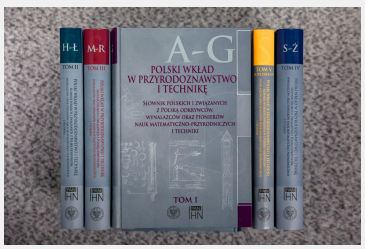
Institute of National Remembrance

Prof. Bolesław Orłowski: Polish contribution to natural sciences and technology – an abstract

Until the partition of Poland, Poles had mostly been passive participants in European culture. The wave of emigrants after the fall of the November Uprising had the opportunity to study at French universities, primarily in professions useful to the military, with a view to liberate and modernize their homeland. The emigration fueled by waves of refugees from subsequent Polish uprisings gradually scattered around the world, carrying out the mission to promote civilizational progress.



Polish Contribution to Natural Science and Technology. Dictionary of Polish and Poland-Related Explorers, Inventors and Pioneers in Mathematics, Natural Sciences and Technology book cover

Until the partition of Poland, Poles had mostly been passive participants in European culture. At that time, Europe experienced the laying down of the foundations of empirical science, marking the onset of the Industrial Revolution. As a result of intensified contacts with France which began with the Napoleonic Wars, Poles soon realized their backwardness. The wave of emigrants after the fall of the November Uprising had the opportunity to study at French universities, primarily in professions useful to the military, with a view to liberate and modernize their homeland. After hopes associated with the Spring of Nations collapsed, the emigration fueled by waves of refugees from subsequent Polish uprisings gradually scattered around the world, also to countries outside of Europe. There, they carried out their mission to

promote civilizational progress. In addition, since the 1880s, Poles migrated in much greater numbers, mainly to the USA, and also to Brazil in search of a better life.

As a result, the most prominent representatives of Polish science and technology dispersed throughout the world, and were active under the auspices of various countries.

Several hundred of them participated in the Europeanization of the Turkish empire, back then extending from the Danube to the Persian Gulf. There, they built an electric telegraph network, monopolized the national engineering corps, modernized agriculture and forestry, and conducted mining and cartographic work (Karol Brzozowski, Franciszek Sokulski).

Several dozen made important contributions to building the foundations of modern Peru, including establishing the first Latin American university of technology in Lima (Edward Habich), modernizing the local university (Władysław Folkierski) and building the Central Trans-Andean Railway (Ernest Malinowski), until recently the highest located route in the world.

Poles in Chile (Ignacy Domeyko), Portugal (Józef Chełmicki), Norway (Aleksander Józef Waligórski), Greece (Zygmunt Mineyko), Switzerland (Aleksander Stryjeński, Antoni Patek, Gabriel Narutowicz, Ignacy Mościcki), Brazil (the Brodowski brothers, Bronisław Rymkiewicz), Argentina (Robert Chodasiewicz, Czesław Jordan Wysocki), and Venezuela (Wojciech Lutowski) were also very successful in their

respective fields.

In the decades that followed they made significant contributions to the development of natural sciences, science and technology in the USA (Rudolf Modrzejewski, Erazm Jerzmanowski, Józef Tykociński-Tykociner, Juliusz Edgar Lilienfeld, Kazimierz Fajans, Kazimierz Funk), France (Maria Skłodowska-Curie, Stefan Drzewiecki), Germany (Ludwik Hirszfeld, Jan Czochralski, Ludwik Eberman) or the Netherlands (Mieczysław Wolfke).

Outstanding representatives of the natural sciences were also among the Polish deportees to the Russian Empire after the uprisings. They contributed to research in Siberia, at times making discoveries of worldwide importance, e.g. endemism of the Baikal fauna (Aleksander Czekanowski, Jan Czerski, Benedykt Dybowski, Wiktor Godlewski).

In the Russian Empire of the Tsars, the engineering corps originating from Poland, educated mainly in Russia, was of key importance. Well over a thousand of them graduated from the St. Petersburg Institute of Communication Engineers, where, at times, the number of Poles reached 40%.

