Index of Names

Abel, Niels Henrik (1802–1829) One of the great geniuses of 19th century mathematics. He died young of poverty and ill health. Today he is remembered by the prestigious Abel Prize.


Albert, Adrian (1905–1972) An outstanding algebrast of the 20th century. A faculty member at the University of Chicago. Did important cryptographic work for the military during World War II.

Artin, Emil (1898–1962) An outstanding figure in 20th century algebra. A professor at Princeton University. Had many important doctoral students. His son Michael Artin is professor of mathematics at MIT.


Banach, Stefan (1892–1945) One of the pioneers of functional analysis in Poland in the 1920s. A scion of the Scottish Cafe, where many famous Polish mathematicians gathered regularly. Died in a German concentration camp.

de Branges, Louis (1932– ) A noted American mathematician of the 20th century. Famous for having proved the Bieberbach conjecture.

Berry, Clifford (1918–1963) One of the developers of the early ABC computer.

Birkhoff, George D. (1884–1944) One of the first great American mathematicians. Noted for having tackled Poincaré’s last theorem, and also for proving the general ergodic theorem.


Bolyai, János (1802–1860) Mathematician noted for having invented non-Euclidean geometry.

Bose, Amar (1929– ) Professor of Electrical Engineering at MIT. Noted for being the father of Bose Acoustics.

Brahe, Tycho (1546–1601) Teacher of Johannes Kepler and noted astronomer. Gathered the data that led to Kepler’s three laws.

Brouwer, Luitzen E. J. (1881–1966) Noted 20th century topologist. Proved the Brouwer fixed-point theorem, which he later repudiated in favor of intuitionism.

Byron, Augusta (1815–1852) Daughter of Lord Byron the poet. Also a programmer for Charles Babbage’s analytical engine.

Byron, Lord George Gordon (1788–1824) Noted poet.

Cantor, Georg (1845–1918) The father of set theory, and known particularly for the theory of cardinal numbers. Helped us to understand the orders of infinity.


Castelnuovo, Guido (1865–1952) Noted Italian algebraic geometer of the early 20th century. Did important work on the classification of algebraic surfaces.


Chauvenet, William (1820–1870)  Founder of the Naval Academy in Annapolis. Also founder of the Mathematics Department at Washington University in St. Louis. Served as chancellor of Washington University. Did the calculations for the Eads Bridge.


Colmar, Thomas of (1785–1870)  Inventor of the first genuine mechanical calculator.

Connes, Alain (1947–)  Outstanding worker in the field of von Neumann algebras. Winner of the Fields Medal.

Coulomb, Jean (1904–1999)  A member of the founding Bourbaki group in France.


Delsarte, Jean (1903–1968)  One of the founding members of the Bourbaki group in France.


de Possel, René (1905–1974)  One of the founding members of the Bourbaki group in France.


Dubreil, Paul (1904–1994) One of the founding members of the Bourbaki group in France. He later dropped out.

Eckert, J. Presper (1919–1995) One of the inventors of the ENIAC computer at the University of Pennsylvania.

Ehresmann, Charles (1905–1979) One of the founding members of the Bourbaki group in France.

Enriques, Federigo (1871–1946) Noted Italian algebraic geometer of the early 20th century. One of the first to give a classification of algebraic surfaces in birational geometry.


Estermann, Theodor (1902–1991) Did important work on the Goldbach conjecture.

Euler, Leonhard (1707–1783) One of the great mathematicians of all time. His complete works comprise 70 volumes. Worked in all areas of mathematics, as well as physics, mechanics, and engineering.


de Fermat, Pierre (1601–1665) The greatest amateur mathematician of all time. A noted magistrate in Toulouse, France. A celebrated number theorist, and father of Fermat’s last theorem.

Feynman, Richard (1918–1988) Noted American physicist. Winner of the Nobel Prize. Father of the Feynman diagram and many other important ideas in quantum theory.


Frege, Gottlob (1848–1925) Perhaps the greatest logician of the 19th century. Recipient of Bertrand Russell’s famous letter about Russell’s paradox.
Galois, Évariste (1812–1832) Noted French mathematical genius who died very young. Inventor of Galois theory and group theory.

Garfield, James (1831–1881) President of the United States, and also creator of one of the many proofs of the Pythagorean theorem.

Gauss, Carl Friedrich (1777–1855) One of the three greatest mathematicians (along with Newton and Archimedes) who ever lived. Prover of the fundamental theorem of algebra. Creator of many seminal parts of number theory.


Germain, Sophie (1776–1831) One of the greatest woman mathematicians of all time. Namesake of the “Sophie Germain primes.” Proved a notable result about Fermat’s last theorem.

Gilman, Daniel Coit (1831–1908) Founding president of Johns Hopkins University.


Goldbach, Christian (1690–1764) Namesake of the Goldbach conjecture in number theory.


Gorenstein, Daniel (1923–1992) A major figure in the modern theory of finite groups. Organizer of the project to assemble the full classification of the finite simple groups.


Hadamard, Jacques (1865–1963) One of the great mathematical analysts of the past 150 years. Prover of the prime number theorem. Also a great humanitarian.


Heawood, Percy (1861–1955) Famous for finding the error in Kempe’s proof of the four-color theorem and formulating the Heawood conjecture.


Henry, Joseph (1797–1878) One of the founders of Johns Hopkins University.

Hilbert, David (1862–1943) One of the outstanding figures in 20th century mathematics. Is reputed to have been an expert in all parts of mathematics. Made seminal contributions to geometry, logic, algebra, and analysis. Was the leader of the mathematics group in Göttingen.


Jobs, Steve (1955– ) One of the founders of Apple Computer. Creator of the NEXT Computer, the IMac, the IPhone, and many other high-tech innovations.

