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### EARLY STAGE OF MINERALOGICAL SCIENCES AT THE JAGELLONIAN UNIVERSITY IN CRACOW

**Abstract.** In 1983 the Jagellonian University celebrated 200 years of first programmed lectures on mineralogy in Cracow delivered by J. D. Jaśkiewicz. The author presents an outline of early period of development of mineralogical sciences in this centre ranging from the XVII th to the beginning of XIXth centuries.

The Jagellonian University was founded in 1364 in Cracow which is situated between two important mining centres, Olkusz (Ilcusia) and Wieliczka (Magnum Sal), famous of silver-bearing lead ores and salt deposits respectively. In the foundation act of the king Casimir the Great we find the name of Borch, an Olkusz mining contractor. Numerous sons of miners and metallurgists from these two centres were students and even professors of this university, contributing financial support to faculties and libraries and even creating scholarship funds and benevolent organizations for youth. However, they did not contribute directly to the development of mineralogical sciences, being generally specialists in such branches as law, medicine, mathematics or astronomy. We have to mention e.g. Maciej Bylica, royal astronomer of the Hungarian Court in Budapest. Well known mathematicians of Biem, Bork and Zarański families were also coming from miners circles. Some of the physicians, because of their natural philosophical education, were interested in the world of minerals. One of them — Adam from Bochynia near Łowicz (died in 1514) — received a permission of the king Alexander the Jagellon for exploration of ores in the whole country. After accomplishing his studies in Cracow in 1492 he moved to Italy where supplemented the medical studies. In the University's Library there is a manuscript of Adam of Bochynia on natural sciences.

The profits of the salt-works of Wieliczka were ensuring to large extent the wages of Cracow University's professors — hence the latin name "salaria" — salaries. Consequently, mathematicians of the university were morally obliged to help in planning of mining works, exploration galleries, organization of transport in the mine etc. So e.g. since 1616, famous mathematician, son of a peasant from Kurzelów, Jan Brożek — Broscius (1585—1652) was often invited to take part in these plans and

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works. It should be emphasized that in 1611 he published the results of mathematical studies which were later included into the methods of geometric crystallography. Starting from the assumption that isometric figures (i.e. those having the same circumference) display surfaces of different areas, he evidenced that among regular polygons, contacting with each other by common apices, only triangles, squares and hexagons are filling firmly the plane (In: ...*Quare apes hexagona figura favos construant*, Cracoviae 1611). Several years later this problem, but relative to the filling of space by regular polyhedra, was studied and described by J. Keppler (*De nive sexangulari*, 1619).

A little younger Jan Jonstone of Szamotuły (1603—1673), author of mineralogical papers (*Thaumatographia*, 1630; *Notitia regni mineralis*, 1661) could not, as protestant, even study in Cracow.

Internal unrests in the middle of 17th century, followed by Swedish invasion and war actions in which Moscovian and Hungarian armies took part, have destroyed mines, industry and defence castles. This resulted also in a decadence of Cracovian University. Even during the reign of king Jan the IIIrd Sobieski the effects' of this sorrowful period could not be eliminated due to new war actions of foreign armies on Polish territory which were stopped after election of Saxonian prince August the IIInd to the king of Poland. One of his attempts was to reconstruct mining industry in Poland. In 1701, August the IIInd intended to organize a mining school in the royal Łobzów palace in Cracow but this project was not realized, probably because of lack of proper lecturers at the Jagellonian University.

Consequently, only after reorganization and modernization of this University by the Commission on National Education (founded in 1777), the Department of Natural History was formed. This new faculty was organized to initiate basic studies on economic own raw materials and united such natural sciences as chemistry, mineralogy, botanics and zoology. Similar departments already existed at two oldest central European universities in Vienna and Prague. In the former it was organized in 1749 by Jangier whilst in the latter in 1752 by Bohadsch and Mikan. Initially, botanics was the dominating discipline in these departments but, after 1780, more attention was paid to chemistry and mineralogy.

