Bohemian mineralogy in the early 19th century: the Vaterländisches Museum in Böhmen

Claudia R. Schweizer

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C.R. Schweizer, Am Modenapark 13/11, A-1030 Wien, Austria (c.schweizer@gmx.at).

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The Vaterländisches Museum in Prague was officially founded in 1822 by Caspar and Franz Sternberg as a manifestation of Bohemian nationalism. It aimed at 1) the education of the public, 2) the sponsorship of Bohemian scientific and cultural research, and 3) the economical utilization of scientific knowledge. Under these aspects also the development of the oryctognostic collection of the museum should be regarded.
In 1818, private mineral collections were donated. After its official opening in 1822, the united collections were split into two parts, a systematic and a local native collection. The first was basically distinguished by a prominent sortiment of gems, particularly by the typical garnet species and varieties, furthermore by the meteorites of Elbogen, Žebrak and Bohumilitz and by a rich portion of metals and their ores. The second exposed its specimens to the observer in an instructive disposition of their natural deposit referring to their topographic location along the Bohemian mountain ranges and formations.
The national endeavours behind the museum's enterprises were additionally manifested in its ambition in scientific research, which in the field of mineralogy has been largely done by the collection's curator Franz-Xaver Zippe.

Contents

Introduction

When the Vaterländisches Museum in Böhmen was officially founded in 1822, many museums of the Austrian-Hungarian monarchy had already opened their gates. These included the Hungarian Nationalmuseum in Pest (1802), the Brukenthal Nationalmuseum in Hermannstadt (1802), the School Museums in Teschen (1802) and Troppau (1814/1818), the k. k. Hofnaturalienkabinette in Vienna (1806), the Joanneum in Graz (1811), the Ossolinsky Institute in Lemberg (1817), the Franzensmuseum in

Brno (1818), and the Nationalmuseum in Ljubliana (1821) (Raffler, 1999). It was the political era of the Restoration, when nations with their own history and their own specifically given natural circumstances, their own cultural traditions and their own language, were yet united in the monarchally gouverned complex of dominions, which centralised and exhibited its power at the court of the Austrian emperor Franz I in its capital city of Vienna. The awareness of their own cultural background, but political dependency on the monarchal court, led all the more to their patriotic urge to preserve and represent their cultural and natural heritage in these dominions, and to open them to their public as an act of self-awareness and self-identification. With her attempt to analyse the historical contexts and causes, that led to the foundations of national museums within the Austrian-Hungarian monarchy in the course of the 19th century, Raffler (1999, p. 254) raised the following questions:

A. How can and should nations be represented?
B. What does this kind of representation distinguish from the patriotic self-portrait of these dominions?
C. Which citeria determine a nation's self-image?
D. To what extent do items of national heritage, displayed in museums, engender feelings of patriotic pride?

To answer these questions in the specific case of the Vaterländisches Museum, it has to be first mentioned, that Bohemian nationalism, which included the German and the Czech speaking populations has got its roots already in the 13th century, when Bohemia had become a kingdom under the reign of Přemysl Vaclav I and had loosened its so far close dependency on the Holy Roman Empire of the German nation. This nationalism has been revived under its clerical reformer Johannes Huss, again in the course of the Austrian absolutism in the 17th and 18th century, and particularly at the beginning of the 19th century after the Napoleonian Wars. It was only increased by the optimism and confidence in scientific progress, both characteristics of the late enlightenment, which rather contrasted with the political and economical atmosphere of the era Metternich. Regarding the predominantly scientific aspects represented in the Bohemian museum, and referring to question A), the exhibition of the specifically Bohemian circumstances in nature, comprising its flora and fauna, as well as the country's geology constituted fundamental national requests. However, it cannot be denied, that the representation of historical and cultural items had also been widely intended at the time by the museum's founders Caspar Count Sternberg (1761-1838), Franz Count Sternberg-Manderscheid (1763-1830), and Franz Count Klebelsberg-Thumburg (1774-1857) as well as by its protector Franz Anton Count Kolowrat-Liebsteinský (1787-1861) (Nebeský, 1868). This emphasized natural-scientific position however should not thrust the fact into the background, that the Bohemian nation – particularly the Czech-speaking population – set a strong accent on the care of its Slav language. It was mainly endeavoured by the slavists Joseph Dobrowský (1753-1829) and Joseph Jungmann (1773.1847), and by the historian František Palacký (1798-1876), and thus made the Czech language to a programmatic item in the Czech self-portrait. Language, therefore, clearly exhibited the main position in the specifically Czech identification process, while the investigation of nature in their native country may be regarded as a general Bohemian endeavour. This is the mutual reply to Rafflers questions B) and C), judging the museum's intentions and their realisation as a direct transfer of Bohemian history and national heritage. At the same time, it

points towards the answer of question D); as far as the natural-scientific research- and exhibition-programme of the museum is concerned, and this particularly applies to the oryctognostic collections, the Vaterländisches Museum has always attempted to represent the completest possible and characteristic reflection of the natural products and deposits of its native country, and to avoid the overpowering effect of any provincial patriotic delusion. As the Vaterländisches Museum was strongly aimed to instruct the public of the objectively represented heritage, it was consequently also striving for an objective identification process to occur to the museum's visitors. It is important in this context to point out that the decision for founding a national museum in Bohemia was not made by any official department, aiming at politically influencing the population by one tendency or another, but by private supporters from the Bohemian aristocracy. These founders took an idealistic interest in promoting the idea of scientific research and cultural preservation, which was also reflected in their care for a close relationship to the Bohemian Society of Sciences.

