

# On Sciences and Technologies



A doctrine of nature can only contain so much science proper as there is in it of applied mathematics.

—*Immanuel Kant*, 1786

Mathematics is the queen of the sciences.

—*Carl Friedrich Gauss*, 1856

The Great Architect of the Universe now begins to appear as a pure mathematician.

—*James Jeans*, 1930

The miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics is a wonderful gift which we neither understand nor deserve.

—*Eugene Wigner*, 1960

Whether or not you ever again use the math you learned in school, the act of having learned the math established a wiring in your brain that didn't exist before, and it's the wiring in your brain that makes you a problem solver.

—*Neil deGrasse Tyson*, 2011

Poor arithmetic will make the bridge fall down just as surely as poor physics, poor metallurgy, or poor logic will.

—*Thomas T. Woodson*, 1966

Bridges would not be safer if only people who knew the proper definition of a real number were allowed to design them.

—*David Mermin*, 1979

The profound study of nature is the most fertile source of mathematical discoveries.

—*Joseph Fourier*, 1822

It was, no doubt, particularly of [Joseph Fourier's] very disregard for rigor that he was able to take conceptual steps which were inherently impossible to men of more critical genius.

—*Rudolph Ernst Langer*, 1947

Nothing is more repellent to normal human beings than the clinical succession of definitions, axioms, and theorems generated by the labors of pure mathematicians.

—*J. M. Ziman*, 1969

Mathematics may be defined as the subject in which we never know what we are talking about, nor whether what we are saying is true.

—*Bertrand Russell*, 1901

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As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality.

—*Albert Einstein*, 1920

If scientific reasoning were limited to the logical processes of arithmetic, we should not get very far in our understanding of the physical world.

—*Vannevar Bush*, 1945

[In physics,] precise logical thinking, typical for mathematicians, inhibits suggestion of new ideas, because it arrests imagination.

—*Pyotr Kapitsa*, 1973

It is really quite impossible to say anything with absolute precision, unless that thing is so abstracted from the real world as to not represent any real thing.

—*Richard Feynman*, 1965

In physics, your solution should convince a reasonable person. In math, you have to convince a person who's trying to make trouble. Ultimately, in physics, you're hoping to convince Nature. And I've found Nature to be pretty reasonable.

—*Frank Wilczek*, 2009

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Oh, physics! That's too much difficult for physicists.

—*David Hilbert*, 1925

All science is either physics or stamp collecting.

—*Ernest Rutherford*<sup>1</sup>

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<sup>1</sup>As quoted, without a date, by J. B. Birks in 1962.

Nature and Nature's laws lay hid in night:  
God said, *Let Newton be!* and all was light.

—*Alexander Pope*, 1730

It did not last: the Devil howling 'Ho!  
Let Einstein be!' restored the status quo.

—*J. C. Squire*, 1926

Because of the quantum nature of the problem, one cannot say that the present stage of knowledge is exactly equal to zero.

—*Harry J. Lipkin*, 1956<sup>2</sup>

Schrödinger called his cat and said,  
'You can be both alive and dead,  
For a linear combination of states  
Postulates two simultaneous fates'.<sup>3</sup>

—*M. Kocher*, 1978

Today we no longer ask what really goes on in an atom, we ask what is likely to be to be observed – and with what likelihood.

—*Otto Robert Frisch*, 1979

A professor of theoretical physics always has to be told what to look for. He just uses his knowledge to explain the observations of the experimenters.

—*Richard Feynman*, 1988

I am convinced that [God] does not play dice.

—*Albert Einstein*, 1926

Bohr could only counter with 'Nor it is our business to prescribe God how He should run the world'.

—*Werner Heisenberg*, 1969

Bohr was inconsistent, unclear, willfully obscure - and right. Einstein was consistent, clear, down-to-earth - and wrong.

—*John Bell*, 2010<sup>4</sup>

Even if we understand all the laws of physics, then exploring their consequences in the everyday world, where complex structures can exist, is a far more daunting task, and that's an inexhaustible one I'm sure.

—*Martin John Rees*, 1988

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<sup>2</sup>From his article *Theoretical Zipperdynamics*, signed by pen name Harry J. Zipkin, and published in the famous *Journal of Irreproducible Results*. (Lipkin was one of its founders.).

<sup>3</sup>To the so-called *Schrödinger Cat paradox* of quantum mechanics.

