VDE conference rooms with "big names"

Facts and figures of important personalities of the history of electrical engineering


Heinrich Hertz


Gustav Kirchhoff


Georg Christoph Lichtenberg


Georg Simon Ohm


Johann Philipp Reis


Wilhelm Conrad Röntgen


Werner von Siemens


Adolf Slaby

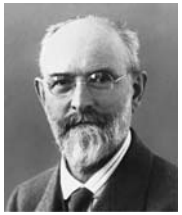

Wilhelm Weber


Konrad Zuse


Karl Ferdinand Braun


Johann Carl Friedrich Gauß


Hermann von Helmholtz


Robert Bosch


Oskar von Miller

Heinrich Hertz 1857 - 1894

…determined the velocity and frequency of electromagnetic waves and discovered their reflection.

Heinrich Hertz, a student of Hermann von Helmholtz, confirmed the assumption of James Clerk Maxwell that electromagnetic waves must have the same properties as light waves. His findings later led to the development of radar and radio technologies.

The scientific unit of frequency – one cycle per second equals 1 Hertz (Hz) – was named after him and has been anchored in the international metric system since 1933.

After receiving his Ph.D. from the University of Berlin, Hertz accepted a position as a lecturer in theoretical physics at the University of Kiel in 1883. From 1885 to 1889, he was a full professor at the University of Karlsruhe, and later moved to the University of Bonn. He discovered the photoelectric effect in 1886, and his assistant Wilhelm Hallwachs continued with the investigations in 1887 to define the so-called "Hallwachs Effekt," now called the photoelectric effect. This effect played a special role in the formulation of Albert Einstein's light-quantum hypothesis in 1905.

Gustav Kirchhoff 1824 - 1887

…was a German physicist who contributed to the fundamental understanding of electrical circuits and formulated the laws used in circuit theory and thermal emission. These laws are fundamental in designing and analyzing electrical circuits and thus indispensible for electrical engineering.

Kirchhoff received his Ph.D. from the University of Königsberg in 1847. His doctoral dissertation contained both of Kirchhoff's circuit laws. He qualified as a professor at the University of Berlin in 1848, and later was appointed professor for experimental physics at the University of Heidelberg in 1854. While there, he collaborated with Robert Wilhelm Bunsen on the discovery of cesium and rubidium.

Kirchhoff discovered spectral analysis in 1859/60. During this period, he also formulated his law of thermal radiation stating that material of any kind, when heated, radiates energy continually, and this radiation is invisible or visible depending on the temperature. This radiation is called temperature or thermal radiation. An extensive experimental investigation of this law was initially unthinkable, since there were no means for measuring higher temperatures and lower levels of radiation energy. The great significance of this law was immediately recognized, and the derived concept of black bodies ultimately led to the quantum theory of Max Planck, who received the Nobel Prize in Physics in 1919.

Georg Christoph Lichtenberg 1742 - 1799

…was above all an early experimental physicist in the field of electricity and famed as a satirist and aphorist. He was one of the first scientists to introduce experiments with apparatus in their lectures, and was a highly popular and respected figure in the European intellectual circles of his time.

After studying mathematics and the natural sciences and following a longer stay in Britain, Lichtenberg was appointed full professor of physics at the University of Göttingen. Branching electrical discharge patterns formed on dielectric plates are now called Lichtenberg figures after him.

With his extraordinary knowledge of physics, he was highly regarded as an expert for technical questions, in particular for the installation of lightning rods. Lichtenberg was the first person to demonstrate electric welding when he fused the mainspring of a watch and a brass blade with an electric discharge inside a vacuum glass container.

Georg Simon Ohm 1789 - 1854

…discovered the fundamental law for electrical circuit theory.

The physicist taught mathematics at upper secondary schools (Gymnasiums) in Bamberg and Cologne. In 1839, Ohm was appointed Director of the Polytechnic School of Nuremberg, and, as of 1849, was appointed professor of experimental physics at the University of Munich.

