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SHORT HISTORY OF TEACHING MINERALOGY AT THE EÖTVÖS LORÁND UNIVERSITY, BUDAPEST

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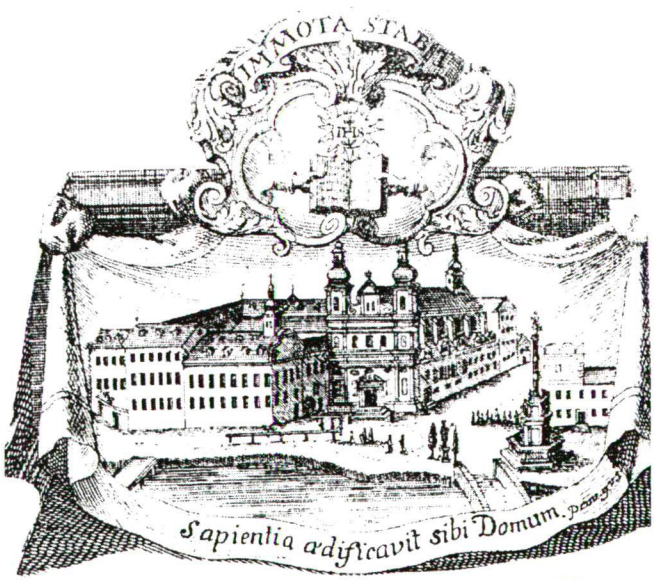
We intend to overview the 230-year history of organised teaching of mineralogy at the Eötvös Loránd University. The University was founded in 1635. Students could learn certain elements of mineralogy already in the early period of the University within the frame of physics. Mineralogy, as an independent subject, has been part of the curriculum since 1774, the year when the Department of Natural History was founded. The separate Department of Mineralogy was established in 1849.
While trying to divide the long historical span into periods, no unique concept appropriate in every respect was found, so changes of institutional structure, as well as the prominent mineralogy-related personalities are used as guidelines. For helping the reader not experienced in historical and cultural development of that part of Central Europe, at some points we are giving also explanatory notes related to political, cultural and science history.

EARLY PERIOD OF TEACHING MINERALOGICAL KNOWLEDGE (MINERALOGY AS PART OF PHYSICS, 1635–1774)

In 1635, when Péter Pázmány, Archbishop of Esztergom, founded the University, the Hungarian Kingdom was divided into three parts. The central part of the country was under Turkish occupation. The eastern part, under the name of Principality of Transylvania, managed to maintain limited independence, balancing between the Turkish Empire and the Habsburg Monarchy. The western and northern parts were ruled by the Habsburgs, crowned also as Hungarian kings. The University was established in this latter part of the country in Nagyszombat (Tyrnau; Trnava today in Slovakia).



University building at Nagyszombat (1635–1777)

The university, like others in Central Europe (e.g. Vienna, Graz), was supervised by the Jesuits. In the first 118 years the curricula and teaching methods were governed by the Jesuit *Ratio Studiorum* (1599). Mineralogy was not included directly in the curriculum, but in books of some professors (e.g. Márton Szent-Iványi, István Csiba) mineralogy related topics had already been discussed. For example in the booklet of István Csiba (*Dissertatio historico-physica de montibus Hungariae, Tyrnaviae, 1714*) mining and topographic mineralogy data, as well as scholastic discussions on some minerals appeared.

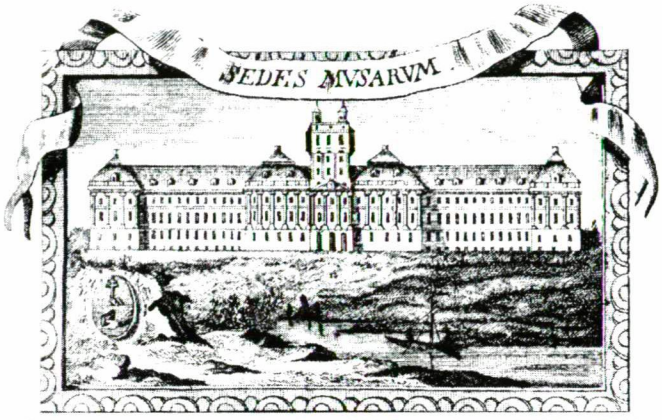
By the first decades of the 18th century the unity of the country had already been re-established. 200 years of "personal union" started with the Habsburgs reigning both as Emperors of the Holy Roman Empire (later only that of Austria) and Kings of Hungary. The increasing impact of the state on the teaching systems was reflected in the first university reform, started in Vienna in 1752, introduced soon in Nagyszombat as well. The new textbooks of physics contained mineralogical chapters in the part *physica particularis* or *specialis*. In 1770 new fundamental reforms were initiated, the Vienna Court issued new study directives (*Norma Studiorum*). The secularisation of the university was completed in 1773, when the Jesuit Order was dissolved in the country.

MINERALOGY AS A SEPARATE SUBJECT WITHIN THE FRAME OF NATURAL HISTORY (1774–1849)

Institutional structure and professors

The first milestone of a new era for mineralogy was the establishment of a separate Department of Natural History (*Cathedra historiae naturalis*) in 1774. Mineralogy became a compulsory basic subject for all students of the Faculty of Philosophy. At that time graduation at the Faculty of Philosophy was a prerequisite for matriculation at the Faculties of Law, Theology or Medicine. The language of teaching was Latin, the official and scholastic language of the era. The first professor of the Department of Natural History was Mathias *Piller* (1733–1788), a Styrian ex-Jesuit,

who had taught at the Theresianum in Vienna. Piller brought his huge natural history collection to the university. By that time the economy and infrastructure of the central part of the country had already been consolidated and the University moved from Nagyszombat first to Buda (1777), then to Pest (1784), two independent royal cities at that time.



University building in the Royal Palace, Buda (1777–1784)

After the death of Queen Maria Theresa (1780) Emperor Joseph II started with large-scale reforms, reflected also in the university programmes. In 1784 the department was divided: the General Natural History Department (*Cathedra historiae naturalis generalis*) was kept within the Faculty of Philosophy, while the Special Natural History Department (*Cathedra historiae naturalis specialis*) was moved to the Faculty of Medicine. The department providing basic curricula at the Faculty of Philosophy gradually lost its importance and was dissolved in 1849. However, the other department, with Piller as professor, started flourishing. It provided the compulsory mineralogical and zoological training for medical students. (Botany had already had a separate department at the Faculty of Medicine since 1770.)

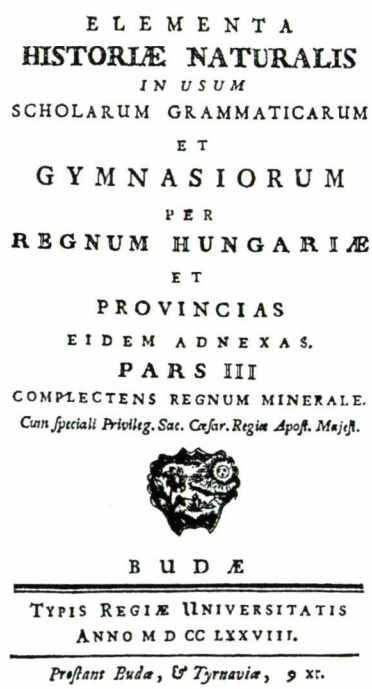
Piller's successor (1789–1807) was Joseph A. *Schönbauer*, a Bohemian-born scholar. After his death János *Schuster* came to the department (1809–1810), but soon left his position and became an excellent Professor of Chemistry at the University. He compiled a comprehensive catalogue of the collection (Schuster 1811).

János Schuster (1809–1810)

The next professor, Johann *Reisinger* (1810–1848), had limited impact on the mineralogy-related fields. After his retirement the Chair was vacant during the Hungarian War of Independence (1848–1849), causing a real threat to the department's teaching facilities, first of all to the collections.