<sup>4</sup>J. Bell's opinion about the famous Einstein-Bohr debate (see the previous two quotes) is important, because he is widely credited for the last significant theoretical contribution to this topic (now called the *local reality problem*), made in the 1960s – even if some physicists still deem the problem not fully solved.

A reductionist philosophy, arbitrarily proclaiming that the growth of understanding must go only in one direction, makes no scientific sense.

—*Freeman Dyson*, 1995

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Chemistry stands at the pivot of science. On the one hand it deals with biology and provides explanations for the processes of life. On the other hand it mingles with physics and finds explanations for chemical phenomena in the fundamental processes and particles of the universe. Chemistry links the familiar with the fundamental.

—*Peter Atkins*, 1987

The chemists are a strange class of mortals, impelled by an almost insane impulse to seek their pleasure amid smoke and vapor, soot and flame, poisons and poverty. Yet among all these evils I seem to live so sweetly that I may die if I were to change places with the Persian king.

—*Johann Joachim Becher*, 1667

A tidy laboratory means a lazy chemist.

—*Jöns Jacob Berzelius*, 1812

A chemist who does not know mathematics is seriously handicapped.

—*Irving Langmuir*<sup>5</sup>

A chemist who is not a physicist is nothing at all.

—*Robert Bunsen*<sup>6</sup>

Chemistry is the dirty part of physics.

—*Johann Philipp Reis*<sup>7</sup>

Chemistry has been named by the physicist as the messy part of physics, but that is no reason why physicists should be permitted to make a mess of chemistry when they invade it.

—*Frederick Soddy*, 1946

Physicists use excellent methods to study poor materials, chemists use poor methods to study excellent materials, and physical chemists use poor methods to study poor materials.

—*Hans Heinrich Landolt*<sup>8</sup>

Between physics and chemistry, it is hard to know who should study what molecule.

—*Philip Morrison*, 1995

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<sup>5</sup>As quoted, without a date, by Albert Rosenfeld in 1962.

<sup>6</sup>As quoted, without a date, by J. R. Partington in 1961.

<sup>7</sup>As quoted, without a date, by R. Oesper in 1975.

<sup>8</sup>To estimate this semi-joke, note that the author (of the Landolt-Börnstein database fame) was one of the pioneers of physical chemistry.

Geography is just physics slowed down, with a couple of trees stuck in it.

—*Terry Pratchett*, 2008

As a young man, my fondest dream was to become a geographer. However... I thought deeply about the matter and concluded that it was far too difficult a subject. With some reluctance, I then turned to physics as a substitute.

—*Duane Francis Marble*<sup>9</sup>

Geology is the music of the earth.

—*Hans Cloos*, 1954

We learn geology the morning after the earthquake.

—*Ralph Waldo Emerson*, 1860

A geologist is a fault finder.

—*Bob Phillips*, 2010

Continental drift was guilty until proven innocent.

—*David M. Raup*, 1986

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*Statistics*: The only science that enables different experts using the same figures to draw different conclusions.

—*Evan Esar*, 1943

Politicians use statistics in the same way that a drunk uses lampposts – for support rather than illumination.

—*Andrew Lang*, 1910

Smoking is one of the leading causes of statistics.

—*Fletcher Knebel*, 1965

Average a left-hander with a right-hander, and what do you get?<sup>10</sup>

—*Don Norman*, 1988

91.7% of all statistics is done on spot, including this number.

—*Anonymous*

There are three kind of lies: lies, damned lies, and statistics.

—*Anonymous*<sup>11</sup>

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<sup>9</sup>Posted (in the 1960s) on his office door, signed *Albert Einstein*, as a joke, provoking quite a few misattributions.

<sup>10</sup>Cf. the Ehrenfest theorem in quantum mechanics, infamous for its lack of insight into many key quantum effects including entanglement.

<sup>11</sup>Misattributed to many, including Benjamin Disraeli and Mark Twain.

Fate laughs at probabilities.

—*Edward Bulwer-Lytton*, 1832

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Computer science is not about machines, in the same way that astronomy is not about telescopes.

—*Michael R. Fellows*, 1991<sup>12</sup>

Computer science is neither mathematics nor electrical engineering.

—*Alan Perlis*, 1968

Computer science [...] is not actually a science.

—*Richard Feynman*, 1970

Any discipline with the word 'science' in its name, such as social sciences, creation science, or computer science, is not a science.

