

## Polish Contributions to the Development of World's Sciences

**Banach, Stefan** (1892-1945), born in Krakow, Poland. He was a mathematician, developed the major concepts and theorems of functional analysis; the term Banach Space is known to every mathematician in the world. He published 58 works of fundamental importance. He was also a professor at the University of Lvov.



**Banachiewicz, Tadeusz** (1882-1954), astronomer, mathematician and geodesist. He established a mathematical method for calculating the orbits of heavenly bodies, known as the Cracovian Calculus. He also developed and applied the chronokinematographic method for observation of Sun eclipse. He wrote over 230 scientific works.

**Bartel, Kazimierz** (1882-1941), scholar and statesman, expert in analytical geometry and professor at Lvov Polytechnic, Prime Minister of Poland, and also a Minister of Education. He was also a professor of mathematics at the Lvov Technical University.

**Bialobrzeski, Czeslaw** (1878-1953), physicist. He was the first to take account of the influence of radiation pressure on stellar equilibrium.

**Biernacki, Edmund** (1866-1911), physician. He was the first one to note a relationship between the rate of disappearance of the red corpuscles in a human blood sample and the general condition of the organism. This method, known as the Biernacki Reaction, is universally practised in all laboratories in the world.

**Biezanko, Czeslaw** (1895-1986), entomologist and recognized authority on South American butterflies; established the generic classification of butterflies; two butterflies families were named after him; eleven entomologic species bear his name.

**Boguski, Jozef** (1853-1933), chemist; pioneer in chemical kinetics. He formulated the "Boguski Rule" concerning the dissolution of solids in liquids.



**Brozek (Broscius), Jan** (1588-1652), mathematician, physician; Rector of Jagiellonian University in Cracow; contributed to a greater knowledge of Copernicus theories. He was the most prominent Polish mathematician of the seventeenth century.

**Bryla, Stefan** (1886-1943), a construction engineer and welding pioneer. He was the author of basic methods of welding steel structures. In 1927, he built the first welded road bridge in the world. He also designed a high rise building called Prudential in Warsaw in 1932. He was executed by the Nazis in Warsaw in 1943.

**Burzynski, Stanislaw** (1943) born in Lublin, Poland. His main scientific accomplishments include discovery of antineoplastons and formulation of theory of biochemical defense system against cancer; invention of new treatment for cancer, AIDS, viral infection, autoimmune diseases, neurofibromatosis and Parkinson's disease. Dr. Burzynski obtained approval of 49 patents for his inventions and is author and co-author of 169 scientific publications.



**Cebertowicz, Romuald Adam** (1897-1981), famous Polish hydrotechnician. He created an electro-injection method of soil solidification.

**Celinski, Zdzislaw** (1847-1929), engineer, constructor of the railway Buenos Aires-Santa Fe and of the Port Gualeguaychu. Explorer of Mato Grosso and Gran Chaco.

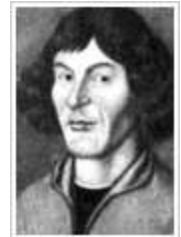


**Chalubinski Tytus** (1820-1889), physician; established systematic tuberculosis sanatoria in Zakopane in Tatra Mtns. Professor of the Medical-Surgical Academy and of the Principal School in Warsaw. He was a Tatra Mountains enthusiast and a student of folklore.

**Charpak, George** (1924-), the Nobel Prize winner in 1992, for the invention and development of particle detectors, the multiwire proportional chamber.

**Chrostowski, Tadeusz** (1878-1923), ornithologist, explorer of the Parana's wildlife, author of "On Some Rare Species in South Brazilian Birds."

**Copernicus, Nicolas** (1473-1543), Mikolaj Kopernik, outstanding astronomer, born in Torun, Poland. He developed the theory that Earth and other planets move around the Sun. He served as a physician, and also worked on the principles of currency reform. His astronomical observations were made using simple wooden instruments without lenses. In 1510 he wrote Commentariolus (a summary of his theory), which was not published until 1540. His most famous work is De Revolutionibus Orbium Coelestium (On the Revolutions of the Celestial Spheres). Thanks to Copernicus, the Earth became a planet not the center of the universe as it was considered.