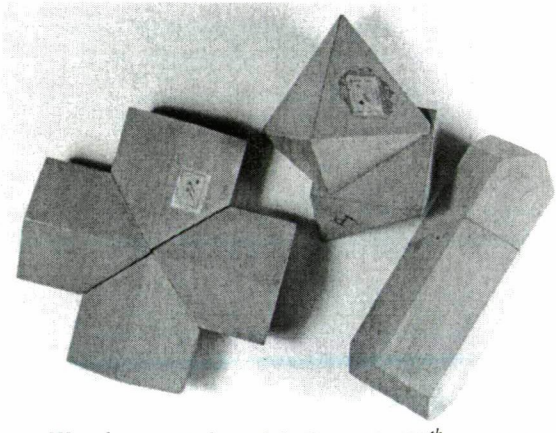
Teaching texts

The department played a key role in the preparation of mineralogy textbooks of the period. Piller wrote the first Latin textbook of mineralogy in Hungary (*Elementa Historiae Naturalis, Pars III. Complectens Regnum Minerale, 1778*). Somewhat later (1791), based on Piller's lectures, one of his students, medical doctor Samuel *Zay* published the second Hungarian textbook on mineralogy (Zay, 1791). Schönbauer compiled a comprehensive book on determinative mineralogy (Schönbauer, 1805–1809). Reisinger published the first volume (1820) of a never-completed Wernerian mineralogy textbook. These textbooks give a clear picture on the style and content of the university mineralogy programme.


ELEMENTA
HISTORIÆ NATURALIS
IN USUM
SCHOLARUM GRAMMATICARUM
ET
GYMNASIORUM
PER
REGNUM HUNGARIÆ
ET
PROVINCIAS
EIDEM ADNEXAS.
PARS III
COMPLECTENS REGNUM MINERALE.
Cum ſpeciali Privileg. Sac. Cæſar. Regiæ Apoſt. Majeſt.

BUDÆ
TYPIS REGIÆ UNIVERSITATIS
ANNO M D CC LXXVIII.

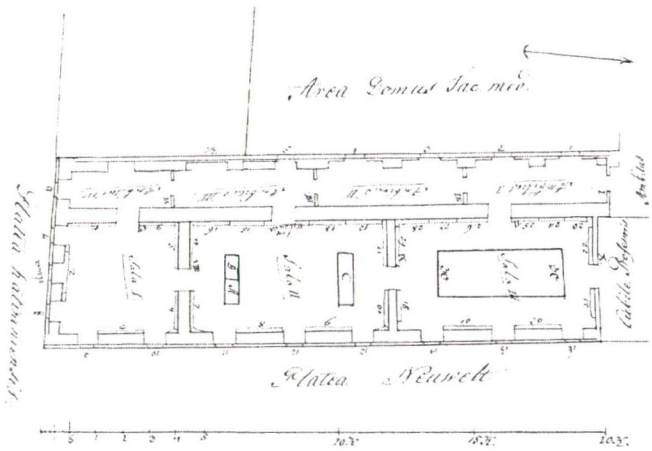
Front page of Piller's book



Wooden crystal models from the 19th century

The Collection

The Natural History Collection, the most treasured part of the department, has always played a central role in teaching. Well-known scholar travellers (e.g. Townson, 1797; Esmark, 1798) described the rich exhibitions, prepared mainly for teaching purposes. After the frequent moving of the department in the first decade, the Collection was exhibited for 60 years on the 1st floor of the old building of the Faculty of Medicine ("Jesuit House", a former Jesuit convent) in Pest. The mineral collection was stored in three rooms (some 300 m^2 area altogether); the botanical and zoological objects were arranged in the corridors.



Plan of the mineral collection (three halls) and the botanical and zoological collections in the corridor of the "Jesuit" House, Pest, 1811

In 1811 the Mineral Collection consisted of 26,000 specimens. Its bulk, the Piller Collection and the collection of the Austrian Archduchess Maria Anna (1781), was purchased. Other parts, such as the minerals of the Russian Grand Duchess Alexandra Pavlovna (courtesy of Palatine Joseph in 1809) and the collection of István *Szaibély*, mine surveyor (1831), were acquired as donations. Minerals, ore samples and rocks from certain Imperial and Royal Mining Offices were also added, mainly in the 1790s.

Maria Anna, Austrian Archduchess, daughter of Maria Theresa, Empress of Austria

Alexandra Pavlovna, Russian Grand Duchess, daughter of Paul I, Emperor of Russia

From the Department of Mineralogy to the Institute of Mineralogy and Petrography (1849–1894)

Foundation and early years of the Department of Mineralogy (1849–1861)

In the middle of the 19th century, after several decades of continuous development of sciences and after the wave of revolutions in Europe, the political changes were followed by reforms also in the university programmes. In the new university structure, introduced in 1849, mineralogy and zoology were separated at the three prominent universities (Vienna, Pest, Prague) of the region governed by the Habsburgs.

At the Pest University (Royal Hungarian University) the first Head of the new Department of Mineralogy (as deputy professor) was József *Szabó*, a 28-year-old scholar, who graduated both at the Pest University (in law) and at the famous Schemnitz (Selmecbánya; today Banská Štiavnica in Slovakia) Academy of Mining and Forestry. The first years of his activity were restricted to the re-establishment of the department and the collections.

Carl Ferdinand Peters (1855–1861)

József Szabó (1849–1855, 1860–1894)

In the early 1850s, a period characterised in Hungary by a political and social silence after the suppression of the Hungarian War of Independence by Austrian and Russian troops, Szabó did not receive permanent tenure. Instead, in the course of the germanisation campaign of the Vienna Court, Carl Ferdinand *Peters*, a Bohemian-born and Vienna-bred geologist, was appointed as Professor. Szabó had to leave the university for five years. Peters was not only an excellent scientist but also a very organised and dedicated teacher. His half a decade activity in Pest provided a solid foundation for the return of Szabó in 1860.

Accommodation of the Department

In 1850 the Department of Mineralogy was moved from the Faculty of Medicine to the Faculty of Philosophy and stayed there for almost a century. The change in the institutional structure was followed by a physical move only in 1854: the department left the "Jesuit House" and settled in the Central Building of University, next to the University Church, downtown Pest. Although Szabó managed to double the surface of the department, in a decade the lack of space became a serious problem at the new location as well. In 1863 József Szabó, together with Tivadar *Margó*, Professor

The Central building of the University in the 19th century in Pest (1853–1886)

of Zoology, and Károly *Than*, Professor of Chemistry, raised the need for a new campus for science departments. In six years József *Eötvös*, Minister of Education, started dealing with the establishment of the new Campus (called Trefort Garden today) at the site of the old Botanical Garden. A few years after the completion of the Chemistry Building the Natural History Building was also ready for hosting the mineralogy, earth science and biology departments. The new institute was officially inaugurated by the King in 1886. From this year on the department was called Institute of Mineralogy and Petrography.

Natural history building of the University In Budapest (1886–2001)

Education, students

During the first decade (1849–1860) mineralogy lectures and practicals were mostly attended by medical and pharmacy students. In the second period of Szabó's leadership (1860–1894) the majority of the students still came from the Faculty of Medicine, but, starting with 1870, an increasing number of students participating in the teacher training programmes at the Faculty of Philosophy attended the lectures. Szabó offered theoretical and different practical courses in mineralogy and geology (including petrography). His work was aided by assistants (one position from 1868; two positions from 1885) and honorary lecturers ("magántanár/Privatdozent"). The latter had the right to announce lectures too: Miksa *Hantken* (1875–1882) delivered lectures in palaeontology, Sándor *Schmidt* (1885–1894, from 1890 as extraordinary professor) in crystallography and Gyula *Szádeczky* (1891–1897) in petrography and petrographic microscopy.

Textbooks

Szabó was a dedicated professor and a talented writer. The several textbooks he prepared during his 40-year-long service dominated the mineralogy courses even decades after his death.

His first lecture notes, *Ásványtan és Földtan* (Mineralogy and Geology), were printed in 1853 and reprinted twice in the subsequent years.

His large *Ásványtan* (Mineralogy) reference book was published in 1861. The first book was followed by three revised and widely extended new editions (1864, 1875, 1893). In his books he emphasised the importance of the chemical properties of minerals and included several practical analytical methods applicable especially for minerals, some of them developed by himself.

ÁSVÁNYTAN.

FELSŐBB TANÍTÁSRA ÉS GYAKORLATI HASZNÁLATRA.

Dr SZABÓ JÓZSEF

EGY KŐNYOMATU SZÍNES TÁBLA, 630 RÉZ-, ZINK- ÉS FAMETSZETŰ KÉP.

NEGYEDIK UJBÓL ÍRT KIADÁS.

BUDAPEST.
FRANKLIN-TÁRSULAT
MAGYAR IROD. INTÉZET ÉS KÖNYVNYOMDA.
1893.