Jordan, Camille (1838–1922) A great 19th century geometer. Namesake of the Jordan curve theorem. Also one of the provers of the classification theory of compact, two-dimensional surfaces.
Kaplansky, Irving (1917–2006) Noted 20th century algebraist. Made significant contributions to group theory, ring theory, operator algebras, and field theory. Served as chair of the University of Chicago Mathematics Department, and also as director of the Mathematical Sciences Research Institute.

Kelvin, Lord (William Thomson) (1900) A noted mathematician and physicist. Did important work on the first and second laws of thermodynamics and also in the theory of electricity.

Kempe, Alfred (1845–1922) Noted worker on the four-color theorem. Published a proof in 1879 that was discovered eleven years later to be false. The namesake of Kempe chains.

Kepler, Johannes (1571–1630) One of the great astronomers of all time. Student of Tycho Brahe. Formulator of Kepler’s laws of planetary motion.

Kilburn, Tom (1921–2001) One of the developers of the Williams Tube, an early computer.


Lagrange, Joseph-Louis (1736–1813) Noted geometric analyst of the 19th century. One of the fathers of the theory of celestial mechanics. Made important contributions to the calculus of variations, and invented Lagrange multipliers.


Leibniz, Gottfried Wilhelm von (1646–1716) An important philosopher. One of the inventors of calculus. The author of The Monadology.

Leray, Jean (1906–1998) An important geometer and algebraist of the 20th century. The inventor of sheaves, and also of spectral sequences.
Levinson, Norman (1912–1975) A protégé of Norber Wiener. A distinguished mathematical analyst, and professor at MIT. Proved a significant result about the zeros of the Riemann zeta function.

Lobachevsky, Nikolai (1793–1856) Along with Bolyai, one of the inventors of non-Euclidean geometry.


Mauchly, John W. (1907–1980) One of the creators of the ENIAC computer at the University of Pennsylvania.


Morse, Marston (1892–1977) Distinguished 20th century geometric analyst. The namesake of Morse theory, or the calculus of variations in the large. Permanent member of the Institute for Advanced Study.

Napier, John (1550–1617) The inventor of logarithms.

von Neumann, John (1903–1957) Noted American mathematical analyst of Hungarian origin. John von Neumann created the modern view of quantum mechanics, and is the father of the subject of von Neumann algebras. He made notable contributions to functional analysis, logic, and many other parts of mathematics. He is considered to be the father of the stored-program computer.


Newson, Mary Winston (1869–1959) The first American woman to earn a Ph.D. degree at the University of Göttingen. She produced the English translation of the transcription of Hilbert’s 23 problems delivered at the International Congress of Mathematicians in 1900.

Occam, William of (1288–1348)  Fourteenth century philosopher. Creator of “Occam’s razor,” the precept that any logical system should be as compact and elegant as possible.

Ohm, Georg (1787–1854)  Namesake of Ohm’s law. Studied electric current. Also worked on the development of the battery. Published works on acoustics.

Painlevé, Paul (1863–1933)  A distinguished 19th- and 20th century analyst. Professor at the Sorbonne. Studied differential equations, gravitation, and complex analysis. Also was involved in politics.

Pascal, Blaise (1623–1662)  Noted 17th century French philosopher. One of the founders of probability theory. The namesake of Pascal’s triangle. Author of Pensées.

Peirce, Benjamin (1809–1880)  Professor of mathematics at Harvard University. Namesake of the Peirce Instructorships. Worked on celestial mechanics, number theory, algebra, and the philosophy of mathematics.


Rademacher, Hans (1892–1969)  Distinguished analyst and number theorist at the University of Pennsylvania. In 1945 he announced that he could disprove the Riemann hypothesis—but he was mistaken.

Ramanujan, Srinivasa (1887–1920)  Great mathematical genius from India discovered almost by accident by G. H. Hardy. Worked with Hardy at Cambridge University, mainly in number theory. Died young of ill health.

Riemann, Bernhard (1826–1866)  Great mathematical analyst of the 19th century. Made seminal contributions to calculus, real analysis, complex analysis, and geometry. Created Riemann surfaces, and created the geometry that was important for Einstein’s general theory of relativity. Died young of ill health.

Schrödinger, Erwin (1887–1961) One of the fathers of quantum theory. A distinguished Austrian physicist. Famous for Schrödinger’s wave equation and “Schrödinger’s cat.”

Selberg, Atle (1917–2007) Distinguished Norwegian analytic number theorist. Famous for results on the zeros of the Riemann zeta function, for the elementary proof of the prime number theorem, and also for the Selberg trace formula.

Serre, Jean-Pierre (1926– ) One of the great algebraists and geometers of the 20th century. Made seminal contributions to algebraic geometry, algebraic topology, number theory, and to many other fields. Winner of the Fields Medal, the Abel Prize, and many other encomia.


Sylvestre, James J. (1814–1897) Distinguished 19th century algebraist. Played an important role in developing mathematics at Johns Hopkins University, and in America at large. Founder of the American Journal of Mathematics.

Tarski, Alfred (1902–1983) Outstanding Polish logician. On the faculty at the University of California at Berkeley for many years, he played a dynamic role in developing modern logic. Famous for the Banach–Tarski paradox.

Turing, Alan (1912–1954) Widely considered to be one of the great mathematical geniuses of the 20th century. He invented the Turing machine, and had seminal ideas in the design of early computers. Did important cryptographic work in World War II. Died of poisoning at an early age.

Vallée Poussin, Charles Jean Gustav Nicolas Baron de la (1866–1962) Outstanding analyst of the late 19th and early 20th centuries. One of the provers of the prime number theorem. One of the first and only winners of the Mittag-Leffler Medal.