**Curie-Sklodowska, Maria** (1867-1934), famous physicist, twice a winner of the Nobel Prize in 1903 and in 1911. Together with her husband Pierre Curie she discovered radioactive polonium and radium in 1898. Maria Sklodowska-Curie was the first woman awarded the Nobel Prize for physics; she helped to establish the Radium Institute in Warsaw in 1932. Her daughter, Irene, also received the Nobel Prize in Chemistry in 1935.

**Cybulski, Napoleon** (1854-1919), pioneer of the science of neurophysiology. In 1897, he announced his discovery of a mysterious substance secreted by the adrenal cortex and influencing blood pressure. This substance, named adrenalin, was the first hormone to be discovered. Cybulski advanced the hypothesis – a very bold one at the time – that adrenalin affects nerve cells. He also laid the foundations of electro-encephalography.

**Czekanowski, Aleksander** (1833-1876), born in Siechnow, Poland. He was a geologist, geographer – explorer of North-Eastern regions of Asia. He worked in Siberia and Asia where The Mountains of Czekanowski bear his name (long 320 kilometers and high 529 meters).

**Czekanowski, Jan** (1882-1965), famous anthropologist and ethnologist. He was the first to apply mathematical statistics in anthropological and ethnographic research in Central Africa. The methods of measurement and typology established by Czekanowski are now used by the majority of anthropologists. He was the author of the synthetic classification of Slavic ethnogenesis.

**Danysz, Jan Kazimierz** (1884-1914), physicist; student of Maria Skłodowska-Curie. He created a first spectrometer beta and also discovered the methods of studying beta rays in the magnetic field.

**Danysz, Marian** (1909-1983), physicist; son of Jan Kazimierz. In 1952, he co-discovered with J. Pniewski a new kind of matter, an atom nucleus, which alongside a proton and neutron contains a third particle: the lambda hyperon. Ten years later, they obtained a hyper-nucleus in excited state, and the following year a hyper-nucleus with two lambda hyperons.

**Dega, Wiktor** (1896-1995), orthopedic surgeon. He pioneered in medical rehabilitation of motion organ. He was the creator of original methods of healing.

**Dehnel, August** (1903-1962), biologist. He made an important discovery: the brain and cephalic box of the shrew changes dimensions twice a year, the variation being quite significant. This discovery is known as the Denhel Phenomenon.

**Dietl, Jozef** (1804-1878), physician who pioneered in balneology. He identified the kidney ailment known as "Dietl's Crisis." In 1858, at Dietl's insistence, the Balneological Commission of the Cracow Scientific Association conducted a physical and chemical analysis of the saline springs at Rabka: the springs were found to contain the best concentration of Iodine-bromine salines in Europe.

**Domeyko, Ignacy** (1802-1889), geologist; discovered a few until then unknown minerals. He was the father of Chilean mining industry and a president of University of Santiago. Domeyko produced the first geological map of Chile. He was also the Rector of University of Santiago during 1867-1883.



**Drzewiecki, Stefan** (1844-1938), pioneer airplane constructor. At first interested in submarines, he then studied the flying behavior of birds and developed the propeller theory. His dissertation, "Theorie generale de l'helice" (1920), was honored by the French Academy of Science as a fundamental work in the development of modern propellers.

**Fajans, Kazimierz** (1887-1975), physico-chemist, professor at the University of Michigan, pioneer of radiochemistry. He discovered, together with O. Goring, a new element protactinium, and parallel to F. Soddy – a basic principle of radioactive decay, known as Soddy-Fajans rule.

**Funk, Kazimierz** (1884-1967), born in Warsaw. He was a Polish biochemist who mainly worked in the US. He was a creator of word "vitamins" in 1912. He also created the hypothesis, that later became theory: undertaking the amount of vitamins can cause different diseases such as beri-beri, pelagry. Funk also worked on sex hormones, and he isolated tobacco acid. He was awarded the degree of Doctor of Philosophy from the University of Bern, Switzerland. In 1933, he published his first report on the discovery of vitamins.