Front page of Szabó's Mineralogy (4th edition)

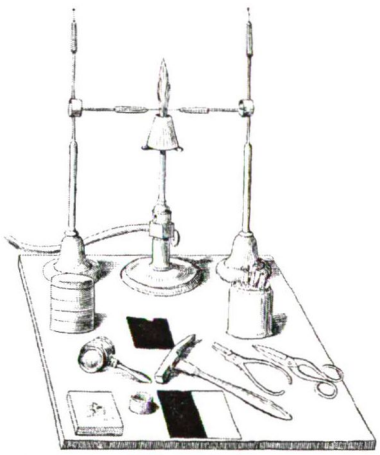
In 1883 he published his *Geologia* textbook, including petrography, the description of the most important rock-forming minerals and also a special method invented by him for the identification of feldspars by flame colouration and fusibility, to help the classification of magmatic rocks.

These textbooks reflect that Szabó was one of the mainstream earth scientists of his age. Almost all of the important new paradigms and research results are included in his texts.

In the 1861 Mineralogy textbook of Szabó the crystallography part was based on Carl Friedrich Naumann's book (1856), the descriptive mineralogy on James D. Dana's mineralogy systematics (1854).

In the second edition (1864) more crystal drawings were included in the crystallography part. The systematic part was updated with the data Szabó received from J. D. Dana as appendix to Dana's 4th edition and from F. Kobell as the latest results in the field of chemical identification of minerals.

The third edition of Szabó's Mineralogy (1875) was fully rewritten reflecting the significant developments of mineralogy. Szabó still used Naumann's system and notation in the crystallography part. Optical mineralogy was extended considerably. The Nicol prism and the polarising microscope were included. The relationship between optical properties and symmetry of minerals was also discussed on the base of A. Des Cloizeaux's work (1862, 1874). In the chemical identification chapter Bunsen's methods (blowpipe, flame colouration) were demonstrated and he treated also the fusibility of minerals. In these latter fields his own special contribution (mainly for the identification of feldspars) was discussed in details as well. He added the description of new minerals discovered between the 5th edition of Dana's book (1868) and 1875 using the *Second Appendix to Dana's Mineralogy by Edward S. Dana.* Not less than 900 mineral species were included in this third edition.



Tools for Szabó's feldspar determination method by flame colouration and fusibility

In 1893, one year before his death, the fourth edition of his Mineralogy was published. Mineralogy developed essentially in the 18-year period between the two editions and Szabó felt he had to revise almost all parts of the 1875 book. He entirely rewrote and enlarged the book. He presented the spherical projection, started to use Miller indices alternatively with the Naumann notation. Pyroelectricity, piezoelectricity and magnetic properties of minerals are discussed. The Tables for Identification of Minerals were enlarged as well.

A large number of new mineral species were added to the descriptive mineralogy chapter, based on the 6th edition of Dana's Mineralogy, published in the previous year (1892). Here, beside the chemical, crystallographic and physical properties of minerals, genetic and locality data are also given. Szabó included the results of several mineral synthesis experiments (Berthier, Fremy etc.) in order to give some idea on how minerals form in their natural environment.

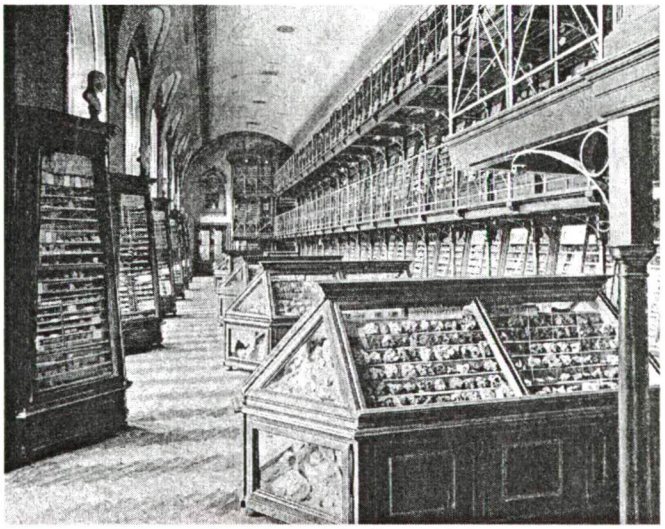
Concerning feldspars, a mineral group Szabó invested a lot of his research time in, A. Des Cloizeaux's and Tschermak's feldspar determination methods and data are given in detail. These methods, based on optical properties (extinction angle), became widespread at the end of the 19th century and surpassed Szabó's flame-based method. It is not common for a 72-year-old scientist to have enough strength to keep up with the development of science, especially as development overwrote a large part of his oeuvre.

Collection, library and equipment

The second half of the 19th century provided a good atmosphere for establishing large, attractive collections representing Nature. By 1860 Peters set up four new modern mineralogy teaching collection parts (Terminology, Exhibition, Systematic, Reserve) by fully rearranging the inherited huge old collections and by buying the *Fauser* Collection containing more than 3000 excellent mineral specimens.

Szabó accepted Peters' collection system, kept and broadened the mineral collections and, in parallel with the rapid development of petrography, started setting up rock collections.

Accordingly, the new Natural History Building, completed in the mid-1880s, contained two large exhibition halls, the Mineral Hall and the Rock Hall, 213 m^2 each, with a three-level gallery system on three of the walls.



The Mineral Hall in 1886

The mineral exhibition consisted of a terminology part in the central showcases and a systematic part in the galleries. The arrangement of the systematic mineral exhibition followed Dana's system. In the Rock Hall not only systematic petrography but also general geology and stratigraphy got place. The exhibitions in both large halls exactly followed the structure of the two textbooks (Mineralogy; Geology) of Szabó, so that students could use them on their own while preparing for the exams.

A very impressive library room was also established. Szabó set up a three-room up-to-date crystallography laboratory, mainly from the generous donation of Andor *Semsey*. By the end of 1886, the number of petrographic microscopes reached 11. An electric arc lit projecting microscope served as teaching aid in the largest auditorium.

The Institute of Mineralogy and Petrography after the separation of Geology (1894–1953)

Institutional structure, professors, general environment

When Szabó died in 1894, the Chair of Palaeontology was also vacant. That situation gave a unique opportunity to fit the institutional structure to the current status of earth sciences. Antal *Koch*, former student and assistant of Szabó, Professor of Mineralogy and Geology at the Royal Hungarian Franz Joseph University in Kolozsvár (Cluj, Klausenburg; today in Romania) was invited to Budapest (1895–1913). On his request a new Institute of Geology and Palaeontology was established on the base of the Department of Palaeontology and on the geology-related disciplines formerly covered by the Institute of Mineralogy and Petrography.

The new Head of the Institute of Mineralogy and Petrography, now really covering teaching and research only in mineralogy and petrography, became József *Krenner* (1894–1913), one of the best descriptive mineralogists of his period. Besides his Chair at the University he also kept his position in the Hungarian National Museum (Head of the Department of Mineralogy and Palaeontology, 1870–1919).

József Krenner (1894–1913)

Béla Mauritz (1913–1950)

In 1913 Krenner retired and his assistant, Béla *Mauritz* followed him in the Chair. Soon he became not only a widely accepted teacher and researcher but, just like József Szabó 50–60 years earlier, he was a prominent personality of the faculty, and served also as Dean and Rector. Mauritz's period should be considered as the third golden era of the Institute, in spite of the restrictive general political and economic climate in the country.

The Hungarian Crown lost 2/3 of its former territory after World War One; global economic crisis from the late 1920s; serious economical and political situations during and after World War II etc.

Additionally, during World War II, Mauritz did a unique, brave action. In the autumn of 1944, acting as Pro-Rector, he refused to evacuate the University to the west that was forced by the fascists. He thus saved the largest Hungarian university from the total disintegration.

After the war, in 1949, a long-awaited structural reform was made in the hierarchy of the university. The natural science departments were separated from the Faculty of Philosophy and the Faculty of Science was formed.

At the turn of 1949/1950 Mauritz was forced to retire and Elemér *Szádeczky-Kardoss,* a well-known petrologist and geochemist, took over the leadership of the Institute. The exceptionally versatile Szádeczky-Kardoss – being also present in the top circles of science politics – was a charismatic person, who started to transform the Institute completely into his own shape. He left the mineralogy-related fields mainly for Kálmán I. *Sztrókay*, and started to develop the petrology and geochemistry fields. In 1950 he established the Geochemistry Research Group, hosted by the Institute and managed by the Hungarian Academy of Sciences.