Poles built land and water infrastructure, engaged in mining and their pioneering achievements included oil extraction from under the bottom of the Caspian Sea (Witold Zglenicki). They were most active in the field of railroad expansion and related steel truss bridges. They made up about 20% of the managerial staff constructing the Great Trans-Siberian Railway. The East China Railway (and also Harbin) was largely

their work. Thus, they spread modern technical civilization over vast territories of the Russian Empire, strengthening it economically and, incidentally, contributing to the consolidation of its authority over the people living there.

Many of these Poles who were part of the Russian engineering corps were among its top leaders. They made a tangible contribution to the development of technology (e.g. Karol Adamiecki, Feliks Jasiński, Stanisław Kierbedź Sr., Stanisław Kierbedź Jr., Aleksander Wasiutyński), many of them lectured at Russian universities and were active in the field of inventions (Stefan Drzewiecki). Despite unfavorable attitudes towards Polish people and the personnel policy of the Tsarist state, they built a strong professional and social position for themselves.

In Galicia, in the mid-1850s, the pioneering worldwide extraction and processing of crude oil was initiated (Ignacy Łukasiewicz), innovative methods in oil and gas mining were introduced by Wacław Wolski, the inventor of the hydraulic drilling ram (1902).

Since the 1870s the Polish self-government had been established throughout Galicia, which led to, among other things, the re-Polonization of local universities. In 1883, at the Jagiellonian University, Zygmunt Wróblewski and Karol Olszewski were the first to liquefy the basic components of atmospheric air – nitrogen and oxygen, creating a world-leading center for cryogenic research (in 1894, at the request of William Ramsay, argon discovered by him was liquefied and its properties were examined there). The physicists Marian Smoluchowski and Władysław Natanson carried out their ground-breaking work in

Cracow, and from 1873 the Academy of Learning was active there.

The Polytechnic School, the first long-lasting Polish technical university (renamed as the Lviv Polytechnic in 1921), had been operating in Lviv since 1877. It had high-class scientific staff headed by the pioneer of the theory of elasticity, Maksymilian Tytus Huber. By the turn of the century, it had already educated more than 700 students. It became the center of the technical journalism and engineering association movement.

The partition of Poland and the subsequent wave of emigration resulted in a significant number of Polish scholars and engineers working abroad, some of whom were among the top specialists in their fields. Most of them returned to reborn Poland, leaving key posts, well-paid jobs, and circles in which they had had recognition and an established position. As a result, the Second Republic had scientific and technical staff far surpassing what could be expected from a country of this size and geographical location.

It included the renowned luminaries already mentioned above, such as Mościcki, Huber, Narutowicz, Wasiutyński or Czochralski, but also a large group of younger people who only began their careers in the Second Republic, such as Tadeusz Wenda (the creator of Gdynia), Tadeusz Sędzimir (who revolutionized rolling and zinc plating of metal sheets on a global scale), Janusz Groszkowski (the pioneer of radar), Stefan Bryła (the pioneer of welding in the construction industry), Eugeniusz Kwiatkowski (the creator of the Central Industrial District), Wacław Szukiewicz (the creator of synthetic rubber KER), and several

aircraft constructors (among others Zygmunt Puławski, Jerzy Dąbrowski).

Overcoming many difficulties arising from the legacy of the partition of Poland, the atrocities of the war and the world crisis of the early 1930s, they laid the foundations of modern Poland. They developed the nitrogen, steam engine, and aircraft industries (as the only ones in history without the backing of a domestic automobile industry). They built a modern seaport in Gdynia, handling half of Poland's foreign trade. They initiated the Central Industrial District, which was to save the Second Polish Republic, ensuring its economic self-sufficiency and strengthening its defense (by 1939, 100 out of 400 planned cutting edge industrial plants were built).