**Godlewski, Emil** (1875-1944), embryologist, physician and also a professor at the Jagiellonian University in Krakow, Poland. He made various discoveries in the field of embryology. He showed the significance of cytoplasm in hereditary process.

**Goepfert-Mayer Maria** (1906-1972), physicist, who independently developed theory of structure of atomic nuclei. The Nobel Prize winner in 1963 in Physics for studies on nuclear shell structure. She was a professor at the University of California. Her works include Statistical Mechanics and Elementary Theory of Nuclear Shell Structure.

**Groszkowski, Janusz** (1898-1984), President of the Polish Academy of Sciences (1962-1972); discovered a new method of high-vacuum measurements and invented the JG vacuumeter. He developed the most important research into certain fields of electronics and radio-engineering. He also devised a method of analyzing non-linear electric oscillations, known as the "Groszkowski method of harmonious oscillations". Before the World War II., he published the first summary of the problems connected with cathode tubes.

**Gzowski, Kazimierz** (1813-1898), construction engineer of Polish descent. His company built the Grand Trunk Railway from Toronto to Sarnia (1853-57), and also the international bridge across the Niagara River at Fort Erie in 1873. He founded the Canadian Society of Civil Engineers in 1887.



**Heweliusz, Jan** (1611-1687), born in Gdansk, Poland. He was an outstanding astronomer who published the earliest exact maps of the moon. He made the most complete catalog of his time containing 1,564 stars. He was the first to conceive the possibility of a multiple-stage rocket and of rocket batteries. He was a member of prestigious international scientific organizations; he also wrote numerous works.

**Hirszfeld, Ludwik** (1884-1954), born in Warsaw, Poland. He was a professor of microbiology and immunology; established the foundation of knowledge of human blood types. He also introduced the new cholera vaccination while he had worked in Serbia. His works include the edition of first Polish medical periodical that dealt with experimental medicine. After War World II, he co-organized the Maria Skłodowska-Curie University in Lublin, where he taught.



**Hoene-Wronski, Jozef** (1776-1853), philosopher and scientist. He was devoted to such diverse disciplines as philosophy, mathematics, economics and politics. He tried to explain the aspects of all human activities. He also participated in the Kosciuszko Insurrection.

**Hoffmann, Roald** (1937), born in Zloczow, Poland. A chemist educated in the US; the Nobel Prize winner in 1981 for the "application of molecular orbital theory to chemical reactions." Together with Robert Woodward formulated the Woodward-Hoffman Rules of Orbital Symmetry. In 1962 he received his doctorate from Harvard University. He worked on the electronic structure of stable and unstable molecules. He developed the extended Huckel method, "a molecular orbital scheme which allowed the calculation of the approximate electronic structure of molecules." His second major contribution was "a two-pronged exploration of the electronic structure of transition sites and intermediates in organic reactions."



**Infeld, Leopold** (1898-1968), physicist; Rockefeller fellow at the Cambridge University. He was interested in the theory of relativity. He worked together with A. Einstein at Princeton University. These two scientists co-formulated the equation describing star movements. He was awarded the doctorate at the Jagiellonian University. He worked as a professor at the Toronto University.

**Jelski Konstanty** (1837-1896), ornithologist, discovered about sixty new species of birds. His specimens are displayed in Museum of Lima, Paris, Warsaw, and other European capitals.

**Kaliski, Sylwester**, scientist; developed the theory of connected magneto-thermo-mechanic fields. A group of scientists from the Military Technical Academy headed by Kaliski in collaboration with scientists from the Institute of Nuclear research obtained – with the help of a laser beam and a "Focus' type system – a plasma temperature of several tens of millions of degrees

Centigrade, i.e. a temperature at which thermonuclear microsynthesis occurs with the isolation of the neutrons of the synthesis. This result brought Polish science into the mainstream of world research as regards new, cheap sources of energy for the future.

**Konorski, Jerzy** (1903-1973), biologist; pupil of Ivan Pavlov. He introduced a new direction of research and established new theories concerning the physiology of the brain. He also explained the mechanism of acquired reflexes, known as secondary conditioned reflexes.

