

Development of Global Seismology

from Myth to Reality

Namazu (Japanese mythology)



In Japanese mythology, Namazu is a giant catfish who causes earthquakes. Namazu lives in the mud beneath the earth, and is guarded by the god Kashima who restrains the fish with a stone. When Kashima lets his guard fall, Namazu thrashes about, causing violent earthquakes.

Jean Baptiste Joseph Fourier (1768-1830)



French mathematician, was born at Auxerre on the 21st of March 1768. The theory of heat engaged his attention quite early, and in 1812 he obtained a prize offered by the Academie des Sciences with a memoir in two parts, Theorie des mouvements de la chaleur dans les corps solides. His mathematical researches were also concerned with the theory of equations, but the question as to his priority on several points has been keenly discussed.

After his death Navier completed and published Fourier's unfinished work. Analyse des equations, which contains much original matter.

Harry Fielding Reid (1859-1944)

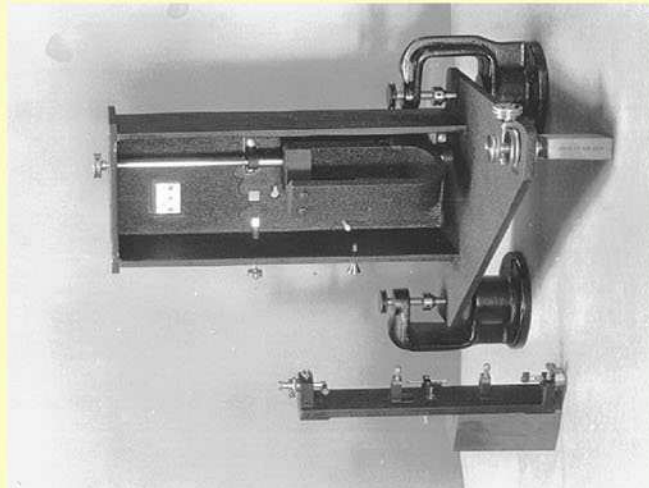


Harry Fielding Reid, seismologist, born Baltimore, Maryland, May 18, 1859; died June 18, 1944. He received his Ph.D. in 1885 from Johns Hopkins University. Taught at Case School of Applied Science; taught at Johns Hopkins University, 1894-1930. Introduced the term "Elastic Rebound Theory" in report of 1906 San Francisco earthquake.

Harry O. Wood (1879-1958)



Seismologist and inventor, born in Los Angeles, He devised and developed many seismic detection.



Sir Edward Crisp Bullard (1907-1980)



Sir Edward (Crisp) Bullard was an English marine geophysicist noted for his work in geomagnetism who made the first satisfactory measurements of geothermal heat-flow through the oceanic crust. In early work, he measured minute gravitational variations by timing the swings of an invariant pendulum, which he used to study the East African Rift Valley. Bullard helped develop the theory of continental drift.

He developed a "dynamo" theory of geomagnetism, which explained the Earth's magnetic field results from the convection of molten material within the Earth's core. He was knighted in 1953.

Rene Descartes (1595-1650)



"I am thinking therefore I exist."

He was born on 31 March 1596 in La Haye (now Descartes),Touraine, France and died on 11 Feb 1650 in Stockholm, Sweden. Rene Descartes was a famous French mathematician, scientist and philosopher. He was arguably the first major philosopher in the modern era to make a serious effort to defeat skepticism. His views about knowledge and certainty, as well as his views about the relationship between mind and body have been very influential over the last three centuries.

Johann Carl Friedrich Gauss (1777-1855)



Carl Friedrich Gauss (1777-1855) was one of the greatest mathematicians of all time. He combined scientific theory and practice like no other before him, or since, and even as a young man Gauss made extraordinary contributions to mathematics. The method of least squares, developed by Gauss as an aid in his mapping of the state of Hanover, is still an indispensable tool for analyzing data. There, one also finds a bell curve, which is the graphical representation of the Gaussian normal distribution in probability. Together with Wilhelm Weber, Gauss invented the first electric telegraph. In recognition of his contributions to the theory of electromagnetism, the international unit of magnetic induction is the gauss.

