

Zbigniew WOJCIK *

IGNACY DOMEYKO (1802—1889)

This eminent scientist, academic teacher and organizer of scientific education and institutions, was the best known Polish mineralogist of the 19th century active abroad. Because of political situation, in this century fairly numerous mineralogical papers were published abroad by Polish scientists as e.g. by S. D. Borkowski (1782—1850), L. Zejszner (1805—1871), F. Kreutz (1844—1910), S. J. Thugutt (1862—1956) and J. Morozewicz (1865—1941). Ignacy Domeyko has left a considerable scientific output documented by rich collections sent from South America to various institutions as: École des Mines and Musée d'Histoire Naturelle in Paris, Academy of Sciences and Jagellonian University in Cracow, University in Warsaw etc. Numerous South American minerals were described by him for the first time. One of them — copper arsenide Cu_3As — was called in his honour *domeykite* by W. Haidinger in 1845. In 1949, V. I. Mikheiev has distinguished two varieties of this mineral — α and β .

Domeyko spent in Chile nearly the whole period of his scientific activity. He created there a modern educational centre for miners, chemists, mineralogists and metallurgists in Coquimbo (N of Santiago de Chile). Besides, he has modernized the system of higher schools there, forming so called German type of university as it was the case with his parent University of Vilno. For many-years he was leading this modernized University (1852—1883) and since 1867 was elected its rector. He was also merited as mining judge and assay officer in Chile and as a member of ecclesiastic-state commission on pacific colonization of Auracan area inhabited by native Indians. As educational activist he tended to restrain impulsive character of Chileans by subordinating lower and medium schools to teachers of high moral reputation, mainly priests. Grateful Chileans have offered to this Polish immigrant honorary citizenship of their country and called him the Apostle of Science.

Informations on Domeyko's achievements have reached soon his motherland Poland, being in 19th century under occupation fo Russia, Prussia and Austria. It should be emphasized that his name (Ignacy-Żegota) was commemorated by Adam Mickiewicz in his poem *Pan Tadeusz* (Mr. Thad-

* Museum of the Earth, Polish Academy of Sciences, 00-488 Warszawa, Al. Na Skarpie 27, Poland.

deus) and in the 3rd part of the drama *Dziady* (Ancient popular ceremony of calling forth the ghosts). Besides, in the second half of 19th century, some Domeyko's papers were published in Vilno, Poznań, Cracow and Warsaw, including his treatise on Auracan Indians (1860), memoirs from student times in Vilno (1873), articles on Chile (including geological studies in the Andes). Domeyko's arrival to motherland and his stay in Poland (1884—1888) was celebrated like a national holidays. Everybody was admiring his deep knowledge and perfect Polish language, no matter of more than 50 years spent by Domeyko abroad.

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Ignacy Domeyko was born on 31 July 1802 in Niedźwiadka, situated ca. 100 km SW of Bielorussian Minsk, in a landed proprietor's family. One of his uncles — Józef — studied, at the end of 18th century, at the Bergakademie Freiberg (Saxony) where mineralogy was lectured by A. G. Werner. Our future mineralogist was educated in the house of another uncle Ignacy, a Lithuanian lawyer.

I. Domeyko has accomplished secondary school in 1816 in the Piarist educational centre in Szczuczyn and was immatriculated as the youngest student of the Mathematical—Physical Faculty of the Vilno University. Already in 1817 he got the first scientific degree of candidate of sciences and in 1822 — the M.Sc. one on the ground of thesis on mathematics. Political events have crossed his plans to begin engineering studies in Berlin.

In 1818, during his studies in Vilno, Domeyko joined secret self-educational student society called „Filomat association” grouping several outstanding persons as the greatest Polish poet Adam Mickiewicz, geologist Tomasz Zan and others. In 1823 this association was detected. Consequently, T. Zan was imprisoned, A. Mickiewicz and others deported to Russia and Domeyko was settled in a village under police control. This punishment was suspended in 1829 but Domeyko's attempts to get job in Warsaw were not successful. Consequently, he was working at home, translating various books, including AlKoran, and supporting financially his friends deported inside Russian Empire.