Jan Dominik Jaśkiewicz (1749, Lwów — 1809, Pińczów), appointed to the first head of this Department (1782), gained the doctorate in medicine at the Vienna University in 1775. His activity in Cracow was started with organization of chemical laboratory, gathering of museum collections and scientific excursion in Cracow and Sandomierz districts, during which he was assisted by medicine doctor Paweł Czemiński (brother of Klementyna Hoffmanowa née Tańska). Having collected the necessary informations on mineral resources of southern Poland, Jaśkiewicz initiated in winter semester 1783/84 the first lectures on chemistry and mineralogy at the Jagellonian University. Simultaneously he edited "Mineralogical tables" which were also used in copies in secondary schools subordinated to the Cracow University. His lectures were illustrated by practical demonstrations e.g. by smelting lead from galena or copper from its carbonate ores as well as by producing brass using heating of malachite or azurite with calamine. For the first time in Poland Jaśkiewicz informed his students during lectures and broader circles of the public at open sessions on the nature of combustion as oxidation process according to Lavoisier's theory. In his scientific activity rather important is chemical study of mineral water from Krzeszowice near Cracow, consisting in determining such components as hydrogen sulphide, chlorides, sulphates, sodium, calcium and, particularly, magnesium. Jaśkiewicz, together with professors of pharmacy Jan Szaster and of physics Franciszek Scheidt participated in the construction of the first balloon. This scientific team

was lead by professor of mathematics and astronomy Jan Śniadecki who carried out detailed calculations of all parameters. The first flight took place from the University's Botanic Garden on 1 april 1784 i.e. 2.5 years after the pioneer experiments of brothers J. and S. Montgolfier in Paris. In the above scientific team's opinion, balloon, together with barometer and thermometer will be the most important instrument in the study of atmosphere.

Jaśkiewicz, as lecturing also botanics, was charged with arranging University's botanic garden but the terrain offered was flooded and rather not fertile what brought him later numerous troubles.

On 25 june 1787, at a solemn University's session, in the presence of king Stanislas August, J. Jaśkiewicz reported on the actual state of knowledge on mineral raw materials of southern Poland. It consisted rather in enumeration of the most important ores of copper, lead, zinc and iron, and of mineral waters. Coal and salts were not taken into account. The most interesting is this report is the presentation of instructions for exploration works based on the results of basic studies. In his opinion, naturalists are obliged to investigate mountainous regions, their morphology and structure, taking into account the character of various rocks composing them. Jaśkiewicz distinguished massif and layered rocks, showing striped distribution of some constituents or differentiation in grain-size. He did not mention volcanic phenomena but described porphyries of Miękinia and mandelstones of Alwernia. He was correct in stating that the commonest in Poland are sedimentary rocks, originated in marine environment what is evidenced by the occurrence in them of fossils of marine fauna (e.g. in Korytnica, Pińczów, Olkusz etc.). However, Jaśkiewicz has accepted only one transgression from the east, whilst 5 years earlier Carosi, custodian of royal natural collections, has stated that "seas have several times submerged our country". In the former's opinion, limestones, marls and sandstones were deposited in horizontal layers according to grain-size or specific weight. Besides, Jaśkiewicz reported that some regions of our country abound in flints leached from their parent calcareous rocks. However, he did not discuss with Carosi the problem of their origin, though this author was the first to characterize in Poland the phenomena of alteration of rocks and minerals. In front of the King he intended to emphasize that Carosi did not take into account the origin of silicified wood trunks of Alwernia since they do not correspond to his genetical theses. Jaśkiewicz attributed the change of primary horizontal position of sedimentary rocks to rather undefined forces acting from Earth's interior, causing simultaneously the formation of fractures in the rocks. He considered the mutual position of beds, their thicknesses and sequences, strikes and slopes to be important diagnostic features in exploration works for ore deposits. The latter are formed due to destructive and creative actions of circulating waters, filling fractures in the form of veins and in carbonate rocks also as incrustations on the walls of earlier leached caves. All these field observations, correlated with morphology and using geodetic trigonometry were applied by Jaśkiewicz and J. Śniadecki in exploration for coal within the territory of Cracow episcopal territory near Siewierz, as well as in localizing shafts and galleries determining the orientation of underground exploitation. This method was applied by two friends after the year 1787 when Jaśkiewicz had to resign of his post at the University and, particularly, after 1791 when he became the president of coal mining. Barely in this year started the scientific activity of William Smith (1769—1818) who, apart from geodetic measurements, paid particular attention to the character of rocks, the presence of fossils, the sequence of rock series and their relation with morphology of the area studied. Very soon W. Smith became an expert in stratigraphy based on lithologic evolution of geological formations and on their paleon-



tological characteristics. Political situation in Poland after the partition of our country did not favour systematic scientific work by large-scale testing of exploration method. Consequently, Jaśkiewicz's pioneer activity in this branch of applied and theoretical geology was not known abroad whilst the achievements of W. Smith were appreciated all through the world.