Cargill Gilston Knott (1856-1922)



Cargill Gilston Knott was born at Valleyfield, Penicuk on 30th June 1856 and spent his early career in Japan. He became a Fellow of the Royal Society, Secretary of the Royal Society of Edinburgh, an internationally acclaimed physicist and mathematician and a pioneer in the study of earthquakes. He worked closely with Milne, Gray and the Japanese seismologist Fusakichi Omori. Knott took part in establishing a network of recording seismometers across the Japanese Empire. From this, the team were able to locate the time and place where Earthquakes occurred using only the recordings made at remote seismological observatories. He died at his home in Newington, Edinburgh, in 1922.

Wood-Anderson Torsion Seismograph

Since the 1920s, earthquakes have been measured by various instruments, including the Wood-Anderson torsion seismometer and recording drum, developed by Drs. H.O. Wood and J.A. Anderson of the Seismological Laboratory of the California Institute of Technology and the Wilson Observatory, both in Pasadena. The pendulum in the torsion seismometer rotates about its suspension when the earth moves, and a beam of light - which is deflected by the mirror on the pendulum - records the movement on photographic paper wrapped around the drum. These were used at several sites throughout California until the early 1990s, when the high cost of photographic paper for the recording drum became prohibitive and as seismology made use of computers. The Richter scale, invented in 1935 by Charles Richter of the California Institute of Technology, was based on the recordings of the Wood-Anderson torsion seismometer.

Kiyoo Wadati



Professor Kiyoo Wadati was an early seismologist at the Central Meteorological Observatory of Japan, researching deep (subduction zone) earthquakes. His name is attached to the Wadati-Benioff zone. The Wadati-Benioff zone extends to a depth of about 700 km (435 miles) from the Earth's surface. It was Wadati's 1928 paper on shallow and deep earthquakes, comparing maximum surface displacement against distance from the epicentre, which led Charles Richter to develop his earthquake magnitude scale in 1935.

Pierre de Fermat (1601-1665)



Pierre de Fermat was born in Beaumont-de-Lonagne, France in August of 1601 and died in 1665. He is considered to be one of the greatest mathematicians of the seventeenth century. Fermat is considered to be one of the 'fathers' of analytic geometry. The Most Famous Question In Math History for 350 Years. Fermat's most important work was done in the development of modern number theory which was one of his favorite areas in math.

He is best remembered for his number theory, in particular for Fermat's Last Theorem. This theorem states that: $x^n + y^n = z^n$ has no non-zero integer solutions for x , y and z when n is greater than 2.

Baron Augustin Louis Cauchy (1789-1857)



Augustin Louis Cauchy, Baron, 1789-1857, French mathematician. He was professor simultaneously in Tilsit (East Prussia). He started his studies of Physics (East Prussia). He was born February 18, 1862 in Petersburg near Penegrad, and died May 4, 1916. He was one of the founders of modern Seismology. In 1911 he was chosen to be the president of the International Seismiology Association. He belonged to the Galitzine family, one of the leading noble houses of Imperial Russia.

Among his nearly 800 publications are works on the theory of waves, algebraic analysis, elasticity, infinitesimal calculus, differential calculus, and the dispersion of light.

Emil Wiechert (1861-1928)



Emil Wiechert was born on the 26th December 1861 on 30th June 1856 and spent his early career in Japan. He became a Fellow of the Royal Society, Secretary of the Royal Society of Edinburgh, an internationally acclaimed physicist and mathematician and a pioneer in the study of earthquakes. He worked closely with Milne, Gray and the Japanese seismologist Fusakichi Omori. Knott took part in establishing a network of recording seismometers across the Japanese Empire. From this, the team were able to locate the time and place where Earthquakes occurred using only the recordings made at remote seismological observatories. He died at his home in Newington, Edinburgh, in 1922.