**Kostanecki, Stanislaw** (1860-1910), born in Myszakow, Poland. He was an organic chemist who pioneered in vegetable dye chemistry. In 1896, he developed the theory of dyes and studied the natural vegetable dyes. Among his many students were famous scientists Kazimierz Funk and W. Lampe.

**Krwawicz, Tadeusz** (1910), ophthalmologist. He was the inventor of tool for removal of cataract. He also discovered new methods of eye cryosurgery and cryotherapy. The Krwawicz method consists in rapid freezing of the tissue to be operated on.

**Las, Wanda**, physicist; author of twenty scholarly papers; took part in Manhattan Project (the code-name for the US effort during World War II to produce the atomic bomb).

**Lojasiewicz, Stanislaw**, mathematician. At the end of the fifties, he solved the problem of distribution division by analytical functions. Its solution opened the road to important results in the new theory of partial differential equations. The method established by Lojasiewicz led him to advance the theory of semi-analytical sets, which opened an important chapter in modern analysis.

**Lukasiewicz, Ignacy** (1822-1882), inventor, developed a product called "nafta" kerosene (1852); invented the petroleum lamp, established the world's first oil "mine" in Bobrka near Krosno (1854) and built the first refinery in Ulaszowice near Jaslo. He replaced hand mining with drilling machinery and steam power.



**Lukasiewicz, Jan** (1878-1946), logician; professor and Rector of Warsaw University. As an author of "Polish notion," he became the founder of the "new triple logics" and member of Lvov-Warsaw school of mathematical logic. He made a number of original contributions to its methodology, of which the most important was his critical study of contradictions in Aristotle's philosophy. Lukasiewicz also dealt with the theory of probability.



**Malinowski, Bronislaw** (1884-1942), born in Krakow, Poland. He was one of the most important anthropologists of the XX century, a founder of social anthropology. He contributed to ethnography, sociology, linguistics, psychology and the theory of culture. He received the doctorate degree from the Jagiellonian University in Krakow, and also the doctor of science from the University of London, where he taught social anthropology. Among his internationally recognized books are: Argonauts of the Western Pacific, Crime and Custom in Savage Society, and Sex and Repression in Savage Society.

**Malinowski, Ernest** (1818-1899), born in Seweryny, Poland. He constructed the TransAndean Railroad in Peru, the highest in the world (4,768 meters above the sea level); this work also involved construction of a few dozen of mountain tunnels and inter-mountain bridges.

**Marchlewski, Leon Pawel** (1869-1946), worldwide known scientist and chemist. He proved that chlorophyll and hemoglobin originate from the same common parent substance – hemopyrol.



**Michelson, Albert Abraham** (1852-1931), physicist, who developed a theory of relativity. He was born in Strzelno, Poland. He invented an interferometer for measuring distances by means of the length of light waves;

measured a meter on terms of the wave of cadmium light. This experiment showed that there is no absolute motion of the earth relative to an ether. He was awarded the Nobel Prize in physics in 1907.

**Modjeski, Ralph** (1861-1940), engineer, who constructed the Delaware River Bridge from Philadelphia to Camden, N. J., which was in 1926 the longest suspension bridge in the world. He also built the Trans-Bay Bridge in San Francisco. He was a son of a world famous actress Helena Modjeska (Modrzejewska).



**Moscicki, Ignacy** (1867-1946), a scientist and President of Poland during 1926-1939. He was the inventor of nitrogen acid production from the atmosphere. He also invented a new method of concentrating nitrogen acid and sulfuric acid. Moscicki established a big chemical plant to produce nitric acids from ammonia.

**Mrozowski, Stanislaw**, nuclear scholar, known for activities in Manhattan Project.

**Natanson, Jakub** (1832-1884), chemist, discovered two new methods of synthesizing urea and aniline. He invented the first artificial pigment, fuchia.

**Nencki, Marcell** (1847-1901), a medical doctor and chemist physiologist. He discovered the therapeutic agent – salol and bacteria, which are capable of subsisting in the anaerobic atmosphere. He also found that the synthesis of urea in the organism takes place in the liver.

