

A Very Brief History of Science and the Universe

(YA stands for Years Ago, BCE stands for Before Common Era)

Some dates are only approximate and may be off by up to a billion years or so.

13.7 Billion YA	Big Bang (Beginning of Universe, space, time)
4.55 Billion YA	Protoearth and other planets form; solar system shows regular structure
4.50 Billion YA	Earth is annihilated by impactor to form new Earth and our Moon
3.85 Billion YA	First life on Earth
3.5 Billion YA	First fire supported on Earth's surface
3500 BCE	Numbers first used; wheeled carts and river boats first used
1800 BCE	Fermentation of dough, grain, and fruit juices is discovered
1700 BCE	Egyptians use fractions first
440 BCE	Democritus speculates about fundamental indivisible particles---calls them 'atoms'
400 BCE	Atomic theory developed; Aristotle & develop their work
260 BCE	Archimedes mathematically works out the principle of the lever and discovers the principle of buoyancy
250	Algebra first used
1202	First use of the number zero
1562	Galileo Galilei Born
1581	Galileo Galilei notices the timekeeping property of the pendulum (he was 19).
1589	Galileo Galilei uses balls rolling on inclined planes to show that different weights fall with the same acceleration.
1642	Isaac Newton Born & Galileo dies. (Steven Hawking born exactly 300 years later)
1659-65	Newton invents calculus at the age of 17. (The plague was going on in England and he was bored at home since school was closed for two years..)
1687	Newton publishes <i>sevenit Principia Mathematica</i> , known as The Principia
1704	Newton publishes <i>sevenit Opticks</i>
1752	Benjamin Franklin shows that lightning is electricity (but he didn't fly the kite)
1781	Joseph Priestly creates water by igniting hydrogen and oxygen (also discovers O)
1799	S.I. (metric system) developed in France
1859	Darwin publishes <i>Origin of Species</i>
1895	Wilhelm Roentgen discovers X-rays
1900-1920	Quantum Mechanics developed – Modern physics is born
1905	Einstein explains photoelectric effect – later earns Nobel Prize for accomplishments
1915	Einstein publishes his relativity theories
1942	Enrico Fermi makes the first controlled nuclear chain reaction (U. Chicago)
1947	Richard Feynman presents his propagator approach to quantum electrodynamics
1969	Man first lands on moon; ARPANET (Internet predecessor) developed at DARPA
1971	Stephen Hawking points out that primordial black holes might have been created in the Big Bang
1991	Tim Berners-Lee invents the World Wide Web while working at CERN
2003 and beyond	who knows?

Some major physics research centers:

LANL	Los Alamos National Laboratory – Los Alamos, NM (First atom bombs; DOE)
ORNL	Oak Ridge National Laboratory – Oak Ridge, TN Energy, environmental, basic science, and security research; some classified
LBNL	Lawrence Berkeley National Laboratory – Berkeley, CA nonclassified DOE research operated by University of California
LLNL	Lawrence Livermore N.L. – Livermore, CA – national security; applied research
BNL	Brookhaven National Laboratory – Suffolk Co., NY physics, biomedical
NIST	National Institute of Standards and Technology – Gaithersburg, MD
CERN	European Organization for Nuclear Research – Geneva, Switzerland
Fermilab	Fermi National Accelerator Laboratory – Batavia, IL (45 miles W. of Chicago)
Argonne	Argonne National Laboratory – Argonne, IL – nanoscale, computational science

Cal Tech, MIT, CMU, Cornell, Harvard, Princeton, Stanford, UC Berkeley, PSU, etc.

*Also many remote and space based observatories and experiments

Major physics funding sources

NASA	National Aeronautics and Space Administration (\$15 Billion budget)
NSF	National Science Foundation (\$5.04 Billion budget)
DOE	Department of Energy (\$21.9 Billion budget)
DOD	Department of Defense

Some Branches of Physics

Atomic & Nuclear	Structure and composition of subatomic particles and atoms
Cosmology	Structure and composition of the universe as a whole
Mechanics	Motion of “human scale” objects; machines
Materials	Composition and behavior of materials
Electricity & Magnetism	Motion and behavior of electrons and magnetic fields
Astrophysics	Behavior of celestial bodies
Optics	Behavior of photons and other forms of electromagnetic radiation
Acoustics	Vibratory motion in all phases of matter (more than just sound)
Modern Physics	Quantum mechanics, solid state electronics, nuclear applications
Metrology	Study of measurement and mathematical principles

Types of Physics Researchers

Experimental	Allow nature to teach about physical phenomena; Universe is our laboratory
Theoretical	Develop hypotheses to test; usually use mathematical modeling

Typical salaries

Postdoctoral Researcher	\$31,000 - \$39,000
Ph.D. Physicist (University)	\$42,000
Ph.D. Physicist (National Laboratory)	\$46,000 - \$54,000

What do physicists do?

Industrial Physicists	Work as consultants or employees for corporations
Researchers	Conduct physics research at public/private laboratories or universities.
Instructors	High school or college instruction