Education and research

The Krenner era

Krenner gave lectures in mineralogy as well as theoretical and applied crystallography for students in medicine and pharmacy. Furthermore, he provided a separate mineralogy course for students in the teacher training programme. At the beginning two assistants helped him, from 1912 one assistant and one associate professor. They and most of the other students of Krenner dealt with crystallography and mineral optics. Gyula Szádeczky (1891–1897) and Béla Mauritz (1909–1913) gave lectures in mineral optics and petrography, Gusztáv *Melczer* (1903–1907) and Zoltán *Toborffy* (1912–1927) mainly in crystallography, as "Privatdozent".

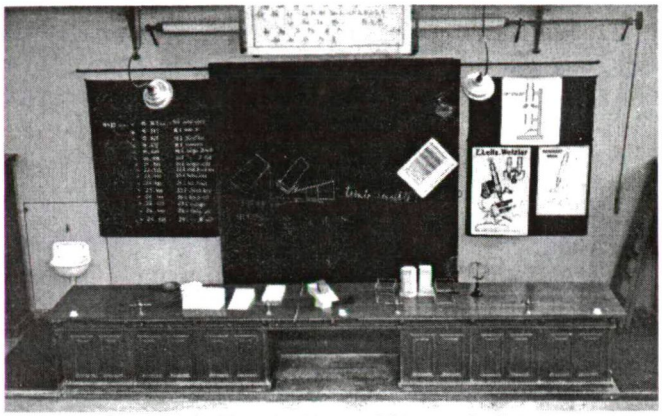
In his research Krenner focused mainly on the National Museum, therefore the Institute somewhat lost its former dynamics. Krenner was engaged mostly with descriptive mineralogy, especially with morphological crystallography. He described a large number of new minerals. On the other hand, towards the end of his activity, he encouraged and helped Mauritz to learn and bring home the newest results in petrography from abroad.

The Mauritz era

The teaching and scientific activity flourished under Mauritz. The courses were attended by students in pharmacy and philosophy. The latter were mainly secondary school teacher candidates in natural history and geography. The Professor gave theoretical and practical courses in crystallography, mineralogy and petrology. Sándor *Koch* (1934–1940), followed by Kálmán I. Sztrókay (from 1940 on) gave introductory lectures in crystallography, mineralogy and petrology. Lectures were given, as "Privatdozent", by Miklós *Vendl* (from 1925) in petrology, László *Tokody* (from 1928) in crystallography, Sándor Koch (1929–1940) in mineral genetics, topographic mineralogy, history of mineralogy and gemmology, Róbert *Reichert* (1935–1937) in petrology, Elemér Szádeczky-Kardoss (from 1935) in coal petrology and sedimentary petrology, Kálmán I. Sztrókay (from 1941) in ore genetics and ore microscopy, and Aladár *Földvári* (from 1943) in sedimentary petrology.

The research area of the institute included descriptive mineralogy, petrography, chemical petrology and, from 1940, ore mineralogy. Mauritz himself started as mineralogist but his main period of activity is connected to petrography and petrology. That balanced background helped him to set up an up-to-date development plan for the scientific profile of the Institute. In the 1930s he encouraged

the introduction of X-ray crystallography in the Institute, but the sudden death of Róbert Reichert caused an unfortunate, two-decade delay of that plan. Mauritz introduced ore mineralogy as well, based on reflected light microscopy, a flourishing study line represented by Kálmán I. Sztrókay and his successors for decades.



Lecture hall in the Natural history building, Budapest, around 1935

The last years of the period

After World War II major changes started in the university. Beside the traditional study lines new degrees, among them geology, were established. The first geologists graduated in 1946. The geology training followed the conception of Elemér *Vadász*, the new Head of the Institute of Geology. Fortunately, his ambition met the increasing need for geological research from the governmental side. That tendency got even stronger after the communist takeover in 1948 who introduced their peculiar industry policy (enforced heavy industry development, more raw materials needed, ideology of "self-sufficiency" etc.).

Though students of the traditional (pharmacy, teacher candidate) and some other new (e.g. chemistry) study lines still attended the courses, the Institute's educational activity – especially in teaching the more specialised subjects – focused more and more on students in geology.

In 1949/50 the whole structure of education on all levels changed radically in Hungary. Compulsory curricula were introduced for all universities. The number of students was determined by the Ministry of Education, based on centralised planning indices. The goal of training was largely modified. Natural history was cancelled from the teaching programmes of the elementary and secondary schools, so the training of teachers of natural history also stopped. Among the new/surviving teacher degree programs geography, geography-biology, chemistry and the short-lived geography-geology line contained limited mineralogy and petrology courses. The new courses were led by professors Szádeczky-Kardoss and Sztrókay, associate professor Vilma *Széky-Fux* and assistants János *Kiss* and Géza *Kisvarsányi*. The "magántanár/Privatdozent" positions were cancelled.

Several new research lines turned up in the Institute's profile: Szádeczky-Kardoss published books and papers on coal petrology and geochemistry. Sztrókay dealt with meteorites and conducted research in ore microscopy and ore deposits. The latter field was represented also by János Kiss and Géza Kisvarsányi. Vilma Széky-Fux was active in volcanic petrology.

Textbooks

In 1931 Róbert Reichert, Tibor *Zeller* and Sándor Koch published a book entitled *Ásványhatározó* (Determinative Mineralogy) for university students, secondary school teachers and collectors. This book was entirely rewritten, enlarged and reissued by Kálmán I. Sztrókay in 1949.

In 1942, 49 years after the last edition of Szabó's Mineralogy a new two-volume mineralogy textbook was written by Béla Mauritz in co-operation with Aladár *Vendl*, Professor of Mineralogy and Geology at the Technical University, Budapest (Mauritz and Vendl, 1942: *Ásványtan*).

During that half century mineralogy developed considerably. In crystallography Naumann's notation was not used any more, only the Miller indices. The method of E. S. Fedorov (1891, 1893) became widespread and commonly used for the identification of feldspars. Ore microscopy, began with P. Drude in the 1880s was developed by J. Orcel (1925), M. N. Short (1931), H. Schneiderhöhn and P. Ramdohr (1931, 1934) and became widely used. In 1896 H. Becquerel discovered radioactivity that became the basis of age determination, starting with B. B. Boltwood (1907), who analysed U and Pb in minerals. The method was further developed by C. N. Fenner and C. S. Piggot, who in 1929 published the first isotopic age results measured by mass spectrometry. O. Lehman published his book (1904) on liquid crystals. V. Goldschmidt issued the 20 volumes of *Atlas der Krystallformen* (1913–1923). N. H. Winchell and A. N. Winchell published their *Elements of Optical Mineralogy* (1909). The discovery of X-ray diffraction by M. T. F. von Laue and his coworkers (Friedrich et al., 1912) and its confirmation by W. L. Bragg (1912) opened a new chapter in mineralogy. The two Braggs, father (W. H.) and son (W. L.), and their followers described the basic crystal structures important for minerals between 1913 and the late 1920s. A remarkable Hungarian contribution to that field was the new, X-ray structure determination based classification of silicates by István Náray-Szabó (1930). P. Debye and P. Scherrer invented the powder diffraction method (1916). V. M. Goldschmidt, F. W. Clarke, V. I. Vernadsky, and A. E. Fersman introduced geochemistry, a new major discipline in earth sciences around 1920. Experimental mineralogy developed considerably through the work of N. L. Bowen, who established the base of modern petrology around 1910.

In their textbook Mauritz and Vendl incorporated practically all important achievements of mineralogy, but it is obvious that they intended to provide more of a well-established background for earth science (petrology, geochemistry, geology) related mineralogy, rather than emphasising the links of mineralogy to crystal chemistry and solid-state physics. They paid more attention to crystal morphology, crystal optics, phase diagrams (crystallisation of silicates from melt and precipitation from aqueous solution) and less attention to X-ray crystallography, crystal structures and crystal chemistry than some of their contemporaries. In the systematic mineralogy they followed more or less the system of the textbook of Klockmann and Ramdohr (1936). When describing mineral species they gave chemical formula and lattice constants, described in detail the physical and chemical properties, genetics, occurrences and localities. There was no second edition of that comprehensive textbook, as the general changes after World War II changed the situation of teaching mineralogy as well.