Vinogradov, Ivan M. (1891–1983) One of the fathers of modern analytic number theory. Famous for his analysis of exponential sums. He served as director of the Steklov Mathematics Institute for 49 years, and was a distinguished leader of Soviet mathematics.
von Kármán, Theodore (1881–1963) A student of David Hilbert, von Kármán is considered to have been the founder of modern aeronautical engineering. Did important work in supersonic and hypersonic airflow.

vos Savant, Marilyn (1946– ) Originally born Marilyn Mach, she is a popular newspaper columnist whose claim to fame is that she is reputed to have the highest IQ in the world. She is married to Robert K. Jarvik, who invented the artificial heart.

van der Waerden, Bartel L. (1903–1996) Important Dutch algebraist. Student of Emmy Noether. Wrote a definitive text in algebra. Proved an important result in Ramsey theory.


Weierstrass, Karl (1815–1897) A distinguished German analyst of the 19th century. Weierstrass made seminal contributions to both real and complex analysis. He is particularly noted for some important examples. His theorems are also frequently quoted.

Weil, André (1906–1998) Widely considered to be one of the great mathematicians of the 20th century. He was a permanent member of the Institute for Advanced Study. Weil made seminal contributions to algebraic geometry, number theory, invariant integrals, Kähler manifold theory, and many other parts of mathematics. His books have been very influential.

Weinberg, Steven (1933– ) Noted American physicist. Winner of the Nobel Prize for studying the unification of the weak force and electromagnetic interaction between elementary particles.


Williams, Frederic (1911–1977) Collaborated in developing the early computer known as the Williams Tube.

Wozniak, Steve (1950–)  Cofounder, along with Steve Jobs, of Apple Computer. Inventor of the 256K memory chip. Wozniak was the “technical talent” in getting Apple Computer off the ground.

Zariski, Oskar (1899–1986)  One of the great algebraic geometers of the 20th century. Namesake of the Zariski topology and inventor of the concept of “blowup” (which led to Hironaka’s Fields-Medal-winning work on resolution of singularities). Zariski was the Ph.D. advisor of two Fields Medalists—David Mumford and Heisuke Hironaka.

References


References


References


<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
<th>Author(s)</th>
</tr>
</thead>
</table>
References


[PTRS] Table of Contents, *Phil. Trans. R. Soc.* A, v. 363 n. 1835(2005), http://journals.royalsociety.org/content/ j2716w637777/?p=e1e83758d3ee4a51b0aa0bba4133518a &pi=0.


References


abacus, 117
ABC computer, 120
A Beautiful Mind, 29, 150
Abel Prize, 171
Abel, Niels Henrik, 59, 171
abstract algebra, 62
academic world
    is a marketplace, 68
Acta Mathematica, 164
Adams, J. Frank, 17
Adler, Alfred, 215
Ahlfors, Lars, 89, 172
AI, 199
Aiken, Howard, 120
AIM, 151
airfoil design, 140
A K Peters, 26
al-jabr, 48
al-Khwarizmi, Muhammad ibn Musa, 48
Albert, Adrian, 187
Alexanderson, Gerald B., 151
algebra problems
    solution using geometric figures, 49
algebraic geometry, 17
algebraic invariants, 62
algorithmic logic, 16
Alhambra, 151
Almgren’s regularity theorem, 217
Almgren, Frederick J., 9, 216
American Institute of Mathematics, 151
American Journal of Mathematics, 215
Ammal, S. Janaki, 94
analysis
    and combinatorics, 34
analytical engine, 119
A New Kind of Science, 126, 192
Annals of Mathematics, 168, 210
Apostol, Thomas, 46
Appel and Haken
    computer proof of four-color theorem, 112
    mistake in computer proof, 113
Appel, Kenneth, 111
Apple II, 124
Applied Logic Corporation, 122
applied mathematics
    and 19th century Europeans, 63
    funding of, 28
Arbeitstagung, 216
Archimedes, 39, 144, 172
archiving mathematics, 148
Argonne National Laboratory, 130
Ariane 5 rocket, 112
Ariston of Chios, 189
Aristotle, 9
    father of logic, 9
Arthur, James, 182
artificial hearts, 224
artificial intelligence, 199
Artin, Emil, 57
Art of Hindu Reckoning, 48
arXiv, 145, 156
Arya-Bhata, 48
Aryabhata, 49
Aschbacher and Smith
    book, 163
Aschbacher, Michael, 160
associative law, 159
Atanasoff, John, 120
Atiyah, Michael, 3, 128
Atiyah-Singer index theorem, 112
Aubrey, John, 18
Aurora, 122
Automated Reasoning Assistant, 122
automated verification
    of computer programs, 127
Automath, 122
automobile body design, 141
axiom
    what is a, 7
axiom of choice, 106
axiomatic method, 25
axioms, 6
central processing unit, 123, 125
Ch’ung-Chih, Tsu, 144
Chauvenet, William, 63
Chen, Jingrun, 191
Chevalley, Claude, 16, 86
chip design, 125
chromatic number, 109
Church’s thesis, 121, 199
cigars, 176
circle, 41
Class NP
problems of, 203
class P, problems of, 202
Clay Mathematics Institute, 151
Clay, Cassius, 151
Clay, Landon T., 151
closed geodesics
infinitely many, 216
Coates, John, 209
COBOL, 224
coding theory, 125
Cohen, Daniel, 113
Cohen, Paul J., 32, 188
Cole Prize, 152
Cologne, University of, 56
communication
electronic, 145
complex structures on the six sphere, 215
complexity, 201
exponential, 201
of a problem, 201
polynomial, 201
complexity theory, 201
composite number, 42
Comptes Rendus, 88
computer
typesetting, 154
computer algebra system, 125
computer algebra systems, 136
list of, 138
computer code, 127
computer games, 202
computer imaging, 141
computer program, 127
as a growing organism, 128
computer science
literature, 19
computer shenanigans, 113
computer visualization, 141
computer-assisted proof, 112
computers
and artillery calculations, 131
and weather calculations, 131
as part of mathematics, 126
can only perform algorithms, 198
conjecture
what is a, 26
who should formulate, 26
conjectures, 16
Connes, Alain, 188
Conrey, J. Brian, 151, 186, 187
constructive analysis, 79
constructivism, 71
continuous function, 72
contrapositive, 12
equivalent to original statement, 13
converse, 12
converse vs. contrapositive, 13
Conway, John Horton, 167
Coq, 122
Coulomb, Jean, 86
counterexample, 16
counting boards, 117
counting problems, 58
Courant Institute of Mathematical Sciences, 28
Courant, Richard, 62
Cplex, 170
CPU, 113, 123
Crafoord Prize, 171
Cray Research, 124
Cray, Seymour, 123
critical line, 185
critical strip, 185
cybernetics, 66