—*Anonymous*<sup>13</sup>

Perhaps the central problem we face in all of computer science is how we are to get to the situation where we build on top of the work of others rather than redoing so much of it in a trivially different way.

—*Richard Hamming*, 1968

Software engineering is that part of computer science which is too difficult for computer scientists.

—*Friedrich L. Bauer*, 1971

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The beauty of a living thing is not the atoms that go into it, but the way the atoms are put together.

—*Carl Sagan*, 1990

Biology [...] is the science that stands at the center of all science.

—*George Gaylord Simpson*, 1964

Seen in the light of evolution, biology is, perhaps, intellectually the most satisfying and inspiring science.

—*Theodosius Dobzhansky*, 1972

Evolution advances, not by a priori design, but by the selection of what works best out of whatever choices offer. We are products of editing, rather than of authorship.

—*George Wald*, 1957

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<sup>12</sup>Possibly based on an earlier (circa 1986) but longer line by Hal Abelson. A close paraphrase of this maxim is frequently misattributed to Edsger W. Dijkstra.

<sup>13</sup>This popular remark is attributed to various scientists, most plausibly to Hal Abelson and Frank Harary, but I could not find a reliable confirmation of either authorship.

While Occam's Razor<sup>14</sup> is a useful tool in physical sciences, it can be a very dangerous implement in biology. It is thus very rash to use simplicity and elegance in biological research.

—Francis Crick, 1988

Biology belongs to one of the surprising sciences, where each rule must always be supplemented with several exceptions (except this rule, of course).

—Claus Emmeche, 1994

Physics was the first of the natural sciences to become fully modern and highly mathematical. Chemistry followed in the wake of physics, but biology, the retarded child, lagged far behind.

—Michael Crichton, 1969

Biology has become a mature science as it has become precise and predictable.

—Philip Handler, 1970

What is truly revolutionary about molecular biology in the post-Watson-Crick era is that it became digital.

—Richard Dawkins, 1995

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Aristotle was famous for knowing everything. He taught that the brain exists merely to cool the blood and is not involved in the process of thinking. This is true only of certain persons.

—Will Cuppy, 1950

The brain is the most complex thing we have yet discovered in the universe.

—James Watson, 1992

A typical neuron makes about ten thousand connections to neighboring neurons. Given the billions of neurons, there are as many connections in a single cubic centimeter of brain tissue as there are stars in the Milky Way galaxy.

—David Eagleman, 2011

The stars may be large, but they cannot think or love; and these are qualities which impress me far more than the size does. I take no credit for weighing seventeen stone.

—Frank Ramsey, 1931

The most underdeveloped territory in the world is under our scalps.

—Dorothy M. Carl, 1972<sup>15</sup>

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<sup>14</sup>“Plurality [of reasons] should not be postulated without necessity” (Lat. “*Pluralitas non est ponenda sine necessitate*”) by William of Ockham. This principle is widely misquoted as “Entities should not be multiplied unnecessarily”.

<sup>15</sup>Unfortunately, I could not identify this author.

Brains cause technology, society, art, science, soap operas, sin. A remarkable set of effects for such a small chunk of coagulated atoms.

—*Collin McGinn*, 1999

I bet the human brain is a kludge.

—*Marvin Minsky*<sup>16</sup>

If the human mind was simple enough to understand, we'd be too simple to understand it.

—*Emerson M. Pugh*, ~1938<sup>17</sup>

The human brain is the last, and greatest scientific frontier.<sup>18</sup>

—*Joel L. Davis*, 1997

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[Medicine:] the art of amusing the patient while nature cures the disease.

—*Ben Jonson*<sup>19</sup>

God cures, and the doctor takes the fee.

—*European proverb*

The blunders of physicians are covered by the earth.

—*Spanish proverb*

Medicine is a science of uncertainty and the art of probability.

—*William Osler*, 1950

It is my duty to heal the sick, not to enrich the apothecaries.

—*Paracelsus*<sup>20</sup>

One of the first duties of the physician is to educate the masses not to take medicine.

—*William Osler*, 1961

A drug is a substance which, if injected into a rabbit, produces a [scientific] paper.

—*Otto Loewi*<sup>21</sup>

<sup>16</sup>As quoted, without a date, by David K. Mellinger in 1991.

<sup>17</sup>First quoted by his son, George W. Pugh, in 1977.