In 1830, the insurrection against Russian occupation broke out in Warsaw and in the next year was spread to Lithuania. Domeyko joined insurgent troops and, after several months of fighting, was forced with it to cross the Prussian frontier, being interned till 1832. Soon, together with A. Mickiewicz, he moved to Paris where they arrived in August 1832.

During his stay in Paris (1832—1838), Domeyko continued his studies in various higher schools (Sorbonne, Collège de France, École des Mines de Paris). After three-year studies in the last one, he got in 1837 the degree of mining engineer and started to work as geologist in Alsace. Soon, following suggestion of the directory of École des Mines, Domeyko has signed a 6-year contract to take up the duties of school-teacher in Coquimbo, Chile. In 1838 he started to teach there physics, chemistry, mineralogy, mine surveying and other subjects. Simultaneously he organized there chemical laboratory and mineralogical cabinet. His Chilean pupils were soon employed in local mining and metallurgy.

In 1842, as a member of the Council on Public Education, Domeyko started to lecture chemistry, mineralogy and physics at the Institutio Na-

cional de Chile. Simultaneously, he was preparing a programme of reform of educational system consisting in the change of so called French model into the German one in secondary and higher schools of this country. This reorganization was based on the experiences of Vilno scientific centre at the beginning of 19th century. In 1852 this programme was accepted by the government and Domeyko was nominated the University Delegate (i.e. prorector charged with the affairs of higher schools) within the National Institute. In 1867 I. Domeyko was elected the rector of modernized, well equipped university, being reelected in 1872, 1877 and 1882. Consequently, for many years he was leading the whole Chilean education system.

In 1850 Domeyko was married to Henriette Sotomayor with whom he had four children: Anna, Henryk, Herman and Kazimierz. After her death (1870) he was educating them alone. In 1877 Anna was married to her cousin Leon Domeyko and soon moved to Lithuania.

In 1883 I. Domeyko resigned of his post of rector and with sons moved to Europe, where Herman started theological studies in Rome and Kazimierz — mining sciences in France and Freiberg (Saxony). After having visited Cracow and Warsaw, he arrived to his parent Lithuania to stay with his daughter and son-in-law. No matter of numerous visits to France, Italy, Germany and even Palestine, Domeyko elaborated in his motherland essential part of Memoirs and several scientific publications.

In autumn 1888 he moved back with his sons to Chile. Unfortunately, on the board of ship he felt heavily ill. In Santiago his health was temporarily improved and he was able to prepare the catalogue of Chilean rocks, minerals and fossils. Ignacy Domeyko died on 23 January 1889 and his funeral in Chilean capital at local cemetery was a great patriotic manifestation¹.

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A. Bolewski, author of the handbook *Mineralogia szczegółowa (Descriptive mineralogy)* characterized Ignacy Domeyko as one of the most prominent Polish mineralogists who, for political reasons, had to work abroad. His numerous scientific publications and fundamental monograph *Elementos de minerologia* (1845) should be considered as the most important Polish contribution to general development of mineralogy. Though more than 100 years passed since its edition, it is still considered in Latin America as fundamental source of knowledge on minerals².

Domeyko's important scientific achievements were due to several factors. He obtained very thorough education in chemistry, mineralogy, geology, mathematics and physics in Vilno and Paris. Domeyko was not only very clever but also very laborious scientist. Besides, all the vacancies he was spending in the field, systematically collecting rich materials for laboratory studies. Moreover, his numerous pupils in South America were sending him mineral samples found in their countries. Consequently, no matter of very time-consuming didactic and organisational activity, Domeyko continued research works initiated in Coquimbo, resulting in nearly 600 publications. Half of them refers to natural sciences (geology, mineralogy, geophysics and others). Besides, several unpublished manuscripts were deposited in various archives in Chile, France and Poland. I. Domeyko's *Opera omnia*, edited in 1903, contain but these publications which are connected with his long stay in Chile. During his stay in Paris

(1832—1838), Domeyko documented his geological interests by publishing *Notice sur les changements qu'a subis la cote prussienne de la mer Baltique depuis les temps historiques* (1837). He refers in it to his works on the Atlas of Poland, consisting of 3 maps: hydrographic (published), industrial and geologic (which remained in manuscript), with explanations (manuscript saved). Unfortunately, Domeyko's departure to Chile and A. Mickiewicz's indolence as editor, resulted in only partial publication of these data.