In 1826, he first presented experimental proof of what later became known as Ohm's law. The law defines the direct proportionality between potential difference (voltage) applied across a conductor and the resultant electric current. The unit of electrical resistance is called an "Ohm."

Ohm also developed the important harmonics theory in describing the nature of sound. He defined the simple tone as a sinusoidal oscillation. He believed that the ear is able to separate any complex signal into a series of sinusoidal signals – as a type of sound analyzer.

Johann Philipp Reis 1834 - 1874

…built the first telephone.

The teacher, born in Gelnhausen in the state of Hesse, took private lessons in mathematics and physics, and subsequently worked from 1858 to his death as a teacher at a private school in Friedrichsdorf, near Bad Homburg.

In 1860, Reis succeeded in transforming membrane oscillations into speech currents, so that sound and speech could be transmitted electrically – at first over a distance of 100 meters. However, his apparatus – which he called a "telephon" – attracted no attention in Germany. When Philipp Reis presented his idea of "telephoning with galvanic electricity" to the Physical Society of Frankfurt on October 26, 1861, his idea generated a good deal of scientific excitement, and stimulated the development of the electrical transmission of sound. The Englishman Alexander Graham Bell drew on the invention of Philipp Reis to design and present a more effective and mature version of the Reis apparatus, which he then patented.

In 1986, on the 125th anniversary of the invention of the telephone, the VDE, Deutsche Telekom AG and the cities of Friedrichsdorf and Gelnhausen created the Philipp Reis Prize. Every two years, the prize is awarded to engineers or scientists under the age of 40.

VDE

Wilhelm Conrad Röntgen 1845 - 1923

…was the first person to be awarded the Nobel Prize in Physics. In addition to the electromagnetic radiation wavelength range known today as X-rays or Röntgen rays, the 111th chemical element Roentgenium was also named after him.

In 1868, Röntgen – who was born in Germany and grew up in Holland – received his degree in mechanical engineering from the Federal Polytechnic Institute in Zurich. Afterwards, he studied physics and received his Ph.D. from the University of Zurich. While there, he was a student of August Kundt, whom he later followed to Würzburg as his assistant. In 1874, Röntgen was appointed lecturer at the University of Strasbourg.

In his 60 scientific works, Röntgen focused in particular on the fields of thermal and electrodynamics in which he investigated electrical discharges under various conditions. His greatest interest, however, was in crystal physics since he was fascinated by their aesthetics.

In 1878, while he was lecturing at Strasbourg, he worked with Kundt on proving the shift in the polarization level of light in gases. This proof had already been sought in vain by Michael Faraday and others, and Röntgen not only succeeded with his proof, but also was able to provide precise measurements backing his proof.

In 1895, Röntgen discovered X-rays while professor at the University of Würzburg. Against the wishes expressed in his testament, the X-rays were renamed Röntgen rays and have remained so. This discovery occurred when, during an experiment with a cathode ray tube, a small cardboard screen painted with barium platinocyanide began to fluoresce. His original paper “On a New Kind of Rays” was translated into many languages. Röntgen refused to take out patents related to his discovery since he wanted mankind as a whole to benefit from practical applications of the new rays.

VDE

Werner von Siemens 1816 - 1892

…was a German inventor and industrialist who founded the electrical engineering company Siemens on the basis of his electrotechnical inventions and discoveries. The SI unit of electrical conductance, the siemens, was named after him. Siemens was raised to the nobility in 1888.

In 1879, he initiated the founding of Germany's first Electrotechnical Society (ETV) in Berlin. He also promoted the establishment of the VDE, which was founded shortly after his death in 1893.

Since Werner von Siemens couldn't afford a university education, he joined the Prussian army. His training at the army's Berlin Artillery and Engineering School in physics and chemistry provided a solid theoretical and practical basis for his future work. After completing his military service, he began financially exploiting his first inventions together with his brother Wilhelm.