Ludwig Carl Geiger (1882-1966)



Ludwig Carl Geiger was born in Basel (Switzerland) on 16, September 1882. In April 1907 he became assistant of Emil Wiechert and started to work on seismology. Geiger worked on observational data as well as theoretical work. He was in charge for the yearly seismic bulletins of the observatory in Göttingen from 1907 to 1910. He and Zoeppritiz determined the incidence angles of the seismic phases P, PP, PPP, S, SS and SSS for different epicentral distances. They proposed a mantle of the Earth made of stone with a thickness of 1519 km and 1438 km from P, and S-wave observations, respectively.

J. Tuzo Wilson (1908-1993)



He was the first child, born on October 24, 1908, in Ottawa, to the former Henrietta Tuzo and John Armistead Wilson. His mother's name, Tuzo, came from her father's distant Angevin Huguenot ancestors, who landed in Virginia in the seventeenth century, worked for the Geological Survey of Canada during the 1960's he refined and championed the theory of plate tectonics, which was then held in disrepute under the moving plates and produce chains of islands like Hawaii and Japan.

Christian Huygens (1629-1695)



At April the 14th 1629 Christian Huygens was born in Den Haag. Christiaan Huygens studied like Pierre de Fermat jurisprudence first, then mathematics and natural sciences. He was in relationship with Antony van Leeuwenhoek, who was known as the best microscope builder of his time and who not only grinded his lenses out of glass, but also out of rock crystal and diamond. His biggest refractor had a length of five meter. With his theory of the wave form of light he was able to calculate the refraction within the lenses and was able to make refractors with lesser chromatic and spherical aberration.

Gabriel Lamé (1795-1870)



Lame was born in Tours on July 22, 1795. He was a French mathematician. He became well known for his general theory of curvilinear coordinates and his motion and study of and his notation and study of classes of ellipse-like curves, now known as Lame curves. He is also known for his running time analysis of the Euclidean algorithm. He also proved Fermat's last theorem's special case of . He worked on a wide variety of different topics.

His work on the stability of vaults and on the design of suspension bridges led him to work on elasticity theory. Lame died in Paris in 1870.

Prince Boris Borisovich Galitzine (1862-1916)



Prince Boris Borisovich was a prominent physicist who invented the first electromagnetic seismograph in 1906. He was born February 18, 1862 in Petersburg near Penegrad, and died May 4, 1916. He was one of the founders of modern Seismology. In 1911 he was chosen to be the president of the International Seismiology Association. He belonged to the Galitzine family, one of the leading noble houses of Imperial Russia.

Galatzine currently has a town named after him in central Pennsylvania Otober 14.

Louis Byrne Slichter (1896-1978)



Louis Slichter was one of the foremost geophysicists of the twentieth century, an outstanding leader, scholar, and teacher. He was a pioneer in studies of inverse problems of geophysics, heat flow and cooling of the earth, free oscillations of the earth, solid-earth tides, crustal seismology, and the application of physical methods to the exploration of mineral deposits. His was the first work in many of these fields.

James A. Van Allen (1914-2006)