There are no documents concerning Domeyko's field works in Alsace in 1836—1837. His map of occurrence of iron ores in E France was not found.

In the period 1838—1846 his geological explorations in N Chile were carried out from living base Coquimbo. From this locality he has examined E part of this country up to Argentinian frontier (Atacama desert) and the regions inhabited by Indians in the south.

During this period Domeyko published several handbooks on chemistry, physics, meteorology and mineralogy. Particularly important was, already mentioned, manual *Elementos de mineralojia* (1845, reedited in 1854, 1860 and 1879 with appendices). Moreover we have to mention the following publications: *Auracania i sus habitantes* (1845), *Tratado de ensayes* (Treatise on assay, 1844) and several reeditons. Numerous scientific papers elaborated in Coquimbo were sent by Domeyko to France and published in *Annales des Mines* whilst abstracts and summaries in German periodicals. Consequently, in the years 1840—1846 there appeared in France 6 papers devoted mainly to chemical studies on minerals occurring in the environs of Coquimbo and Capiapo in N Chile. In the treatise *Memoire sur la constitution géologique du Chili* (1846) he published general geologic map of this country and documentation of Jurassic sequence, correcting some Darwin's errors. In the above papers particular attention was paid to silver, copper, lead, mercury and arsenic ores. These minerals were occurring in specific parageneses different from those met in Europe. In 1845, when returning from Auracania, Domeyko examined the active volcano Antuco and published his observations in 1848 in *Annales des Mines*.

During his stay in Santiago (1846—1889), Domeyko's original papers were still published mainly in European periodicals and only some in *Anales de la Universidad de Chile*. His scientific-popular sketches and other articles were appearing in daily and monthly newspapers in Chile, Poland and other countries.

When working in the National Institute of Santiago (1847—1851), Domeyko published a treatise *Metalurgjia de la amamgamacion americana* (1849), as well as hydrogeologic, petrographic and mineralogical papers e.g. on lead and copper vanadates, pit-coal etc. In this period there also appeared a treatise on lateral solfataras of Cerro Azul volcano in Talca Cordillera (SE of Santiago), originated in 1847. During this expedition Domeyko was in very serious danger, subjected to the action of poisonous gases and abandoned by his guides.

In the years 1852—1867, when employed as University's Delegate, Domeyko published several important papers reporting e.g. on argentiferous tetrahedrites and feldspars from volcanic lavas (1853), salt minerals from Atacama (1854), natural amalgams (1857) and on several, supposingly, new minerals as taltalite (1860) or toconalite (1867) which were found recently

to represent mixtures of tourmaline with copper ores and of silver and mercury iodides respectively. Very well known is his paper *Memoire concernant les grandes masses d'aérolithes, trouvées dans le désert d'Atacama dans le voisinage de la Sierrades Chaco* (1864). Domeyko and his pupils have collected fairly large specimens (up to 20 kg in weight) of this meteorite which were sent to several museums and scientific centres in Europe and America. Worth mentioning are also his papers on mineral and fresh waters, earthquakes and geological observations in Andean mountain belts.

Very fruitful was also the period of Domeyko's rectorship of Santiago's University (1867—1883) when he published the characteristics of several interesting, partly new minerals, as daubréeite $\text{BiO}(\text{Cl}, \text{OH})$, kröhnkite — $\text{Na}_2\text{Cu}(\text{SO}_4)_2 \cdot 2 \text{H}_2\text{O}$ (1876), castillite = guanajuatite — $\text{Bi}_2(\text{Se}, \text{S})_3$ and bordosite — silver amalgam containing more Hg (ca. 31 wt. %) than kongsbergite (1879). Besides, Domeyko has analysed minerals contained in guano, mineral waters, meteorites etc. In 1878 he published in *Transactions and Reports of the Academy of Sciences in Cracow* a detailed paper entitled *Rzut oka na Kordyliery chilijskie i zawarte w ich tonie pokłady metaliczne* (General description of Chilean Cordilleras and metallic deposits contained in them).