Caspar Maria Sternberg

A few brief words may outline the personality that stood behind the museum's main initiative, that of the founder Caspar Maria Count Sternberg, following information from his autobiography (Helekal, 1909). He was born on the 6th January, 1761, in Prague as the youngest of three sons of Johann Count Sternberg and Anna Maria Josepha Countess of Sternberg, born Kolowrat-Krakowská. His brothers, Johann and Joachim, followed military careers, while it was determined by his parents, that Caspar should start a clerical career. With this intention he was sent at the age of eighteen years (1779) to the Collegium Germanicum in Rome. In 1784 he entered the clerical chapter in Ratisbon in Germany and served there under the elector-archchancellor Theodor von Dalberg until 1810. Political developments in Germany, strongly influenced by the Napoleonian seizure of power, made Sternberg decide to leave his clerical career and to return to Bohemia in order to dedicate the rest of his life to science. In 1804 Sternberg had already founded the Botanical Garden and in 1806 the Academy of Sciences in Ratisbon under his presidency, and now autodidactically he acquired an extensive knowledge in botany, meteorology, palaeontology, geology and mineralogy. Numerous publications, mostly in the fields of botany and geognostics, spread his name beyond the borders of his native country, and he became an honorary member of many scientific societies. Always endeavouring to promote scientific dialogue between countries, in 1832 Sternberg invited the Meeting of the Association of German Scientists and Medical Doctors (Versammlungen der Gesellschaft deutscher Naturforscher und Ärzte) to Vienna and in 1837 to Prague, both important events, which strongly promoted the scientific reputation of the Austrian-Hungarian monarchy in Europe. Sternberg was held in esteem by Metternich and even the emperor Franz I, who both asked him for his advice in scientific matters on various occasions.

The Vaterländisches Museum

The Bohemian museum was originally planned to follow the organization of the Joanneum in Graz. Caspar Sternberg was in correspondence with the Archduke Johann,

and also had informed himself of its structure and organization (Wagner, 1977). The medical doctor and professor in natural history at the Karl-Ferdinand-university in Prague, Franz-Xaver Berger (1782-1818), who had devoted his expertise to the Joanneum, strongly encouraged the promotion of a similar enterprise. However, at the time Bohemia was particularly short of money, mainly due to severe crop failures in 1816, and therefore had to limit the extent of the museum. Eventually, on 23rd December, 1822, the Society of the Bohemian Vaterländisches Museum (Gesellschaft des Vaterländischen Museums in Böhmen) was officially founded, only after the head of the Bohemian dominion, Franz Anton Count Kolowrat-Liebsteinský, had obtained permission from the emperor Franz I to give the museum the statutes of an association. On this occasion Caspar Sternberg was elected its president and remained in this function until his death in 1838.

Caspar Sternberg's scientific and cultural visions, that made him and his cofounders begin this enterprise, were:

1. The education of the public at all social levels including women and adolescents, in other words the creation of a civil institution, mainly supported and provided by members of Bohemian nobility, in order to inform the public on the Bohemian cultural and natural history.
2. The sponsorship and encouragement of Bohemian scientific and cultural research on the native country.
3. The economic use of scientific knowledge.

This last point has always been of crucial importance in any Bohemian scientific research, and it became specially topical in the first third of the 19th century, when the industrial revolution also did not stop before the Bohemian borders. Thus, mining of hard and brown coals has been an old tradition of the country, just as well as the trade in jewellery or the production of silver and gold, and of manufacture china. Research results were published in the museum's journal, *Verhandlungen der Gesellschaft des Vaterländischen Museums in Böhmen*, later retitled *Monatschrift der Gesellschaft des Vaterländischen Museums*, and it speaks for itself that in parallel a journal in Czech language was edited, *Časopis společnosti músea*, which did not appear as a literal translation of the German version, but rather as a popular edition on native interests.

Caspar Sternberg and his cousin, Franz Count Sternberg-Manderscheid, started to store the first collections of the museum in 1818 in a hall of the Minorits' monastry St. Jakob. In 1819 the collections were moved partly to the palais of Franz Anton Count Hartig at Thun street, and partly (particularly the minerals) into the flat of the professor in chemistry at the Polytechnical Institute, Josef Steinmann. In 1821 they were established in the rented ground floor of the Palais Sternberg in Prague, close to the Hradčin; the Palais was at the time in possession of the Private Society of Patriotic Friends of Art. At this early stage the collections were comprised of botanical, palaeontological, geognostic, mineralogical, and numismatic specimens, and a smaller historical collection with old Bohemian incunabula, handwritings and pieces of art. The original, botanical, palaeontological and mineralogical collections, as well as the scientific library, had been donated by Caspar Sternberg, and the numismatic collection by his cousin Franz.