Dahlberg, Björn, 141
Dantzig, George, 167
Death of Proof, 219
decision problem, 202
decision problems, 202
definition
as a language for doing mathematics, 7
Index

formulation of, 6
what is a, 6
definitions, 6
degree of accuracy, 82
Dehn, Max, 85
Deligne, Pierre, 164
Delsarte, Jean, 86
Department of Defense, 67
Department of Energy, 67
Descartes, René, 149
design
    auto body, 141
    ship hull, 141
deterministic, 202
deterministic Turing machine, 120
Dieudonné, Jean, 86, 90, 180
difference between \( \text{NP} \) and \( \text{P} \), 204
differential equations
    numerical solutions of, 125
Diophantine equation, 55
Dirichlet, Peter Gustav Lejeune, 55, 57, 63
discriminant, 62
Djursholm, Sweden, 171
\( \text{D} \)-modules, 129
Donaldson, Simon, 146
Doob, Joseph, 97
Douglas, Jesse, 172
Dunwoody, M. J., 174
Eastwood, Clint, 208
Eberly, Robert, 69
Eckert, J. Presper, 121
École Normale Supérieure, 86
EDVAC, 122
effective computability, 201
effectively computable function, 199
Egyptians
    Pythagorean tool, 45
Ehresmann, Charles, 86
86-DOS, 124
Eilenberg, Samuel, 90
Einstein, Albert, 150
Ekhad, Shalosh, B., 165
element of, 31, 33
e-mail attachment, 155
embedded minimal surfaces, 142
Engelman, Carl, 136
ENIAC, 121

Enriques, Federigo, 16
esilions, 97
Eratosthenes, 39, 189
Erdős, Paul, 95, 113, 187, 217
    and sexual pleasure, 96
    number, 97
Estermann, Theodor, 188
Euclid
    student of, 40
Euclid of Alexandria, 6, 39, 115, 144, 226
    as a number theorist, 42
    influence of, 41
    other works, 42
    the geometer, 39
    who was he?, 39
Euclidean geometry
    axioms of, 40
Euclid’s \textit{Elements}, 14, 39
    as a paradigm for mathematics, 40
Eudoxus, 6, 38, 40
Euler, Leonhard, 53, 149
    ideas of, 54
    intuition of, 54
    precision of, 54
experimental mathematics, 25
\textit{Experimental Mathematics}, 25
expert systems, 199
exponential complexity, 201

factoring a large integer, 203
fads
    controlling, 148
false, 10
Faltings, Gerd, 208
FAX machine, 155
Fejes Tóth, Gábor, 168
Fejes Tóth, László, 166
Feller, William, 38
Fermat’s last theorem, 57, 192, 214
Fermat, Pierre de, 144, 205
    as a judge, 205
    as a number theorist, 206
    as provocateur, 206
    in Toulouse, 205
    marginal comment, 207
Feynman, Richard, 9
    and strip club, 9
Fibonacci, 50
Fields Medal, 172
Fields, John Charles, 172
first scholarly journal, 34
Fischer, Bernd, 161
Fitzgerald, Carl, 164
fixed-point theorem, 69
Flexner, Abraham, 150
floating-point operation, 124
flop, 124
FLT, 208
FlySpeck, 170
foliation theory, 173
formal verification, 127
of computer programs, 127
Fortran, 123, 154, 224
Four Colors Suffice, 114
four-color problem, 108
four-color theorem, 123
Fourier analysis, 103
Fourier, Jean Baptiste Joseph, 55, 59
Foy, Maximilien Sébastien, 55
fractal, 197
fractal dimension, 197
fractal geometry, 196
fractals
and mathematical amateurs, 198
applications of, 197
for modeling, 197
fractional dimension, 197
Fraenkel, Adolf, 23
Francoeur, Louis, 55
Franklin, Philip, 111
Franks, John, 216
Frege, Gottlob, 20, 31
epic work, 32
Fry's Electronics, 151
Fry, John, 151
Fuld Hall, 150
Fuller, Buckminster, 167
Galois, Évariste, 59, 149, 158
game of life, 193
GANG, 142
garbage in, garbage out, 112, 126
Gardner, Martin, 106
Gates, Bill, 115
Gauss, Carl Friedrich, 55, 63, 143, 167, 183
Gelbart, Abe, 67
Gelernter, H., 122
genetics, 3
genome project, 3
Geometer's Sketchpad, 135
geometries
eight fundamental, 173
gometric program, 173, 216
gometric program of Thurston, 20
geometry
hyperbolic, 173
Geometry Machine, 122
Georg-August Universität Göttingen, 213
Gerbert of Aurillac, 50
gigaflp, 133
Gilman, Daniel Coit, 64
Gilmore, P., 122
Ginsparg, Paul, 156
God's book, 97
Gödel incompleteness theorem, 199
Gödel, Kurt, 32, 61
Gödel number, 33
Gödel first incompleteness theorem, 123
Gödel incompleteness theorem, 33
Goldbach conjecture, 115, 188
computer check of, 188
weak version, 188
Goldfeld, Dorian, 217
Goldstone, Herman, 122
Gonthier, Georges, 114
Good Will Hunting, 29
Gorenstein, Daniel, 160, 161
Göttingen
as a center for mathematics, 62
Graham, Ronald, 96, 113
graphic user interface, 124
graphs, isomorphism of, 202
Green, Benjamin, 57
Green, George, 27
Griess, Robert, 161
Gromoll, Detlef, 216
Grothendieck, Alexandre, 16, 90
declines Wolf Prize, 180
quits mathematics, 180
group, 15, 158
and physics, 159
monster, 161
simple, 160
sporadic, 161