The last period of his life (1883—1889) Domeyko spent mainly in Europe, moving to various countries, including Palestine. All these visits did not disturb him to publish several papers in Paris and in Cracow e.g. on earthquakes, geography of Polish territory etc. But, first of all, in these years he has written detailed memoirs and their manuscripts were deposited by family in the Academy of Sciences in Cracow. They were published in Poland in 1962—1963 and the first two volumes were also edited in Spanish. In the last years of his laborious life Domeyko has prepared *Catalogue de la collection minéralogique du Chili, envoyée a l'exposition universelle de Paris de 1889 par la section de Minéralogie de la Commission de l'Exposition Chilienne* (1889).

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Ignacy Domeyko as mineralogist was rather solitary not only in Chile but also in the whole South America of that time. However, he was maintaining close contacts with his teachers and colleagues from École des Mines de Paris e.g. with A. Daubrée (after whom he named one of new minerals found by him in Chile). These friends attempted several times to introduce Domeyko to the French Academy but this action was not successful — in 1862 his opponent was Ch. Lyell. Nevertheless, I. Domeyko was honoured with medals for scientific merits and for collections of Chilean minerals presented at international exhibitions. Moreover, he was nominated the member of the Museum of Natural History in Paris and of the Scientific Society in Göttingen.

Domeyko was very appreciated in Poland. In 1850 Prof. L. Zejszner, on behalf of the Jagellonian University in Cracow, attempted to invite him to take up the duties of head of Department of Mineralogy of this oldest Polish higher school but, unfortunately, his return to motherland in this time was impossible. In 1873 I. Domeyko was nominated the member of Polish Academy of Sciences and in 1887 he obtained the degree of honorary doctor of the Jagellonian University in Cracow.

Several Polish scientific centres have received from Domeyko numerous valuable publications and collections. Some of them, e.g. that deposited in the Physiographic Museum of the Academy of Sciences in Cracow, were later strongly impoverished, whilst the other, e.g. the collection of Chilean minerals donated to the Mineralogical Cabinet of the Jagellonian University in Cracow is fairly well preserved (E. Koszowska, A. Wolska, this volume). Domeyko's collection offered to the Warsaw University was highly appreciated by Russian specialists e.g. by one of the founders of modern geochemistry V. Vernadski³.

The centenary of death of the eminent Polish mineralogist, the Mineralogical Society of Poland and the Committee on Mineralogical Sciences of the Polish Academy of Sciences celebrate by foundation of Domeyko's Prize, conferred each year for the best paper of a young Polish research worker and by minting Domeyko's Medal, the highest Polish award in the field of mineralogical sciences.

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¹ This short biography is based mainly on the data contained in the following books:

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R. Fleszarowa — *Retrospektywna bibliografia geologiczna Polski (Retrospective geological bibliography of Poland)*, Warszawa 1966, pt. II, 116—124.

S. Czarniecki, Z. Martini — *Retrospektywna bibliografia geologiczna Polski, uzupełnienia (Retrospective geological bibliography of Poland, Supplement)*, 1972, 56—57.

Besides, the manuscript *Lista de los trabajos del Senor Ignacio Domeyko* is deposited in the Library of Ossoliński National Institute in Wrocław.

All the minerals described first by I. Domeyko are detailed in A. Bolewski's paper: *Polonica in mineralogical nomenclature* (Min. Pol., this volume, pp. 105—111).

² A. Bolewski — *Mineralogia szczegółowa (Descriptive mineralogy)*, Warszawa, 1965, p. 729.

³ J. Morozewicz's letter on the specimens of I. Domeyko in the Geological Museum of the Warsaw University. Archive of the Acad. of Sci. of USSR, Vernadsky's collection, Moscow.