In 1847, he constructed a pointer telegraph that was far superior to those already in use. On the basis of this invention, he founded "Telegraphen-Bauanstalt Siemens & Halske," which laid the first underground telegraph line from Frankfurt to Berlin in 1848. In 1875, Siemens succeeded in laying the first direct transatlantic telegraph cable with the help of his brother.

Based on the work of Faraday, Siemens made his most important discovery – the dynamoelectric principle – in 1866. With the advent of the electrical dynamo generator, electricity could be exploited in a large scale and the triumphant advance of power engineering began – today's electrical engineering.

In 1879, Siemens built the first electric locomotive and the first electrical street lighting system. The company introduced the first electric elevator in 1880 and the first electric tram in the following year.

VDE

Adolf Slaby 1849 - 1913

…a pioneer in wireless telegraphy in Germany, was one of the founders of the VDE in 1893 and the Electrotechnical Society (ETV) in Berlin in 1879. He served as the first president of the VDE from 1893 to 1896.

Slaby received his doctorate in mathematics from the University of Jena and subsequently taught math and mechanics at the Royal Vocational School in Potsdam. In 1883, he became a tenured professor of electro-technology at the Charlottenburg Technical University. With the support of Berlin's electrical industry, he established an electro-technical laboratory at the university, an unusual facility for the times.

In 1897, he took part in Marconi's experiments with wireless telegraphy across the English Channel. In these experiments, Marconi succeeded in transmitting wireless signals across the Channel. Slaby repeated the experiments in Berlin and worked with Count Georg von Arco, with the support of AEG, to develop the Slaby-Arco-AEG system, which later became Telefunken AG following the 1903 consolidation with the Braun-Siemens company.

Wilhelm Weber 1804 - 1891

…was one of the primary figures in pre-Maxwellian electrophysics. Weber's investigations in electro-dynamic measurements were of fundamental importance for science. The SI unit of magnetic flux, the weber (symbol: Wb) is named after him.

As a student, Wilhelm Weber participated in the experimental investigations conducted by his elder brother Ernst Heinrich that led to the publishing of a book on "Wave Theory and Fluidity" in 1825. Following his appointment as Professor Extraordinary of natural philosophy at the University of Halle, Wilhelm Weber was hired by the University of Göttingen as professor of physics in 1831. He was dismissed in 1837 along with other professors (the Göttingen Seven) when they protested against changes made to the constitution. He taught physics for a while at the University of Leipzig, but was reinstated by the University of Göttingen in 1849.

While at Göttingen, Wilhelm Weber worked for many years with Carl Friedrich Gauss. The methods and instruments that they developed provided the basis for precision measurements. In 1833, they constructed the first electromagnetic telegraph.

In 1846, Weber formulated his basic law of electrical effects that compiled nearly all electrotechnical findings available at the time.

In 1856, Weber demonstrated with Rudolf Kohlrausch that the ratio of electrostatic to electromagnetic units produced a number that matched the speed of light. This finding led to Maxwell's conjecture that light is an electromagnetic wave.

VDE

Konrad Zuse 1910 - 1995

…developed the first fully automatic, program-controlled and freely programmable binary floating-point computer. His Z3 machine, built in 1941, was the world's first fully operational electromechanical computer, and his Plankalkül was the first universal high-level programming language.

Following his mechanical engineering studies in Berlin, Konrad Zuse began working at the Henschel aircraft factory in 1935 while at the same time experimenting with the construction of a programmable computer in his parents' apartment. His decisive contribution was determining that machines did not necessarily have to be based on the decimal system, but that a binary numbering system could be combined much easier with telephone system components for a calculating machine.

In 1938, Zuse presented his first experimental Z1 machine in which all operations were carried out purely in a binary form. In 1940, he built the improved Z2 using telephone relays. With the support of the German Research Institute for Aviation, he improved on the basic Z2 machine and built the Z3 for his own company, Zuse Apparatus Construction, in Berlin. The Z3 was a binary 22-bit floating-point calculator with limited programmability, memory capacity and a central computing unit.