types of, 15

group theory, 159

groups

classification of, 159

classification, second-generation proof, 162

finite simple, classification of, 160

quasithin, 162

Gutenberg, Johannes, 154

Guthrie, Francis W., 107

Guthrie, Frederick, 108

Hachette, Jean, 55

Hadamard, Jacques, 123, 185

Hahn–Banach theorem, 106

Haken, Wolfgang, 111

Hales, Thomas, 115, 123, 167, 215

and Kepler conjecture, 167

and Wu-Yi Hsiang, 167

Hall, Marshall, 14

Hall, Monte, 103

problem, 103

Halmos, Paul, 97

as a teacher, 98

as a writer, 98

fields of interest, 97

ham sandwich

classical, 76

generalized, 76

slice of, 77

ham-sandwich theorem, 76

generalized, 76

Hamilton, Richard, 176, 182

alternative proof of the Poincaré conjecture,

keynote lecture at the ICM, 181

Hamilton, William Rowan, 28, 108

Han Dynasty, 117

Hardy, Godfrey Harold, 28, 94, 186, 191

feud with God, 186

harmonic analysis, 29

Harrison, John, 123

Harvard Mark I, 120

Harvard University, 213

Hawking, Stephen, 24, 207

Heawood conjecture, 111

Heawood, Percy, 109

formula, 109

theorem, 110

Heesch, H., 111

Heisenberg, Werner, 159

Henry, Joseph, 64

Hero of Alexandria, 118

heuristics, 16

high-level computing languages, 125, 154

Higher Order Logic, 122

Hilbert basis theorem, 62

Hilbert Nullstellensatz, 62

Hilbert space, 159

Hilbert, David, 32, 59, 61

and logic, 85

dream of, 20

problems, 84

program, 85

Hilbert Spaces of Entire Functions, 164

Hill, M. J. M., 94

Hirzebruch, Friederich, 216

Hobbes, Thomas, 18

and geometry, 18

Hobson, E. W., 94

Hoffman, David, 142

Hoffman, James, 142

HOL Light, 122

Hollerith, Herman, 119

homotopy theory, 74

Honeywell, 121

Hooke, Robert, 34

Horgan, John, 219

Hörmander, Lars, 68

Professorship in Sweden, 68

Hsiang, Wu-Chung, 165

Hsiang, Wu-Yi, 165, 215, 225

proof of Kepler conjecture, 167

Hui,Liu, 144

Husson, Raoul, 87

hyperplane, 79

IAS Computer, 122

IBM, 119

IBM automatic sequence controlled calculator,

120

IBM Selectric Typewriter, 153

identity element, 158

Illusie, Luc, 209

image compression, 103

IMPA, 150
infinitary number, 212
infinitely many primes, 41
infinitesimal, 211, 212
infinity
- discussion of forbidden, 51
- idea of, 51
Institut des Hautes Études Scientifiques, 180
Institute for Advanced Study, 67, 97, 150
Institute for Useless Knowledge, 150
Instituto Nacional de Matemática Pura e Aplicada, 150
intellectual process
- empirical, 15
International Business Machines, 119
International Mathematics Olympiad, 178
Internet, 155
intractable problems, 204
intuitionism, 71
invariant subspace problem, 163
inverse element, 158
irrational numbers, 58
irrationality of $\sqrt{2}$, 44
is defined to be, 11
Isaac Newton Institute for Mathematics, 207
Isabelle, 122
Iwaniec, Henryk, 191
Jacobi, Carl, 57, 59
Jacquard loom, 119
Jaffe, Arthur, 147
Jarvik, Robert K., 105
Java, 154
Jevons, W. S., 119
Jinabhadra Gani, 49
Jobs, Steve, 124
Johns Hopkins University, 64
Jordan curve theorem, 69, 123
Jordan, Camille, 69, 109
Kantian view, 24
Kaplansky, Irving, 217
Kapovitch, Vitali, 178
Kármán, Theodore von, 62
Katz, Nick, 208
Kemeny, John, 28
Kempe chain, 109
Kempe, Alfred, 109
Keng-Chih, Tsu, 144