**Nernst, Walther Hermann** (1864-1941), physical chemist known for his enunciation of the third law of thermodynamics. He developed an electric lamp, called the Nernst lamp, which was more efficient than the old carbonic lamp. He received the Nobel Prize in chemistry in 1920.



**Ochorowicz, Julian** (1850-1917), engineer, physician, psychologist, and philosopher. In 1878, Kosmos, a Lvov periodical, published his article, in which the future technique of transmitting moving pictures was correctly forecast. Therefore, Ochorowicz can be said to have been one of the first to conceive the idea of television.



**Olszewski, Karol** (1846-1915), chemist, physicist and expert of low temperatures; the first scholar who liquefied nitrogen and oxygen; he also discovered a method of hydrogen liquefaction and constructed machinery for that purpose, which enabled him to reach the then-lowest world temperature,  $-225$  C.

**Orlicz, Wladyslaw** (1903), mathematician; author of a new space in functional analysis known as “Orlicz space”.

**Jakub Parnas** (1884-1949), biochemist. He was the first to introduce the isotope method in the study of changes in phosphorus compounds in the organism.

**Pniewski Jerzy** (1913-1989), physicist; co-discovered with M. Danysz a hypernuclei and hypernuclear isomery.

**Prazmowski, Adam** (1853-1920), one of the founders of Polish microbiology. He discovered, independently of Martinus Beijerinck, nitrogen assimilating (papillose) bacteria.

**Proszynski, Kazimierz** (1875-1945), inventor. In 1894, he built one of the first cinema cameras in the world. This pleograph, or apparatus for taking photographs and projecting pictures, was built before the Lumiere Brothers lodged their patent. Proszynski also made the first pocket film-camera and devised a method of synchronizing sound and film tracks. He died in the Nazi concentration camp of Mauthausen in 1945.

**Rostafinski, Jozef** (1850-1928), cytologist. He discovered the phenomenon of merogony – development of the egg, or fragment of it, without the nucleus and artificially inseminate – and myxomycete taxonomy.

**Rudnicki, Konrad**, astronomer. He discovered several super-nova stars – one, found between two galaxies, was the first such discovery to be made in the history of astronomy – and has had a comet named after him. He also advanced a new hypothesis on the structure of galactic clusters.

**Reichstein, Tadeusz** (1897-1996), born in Wloclawek, Poland. He was the Nobel Prize winner in 1950 in Medicine and Physiology for the discoveries relating to the hormones of the adrenal cortex – structure and biological effects. He succeeded in synthesizing vitamin C (ascorbic acid) in 1933. Reichstein also worked on glycosides of plants.



**Schally, Andrew Victor** (1926), born in Wilno, Poland. He was the Nobel Prize winner in 1977 in Medicine for research work. He developed a whole new realm of knowledge concerning the brain's control over body chemistry. His works were also concentrated on birth control methods and growth hormones. He was awarded an honorary Doctoral Degree from Jagiellonian University at Cracow.

**Schauder, Juliusz** (1896-1942), mathematician. He was the first to apply the method of functional analysis in differential equations.

**Sedziwoj, Michal** (1566-1636), famous Polish alchemist. He was the first man in history of chemistry to describe oxygen – “the food of life, which exists in the air”. He advanced the theory of combustion and breathing.

**Sendzimir, Tadeusz** (1894-1989), Polish scientist. He was an inventor of new methods of cold and hot rolling of steel. In 1939, he moved to the US. Sendzimir was a recipient of an Honorary Degree from the University of Mining and Metallurgy

**Siemienowicz, Kazimierz**, 17-century deputy of the Polish Royal Artillery; may be considered a precursor of space flight. His ideas seemed amazing at the time: he was the first to conceive the possibility of a multiple-stage rocket and of rocket batteries.



**Sierpinski, Wacław** (1882-1969), mathematician. He was a father of the famous Polish School of Mathematics. His most important works are in the area of set theory, point set topology and number theory. He was also the founder of the world famous mathematical journals of that time (1920): *Fundamenta Mathematicae* and *Acta Arithmetica*.