Collection, library, equipment

The structure, arrangement and teaching role of the collections, set up by Szabó, did not change till the end of the period discussed. The only exception was the transfer of the Stratigraphy Collection to the new Institute of Geology and Palaeontology. The space in the Rock Hall left behind by the moved collection was filled up again by using the generous donation of Andor Semsey with a systematic rock collection arranged according to Rosenbusch's system. Between the two World Wars new specimens and entire collection parts (e.g. basalts), showing the professor's research interests, were added to the rock collection. More and more ore samples and samples representing ore formation and other rock alteration processes were collected from the beginning of the 1930s.

In 1952 Szádeczky-Kardoss decided to create study rooms and laboratories in the area of the Rock Hall. The furniture of the Rock Hall was demolished, a smaller part of it was transported to other rooms. The rock specimens themselves were put to the floor of the Mineral Hall and to the cellar of the building.

The library maintained its continuous development. Mauritz was keen to keep running the subscription of journals and to buy new books, in order to counterbalance the partial isolation of Hungary, especially from the Anglo-Saxon scientific community.

Equipment was continuously upgraded. In Krenner's period the professor used his resources for buying minerals mainly for his department in the National Museum and equipment for his institute at the University. The only exception was the laboratory for mineral wet chemistry that had traditionally been set up and developed in the Museum. At the university mainly optical tools (goniometers, microscopes etc.) were acquired. In the 1910s and 1920s, the first decades of Mauritz, the economic situation was very poor in Hungary. From the 1930s the general situation improved and parallel to that Mauritz became strong enough in science politics to apply successfully for equipment grants. For example the large Leitz research microscope, both for transmitted and reflected light, operable even today, was bought. Laboratory equipment for sedimentary petrography was also developed in the mid-1930s.

Szádeczky-Kardoss started with a large-scale development of laboratories. In the first step laboratories for spectrography and thermoanalysis (DTA) were established.

The Department of Mineralogy between 1953 and 1988

Institutional structure, professors and staff, general environment

In 1953 the Department of Mineralogy and the Department of Petrology and Geochemistry were separated. (The Institute, as umbrella organisation, formally existed until 1962.) Kálmán I. Sztrókay became the Head of the Department of Mineralogy. The other department was lead by Elemér Szádeczky-Kardoss, who kept also his position as Head of Institute, and soon (1955) got additionally a third position, Director of the Laboratory for Geochemical Research of the Hungarian Academy of Sciences, a new institution formed from his former Geochemistry Research Group, working in strong symbiosis with the Department of Petrology and Geochemistry until 1975.

In 1983 a loose conglomerate of the six geology-related departments of the Faculty was formed under the name Institute of Geology (Geológiai Tanszékcsoport), but the member departments kept their full independence both in teaching and research.

Sztrókay directed the Department of Mineralogy between 1953 and 1973. The staff of the Department gradually increased. In addition to the academic teaching staff research scientists were also employed. János Kiss, Géza Kisvarsányi, István *Vörös*, László *Ódor*, László *Bognár*, György *Buda*, József *Pálmai*, György A. *Lovas*, József *Frecska*, Andrea *Mindszenty* (for a short period) and János *Bérczi* represented the staff in the two decades of the leadership of Sztrókay.

Kálmán Sztrókay (1953–1973)

In 1973 János Kiss became Head of Department (1973–1987). Though Sztrókay retired in 1978, a separate study room was still reserved for him and he visited the department regularly until his death in 1992. From the staff of the previous period Bognár, Buda, Lovas and Bérczi continued their service; in the early 1980s Bérczi left and Mindszenty rejoined the department. A large influx of fresh graduates was characteristic for the first decade of the leadership of Kiss: in the mid to late-1970s István *Dódony* and István *Gatter* joined the Department; from the early to mid-1980s Tamás G. *Weiszburg*, József *Takács*, Melinda *Jánosi*, Gábor *Papp*, Miklós *Soós* and Ferenc *Molnár* worked at the department for longer or shorter periods in different capacities. Alajos Kálmán helped the department's acivities as honorary lecturer. The number of the assistant personnel grew side by side with the growth of administrative tasks.

In 1987 János Kiss withdrew from the chair and for one year (1987–1988) László Bognár was Acting Head of Department.

Interestingly, the sometimes rapidly, sometimes slowly changing general political and economical environment in Hungary had only limited impact on the professional activity and personal life of the Department in the 1953–1988 period.

These decades covered, among others, the Hungarian Revolution in 1956; the years of silence and isolation until the early–mid-1960s; the slow, but unidirectional step-by-step relaxing of the dictatorship, increasing freedom in travel and international contacts, increasing investments – both.

equipment and personnel – in research and higher education from the 1970s The continuous economical changes resulted in peaceful political changes at the end of the period.

That situation could be thanked mainly for the Head of Department: Sztrókay acted in the most critical first two decades as an umbrella over staff, teaching and research. He managed to keep proper distance from politics, but, by utilising his home and international reputation and contacts, still to show the importance of his science in the domestic science politics. He followed the main trends of mineralogy and, last but not least, kept his own scientific standards.

Teaching and research

The Sztrókay era (1953–1973)

As a continuation of the trends of the previous years, participation in the geologists' training became the most important teaching activity of the department. The three most important standard courses in the geology curriculum covered by the department were mineralogy (including crystallography), determinative methods for minerals, and ore deposits (including reflected light microscopy). Additionally several special courses were also offered by the professor and the staff. In the 1950s and 1960s 10–40 geology students were trained every year. At the end of the 1960s that number dropped, and in the early 1970s there were years when the geology programme did not even start at the university.

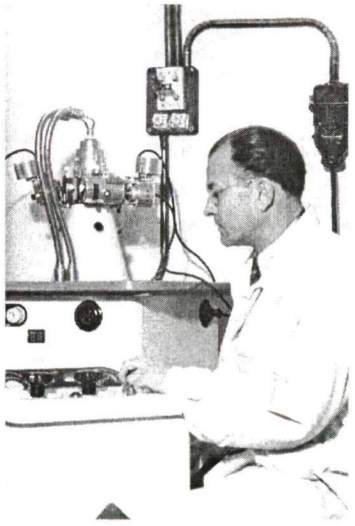
Beside the geology programme, other study lines (e.g. chemistry, geophysics, several teacher candidate degree programs, like biology-chemistry, geography) also had separate basic courses in mineralogy, sometimes mineralogy and petrology in one introductory course. These latter type "mixed" courses were designated either to the Department of Mineralogy or to the Department of Petrology and Geochemistry; there were no shared courses between the two departments. For a while, by offering a course on description of commercial goods, the Department also cooperated with the University of Economy, Budapest.

From 1957, after a break of a decade, the universities in Hungary got back their right to issue again doctoral degrees, even if the right for issuing real academic degrees was kept by the Academy of Sciences. Professor Sztrókay supervised several doctoral processes. Another change in the 1960s was the introduction of a research grant system of the Academy of Sciences. The grantees, many of them coming from abroad, mainly from developing countries, could prepare their degree thesis not only in research institutes of the Academy, but also at university departments. The Department of Mineralogy was also included among these training places. The foreign postgraduates trained here represent, even today, a vivid link of the department to the world.

Concerning research, Sztrókay studied Hungarian meteorites of international interest (e.g. CV3 carbonaceous chondrite from Kaba, LL5 ordinary chondrite from Nyírábrány) and was also active in the theoretical aspects of mineral systematics in the early 1960s. He continued his ore mineralogy and ore deposits interest, and under his influence a large part of the research activity in these decades was focused on that subject (Sztrókay, Kiss, Kisvarsányi, later Bognár, Vörös, Mindszenty).

Buda took also part in meteorite research and ore prospecting projects at home as well as abroad, but he has already started with his main research area, the rock forming minerals of granitoids (e.g. ordering of the feldspar structure). He specialised himself in optical studies (e.g. U-stage) and X-ray powder diffraction.

The Department's research was helped from the mid-1950s by X-ray diffraction (mainly powder diffraction; phase analysis) and from the mid-1960s by X-ray fluorescent spectroscopy. From the early 1960s Bognár run the X-ray laboratory. In a few years Lovas, doing X-ray crystallography, joined him.



Debye-Scherrer X-ray equipment in the Department (K. Sztrókay on the photo, 1954)

The Kiss era (1973–1987)

In 1975, partly as a response of the faculty to the difficulties of earlier years, major changes happened in the structure of earth science related degrees at the University. The previous programmes were stopped and a brand new, integrated programme called "Earth science" was launched. In this programme, after two years of joint study covering most aspects of earth sciences, three years of subject specific programmes were offered resulting MSc degrees in geology, geophysics, meteorology, cartography, geography and further minors in pedology, hydrology and mineralogy. In the new system an introductory mineralogy course was offered for all earth science students in the first semester, while for those specialised in geology two semesters of mineralogy were included in the third year (4 hours lecture and 4 hours practical in both semesters). The courses of ore deposits and determinative methods for minerals were similarly delivered in the fourth and fifth years. The integrated approach had many advantages but on the other hand the shorter period (only 3 years) available for specialisation caused also stress in the programmes. As a result, the earth science programme was terminated in the last years of the 1980s and the separate 5-year programmes for geology, geophysics etc. started again.