<sup>18</sup>Cf. the expression “Space, the final frontier” used in the *Star Trek* movies.

<sup>19</sup>As quoted, without a date, in an editorial of *The Veterinarian* in 1851; frequently misattributed to Voltaire.

<sup>20</sup>As quoted, without a date, by many, possibly starting with Joseph Ennemoser and Mary Botham Howitt in 1854.

<sup>21</sup>As quoted by A. Szent-Gyorgyi in 1976; paraphrased, after O. Loewi’s death in 1961, by others —mostly without a reference.



The best doctors are Dr. Diet, Dr. Quiet, and Dr. Merryman.

—*English proverb*<sup>22</sup>

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A vigorous five-mile walk will do more good for an unhappy but otherwise healthy adult than all the medicine and psychology in the world.

—*Paul Dudley White*<sup>23</sup>

What is true [in psychology] is alas not new, the new is not true.

—*Hermann Ebbinghaus*, 1873

[Modern psychology] appears to be the sickly offspring of average common sense.

—*Ludwig Klages*, 1929

The psychiatrist unfailingly recognizes the madman by his excited behavior on being incarcerated.

—*Karl Kraus*<sup>24</sup>

Anyone who goes to a psychiatrist should have his head examined.

—*Samuel Goldwyn*<sup>25</sup>

Psychoanalysis is a permanent fad.

—*Peter De Vries*, 1973

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[The economist] must be suspicious of any direct light that the past is said to throw on the problems of the present.

—*Alfred Marshall*, 1925

The only function of economic forecasting is to make astrology look respectable.

—*Ezra Solomon*, 1984<sup>26</sup>

An economist is an expert who will know tomorrow why the things he predicted yesterday didn't happen today.

—*Laurence J. Peter*, 1977

If all economists were laid end to end, they would not reach a conclusion.

—*Anonymous*<sup>27</sup>

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<sup>22</sup>Essentially, a succinct version of an earlier (circa 1449) line by John Lydgate.

<sup>23</sup>As quoted, without a date, by William Fitzgibbon in 1972.

<sup>24</sup>As quoted, without a date, by many, starting perhaps with Thomas Szasz in 1976.

<sup>25</sup>As attributed in 1948; it is suspected that Lillian Hellman was the real author.

<sup>26</sup>Frequently misattributed to John Kenneth Galbraith.

<sup>27</sup>Frequently misattributed to George Bernard Shaw.

Economics is based on the assumption that people have reasonably simple objectives and choose the correct means to achieve them. Both assumptions are false – but useful.

—*David Friedman*, 1996

In economics, hope and faith coexist with great scientific pretension.

—*John Kenneth Galbraith*, 1970

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There is nothing so absurd but some philosopher has said it.

—*Cicero*, 44 BC

There are more things in heaven and earth, Horatio,  
Than are dreamt of in your philosophy.

—*William Shakespeare*, 1603

Philosophy is nothing but discretion.

—*John Selden*, 1689

Philosophy [...] consists chiefly in suggesting unintelligible answers to insoluble problems.

—*Henry Adams*, 1907

Philosophy, *n.* A route of many roads leading from nowhere to nothing.

—*Ambrose Bierce*, 1911

A philosopher is a blind man in a dark room looking for a black cat that isn't there.  
A theologian is the man who finds it.

—*Anonymous*<sup>28</sup>

Philosophers no longer write for the intelligent, only for their fellow professionals.

—*Jacques Barzun*, 1989

Philosophy consists very largely of one philosopher arguing that all others are jackasses. He usually proves it, and I should add that he also usually proves that he is one himself.

—*H. L. Mencken*, 1956

Philosophers, incidentally, say a great deal about what is absolutely necessary for science, and it is always, so far as one can see, rather naive, and probably wrong.

—*Richard Feynman*, 1963<sup>29</sup>

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<sup>28</sup>Published as an anonymous joke by H. L. Mencken in 1942. It might be based on a similar statement (about the term “equity”) by Charles Bowen, quoted in 1911 by John Alderson Foote.

<sup>29</sup>I could not find a reliable confirmation of the authorship of another famous aphorism on this subject, sometimes attributed to R. Feynman and sometimes to S. Weinberg: “The philosophy of science is as useful to scientists as ornithology is to birds.” (The same is frequently said about the value of aesthetics for arts).