The resignation of Jaśkiewicz was caused by his poor health — he was unable to deliver so many lectures and to administrate Collegium Physicum where all the chairs of Mathematical-Physical and Natural faculties were located.

His successor viceprofessor and doctor of physics Franciszek Scheidt (1759—1807) was coming from a rich burgher's family. In the years 1772—1775 he frequented Nowodworski's Secondary School, subordinated to the University, and in 1779 gained the degree in physics. In 1780 Scheidt obtained the post of lecturer of physics at the provincial school in Lublin. Due to his successes both in didactic and scientific researches, he was moved already in 1783 to Cracow where, apart from lecturing in secondary school, was attending Jaśkiewicz's lectures at the University (1783—84). On 16 december 1784 Scheidt was nominated viceprofessor of the Department of Natural History and started to help Jaśkiewicz in didactic works but, first of all, paid much attention to Department's Natural Museum which was now open not only for students but also for public. In 1786 was published (with University's support) his paper "On electricity observed in terrestrial bodies in atmosphere" (pp. 230), prepared during the stay in Lublin. On 17 february 1787 F. Scheidt was promoted the head of the Department of Natural History and soon was sent by the University to Vienna to supplement his knowledge in botanics. After having worked 4 months in Botanical Garden lead by M. J. Jacquin, he returned to Cracow bringing numerous books bought by his own funds. Scheidt visited Vienna yet in 1788 and 1790 since botanics became now his main scientific interest. This is evidenced by 8 volumes of the herbarium "Phytanthologia" (hand-painted) preserved till now in the National Library of Vienna. He was promoted to professor's degree but in 1791. During Kościuszko's insurrection he performed administrative duty in Cracow, similarly as Jaśkiewicz in Warsaw. After the fall of insurrection, Scheidt was still lecturing at the University, occupied by Austrians, till 1803 when he was released together with other Polish professors. Thanks to T. Czacki's effort he was employed as lecturer of natural history at the Lyceum in Krzemieniec (Volhynia).

During the first 20 years of the Department of Natural History several books on mineralogical sciences have been edited. We have to mention "Metalurgia", being probably the 2nd volume of a handbook "Natural Sciences" whereby the first volume was entitled "Mineralogia". "Metalurgia" was reprinted in 1969 for the 50th jubilee of the Academy of Mining and Metallurgy in Cracow. The manuscript was preliminarily attributed to Jaśkiewicz but several authors, especially Włodzimierz Hubicki, questioned this supposition since e.g. the manuscript contained some chemical facts which could not be known to Jaśkiewicz. In Hubicki's opinion, the manuscript on Natural History should be attributed rather to Franciszek Scheidt who since 1784, as viceprofessor, was attending and recording Jaśkiewicz's lectures very carefully as the basis for his future didactic work. Moreover, the three heads of "Natural History" i.e. I. Metallurgy, II. Mineralogy and III. Botany (especially that serving to natural treatment) resemble very much in the form and approach to the problems the publications of M. J. Jacquin, Scheidt's teacher of botany in Vienna.

The release of all the Polish professors in 1803 was a symptom of liquidation of higher schools within the Austrian sector of partitioned Poland. However, the liquidation of Cracow University was stopped since numerous German professors

released from earlier closed Lwów University were directed just to this higher school. The Department of Natural History was again included to the Medical Faculty and lead for two years (1806—1808) by Józef August Schultze, who was subsequently moved to Innsbruck and, afterwards, to Landshut in Bavaria where lectured at the University in the years 1811—1831 and died. During his stay in Poland, Schultze has merely criticised a booklet of Austrian officer edited in Przemyśl on the occurrence of decorative stones in gravels of the San River (1801).

