordination, cognitive speed, and manual dexterity.

—Peter H. Diamandis

The study of the ways of animals will help us to delve more deeply into the life sciences, increase our knowledge of the nature of things, and expand our love.

—Élisée Reclus

Earth provides enough to satisfy every man's needs, but not every man's greed.

—Mahatma Gandhi

Since the start of the Paleozoic era, more than 500 million years ago, excess carbon dioxide is thought to have triggered at least four of the Earth's mass extinctions. At humanity's present rate, we could poison the atmosphere in this way as soon as the 22nd century. Then we all would be on the verge of extinction.

—Richard W. Emory Jr.

From pre-K through college, U.S. classrooms and curricula fail to include or celebrate Native people and Native science. As a result, an incredible wealth of knowledge is going untapped. Especially now, as human-caused climate change ravages our planet, the world urgently needs Indigenous scientists who can draw on the sustainability practices and knowledge of their ancestors. The world needs Native science to become the coequal partner of Western methods. Combined with modern instrumentation and data analyses, Native science can help provide a holistic path toward a sustainable planet.

—Josiah Hester

The single biggest thing I learned was from an indigenous elder of Cherokee descent, Stan Rushworth, who reminded me of the difference between a Western settler mindset of ‘I have rights’ and an indigenous mindset of ‘I have obligations.’ Instead of thinking that I am born with rights, I choose to think that I am born with obligations to serve past, present, and future generations, and the planet herself.

—Haleigh Atwood

We’re so self-important. So arrogant. Everybody’s going to save something now. Save the trees, save the bees, save the whales, save the snails. And the supreme arrogance? Save the planet! Are these people kidding? Save the planet? We don’t even know how to take care of ourselves; we haven’t learned how to care for one another. We’re gonna save the fuckin’ planet? . . . And, by the way, there’s nothing wrong with the planet in the first place. The planet is fine. The people are fucked! Compared with the people, the planet is doin’ great. It’s been here over four billion years . . . The planet isn’t goin’ anywhere, folks. We are! We’re goin’ away. Pack your shit, we’re goin’ away. And we won’t leave much of a trace. Thank God for that. Nothing left. Maybe a little Styrofoam. The planet will be here, and we’ll be gone. Another failed mutation; another closed-end biological mistake.

—George Carlin

We have lived our lives by the assumption that what was good for us would be good for the world. We have been wrong. We must change our lives so that it will be possible to live by the contrary assumption, that what is good for the world will be good for us. And that requires that we make the effort to know the world and learn what is good for it.

—Wendell Berry

Belief gets in the way of learning.

—Robert A. Heinlein

For a long time then, I reflected on this confusion in the astronomical traditions concerning the derivation of the motions of the universe's spheres. I began to be annoyed that the movements of the world machine, created for our sake by the best and most systematic Artisan of all, were not understood with greater certainty by the philosophers, who otherwise examined so precisely the most insignificant trifles of this world. For this reason I undertook the task of rereading the works of all the philosophers which I could obtain to learn whether anyone had ever proposed other motions of the universe's spheres than those expounded by the teachers of astronomy in the schools. And in fact I found in Cicero that Hicetas supposed the earth to move. Later I also discovered in Plutarch that certain others were of this opinion. . . . Therefore, having obtained the opportunity from these sources, I too began to consider the mobility of the earth.

—Nicholas Copernicus  
(1473-1543)

In highly specialized technical fields, soft-skills are critical to the career path. A survey the American Enterprise Institute conducted last year found that nearly half of workers in science, technology, engineering and math fields thought that good writing and communication skills were extremely important and around 70% said the same regarding critical thinking skills. At the same time, less than 40% of these workers said that high level math, analytical or computer skills were extremely important.

—Brent Orrell

Classification, broadly defined, is the act of organizing the universe of knowledge into some systematic order. It has been considered the most fundamental activity of the human mind.

—Lois Mai Chan

The archaeologist's three absolutely necessary tools: the spade, the human eye, and imagination—the most important of all and most easily abused. It must be carefully controlled by such facts as are available, while remaining fluid enough to shift and conform as new facts are brought to light. It must be governed by stern logic and good common sense, and...measured out with the care of a chemist who compounds a life-giving drug. Without imagination, the relics that archaeologists dig up are nothing but dry bones and variegated dust. Imagination enables them to rebuild the walls of fallen cities...visualize great trade roads stretching across the world, filled with curious travelers, greedy merchants and soldiers setting forth to great victories or defeats now completely forgotten.

—Ann Axtell Morris

Not only does science begin in wonder, it ends in wonder.

—Abraham Maslow

If you are not a scientist, and you disagree with scientists about science, it's actually not a disagreement. You're just wrong.

—Internet Meme

A natural law regulates the advance of science. Where only observation can be made, the growth of knowledge creeps; where laboratory experiments can be carried on, knowledge leaps forward.

—Michael Faraday

The true men of action in our time, those who transform the world, are not the politicians and statesmen, but the scientists. Unfortunately poetry cannot celebrate them because their deeds are concerned with things, not persons, and are, therefore, speechless....When I find myself in the company of scientists, I feel like a shabby curate who has strayed by mistake into a drawing room full of dukes.

—W. H. Auden

If you cannot, in the long run, tell everyone what you have been doing, your doing has been worthless.

—Erwin Schrodinger

Chemistry creates its subject. This creative ability, similar to that of art, essentially distinguishes Chemistry among the natural sciences.

—Ambre M. Bertholet

If universities and liberal arts colleges would demand as many courses in science as MIT and Caltech require in the humanities, we could lead our students up a gentle slope to a considerable level of learning.

—F. H. Westheimer

Biographical history, as taught in our public schools, is still largely a history of boneheads: ridiculous kings and queens, paranoid political leaders, compulsive voyagers, ignorant generals—the flotsam and jetsam of historical currents. The men who radically altered history, the great scientists and mathematicians, are seldom mentioned, if at all.

—Martin Gardner

One can measure the importance of a scientific work by the number of earlier publications rendered superfluous by it.

—David Hilbert

The real end of science is the honor of the human mind.

—Carl Jacobi

No human investigation can be called real science if it cannot be demonstrated mathematically.

—Leonardo da Vinci

Mathematics is the cheapest science. Unlike physics or chemistry, it does not require any expensive equipment. All one needs for mathematics is a pencil and paper.

—George Polyá

Keywords: #Quotes #Quotations #Education #School #Teacher #Teaching #college #learning #wisdom #research #science #physics #biology #astronomy #inquiry #knowledge #chemistry #botany #ecology #environment