Kepler conjecture
- Hales proof of, 170
- Hungarian team of referees, 168
- proof of in *Annals*, 170
Kepler sphere-packing problem, 215
Kepler, Johannes, 34, 165
- conjecture, 167
- sphere-packing conjecture, 167
Kilburn, Tom, 121
Klein, Felix, 109
Kleiner, Bruce, 179
Kleitman, Daniel, 96
Kline, J.R., 94
Kline, John R., 187
Klingenber, Wilhelm, 216
Knuth, Donald, 154
Kolata, Gina, 17
Kolmogorov, Andrei, 16, 101
Kosambi, Damodar Dharmananda, 88
Kovalevskaya, Sonya, 27, 171
Kronecker, Leopold, 52, 57
Kuhn, Thomas, 174
Lacroix, Sylvestre, 55
Lagrange, Joseph-Louis, 59
Lamport, Leslie, 154
Lanford, Oscar, 113
Lang, Serge, 90
Laplace, Pierre-Simon, 55
laser printer, 124
LASIK surgery, 224
\LaTeX, 154
Laugawitz, Detlef, 212
law of the excluded middle, 10, 31
Lebesgue, Henri, 101
Legendre, Adrien-Marie, 55
Leibniz, Gottfried Wilhelm von, 34, 118, 220
Leonardo of Pisa, 50
Lésniewski, Stanislaw, 32
LET’S MAKE A DEAL, 103
Levinson, Norman, 67, 186
Levy, Silvio, 175
Li, Xian-Jin, 187, 188
*Liber abaci*, 50
Lie groups, 129
life as we know it on Mars, 10
line, 41
linear programming problems, 168
Liouville, Joseph, 63
Lisp, 200
Littlewood, John Edensor, 191
Lobachevsky, Nikolai Ivanovich, 8, 184
Logic Theory Machine, 122
logical primitives, 123
Lokavibhaga, 49
Lorenzen, Paul, 212
lost child in the wilderness, 212
Lott, John, 179, 182
Lucasian Chair, 207
Luminy
   mathematics institute at, 150
Lyons, Richard, 161
Lysanias of Cyrene, 189
Mac Lane, Saunders, 27
Mach, Marilyn, 105
machines
   that think, 199
   thinking, 67
MacPherson, Robert, 168
Macsyma, 125, 136
magnetic resonance imaging, 224
Mandelbrot set, 127
Mandelbrot, Benoit, 127, 196
Mandelbrot, Szolem, 86
Mani-Levitska, Peter, 181
Mann, Allen L., 130
Maple, 125, 137
Martin, William A., 136
Massachusetts Institute of Technology, 213
math castle, 151
Mathematica, 125, 136, 192
   and business schools, 137
   and calculating, 137
   and graphing, 137
mathematical
benefactors, 149, 150
certainty, 18, 20
collaboration, 28, 29
collaboration, consequences of, 30
communication, 152
experimentalists, 15
golf course, 151
logic, 9
models, 19
notes, 145
paper, form of, 23
paper, writing of, 152
papers, vetting of, 156
paradoxes, 98
patrons, 149
proof, 3
proof, validation of, 30
sciences, division of, 227
theorists, 15
thinking, 36
uncertainty, 30
unknowns, 49
mathematical notation
   importance of, 49
mathematical work
judged by a jury of ones peers, 213
Mathematica
   notebook, 139
mathematician
   as a lone wolf, 28
   as single-combat warrior, 29
black despair of the profession, 213
characteristics of, 1
secretive nature of, 34
spends life making mistakes, 25
mathematicians
   communication among, 144
   try things, 25
mathematics
   and chemical engineering, 29
   and computers, 125
   and email, 146
   and plastic surgery, 29
   and practical consideration, 38
   and practical questions, 4
   and the Egyptians, 4
   applications of, 2
   applied, 27
   archiving, 148
   as a heuristic and phenomenological sub-
   ject, 223
   as a Kantian activity, 23
   as a Platonic activity, 23
   Babylonian, 38
   Chinese, 144
dissemination of, 34
eperimental nature of, 25
financial, 2
formal development of, 23
heuristic use of, 20
how it is discovered, 25
how it is recorded, 25
in 19th century Europe, 59
in industry, 150
in its own right, 4
in the financial sector, 150
in the university, 150
interdisciplinary work in, 227
leaps of faith in, 30
method of recording, 25
modeling nature, 19
opens many doors, 226
phenomenological, 5
phenomenological studies, 197
professionals, 225
publication of, 34
pure, 27
reproducibility of, 19
role of conjecture in, 26
students, 225
universally accepted language for, 84
mathematics institutes, 150
Mathematisches Forschungsinstitut Oberwolfach, 150
Math Reviews, 147
MathSciNet, 147
MATLAB, 125, 137
MATLAB
and complex numbers, 137
matrices, 158
matrix multiplication, 158
Matthias, A., 123
Mauchly, John W., 121
Mazur, Barry, 106
McCune, William, 130
McKenzie, R. Tait, 172
McLuhan, Marshall, 35
medical
literature, 19
Meeks, William, 142
Meierfrankenfeld, Ulrich, 162
Merton, Robert K., 35
Message Passing Interface, 123
Meyer, Albert, 131
Meyer, Wilhelm, 216
Mflop, 124
microcomputer, 137
Millenium Problems, 151
Miller, Gary, 16
Milnor, John, 176, 182
Mittag-Leffler Institute, 145
Mittag-Leffler Prize, 171
demise of, 172
Mittag-Leffler, Gösta, 145, 171
Mizar, 122
Mizar, 123
Möbius, August, 109
modus ponendo ponens, 11
misuse of, 11
modus ponens, 13
modus tollendo tollens, 13
modus tollens, 13
monster group, 161
Monte Hall problem, 103
Morgan and Tian booki, 182
Morgan Hill, 151
Morgan, Augustus de, 108
Morgan, John, 179, 182
Morse, Marston, 67, 216
Moses, Joel, 136
MPI, 123
MS-DOS, 124
multivalued logic, 11
multivalued truth function, 11
muqabala, 48
National Institutes of Health, 34
National Science Foundation, 34, 35, 67
National Security Agency, 42, 225
negative numbers, 50
Neumann algebras, von, 129
Neumann, John von, 97, 122, 125, 131, 159
calculating ability, 132
Nevanlinna, Rolf, 89
Newell, A., 122
Newson, Mary Winston, 84
Newton’s method, 79, 80
Newton, Isaac, 27, 34, 207, 220
reluctance to publish, 34
secretiveness, 34
Nicely, Thomas, 112
Nicolas Bourbaki
special symbol, 92
Nirenberg, Louis, 171
Nobel Prize, 170
none in mathematics, 170
Nobel, Alfred, 170
common-law wife, 171
wife, 171
Noether, Emmy, 57
non-Euclidean geometry, 221
nondeterministic Turing machine, 203
nonstandard analysis, 212
NP-complete, 204
NP-completeness, 204
NP-completeness problem, 201
NP contains P, 204
NP \ P nonempty, 204
NP
problems of class, 203
NSA, 225
number systems
construction of, 51
Numbers, 29, 150
numerical analysis, 82, 140