In 1808 the Department of Natural History in Cracow was entrusted to Baltazar Hacquet (1739 or 1740—1815), former professor of Lwów University (1787—1805). He studied philosophy and medicine in Rennes, Pont à Mousson (doctorate), Montpellier and Paris and was later employed as surgeon in French, English, Prussian and Austrian armies. In 1762 Hacquet moved to Prague where got the post of senior surgeon of the University Hospital and in 1773 — to Lublana, being nominated the head of Department of Anatomy, Surgery and Obstetrics. In Lwów he was living for 18 years and in 1805 moved to Cracow where he stayed till 1809, when this town was incorporated into the Grand Duchy of Warsaw.

As already mentioned, after reorganization, the Department of Natural History was included into Medical Faculty of the Cracow University. Nevertheless, lectures on practical natural history and technology were delivered at the Philosophical Faculty by Emanuel Kornbaum. B. Hacquet lectured only mineralogy, zoology and theoretical botany. After the liberation of Cracow in 1808 by troops of the Grand Duchy of Warsaw, Hacquet refused the proposal to remain as the head of Department because of bad health. Soon he left Galicia and moved to Vienna where died in 1815. The collection of minerals used by him to demonstrate during lectures was purchased by the University thanks to personal efforts of professor of botany Alojzy Estreicher.

Hacquet published the results of his scientific travels to the Alps, Carpathians and adjacent areas. Geographical and mineral-raw material problems of the Polish territories under Austrian oppression were described in the volume IV of the monograph "Neuste physikalisch politische Reisen in den Jahren 1788—1789 durch die Dacischen und Sarmatischen oder Nördlichen Karpathen". Nürnberg, 1790—1796 Bd. I—IV. It contains interesting data on mineral waters of Lubień, Szkoło, Swoszowice, Krynica, salt mines of Bochnia and Wieliczka, iron ores in Polish Lowland, Carpathians and Tatra Mts., ore deposits of Olkusz and a mineral of Miedziana Góra near Kielce, obtained from Soldenhof and called "manganesia ochracea nigra sub-splendente argento".

Since 1814, the lectures on mineralogy at the University were delivered by Józef Tomaszewski (1783—1844), appointed by the Chamber on Public Education to the professor of mineralogy and geology. In 1809—1812 he studied in Freiberg and Paris thanks to the scholarship of this Chamber and was directed to Cracow mainly as teacher of secondary schools. This decision was caused by programmed second reform of the Cracow University by H. Kołłątaj who tended to create a separate higher school of mining. Thanks to efforts of S. Staszic and B. Pusch this school was founded in Kielce and in 1817 Tomaszewski moved there to take the post of lecturer and organizer of mining industry. Consequently, the lectures on mineralogy at the Cracow University were entrusted to professor of chemistry Józef Markowski who was delivering them till his death in 1830. Moreover, he supplemented Hacquet's collection by purchasing from Breithaupt (Freiberg) valuable specimens illustrating mineral parageneses.

In 1830 was closed the Enlightenment period in Poland, during which mineralogy was gradually becoming independent among still dominating lectures on natural history.



## POCZĄTKOWY OKRES ROZWOJU NAUK MINERALOGICZNYCH NA UNIWERSYTECIE JAGIELLOŃSKIM W KRAKOWIE

### Streszczenie

W 1983 r. obchodzono w Krakowie 200 rocznicę wprowadzenia regularnych wykładów z mineralogii na Uniwersytecie Jagiellońskim. Pierwszym wykładowcą był J. D. Jaśkiewicz. Autor omówił pierwszy okres rozwoju nauk mineralogicznych w tej uczelni, od początków XVII do początków XIX wieku.

Антони ГАВЕЛ

## НАЧАЛЬНЫЙ ПЕРИОД РАЗВИТИЯ МИНЕРАЛОГИЧЕСКИХ НАУК В ЯГЕЛЛОНСКОМ УНИВЕРСИТЕТЕ В КРАКОВЕ

### Резюме

В 1983 г. отмечалась 200-я годовщина введения первых систематических лекций по минералогии, читаемых впервые Я. Д. Яськевичем. Автор охарактеризовал первый период развития минералогических наук в этом высшем учебном заведении, с начала XVII до начала XIX столетия.