The department kept its position in the postgraduate studies, too. Several doctoral degrees were issued in mineralogy, partly in the traditional and partly in a new grant system introduced in 1983 by the Scientific Qualification Committee (TMB) of the Academy of Sciences.

In research Kiss, Buda, Bognár and Lovas carried on with their previous research interest. In addition, Kiss pursued experimental mineralogy (e.g. hydrothermal synthesis of sulfides and hydroxides). Mindszenty dealt mainly with sediment-related ore formation (bauxite, manganese) and connected weathering processes.

János Kiss (1973–1987)

New analytical methods turned up in the Department. Bérczi, graduated in chemistry and physics, dealt with neutron activation analysis (NAA) in cooperation with the Teaching Nuclear Reactor Centre of the Technical University, Budapest. The study of minerals in the micrometre–nanometre range by transmission electron microscopy and electron diffraction, with a focus on the real structure of minerals, started at the Department by Dódony in the second half of the 1970s. His students in the 1970s and 1980s (Weiszburg, Takács, Papp, Soós, Pósfai) contributed also to the same research direction. Fluid inclusion studies, mainly on hydrothermal ore deposits, started in 1977 when Gatter set up the microthermometry laboratory. Molnár joined that research line after a decade.

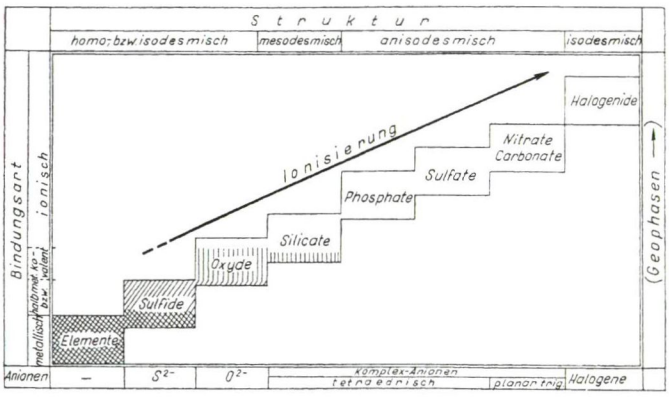
From 1984 two new research directions, topographic mineralogy of Hungary, a contract-based research for several staff members (Weiszburg, Papp, Molnár, Jánosi), and history of mineralogy (Papp, Weiszburg), mainly in connection with the history of the collection, were also launched.

Textbooks

In 1955 Kálmán I. Sztrókay, in co-operation with Sándor Koch, Professor of Mineralogy at the University of Szeged, published a new mineralogy textbook (*Ásványtan;* Koch and Sztrókay, 1955). The one volume textbook was enlarged and updated by Sztrókay and, on behalf of Koch, by Gyula Grasselly (Szeged). That second edition was published in two volumes in 1967. The third edition, containing minor corrections of Sztrókay was published in 1986.

The 1955 edition of the textbook of Koch and Sztrókay is divided into general mineralogy (including crystallography) and systematic mineralogy. The former, written by Koch, is practically a condensed version of the general mineralogy part of the textbook of Mauritz and Vendl (1942). The only important exception is the inclusion of a real crystal chemistry chapter (bond types, coordination numbers etc. and their relationship to the physical and chemical properties of minerals), a field developing rapidly in the previous decade (Niggli, 1941, 1942; Náray-Szabó, 1944). Another additional chapter showed the history of mineralogy, a favourite topic of Koch, while the traditional mineral formation chapter, Koch's other favourite subject, was left out by the pressure of the reviewer, E. Szádeczky-Kardoss. Optical mineralogy, another strong chapter of the book of Mauritz and Vendl (1942) was modernised by demonstrating the connection between optical properties and chemical bonds in crystals, based on the packing indices of Fairbairn (1943). The systematic mineralogy part, written by Sztrókay, differs substantially from the previous Hungarian textbook. It is fully crystal chemistry based and the sequence of mineral classes reflects Sztrókay's own concept (Sztrókay, 1962), started with metallic (native metals and sulphides), followed by covalent (oxides) and more and more ionic bonds (silicates, phosphates, sulphates, borates, carbonates, nitrates, halides) and finished with the molecular structures of organic minerals. When describing the individual mineral species, Sztrókay included crystal structure, lattice parameters, symmetry, but also emphasised the traditional diagnostic features (morphology, physical and chemical properties) and gave detailed information on genetics and localities.

The 1967, second, edition kept the structure of the 1955 book. General mineralogy was largely restructured and modernised (crystal chemistry part enlarged and updated by Gy. Grasselly) and all important updates, changes in theoretical background and new data were included also in the systematic part by Sztrókay.



Sequence of mineral classes by K. Sztrókay (1962)

From the middle of the 1960s several mineralogy-related textbooks and lecture notes were prepared in the Department partly for introducing teaching of new analytical methods, partly for serving the needs of the changing structure of education. Such examples are: *Ore Microscopy* (Ércmikroszkópia) by Sztrókay (1966), *Modern Methods and Instruments in Mineralogical and Petrological Investigations* (Az ásvány-kőzettani anyagvizsgálat korszerű módszerei és eszközei) by Buda et al. (1968), *Tables for Crystallography* (Kristályrendszertani táblázatok) by Buda (1968), *Laboratory Practices in Mineralogy* (Ásványtani praktikum) by Sztrókay et al. (1970, 1971), *Determinative Tables for Ore Microscopy* (Ércmikroszkópiai határozó) by Vörös (1970), *Elements of Crystallography* (Kristálytani alapismeretek) by Sztrókay and Bérczi (1972), *Methods of Ore Prospecting* (Érclelőhelyek kutatási módszerei) by Bognár (1977), *Elements of Mineralogy and Petrology* (Ásvány-kőzettani alapismeretek) by Kiss (1978), *Mineralogy* (Ásványtan) by Kiss (1980; in cooperation with Bognár, Buda, Dódony and Sztrókay).

In the 1980s two textbooks, a two-volume *Ore Deposits* (Ércteleptan) by Kiss (1982) and a *Determinative Mineralogy* (Ásványhatározó) by Bognár (1987) were prepared in the

Department. It is worth mentioning that later a second edition of the latter book (Ásványhatározó; Bognár, 1999) and a related *Glossary of Mineral Names* (Ásványnévtár, Bognár, 1995) were also prepared by Bognár for helping university level teaching.

Collection, library and equipment

In the 1950s and 1960s the mineral collection was developed mainly by Sztrókay who collected regularly on his field trips both in Hungary and abroad. One important purchase (the Streda Collection) brought small but excellent display specimens to the department. A more and more complete ore deposit collection was also set up by the staff members involved in ore deposit studies (Kiss, Vörös, Bognár etc.).

In 1959, on the occasion of the International Geochemical Congress organised by Szádeczky-Kardoss, the former Mineral Hall was re-opened as Mineral and Rock Hall. Three larger exhibitions were set up. The systematic mineral exhibition, arranged according to the system of Sztrókay described in his textbook, occupied the central part of the ground floor. The systematic rock collection, exhibited on the ground floor along the walls, reflected the scientific views of Szádeczky-Kardoss on petrogenesis and geochemistry. On the two upper gallery levels regional collections (Hungary, Carpathian volcanic belt etc.) were exhibited. These exhibitions were compiled mainly from the rock collections of Szabó and Mauritz.

In 1981 systematic work started in the collections for the preparation of the planned move of the Faculty to a new campus.

The once joint Institute Library was set up in the area of and was operated by the Department of Petrology and Geochemistry. From the 1980s a few special mineralogy- or crystallography-related journals were transferred to the Department of Mineralogy. Until the financially difficult period starting in the mid-1980s, most of the traditional and important new periodicals and internationally recognised textbooks and handbooks were accessible in the library.