Despite the war, Zuse worked on building the successor Z4 machine. The Z4 was installed at the Swiss Federal Institute of Technology Zurich (ETH) following the war. Beginning in 1949, Zuse continued his developments at his new company Zuse AG in Bad Hersfeld. Notable were the Z11, which was sold to the optics industry and to universities, and the Z22, the first computer with a memory based on magnetic storage. Up to 1967, when his company was sold to Siemens, Zuse produced a total of 251 computers. Konrad Zuse was awarded the VDE Ring of Honor in 1986.

VDE

Karl Ferdinand Braun 1850 - 1918

...was a German physicist, electrical engineer and Nobel laureate in physics (in 1909, together with Guglielmo Marconi), who contributed significantly toward making electromagnetic radiation practical for wireless communication. Braun's fame today is based on his invention of the cathode ray tube (CRT), which is still called the "Braun tube" ("Braunsche Röhre") in German-speaking countries.

Braun was born in Fulda, Germany, and studied mathematics and natural sciences at the University of Marburg and the University of Berlin. After receiving his Ph.D., he began working as a secondary school ("Gymnasium") teacher in Leipzig in 1874. In the course of his extracurricular research activities, he discovered the rectifier effects on crystals. Beginning in 1877, he held professorships at the universities in Strasbourg, Karlsruhe, Tubingen and, once again, Strasbourg. In 1897, he developed the cathode ray tube, which later served as the primary component in televisions and computer monitors. In addition, Braun improved wireless frequency tuning, created the basis for radio transmissions and invented the crystal diode rectifier, a forerunner of the transistor.

In 1900, Braun founded "Prof. Braun's Telegraphie GmbH," which later became "Telefunken AG." In 1909, Ferdinand Braun and Guglielmo Marconi shared the Nobel Prize in Physics for their "contributions to the development of wireless telegraphy." In 1914, Braun went to New York on behalf of Telefunken and was detained in the country in 1917 when the U.S. entered the war against Germany. One year later, he died in his house in Brooklyn as the consequence of an accident in New York City.

Johann Carl Friedrich Gauß 1777 - 1855

...was a German mathematician, astronomer, geodesist and physicist who contributed substantially to non-Euclidean geometry, countless mathematical functions, integral equations, number theory, the Gaussian curvature, the first solutions for elliptical integrals, and the Gaussian formula for determining the date of Easter.

While working on addition exercises at the age of seven, the child prodigy and native of Braunschweig (Brunswick) discovered the mathematical formula later known as the "Little Gauss." At 18, Gauss – whose studies were sponsored by the Duke of Braunschweig – created the basis of modern equalization calculation and mathematical statistics (least-squares method), which made the rediscovery of the asteroid Ceres possible in 1800. In 1807, he was appointed Professor of Astronomy and Director of the astronomical observatory in Göttingen, a post he held for the remainder of his life. Later he was also given the responsibility to carry out a geodesic survey of the Kingdom of Hanover. Along with his numbers and potential theory, he conducted research on the earth's magnetic field and developed the first geoid study.

Just a year after Gauss' death, the King of Hanover had a commemorative coin minted honoring the "Prince of Mathematicians." Since Gauss published only a small fraction of his discoveries during his lifetime, the world first found out about his extensive scientific work only after his diary was found in 1898 and evaluated.

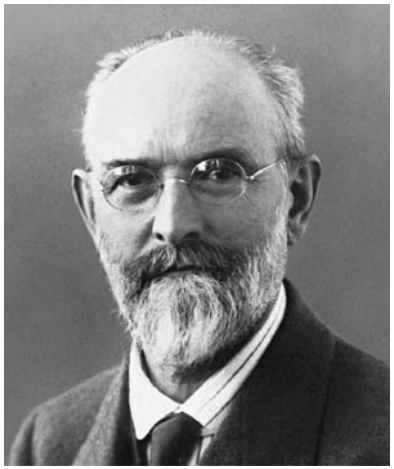
Hermann von Helmholtz 1821 - 1894

...was a German physiologist and physicist who was renowned for his pioneering research and developments in the fields of physiology, optics, acoustics and electrodynamics, as well as for closely integrating scientific research and technological practice.