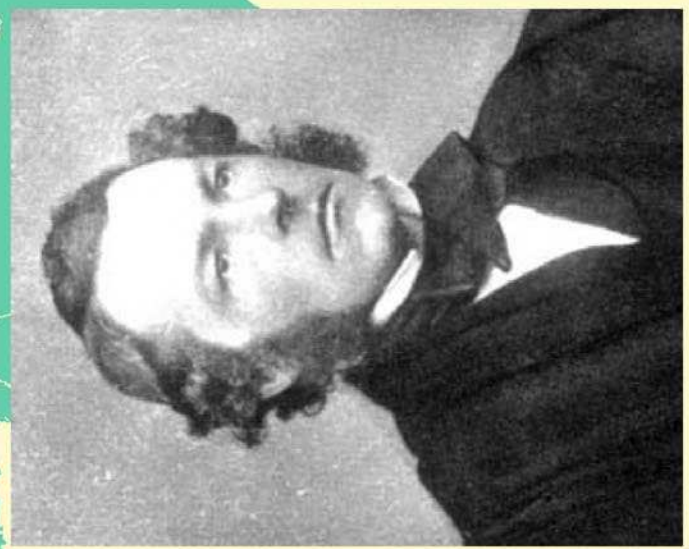
James A. Van Allen was a pathbreaking astrophysicist best known for his work in magnetospheric physics. Allen graduated from Iowa Wesleyan College in 1935. He then enrolled at the University of Iowa where he received an M.S. in 1936 and a Ph.D. in 1939. After the success of the Soviet Union with Sputnik 1, Van Allen's Explorer spacecraft was approved for launch on a Redstone rocket. It flew on 31 January 1958, and returned enormously important scientific data about the radiation belts circling the Earth.

Sir Issac Newton (1642-1727)



Isaac Newton was born prematurely on Christmas day 1642 (4 January 1643–New Style) in Woolsthorpe, a hamlet near Grantham in Lincolnshire. English natural philosopher, generally regarded as the most original and influential theorist in the history of science. In addition to his invention of the infinitesimal calculus and a new theory of light and color, Newton transformed the structure of physical science with his three laws of motion and the law of universal gravitation. As the keystone of the scientific revolution of the 17th century, Newton's work combined the contributions of Copernicus, Kepler, Galileo, Descartes, and others into a new and powerful synthesis.

George Gabriel Stokes (1819-1903)



He was Born Sligo, Ireland and died Cambridge, England. Stokes established the science of hydrodynamics with his law of viscosity (1851), describing the velocity of a small sphere through a viscous fluid. He investigated the wave theory of light, named and explained the phenomenon of fluorescence in 1852, and in 1854 theorised an explanation of the Fraunhofer lines in the solar spectrum. Stokes developed mathematical techniques for application to physical problems, founded the science of geodesy, and greatly advanced the study of mathematical physics in England.

Fusakichi Omori (1868-1923)



Fusakichi Omori developed the Omori scale of earthquake intensity: first scale relating ground motion (acceleration). Omori's first important work was his memoir published in 1894 on the after-shocks of earthquakes, in which he stated his well-known law that governs their decline in frequency. Omori's law states that aftershock frequency decreases by roughly the reciprocal of time after the main shock. Five years later he described his mechanically recording horizontal pendulum (now called the Omori seismometer).

Harry Hammond Hess (1906-1969)



Harry Hammond Hess was born in New York City on May 24, 1906. He was appointed a professor of Geology at Princeton University in 1932 and when the Second World War broke out, he saw active duty in the Pacific Ocean. His ship was equipped to make detailed soundings of the ocean floor and Hess kept notes on his observations. After the war, he continued his research into the mid-ocean mountain that the sea floor was spreading out from vents in the cracks ranges and deep underwater valleys, where hot magma oozed up to the surface. Harry Hess died in 1969, a month after Apollo 11 completed its successful mission to the moon.

Frank Press



He was Born in 1924. Dr. Press was the first to propose that the dispersion of long period earthquake surface wave motion could be used as a tool for studying the structure of the earth's crust and upper mantle. Analyzing surfaces waves, he verified that the occurrence of an earthquake is fault motion itself.

He was the leader in the promotion of scientific research and development in the area of disaster mitigation. As demonstrated by his efforts for International Geophysical Year and Worldwide Standardized Seismograph Network, he recognized the importance of international cooperation in disaster sciences.