Polish mathematics leaped to prominence around the world, having at its disposal several top-class talents headed by Stefan Banach. A group of mathematical cryptologists led by Marian Rejewski fathomed the secrets of the German electro-mechanical Enigma ciphering machine in 1932, which laid the foundations for the operations of the British intelligence center at Bletchley Park from 1939. Polish physicists conducted important research on luminescence (Stefan Pieńkowski) and actively participated in the study of cosmic radiation (Stanisław Ziemecki).

After the September 1939 defeat, which could not be avoided due to the huge material advantage of the aggressors, Polish engineers and scientists continued to fight alongside the Polish Armed Forces in the West. According to the records from 1 January 1944, there were 5,592

of them, mainly in the United Kingdom, 4,049 them in the Armed Forces. By creatively perfecting militarily equipment, they were instrumental in shortening the war and reducing Allied losses. Their most important achievements included Rudolf Gundlach's reversible tank periscope, which provided a full field of vision; Józef Kosacki's electromagnetic mine detector (used since the battle of El Alamein in November 1942); Jerzy Podsędkowski's Polsten anti-aircraft gun; Jerzy Rudlicki's improved bomb-dropping system (installed in the American B-17 *Flying Fortress* aircraft since 1943); Wacław Struszyński's bearing antenna making it possible to locate emerged German submarines when they radioed their bases; Henryk Magnuski's contribution (3 key patents) to the development of the SCR-300 portable radio set (*walkie-talkie*), used by the US Army since 1943; pioneer WS nº10 radio line created by the British team led by Zygmunt Jelonek, allowing the command of the Operation Overlord (June 6,1944) to communicate through eight channels with troops fighting on the Normandy beaches.

These praiseworthy achievements, which certainly had no less impact on the development of World War II than Polish victories on the battlefields, have only recently been made known to us because they had been enveloped in a shroud of silence by the communist mass media. Just a few of their creators returned to post-Yalta Poland.

The People's Republic of Poland was a part of the Soviet empire, so with the beginning of the "Cold War", the opportunities for creative participation in the mainstream of the world’s scientific and technological development were very limited for Poles working in the

country. The anti-market and bureaucratic economy was not conducive to the spirit of invention. The only domestic inventor of the world class was Tadeusz Rut, the creator of the method of forging crankshafts weighing up to 40 tons with a special press, which he improved from 1961. Between 1965 and 2009, the license for his solution was sold all over the world, mainly to highly developed countries.

The industry was greatly expanded, but it did not meet modern requirements for manufacturing efficiency or quality. Its central management led to pathologies and even violations of one the basic principles of the civilization we have lived in since the Sumerians, namely the social division of labor. The authorities flaunted export of thousands of complete industrial facilities, mainly to the so-called Third World countries, and one of the main reasons for this success was cheap labor in Poland.

At the same time, Polish professionals active in the West after World War II achieved many spectacular successes.

Brilliant mathematician Stanisław Marcin Ulam made a key contribution to Edward Teller's development of the hydrogen bomb (1952).

Versatile inventor Stefan Tyszkiewicz was awarded the Grand Prix at the Brussels Expo 58 general exhibition for his electronic methods of remote dictation and playback, equipped with code protection.

Tadeusz Marek constructed improved extremely efficient 6- and 8-cylinder car engines for the Aston-Martin company.

Stanisław Prauss, Zygmunt Cyma, Gustaw Mokrzycki, Janusz Przemieniecki shone as aircraft designers and aerodynamicists, and Edward Skurzyński was a successful rocket engineer.

Mieczysław Bekker was the main creator of the Lunar Roving Vehicle, used three times by American astronauts in Apollo 15, 16 and 17 missions (1971-1972).

Jerzy Nomarski in France obtained 26 patents for optical inventions, including interference contrast, perfected since 1950 and used in subsequent generations of optical ultramicroscopes.

Andrzej Rozwadowski was the creator of the CN Tower in Toronto (1976), which back then, at 533 metres, was the highest TV tower in the world.

Our compatriots also specialized in spatial structures (coverings) over stadiums, hangars, railway stations, and temples (Zygmunt Stanisław Makowski, Stefan du Château, Edmund Obiała).

Prof. Bolesław Orłowski

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