Equipment developed remarkably in the period. The first X-ray generator, equipped with Debye-Scherrer cameras, was bought in 1954. In 1966 the X-ray laboratory was enlarged by a new Siemens generator serving a powder diffractometer and an X-ray fluorescence spectrometer. In the early 1980s a second Siemens generator, connected to a D-500 diffractometer, was installed. Thermal analysis was introduced through the purchase of a combined DTA, TG, DTG unit ("Derivatograph" of MOM, an instrument developed in Hungary and used world-wide). The traditional polarised light microscopy laboratories were modernised. New research microscopes, as well as new microscopes to the students' laboratories were bought. Special methods based on optical microscope stages (e.g. U-stage, Chaixmeca type heating and cooling stage) were also introduced both in research and teaching. In the mid 1980s basic equipment for gemmology courses were purchased. The transmission electron microscope laboratory (JEOL JEM 100U), located on the ground floor of the Department of Mineralogy, was set up by the Academy of Sciences in 1973. (The first head of the TEM laboratory was Klára *Árkosi*.) The TEM lab became part of the Department of Mineralogy in 1978. From the mid-1980s subsequent generations of the rapidly developing table top, later personal, computers were installed.

The recent years of the Department of Mineralogy (since 1988)

Professor and staff, general environment

In 1988 György Buda took over the leadership of the Department of Mineralogy. He was also Head of the Institute of Geology for six years (1992–1998) and Acting Head of the Department of Petrology and Geochemistry in two periods (1993–1995; 2001–2003).

From the permanent and temporary staff of the 1980s Bognár left for the Hungarian Geological Survey, Papp for the Hungarian Natural History Museum, Soós and Takács for business at the turn of the 1980/90s. In the same period Jánosi took over the microprobe laboratory of the Department of Petrology and Geochemistry, while Mindszenty became Head of Department at the Department of Applied and Technical (later: Environmental) Geology. Kiss retired in 1991 but kept his room and took part actively in the life of the Department until the move to the new campus in 2001.

Currently the staff consists of one professor (Buda), three associate professors (Dódony, Gatter and Molnár) and two research associate professors (Lovas and Weiszburg).

Because of the serious control on the number of staff, started in early 1990s, the PhD (earlier "doctoral") students started to play a more and more increasing role in the teaching and research activity of the department. Those who worked here for years, continued their activity in other mineral science related academic (Bernadett *Bajnóczy*, Geochemical Laboratory of HAS; Norbert *Zajzon*, University of Miskolc) or industrial (Krisztián *Szentpéteri* and István *Valdman*, mineral exploration/mining in Recsk Hungary/Copiapo, Chile) research places in Hungary, out of Hungary (Mohamed Ali *Mattash*, Yemen; Imbarak Sayed *Hassan*, Egypt; Ágnes *Gál*, Cluj, Romania; Marija *Horvat*, Zagreb, Croatia), or are still active in the department (Viktória *Kovács-Kis*, Erzsébet *Tóth* and the current PhD grantees, Zsolt *Benkó* and Tamás *Váczi*).

The increasing importance of the historical collections was honoured by the Faculty by the foundation of curator positions (one full academic and one half technical) in the early 1990s. Currently Klára *Kóthay* is the curator.

The continuous economical changes (having their roots back in the mid-1970s) and the step-by-step political changes (started in the mid-1980s) resulted in a peaceful change of the political system in Hungary in 1989. These changes had no dramatic impact on the universities. The only short-term result, in connection with the rapid temporary decline of the Hungarian economy in the early 1990s, was the practically complete loss of the contract-based applied research that earlier represented an important contribution to the department's budget. That negative effect was compensated soon by new grant programs, connected, at least partly, to the European Union, opened for the Hungarian academic sector well before the country itself joined the EU in 2004. In the universities the political changes were the most reflected in the number of students: while previously only about 10% of the population born in a given year entered higher education, in the new era that number increased to above 40%.

The most significant event in the recent history of the Department was the move from the Trefort Garden Campus (centre of Pest) to the new riverside Campus of the Eötvös University at Lágymányos (southern Buda). Planning started, in several runs, decades ago, but the effective planning and packing determined the Department's life between 1997 and 2002. At the new site the general infrastructure, including laboratories and lecture rooms, provides an excellent environment for teaching and research up standards of the 21st century, just as the former Trefort Garden building, functionally designed by József Szabó 120 years ago, offered a proper environment for mineral sciences in the 20th century.

The southern building of the new Lágymányos Campus of the University, home of the Department since August 2001. X marks the Historical Hall of the Mineral and Rock Collection.

Teaching and research

From the middle of the 1990s the teaching load of the Department increased rapidly.

The main task was still the training of students in geology. Though the mineralogy-related part of the five-year geology programme faced only minor changes in the last 15 years, the number of students entering the first year doubled (60–80). As the main mineralogy course is delivered in the first two semesters, the number of the practical courses had also to be doubled. The situation is somewhat better in the second year (a 50–60 % average increase of students), where analytical methods in mineral sciences (a joint two-semester course of the Department of Mineralogy and the Department of Petrology and Geochemistry) is taught. Ore deposits, now two independent one-semester courses are delivered in the third year of the geology programme.

Beside the geology programme the Department kept on teaching mineralogy and related fields for other traditional programmes of the Faculty (geophysics, chemistry, engineering physics, teacher candidates in chemistry) and also took part in three new degree programs, geography, launched in 1994, teacher candidates for environmental science, launched in 1998, and environmental science, launched in 2004.

The currently running largest change in the Hungarian higher education is the adoption of the harmonised three-cycle European teaching system within the frame of the Bologna Process. That system, with an integrated three-year BSc degree in earth sciences, and, built on that, two-year MSc degree programs in geology, geophysics, astronomy and meteorology, is planned to be launched in 2006 in Hungary. The Department of Mineralogy tried to do its best for understanding the main tendencies of the European higher education by initiating and co-ordinating several international curriculum development projects within the frame of the Erasmus programme in the years 1998–2004. The universities of Cluj, Darmstadt, Kiel, Manchester, Pisa, Thessaloniki, Turin, Veszprém and Vienna were the main standard partners of these projects.

The changes in the postgraduate studies ("third Bologna cycle") started in Hungary even before the Bologna Declaration. From the mid-1990s postgraduate studies are organised solely by universities within the frame of doctoral schools. The Earth Sciences Doctoral School of the Eötvös L. University was set up in 1993. All permanent staff members of the Department of Mineralogy are also members of the Doctoral School, deliver courses and guide PhD students in thesis preparation. Well-known scientists invited by the Department from Austria, Canada, Germany, Greece, France and Japan gave also short courses in specific subjects.

In 1995 the Department hosted the Ore Mineralogy short course of the Commission of Ore Mineralogy of the International Mineralogical Association, an important postgraduate teaching event on that field.

In 1997 the European Mineralogical Union started its EMU School programme, a short course series in English attracting annually 80–120 participants from 20–30 countries. Out of the six EMU schools organised until now four (1997, 2000, 2002, 2003) were hosted by the Department of Mineralogy in Budapest, providing an excellent opportunity for local PhD and MSc students (and also for professors) for participation.

In 1999 the Society of Economic Geologists organised its field conference on the epithermal ore deposits of the Western Carpathian volcanic area. The organisation and academic preparation of the Hungarian part of that course was managed also by the Department.

In research Buda promoted continuation of the research branches that proved to be fruitful earlier.

The experimental mineralogy activity of Kiss was extended to biomineralogy (human tooth enamel). Buda and his students (Zoltán *Dani*, M. A. Mattash, Yao *Hua*, I. S. Hassan, William *Heins*, M. Horvat) further pursued the investigation of rock-forming and accessory minerals of granitic rocks (e.g. zircon morphology) and dealt with basic volcanic, ophiolitic series (e.g. mineralogy of chromite deposits). Dódony kept on with his interest in the nano-region structure of minerals, dealt, among others with the serpentine-group minerals and took part in the description of new minerals, partly during his longer stays abroad. Lovas, from 1989 Head of the X-ray Laboratory, was active not only in X-ray phase analysis, but also in application of computers in teaching and research. Gatter and Molnár continued their research mainly in the field of hydrothermal ore genesis. Molnár worked on different ore deposits abroad (Canada, Chile, Turkey etc.) and in the field of archaeometry as well as topographic mineralogy. Having started from the fluid inclusion studies Gatter showed increasing interest in gemmology. Weiszburg continued his interest in the complex application of analytical methods in mineralogy (working

currently in the celadonite-glauconite group), and was still active in some of his earlier fields (history of mineralogy, topographic mineralogy).