**Skarzynski, Boleslaw** (1901-1963), microbiologist. He discovered the mechanism of assimilation of non-organic sulphur compounds by bacteria.

**Smoluchowski, Marian** (1872-1917) physicist and professor of universities of Lvov and Cracow. In 1906, independently of Einstein, he established a correct hypothesis on the theory of Brownian movement. His studies on thermodynamic fluctuation, i.e. on random condensation and the dilution of matter in gases, confirmed the theory of the existence of atoms and particles, which was still being questioned at the time.



**Sniadecki, Jan** (1756-1830), greatest Polish mathematician and astronomer at the turn of the 18th century. He published many works, including his observations on recently discovered planetoids. His observations, contained in *O rachunku losow* (On the Calculation of Chances, 1817) on the possibilities of a theory of probability, were of a pioneer nature.

**Sniadecki, Jędrzej** (1768-1838), born in Znina, Poland. The younger brother of Jan, Jędrzej was a chemist, medical doctor, biologist and philosopher. He is the author of the first Polish chemical handbook; he described scientifically the Polish chemical nomenclature.

**Stern, Abraham** (1769-1842), scientist. In 1817, he demonstrated the "first calculating machine in the world which could perform the four basic arithmetical processes and extract roots". He named it the arithometre. Stern also built a harvester and thresher, as well as various measuring instruments of strikingly novel design.

**Strzelecki, Pawel Edmund** (1797-1873), geographer, geologist, member of the Royal Society, explorer and discoverer of mineral layers (minas gerais), Indian culture researcher. He contributed to early Australian history. Thanks to him, many Australian places have Polish names, such as Kosciuszko Mountain in Australian Alps.

**Swietoslowski, Wojciech** (1881-1968), physico-chemist, father of thermochemistry. He designed a microcalorimeter and various other types of calorimeters. He also was a founder of ebullioscopy. Swietoslowski was a candidate for the Nobel Prize award before the World War II for his sensational work on the theory of liquid-steam balance systems and on problems of the distillation of carbon compounds.

**Szczepanik, Jan** (1872-1926), inventor; sometimes called the "Polish Edison". Szczepanik patented many important inventions which were of use in textile machinery, electric television, color photography and films, and devised a method for the optical registration of sound.

**Tarski, Alfred** (1901-1983), mathematician and logician; his famous theorem, established jointly with S. Banach, on the decomposition of the sphere, as well as his theory of inaccessible cardinals, have a definite bearing on the epistemology of mathematics.

**Ulam, Stanislaw, Marcin** (1909-1984), an American nuclear scholar born in Poland; known for his activities in Manhattan Project (1942-1947) that led to the creation of nuclear weapons in Los Alamos. He solved the problem of how to initiate fusion in the hydrogen bomb. The plan Orion was proposed by Ulam for nuclear propulsion of space vehicles. He also worked as a professor at Harvard University.

**Wasiutynski, Aleksander** (1859-1944), expert on rail communications. He introduced modern methods of track laying. He also devised a theory on the strength of railway tracks.



**Wolfke, Mieczyslaw** (1883-1947), physicist. Together with W. H. Keesom, Wolfke discovered helium II. He also established the theoretical principles of holography, long before Denis Gabor.

**Wolszczan, Alexander** (1946), astronomer, who first discovered an extrasolar planet.

Woytkowski, humanist by trade and naturalist by vocation, collected specimens of etnofauna and flora for Peruvian and North American museums; some of his specimens are bearing his name.



**Wroblewski, Zygmunt** (1845-1888), physicist; he researched the phenomena of gas diffusion in liquids and solids. Of special importance was his research in the field of low temperatures. Together with K. Olszewski, he liquefied oxygen and nitrogen; he also solidified carbon dioxide and alcohol and discovered a critical formula for stabilizing hydrogen molecules.

**Zakrzewska, Marie Elizabeth** (1829-1912), female obstetrician; educated in Berlin, Warsaw and Cleveland. She was the first woman physician in New England. Zakrzewska organized a hospital in Boston, which was one of the first American professional schools for nurses.