O’Connor, 123
Occam’s razor, 14
Oka, S., 17
Okounkov, Andrei, 180
Oldenburg, Henry, 34, 144
On proof and progress in mathematics, 175
operating system, 113
operating systems, 125
Otter, 124, 131
Overbeek, R. A., 122

Painlevé, Paul, 87
parallel postulate, 8, 41
Playfair’s formulation, 8
Playfair’s formulation of, 41
Pascal, Blaise, 118, 206
Paterson, Tim, 124
PC, 124
*.PDF, 155
PDF, 155
*.PDF translator, 155
Peano, Giuseppe, 32
Peirce, Benjamin, 32
Penrose, Roger, 198
Pentium FDIV computer chip bug, 112
Perelman, Grigori, 152, 176, 180, 216
declines Clay Millenium Prize, 152
declines Fields Medal, 152
declines prizes, 178
groundbreaking papers, 178
papers on the Internet, 179
quits mathematics, 180
Perelman, Grisha, 176
petaflop, 124
Petersen, J., 111
The Philosophical Transactions of the Royal Society of London, 35
physics
theoretical, 15
pigeonhole principle, 58
Pixar, 150
Plato, 39
Platonic figures, 39
Platonic solids, 39
Platonic view, 24
and theism, 24
Plimpton 322 tablet, 38
P/NP problem, 200
Poénaru, Valentin, 175
Poincaré conjecture, 27, 174
Poincaré, Henri, 61
point, 6, 41
Poisson, Siméon, 55
polynomial complexity, 201
polynomial equivalence, 204
Pommerenke, Christian, 164
Pontryagin, Lev Semenovich, 88
Popper, Karl, 8
Portable Document File format, 155
Possel, René de, 86
PostScript, 155
P, problems of class, 203
Prawitz, D., 122
preprint, 164
preprint server, 155
electronic, 156
preprint servers, 145
prime factorization problems, 203
verification procedure, 203
prime number, 42
prime number theorem, 123, 185
elementary proof of, 217
prime numbers
arithmetic sequences of, 57
distribution of, 186
infinitude of, 41
primitives, 7
Princeton University, 213
mathematics library, 145
Principia Mathematica, 23, 122
priority of ideas, 148
Prix Fermat, 152
probability
and measure theory, 16
theory, 17
problems of class NP, 203
problems that can be verified in polynomial time, 203
problems, tractable, 202
Proclus, 39
programming languages, 125
proof, 3
and other sciences, 19
as a sociological process, 127
as benchmark, 222
as the heart of mathematics, 224
as the lingua franca of mathematics, 19
computer check of, 114
computers are better than humans, 220
evolution of the concept, 226
explains why something is true, 19
first in history, 37
form of, 23
forms of, 8
formulation of, 8
immortality of, 227
in the next century, 227
independent of any machine, 128
is immortal, 222
lasting value of, 227
methodology of mathematics, 36
omitting steps in, 31
probabilistic, 17
purpose of, 3
rigorous, 16
skipping steps in, 30
that nobody believes, 214
timeline of, 20
too complicated for humans, 220
versus heuristic reasoning, 222
what is a, 5
Proof, 29
proof, purpose of, 15
ProofPower, 122
proofs
mechanical, 16
Prover9, 124
*.ps translator, 155
Ptolemy, 39
publications
organizing, 148
publish or perish, 35
publishing
importance of, 35
scholarly, 35
punch card input, 121
punch cards, 120
pure and applied mathematics
interaction of, 29
pure vs. applied mathematics, 27
Pythagoras, 43, 226
Pythagorean society, 43
contributions to mathematics, 44
tenets of, 43
Pythagorean theorem, 38, 44
and the Babylonians, 44
and the Chinese, 44
quantum mechanics, 15, 33
quest for certainty, 115
queuing theory, 125
Rabin, Michael, 16
Rademacher, Hans, 187, 191
Raleigh, Sir Walter, 165
Ramanujan conjecture, 164
Ramanujan, Srinivasa, 94
and proof, 95
rational numbers, 159
real analysis, 103
real numbers, 159
recursive function, 199
Index