Born in Potsdam near Berlin, Helmholtz received his degree in medicine and worked as a military doctor in Potsdam and as lecturer in anatomy at the Berlin Academy of Art before being appointed associate professor of physiology and pathology at the Prussian University of Königsberg. Following other professorships in Bonn and Heidelberg, Helmholtz was appointed professor of physics at the University of Berlin in 1871. He was founding president of the German Physical-Technical Imperial Institute (later the Association of German Electrical Engineers) in Charlottenburg, which he established along with Werner von Siemens.

Helmholtz discovered the principle of the conservation of energy, was the first to determine the wavelengths of ultraviolet light, calculated the capacity of the light microscope, and developed the three-component theory of color vision. His research work in hydrodynamics and on the theory of electrodynamics was also pioneering. Helmholtz succeeded in defining the mathematical formula for the First Law of Thermodynamics. He is also known as the founding father of modern meteorology based on his mathematical studies of meteorological phenomenon. In addition, he invented the ophthalmoscope, which made it possible for the first time to see the retina, and the ophthalmometer or keratometer, an instrument for measuring the curvature of the cornea.

Robert Bosch 1861 - 1942



...played a major role in the development of internal combustion engines, in particular their engine electronics and ignition systems. Among his other inventions, he developed low-voltage and high-voltage magneto ignition systems for internal combustion engines, the so-called “Bosch ignition.”

Robert August Bosch was born in Albeck, a village near Ulm in southern Germany. He attended a secondary technical school in Ulm, completed an apprenticeship as a precision mechanic, worked at first in the electrical tool industry and later attended lectures at the Technical University Stuttgart following his military service. In 1884, he traveled to the United States, where he worked for Thomas Alva Edison in the latter’s Menlo Park workshop until 1885. Following a further year abroad working for Siemens Brothers in England, he opened his own “Workshop for Precision Mechanics and Electrical Engineering” in Stuttgart in 1886. The business was converted to a public stock company in 1916 and was restructured as a private limited company “Robert Bosch GmbH” in 1937.

Bosch developed a low-voltage magneto ignition system for internal combustion engines as early as 1887. The development of the first commercially viable high-voltage spark plug by Bosch’s engineer Gottlob Honold paved the way for high-performance gasoline engines. In addition to numerous innovations such as diesel fuel injection systems, Bosch was the first company to deliver standard electrical and electronic equipment for automobiles.

VDE

Oskar von Miller 1855 - 1934

...was a German engineer, a pioneer in hydro power, and founder of the Deutsches Museum, a major institution of technology and science, in Munich. His outstanding contributions included construction of the first power plant in Germany and the first long-distance transmission of alternating current.

Oskar von Miller educated himself in the field of electrical engineering and organized the first electrotechnical exhibition in Germany, held in Munich in 1882. In partnership with Marcel Deprez, he succeeded in transmitting an electric current for the first time over a distance of approximately 60 kilometers, from Miesbach to Munich. Between 1883 and 1889, he served as a director of the German Edison Company (later AEG), together with Emil Rathenau. In 1884, he built Germany's first power plant in Munich. In 1890, he founded his own engineering bureau, which soon became prominent in the energy industry.

In 1891, he took over management of the electrotechnical exhibition in Frankfurt am Main. For this event, he succeeded in transmitting 20,000 volts of alternating current from Lauffen am Neckar to Frankfurt am Main, a technical masterpiece and a major breakthrough in the transmission of alternating current. Other pioneering projects included construction of the Schöngeising and Walchensee hydroelectric power plants in Bavaria, and development of Bavaria's power grid, as well as founding the forerunner of today's Research institute for Hydraulic Engineering and Water Management (Oskar von Miller Institute).

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