It is far safer and wiser that the physicist remain on the solid ground of theoretical physics itself and eschew the shifting sands of philosophic extrapolations.

—*Louis de Broglie*, 1962

People complain that our generation has no philosophers. They are wrong. They now sit in another faculty. Their names are Max Planck and Albert Einstein.

—*Adolf Harnack*, 1911

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The most ominous conflict of our time is the difference of opinion, of outlook, between men of letters, historians, philosophers, the so-called humanists, on the one side and scientists on the other. The gap cannot but increase because of the intolerance of both and the fact that science is growing by leaps and bounds.

—*George Sarton*, 1930

The intellectual life of the whole western society is increasingly being split into two polar groups. [...] At one pole we have the literary intellectuals [...], at the other scientists, and as the most representative, the physical scientists. Between the two a gulf of mutual incomprehension.

—*C. P. Snow*, 1959

The backwardness of the economic and social sciences with respect to the sciences of matter is one of the causes of the present human calamities through lack of foresight.

—*Jean Fourastié*, 1949

One of the differences between the natural and the social sciences is that in the natural sciences, each succeeding generation stands on the shoulders of those that have gone before, while in the social sciences, each generation steps in the faces of its predecessors.<sup>30</sup>

—*David Zeaman*, 1959

Science is one of the very few human activities – perhaps the only one – in which the errors are systematically criticized and fairly often, corrected.

—*Karl Popper*, 1963

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. [...] I cannot recall the last time something like that happened in politics or religion.

—*Carl Sagan*, 1987

There is a noticeable general difference between the sciences and mathematics on the one hand, and the humanities and social sciences on the other. [...] You can lie or distort the story of the French Revolution as long as you like, and nothing will happen. Propose a false theory in chemistry, and it'll be refuted tomorrow.

—*Noam Chomsky*, 1992

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<sup>30</sup>As a member of the natural science community, I am grateful for author's high opinion of it, but cannot help noticing that some of its dwarfish members use their elevated positions to relieve themselves on the heads of their predecessors.

The specialized languages of [social sciences] serve virtually no other purpose than to conceal valuation behind an ostensibly scientific and therefore nonvaluational semantic screen.

—Thomas Szasz, 1990

Praise up the humanities, my boy, that'll make them think that you're broad-minded!

—Winston Churchill, 1946<sup>31</sup>

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Computing is not about computers anymore. It is about living.

—Nicolas Negroponte, 2015

[The computer] seems to me to be an Old Testament god with a lot of rules and no mercy.

—Joseph Campbell, 1988

On two occasions I have been asked, by members of Parliament, 'Pray Mr. Babbage, if you put into the machine the wrong figures, will the right answers come out?' [...] I am not able rightly to apprehend the kind of confusion of ideas that could provoke such a question.

—Charles Babbage, 1864<sup>32</sup>

Garbage in, garbage out.

—Anonymous<sup>33</sup>

I spend almost as much time figuring out what's wrong with my computer as I do actually using it.

—Clifford Stoll, 1996

That's the thing about people who think they hate computers... What they really hate are lousy programmers.

—Larry Niven, 1982

Software engineering has accepted as its charter 'How to program if you cannot.'

—Edsger W. Dijkstra, 1988

Most software today is very much like an Egyptian pyramid with millions of bricks piled on top of each other, with no structural integrity, but done just by brute force and thousands of slaves.

—Alan Kay, 2005

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<sup>31</sup>As quoted in 1996 by R. V. Jones, to whom this advice was given.

<sup>32</sup>This was about his *Difference Engine No. 1*—essentially the first computer.

<sup>33</sup>This elegant twist of the term *First-In, First-Out* (FIFO) *register* has turned into a major principle of computer applications. Created in the mid-1950s, it is typically attributed to either Stephen Wilfred ("Wilf") Hey or E. E. Blanche, but I could not reliably confirm these authorships and even identify these persons.

If the automobile had followed the same development cycle as the computer, a Rolls-Royce would today cost \$100, get a million miles per gallon, and explode once a year, killing everyone inside.

—Robert X. Cringely, 1969<sup>34</sup>

If builders built houses the way programmers build programs, the first woodpecker to come along would destroy civilization.

—Gerald Marvin Weinberg<sup>35</sup>

A refund for defective software might be nice, except it would bankrupt the entire software industry in the first year.