Pierre-Simon Laplace (1749-1827)



Pierre Simon de Laplace was born in Beaumont-en-Auge, France. Like his teacher, Laplace achieved great distinction as a mathematician and physicist, making innumerable and crucial contributions to both fields. He dealt with such matters as integral calculus, the theory of chance, corpuscular optics, the chemical physics of heat, the speed of sound, the pattern of the tides, the orbits of comets, and the moons of Jupiter -- to name just a few.

Sir Horace Lamb (1849-1934)



He was born on 29 Nov 1849 in Stockport, England and died on 4 Dec 1934 in Cambridge, England. His teachers were George Stokes and the great mathematical physicist James Clerk Maxwell. Among the great variety of fields of applied mathematics to which Lamb made important contributions are electricity and magnetism, elasticity, acoustics, vibrations and wave motion, statistics and dynamics, seismology, and the theory of tides and terrestrial magnetism. Lamb's work in geophysics was also important. He wrote a paper in 1904 on the propagation of waves over the surface of an elastic solid, in which he virtually laid the whole theoretical foundations for modern mathematical seismology.

Ludger Mintrop (1880-1956)



Ludger Mintrop, famous for his discovery of the seismic head wave (also called Mintrop-wave) and his examinations with artificial seismic waves - was born in the Ruhr - District, Germany. He constructed a portable vertical seismometer with a photographic device for registration and a three - component model for parallel registration of vertical and horizontal earthquake waves. Later in the 1940's he wrote, that he had discovered the seismic head wave in August 1919. This event was a result of many years of systematic measurements.

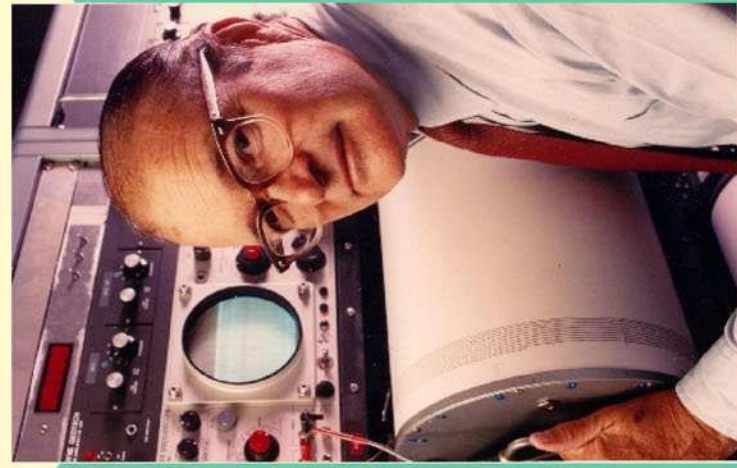
His final interpretation of the travel-time curves was founded on methods developed by Wiechert and Zoeppritz in global seismology.

William Maurice Ewing (1906-1974)



William Maurice Ewing was born in Lockney, Texas, on May 24, 1906 and died in John Sealy Hospital in Galveston, Texas, on May 4, 1974. He received a B.A. with honors in mathematics and physics and M.A. and Ph.D. (1931) degrees in physics. Ewing wrote over 340 scientific papers, most with colleagues and students, and trained more than 200 graduate students. He developed seafloor seismic equipment, made the first seismic-refraction measurements in the open sea, measured sedimentary velocities in the deep ocean, made pendulum gravity measurements at sea, and made theoretical studies of underwater sound transmission, predicting and discovering the SOFAR channel for long-range sound transmission in the oceans.

Bruce Bolt (1930-2005)



Bolt was born in Largs, New South Wales just north of Maitland in 1930. He studied at the University of Sydney obtaining his Bachelors Degree in 1952, Masters Degree in 1955 and a Doctorate in Applied Mathematics in 1959. He was a Professor of Earth and Planetary Science at the University of California, Berkeley. Professor Bolt was a seismologist known as pioneer of engineering seismology. Professor Bolt also wrote two popular books: "Earthquakes: A Primer" and "Inside the Earth: Evidence From Earthquakes."