Staff members held abroad several invited courses and lectures (e.g. Buda in Egypt, Korea and France) and spent shorter or longer periods as guest researchers e.g. in Austria, Canada, France, Japan, United Kingdom and USA. They also have actively been involved in various committees of and held offices in professional international organisations (e.g. EMU, IMA, SEG).

Currently the following six are the official research fields of the Department: I) mineralogy, petrology, ore deposits; II) crystal morphology, optics, structure, crystal chemistry, genetics and topography of natural and synthetic solid phases; III) applied mineralogy; IV) archaeological mineralogy, archaeometry; V) methodological research; VI) history of mineral sciences.

Textbooks and related teaching materials

The rapidly developing technical environment of teaching in the 1980s inspired new approaches in the first part of the period. Both analogue (video movies; Juhász et al., 1989) and interactive digital (PC based multimedia packages; based on Buda, 1996 and Molnár et al., 1996 manuscripts) teaching materials were produced in the Department by Lovas et al..

In 1993 I. Gatter contributed to a book on *Mineral species of Hungary* (Magyarországi ásványfajok; Szakáll, Gatter 1993), used also in teaching.

In the last seven years a new line of textbook-related activity of the Department was publishing of the *EMU Notes in Mineralogy,* a university textbook series. That series contains the edited version of the lectures delivered during the joint EMU Schools and Erasmus Intensive Programmes. EMU Notes is published by the Eötvös University Press. The two Series Editors are G. Papp and T. G. Weiszburg. The technical editing of the series is also done at the Department, recently by T. Váczi. Up to now six books containing outstanding achievements of the last decade of mineralogy and petrology have been published: S. Merlino (ed. 1997): *Modular Aspects of Minerals;* D. J. Vaughan, R. A. Wogelius (eds. 2000): *Environmental Mineralogy;* C. A. Geiger (ed. 2001): *Solid Solutions in Silicate and Oxide Systems;* C. M. Gramaccioli (ed. 2002): *Energy Modelling in Minerals;* D. A. Carswell, R. Compagnoni (eds. 2003): *Ultrahigh Pressure Metamorphism;* A. Beran, E. Libowitzky (eds. 2004): *Spectroscopic Methods in Mineralogy.*

However, in spite of all the above listed activities, a modern comprehensive textbook of mineralogy in Hungarian, just as a similar textbook on ore deposit geology are missing very much. These tasks are open for the coming years for the staff.

Collection, library and equipment

The first fruits of the systematic curatorial work, started in the 1980s in the collection became visible in the 1990s. The re-inventorying of the mineral collection and computer cataloguing were in progress. The large systematic mineral exhibition was updated and renewed for the 3rd International Conference on Mineralogy and Museums (1996) organised in and by the Department. In the mid-1990s 4–5000 visitors, mainly school classes visited the Historical Mineral Hall. From 1998 the preparation of the move to the new campus dominated the life of the collection. The move itself started in mid-August 2001 and was finished by the official opening of the Historical Mineral Hall in June 2002. An important achievement of the move was the intact transition of the 216 m^2 Historical Mineral Hall into the new building. The furniture, the largest one-piece protected furniture ever transported in Hungary, was restored in its original, mid-1880s form (see the cover photo of the current issue). A less attractive, but from a scientific point of view just as important move-related activity was the first inventorying and computer cataloguing of the whole rock collection and the ore deposit collection. At the new campus the roomy compact storage system also allowed the use of the collection as *scientific archive*: well documented specimens, thin sections, separated fractions of samples studied and published by the university staff are archived here for the future. From January 2004 the Mineral and Rock Collection became part of the newly established Natural History Museum of the Faculty of Science. In the new organisational structure the collections preserve their original strong links with teaching and research, but can open their activity also in the direction of the broad public. That system helps the better integration of the university in the society and opens new resources for the, until now not funded, curatorial work in the museum.

The move to the new campus resulted in major changes also in the library system. Department libraries were merged into a professional Faculty of Science Library. One of its subunits is the Biology-Informatics-Earth Sciences Library, operating on the first floor of the new building. With time, with increasing practice and increasing resources smoother and smoother running of the new unit is expected.

In equipment modernisation two periods are worth mentioning. In 1992–1995, mainly from the resources of the newly set-up Development Fund for Higher Education (FEFA), a huge sum, some 130 million Hungarian Forints were spent on research facilities of the Department. Among the research laboratories the X-ray laboratory was upgraded with a Siemens D-5000 diffractometer, the fluid inclusion microthermometry laboratory purchased a new Chaixmeca type apparatus and a new VIS–NIR microscope spectrophotometry laboratory (Zeiss MPM400) was set up. The mineralogical use of a 125 kV transmission electron microscope (HITACHI) equipped with EELS imaging filter (Gatan GIF) operated by biologists became available by the purchase of a new goniometer. A full set of new transmitted and reflected light microscopes was installed in the students' optical microscope laboratory. Computers (subsequent generations of PCs, a Silicon Graphics workstation) and software (databases, traditional office and graphical software, research packages, like CERIUS^2) were also purchased. Between 1995 and 2003 both the limited financial resources available in the whole Hungarian higher education and the, by the move, strongly limited internal human resources of the Department hindered the development of equipment. In 2004, as Hungary joined the EU, new funds opened again. Based on two successful grant applications the X-ray diffraction and the microthermometry laboratories will be reconstructed in the close future.

CLOSING REMARKS

Based on the 230-year-long traditions summarised above and the efforts of the recent staff it is hoped that the niveau of mineral science related teaching in Budapest can be kept also in the future, in the new Bologna system. (N.B. József Szabó was, among others, also Doctor Honoris Causa of the University of Bologna)

József Szabó, Doctor Honoris Causa (honorary doctor) of the University of Bologna.

The broad scientific interest, in combination with the intensive local and international co-operations may also give a solid background for hosting the 20th General Meeting of the International Mineralogical Association in 2010, an important event for the whole region, organised by the Austrian, Hungarian, Slovak and Romanian mineralogical communities.

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Name and affiliation of the department / institute where mineralogical subjects were taught

Period	Faculty of ...	Name of the department (D) / institute (I)
1774–1784	Philosophy	D. of Natural History[1]
1784–1849	Philosophy	D. of General Natural History, Physical Geography, Agriculture and Technology[2]
	Medicine	D. of Special Natural History[3]
1849–1850	Medicine	D. of Mineralogy[4]
1850–1885	Philosophy	D. of Mineralogy[4]
1885–1949	Philosophy	I. of Mineralogy and Petrography[5, 6]
1949–1953	(Natural) Science	I. of Mineralogy and Petrography[5]
1953–1957	Life and Earth Sciences	D. of Mineralogy[4] (within the I. of Mineralogy and Petrography[6])
1957–1962	(Natural) Science	D. of Mineralogy[4] (within the I. of Mineralogy and Petrography[6])
1963–	(Natural) Science	D. of Mineralogy[4]

[1]Cathedra historiae naturalis, [2]Cathedra historiae naturalis generalis, geographiae physicae, oeconomiae rusticae et technologiae, [3]Cathedra historiae naturalis specialis, [4]Ásványtani Tanszék, [5]Mineralogiai és Petrographiai Intézet, [6]Ásvány- és Kőzettani Intézet

Professor (and/or head of department/institute)

1774[1]–1788 (†): Mathias Piller
1789–1807 (†): Joseph Schönbauer
1808–1809: János Reisinger (S)
1809[2]–1810: János Schuster
1810–1848 (R): János Reisinger
1848–1849: vacant
1849–1855: József Szabó (S)
1855–1861[3]: Carl Ferdinand Peters
1860–1894 (†): József Szabó (until 1862 S)
1894: Sándor Schmidt (T)
1894–1913 (R): József Krenner
1914–1950 (R): Béla Mauritz
1950: Kálmán I. Sztrókay (T)
1950–1962: Elemér Szádeczky-Kardoss (head of institute)
1953–1973: Kálmán Sztrókay (head of department)
1973–1987: János Kiss
1987–1988: László Bognár (T)
1988–: György Buda

Professor of the parallel department between 1784–1849 at the Faculty of Philosophy

1784–1814 (†): Ludwig Mitterpacher
1814–1841 (†): Mihály Faliczky (until 1815 S);
1841–1849: ? (S)

Abbreviations and symbols: R: retired, S: *supplens* (supply professor), T: temporary, †: deceased
[1]Year of "*concursus*" (competitive examination); [2]Year of entering his office, year of appointment: 1808; [3]Year of leaving for the Vienna University