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| Introduction |

The intellectual roots of AI, and the concept of intelligent machines, may be found in Greek mythology. Intelligent artifacts appear in literature since then, with real (and fraudulent) mechanical devices actually demonstrated to behave with some degree of intelligence. Some of these conceptual achievements are listed below under "Ancient History."

After modern computers became available, following World War II, it has become possible to create programs that perform difficult intellectual tasks. From these programs, general tools are constructed which have applications in a wide variety of everday problems. Some of these computational milestones are listed below under "Modern History"

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| ****Ancient History**** |

Greek myths of Hephaestus, the blacksmith who manufactured mechanical servants, and the bronze man Talos incorporate the idea of intelligent robots. Many other myths in antiquity involve human-like artifacts. Many mechanical toys and models were actually constructed, e.g., by Archytas of Tarentum,Hero, Daedalus and other real persons.

## ****5th century B.C.****

Aristotle invented syllogistic logic, the first formal deductive reasoning system.

## ****13th century****

Talking heads were said to have been created, Roger Bacon and Albert the Great reputedly among the owners.

Ramon Lull, Spanish theologian, invented machines for discovering nonmathematical truths through combinatorics.

## ****15th century****

Invention of printing using moveable type. Gutenberg Bible printed (1456).

## ****15th-16th century****

Clocks, the first modern measuring machines, were first produced using lathes.

## ****16th century****

Clockmakers extended their craft to creating mechanical animals and other novelties. For example, see DaVinci's walking lion (1515).

Rabbi Loew of Prague is said to have invented the Golem, a clay man brought to life (1580).

## ****17th century****

Early in the century, Descartes proposed that bodies of animals are nothing more than complex machines. Many other 17th century thinkers offered variations and elaborations of Cartesian mechanism.

Pascal created the first mechanical digital calculating machine (1642).

Thomas Hobbes published The Leviathan (1651), containing a mechanistic and combinatorial theory of thinking.

Leibniz improved Pascal's machine to do multiplication & division with a machine called the Step Reckoner (1673) and envisioned a universal calculus of reasoning by which arguments could be decided mechanically.

## ****18th century****

The 18th century saw a profusion of mechanical toys, including the celebrated mechanical duck of Vaucanson and von Kempelen's phony mechanical chess player, The Turk (1769). For Edgar Allen Poe's description of the Turk, see Poe Writes about Maelzel's Chess Player April 1836.

## ****19th century****

Luddites (led by Ned Ludd) destroyed machinery in England (1811-1816).

Mary Shelley published the story of Frankenstein's monster (1818).

George Boole developed a binary algebra representing (some) "laws of thought," published in The Laws of Thought.

Charles Babbage & Ada Byron (Lady Lovelace) designed a programmable mechanical calculating machines. A working model was built in 2002; a short video shows it working.

Modern propositional logic developed by Gottlob Frege in his 1879 work Begriffsschrift and later clarified and expanded by Russell, Tarski, Godel, Church and others.

## ****20th century - First Half****

Bertrand Russell and Alfred North Whitehead published Principia Mathematica, which revolutionaized formal logic. Russell, Ludwig Wittgenstein, and Rudolf Carnap lead philosophy into logical analysis of knowledge.

Karel Capek's play "R.U.R." (Rossum's Universal Robots) produced in 1921 (London opening, 1923). - First use of the word 'robot' in English.

Warren McCulloch & Walter Pitts publish "A Logical Calculus of the Ideas Immanent in Nervous Activity" (1943), laying foundations for neural networks.

Arturo Rosenblueth, Norbert Wiener & Julian Bigelow coin the term "cybernetics" in a 1943 paper. Wiener's popular book by that name published in 1948.

Emil Post proves that production systems are a general computational mechanism (1943). See Ch.2 of Rule Based Expert Systems for the uses of production systems in AI. Post also did important work on completeness, inconsistency, and proof theory.

George Polya published his best-selling book on thinking heuristically, How to Solve It in 1945. This book introduced the term 'heuristic' into modern thinking and has influenced many AI scientists.

Vannevar Bush published As We May Think (Atlantic Monthly, July 1945) a prescient vision of the future in which computers assist humans in many activities.

Grey Walter experimented with autonomous robots, turtles named Elsie and Elmer, at Bristol (1948-49) based on the premise that a small number of brain cells could give rise to complex behaviors.

A.M. Turing published "Computing Machinery and Intelligence" (1950). - Introduction of Turing Test as a way of operationalizing a test of intelligent behavior. See The Turing Institute for more on Turing.

Claude Shannon published detailed analysis of chess playing as search in "Programming a computer to play chess" (1950).

Isaac Asimov published his three laws of robotics (1950).