—Andrew S. Tannenbaum, 2003

It’s scary to think that the infrastructure of the industrialized world is increasingly based on software like this.<sup>36</sup>

—Anonymous<sup>37</sup>

It’s the basic fact that all programming languages suck.

—Larry Wall, 2006<sup>38</sup>

The purpose of most computer languages is to lengthen your resume by a word and a comma.

—Anonymous<sup>39</sup>

There is more disputing about the shell then the kernel.

—German proverb<sup>40</sup>

The most likely way for the world to be destroyed, most experts agree, is by accident. That’s where we come in; we’re computer professionals. We cause accidents.

—Nathaniel Borenstein, 1991

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<sup>34</sup>With the ongoing development of autonomous (computer-driven) cars, the last goal seems within reach.

<sup>35</sup>As quoted, without a date, by Murali Chemuturi in 2010.

<sup>36</sup>This was apparently written in 1992 about *AutoCAD* rev. 12. In comparison with that program, most software packages I have to use nowadays are hardware-resource-wasting junk.

<sup>37</sup>I have seen this statement attributed to some Stephen Wolfe, but I was unable to confirm this authorship.

<sup>38</sup>Note that L. Wall has himself created one of the languages (*Perl*), and did not exclude it from this rule.

<sup>39</sup>Sometimes also attributed to the same Larry Wall, but I could not find a reliable confirmation of his authorship.

<sup>40</sup>I find it remarkable how well some old wisdoms work in new contexts – in this case, of the computer operation system development.

By this Contrivance, the most ignorant Person at a reasonable Charge, and with a little body Labor, may write Books in Philosophy, Poetry, Politics, Law, Mathematics and Theology, without the least Assistance from Genius or Study.

—Jonathan Swift, 1724<sup>41</sup>

There is no security [...] against the ultimate development of mechanical consciousness.

—Samuel Butler, 1872

I propose to consider the question, ‘Can machines think?’.

—Alan Turing, 1950

The real problem is not whether machines think but whether men do.

—B. F. Skinner, 1969

A computer would deserve to be called intelligent if it could deceive a human into believing that it was human.<sup>42</sup>

—Alan Turing, 1950

Any artificial intelligence smart enough to pass a Turing test is smart enough to know to fail it.

—Ian McDonald, 2006

We’re rapidly creating an extraordinary silicon-based Petri dish for evolution of intelligence. By the year 2025 [...] we’re likely to have computers whose raw processing power exceeds that of the human brain. Also, we’re likely to have more computers than people.

—J. Doyne Farmer, 1995<sup>43</sup>

We cannot prevent the *Singularity*,<sup>44</sup> that is coming as an inevitable consequence of the humans’ natural competitiveness and the possibilities inherent to technology.

—Vernor Vinge, 1993

The development of full artificial intelligence could spell the end of the human race. We cannot quite know what will happen if a machine exceeds our own intelligence, so we can’t know if we’ll be infinitely helped by it, or ignored by it and sidelined, or conceivably destroyed by it.

—Stephen Hawking, 2014

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<sup>41</sup>Ridiculing the artificial intelligence hopes of his time.

<sup>42</sup>The original suggestion of what is now called the *Turing Test*.

<sup>43</sup>Note that both these thresholds were reached at least 5 years before the supposed date.

<sup>44</sup>In his earlier (1987) book, Vinge defined the *Singularity* as the hypothetical point of “creation of intelligences greater than our own”. (Several earlier authors, starting at least from John von Neumann, are credited for similar notions, under different names. The *Singularity* term has received an additional strong promotion from a 2005 book by Ray Kurzweil.)

[The developers of conventional artificial intelligence] have to admit that deep learning is doing amazing things, and they want to use [it] as a kind of low-level servant to provide them with what they need to make their symbolic reasoning work.

—*Geoffrey Hinton, 2018*<sup>45</sup>

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<sup>45</sup>Hinton is one of the pioneers of the current revolution in deep learning (DL)—a machine learning technique frequently oversold as artificial intelligence (AI). Actually, the DL is currently limited to pattern classification, not explicitly addressing general AI tasks—the main goal of the conventional, symbolic approaches to AI, snubbed by Hinton. (To be fair, these approaches, indeed, are not showing a nearly fast progress, while their proponents, in turn, frequently snub neural-network techniques such as DL as primitive *connectionist models*.) More generally, I am sorry for finding too few suitable quotes on these topics, which I believe are of paramount importance for our civilization.