regression
  infinite, 5
relativity
  general, 15
reproducible experiment, 15, 92
reproducible ideas, 30
reproducible result, 18
research conferences, 9
retraction, 75
  non-existence of, 75
Reverse Cuthill–McKee package, 127
Ribet, Ken, 210
Ricci flow, 176
Richard the Lionheart, 50
Riemann hypothesis, 27, 151, 183
Riemann zeta function, 185
Riemann, Bernhard, 27, 57, 59, 63, 143, 149, 183
  broad interests of, 184
ring theory, 130
Ringel, Gerhard, 111
Robbins algebra, 130
Robbins conjecture, 129
Robbins Prize, 170
Robinson, Abraham, 211
Rockefeller, John D., 67
Rourke, Colin, 174
RSA encryption, 203
rubber sheet geometry, 18
Rudin, Walter, 14, 91
Russell’s paradox, 32
Russell, Bertrand, 20, 31, 61, 106, 122
Rutherford, Ernest, 28
Sahni, Vijay, 18
Salamin tablet, 117
SAM, 122
Sarnak, Peter, 208
Schmidt, U., 113
Schnirelmann, Lev, 189
Schock Prize, 152, 171
scholarly journal
  first, 34
Schrödinger, Erwin, 159
scientific arithmetic, 1
scientific discourse, 195
Scientific Workplace, 137
Segev, Yoav, 162
Seiberg, Nathan, 146
Seiberg-Witten equations, 146
Selberg, Atle, 186, 188, 217
Selvin, Steve, 105
semi-automated mathematics, 122
Serre, Jean-Pierre, 90, 163
set, 6, 31
  measurable, 103
  non-measurable, 103
  that is too large, 32
set theory, 31, 33
Seymour, Paul, 114
Shankar, Natarajan, 123
Shimura, Goro, 210
ship hull design, 141
Siegel, Carl Ludwig, 187
sieve of Eratosthenes, 189
sieve technique, 189
sifr, 50
signal processing, 103
Simon, H. A., 122
Siu, Yum-tong, 215
slaves, 97
SLIP, 142
Smith, Stephen, 160
Smullyan, Raymond, 33
Sneakers, 203
SNOBOL, 224
Solomon, Ronald, 161
Solovay, Robert, 17
Song Dynasty, 118
Sperry Rand, 121
sphere packing
  hexagonal, 166
  rectilinear, 166
spherical trigonometry, 225
Sputnik era, 145
Sputnik program, 145
square root of 2
  calculation of, 140
standards of quality
  maintaining, 147
Stein, Elias M., 171
Steinhaus, Hugo, 62
Steklov Mathematics Institute in Leningrad, 164
Stickel, Mark E., 130
Stirling’s formula, 201
Index

stochastic processes, 67
Stone, Marshall, 67
Strassen, Volker, 17
Strichartz, Robert, 115
string theory, 15, 220
Stromquist, Walter, 111
subgraph problem, 201
supercomputer, 123
supergravity, 24
Suppes, Patrick, 14
supreme fascist, 97
surfaces
  classification of, 109
surgery theory, 176
Sylvester, J.J., 64, 65
Sylvester, James Joseph, 63, 65
  ambush by a student, 64
synthetic argumentation, 131
Tait, P. G., 111
tangent line, 80
Taniyama, Yutaka, 17
Taniyama–Shimura–Weil conjecture, 210
tao, Terence, 57, 69, 180, 214
tarski, alfred, 101
taylor, richard, 210
technophobia, 118
teraflop, 124
\TeX, 154
Thales, 6
Theaetetus, 6
The Emperor’s New Mind, 198
The End of Science, 221
theorem, 38
theorem-proving software, 128
theorems, 6
thing, 49
thinking machines, 199
Thomas of Colmar, 118
3-dimensional manifolds
  classification of, 173
Thurston, William, 20
  geometrization program, 20
Thurston, William P., 173, 182, 225
  lecture notes, 175
Thurston, William P., 216
tian, gang, 179
time-sharing system, 113
Toda, H., 17
topology, 18, 69
torus
  cutting of, 110
transcendental problems, 202
transcendental numbers, 58
traveling salesman problem, 201
true, 10
truth
  transient, 11
truth value, 10
Tube, 122
Turing machine, 120, 125
  deterministic, 203
  nondeterministic, 203
Turing machine, nondeterministic, 203
Turing, alan, 27, 120, 121
twin-prime conjecture, 191
U. S. Census Bureau, 119
U. S. Naval Academy, 63
UCLA, 214
Uncle Paul sitting, 96
undecidable statement, 33
undecided statement, 10
UNIVAC, 121
Université de Paris, 213
universities
  growth of, 145
University of California at Berkeley, 213
University of California at Los Angeles, 214
University of Illinois, 114
unprovable statement, 33
U. S. Patent Office, 221
Vallée Poussin, Charles Jean Gustav Nicolas
  Baron de la, 123, 185
van der Waerden, Bartel Leendert, 41
Varamahithra, 49
Vinogradov, Ivan, 188, 191
Volvo Corporation, 141
vos Savant, Marilyn, 105
  education, 105
Wall Street, 226
Walters, Barbara, 208
Wang, H., 122
Waterloo Maple, 137
wavelet algorithms, 29
wavelet theory, 103
Web posting
   versus traditional publishing, 147
Weierstrass, Karl, 59, 63, 144
Weil, André, 16, 86, 88, 210
   in Helsinki, 88
   in prison, 89
   invention of the empty set notation, 89
Weil, Eveline, 88
Weinberg, Steven, 9
Weinstein, Lenard, 165
Weil, André, 87
Werner, Wendelin, 180
Weyl, Hermann, 62
Whitehead, Alfred North, 20, 122
Whitney, Hassler, 67
Wiener, Norbert, 66
   and applications of mathematics, 67
   and stochastic processes, 67
   at Tufts, 66
Wiles, Andrew, 105, 152, 206, 214
   and FLT, 208
   secretive about Fermat’s last theorem, 207
   shows portions of his manuscript, 208
Williams Tube, 121
Williams, Frederic, 121
Wilson, Logan, 35
Windows, 124
Windows Vista, 127
Witten, Edward, 146
Wolfram Research, 192
Wolfram, Stephen, 125, 136, 192
Wolfskehl Prize, 152
wormhole, 24
Wos, Larry, 130
Wozniak, Steve, 124
Xerox PARC, 124
Yang-Mills field equations, 146
Yau, Shing-Tung, 177
Youngs, J. W. T., 111
Yue, Xu, 117
Z1 machine, 119
Z3 machine, 120
Zahler, Raphael, 17
Zariski, Oskar, 16
zefiro, 50
Zeilberger, Doron, 115, 165
Zermelo, Ernst, 23, 106
Zermelo–Fraenkel axioms of set theory, 23
zero, 50
   history of, 49
   in ancient Greece, 49
   in the Middle Ages, 49
zeta function, 185
Zhu, Xi-Ping, 180, 182
Zuse, Konrad, 119