In 1818, Prague already possessed two cabinets of natural products, including mineral collections. One belonged to the philosophical faculty of the Karl-Ferdinand-

University under the contemporary administration of Franz-Xaver Berger, and had been founded by Karl Egon Prince Fürstenberg (1729-1787), Franz Josef Count Kinsky (1739-1805) and Ignaz von Born (1742-1791). The second cabinet belonged to the Bohemian Society of Sciences. Because of this, there was not really an urgent need for founding a third one. Yet, the example of other nations encouraged the influential Bohemian circle, its institution expressed as a patriotic matter of prestige, which was increased by the honour of Franz I giving his blessing to this new foundation and even contributing specially pretious gifts, indicating the positive reputation of its sponsors in the monarchy's capital. Indeed, it rapidly developed to one of the most outstanding in the monarchy.

Franz Xaver Zippe and the mineral collections

The oryctognostic collections constituting the museum's mineral estate at the time of foundation originated from different private owners. In 1816 Caspar Sternberg bought the mineral collection from the mining official Johann Thaddäus Lindacker (1768-1816) and united it with his own, under the condition that both collections should be incorporated into a public institution and that Lindacker would be any time allowed to use them for life (although he died the same year). At the same time Prokop Count Hartmann-Klarstein and Rudolf Count Wrbna donated their large collections, and Franz Anton Count Kolowrat-Liebsteinský added his, which mainly consisted of Bohemian and Hungarian minerals. Josef Count Wratislav-Mitrowitz eventually contributed a further valuable set of minerals. All these collections were separatly catalogued and stored according to Abraham Gottlob Werner's mineral system until 1824, when their curator, Franz-Xaver Zippe (1791-1863), reorganized them. They formed the basic mineral stock of the museum and before its official opening in 1822 had to remain in their original composition, only being enriched by gifts or purchase. Sale and exchange of specimens were forbidden, a step which ensured that no acquisitions whatsoever got lost. Only later were duplicates exchanged and sold.

Franz-Xaver Zippe was a remarkable personality, an enthusiastic scientist and, particularly, a dedicated mineralogist. He was born in 1791 in Falkenau in north Bohemia. After having ended grammar school in Dresden, he started philosophical studies in 1807 at the University of Prague, which he interrupted in 1809 to go to war against Napoleonian forces. Having returned to Prague, he completed his scientific studies in 1814 and 1815 in the technical institute under the professor in chemistry, Karl August Neumann, and got his first employment under Neumann's successor Josef Steinmann in 1819. In 1822 he was authorized to give extraordinary lectures on mineralogy and geognostics, which he continued after having attained his employment at the Vaterländisches Museum as a curator. In 1835 he got a professorship in natural history at the polytechnical Institute in Prague. Zippe was a convinced supporter of Mohs's mineral classification, and he also became Mohs's personal friend. In 1839, shortly after Mohs's death, he published the revised part on the physiography of Mohs's *Leichtfassliche Anfangsgründe der Naturgeschichte des Mineralreiches* from 1832, which had been written by way of explanation to his university lectures. In 1849 Zippe became director of the mining school in Pzribram and in the same year professor at Vienna University. In 1858 he eventually edited a second edition of Mohs's mineral

system from 1821 and included therein many new minerals, that he had also incorporated into the Bohemian museum's collection. He died in 1863.

When Zippe reorganized the museum's donated collections in 1824, he first united them and then split them into two separate collections, a systematically organised collection and a local collection, comprising only Bohemian minerals. A collection of about 2000 crystallographic gypsum-models of mineral varieties (Fig. 1), made by Zippe himself, was added. In the systematic collection Zippe's main achievement was the transformation of Werner's mineral system into that of Mohs which can be regarded as the critical point in the development of the collections. It meant reduction of Werner's numerous, sensorily perceptible, natural historical characteristics of genera, species and suites of varieties to Mohs's scientifically much more precisely outlined system, essentially based on the crystallographic configuration of the minerals, their conventional natural historical characters such as fracture, streak, glance, transparency and colour, and also physical parameters including specific gravity, divisibility and hardness. At that time, the collection comprised about 4600 specimens, and it is easy to imagine, what pains had to be taken to form the relevant suites of crystallographic structures and varieties to each species represented according to Mohs's principles. In addition, many minerals that had been destroyed or affected, and could not be used for classification, had to be removed, which considerably diminished the number of specimens.

Fig. 1. Crystallographic models, made by Franz-Xaver Zippe. Scale bar represents 3 cm.

This systematic collection was stored in cupboards with approximatly 20 drawers each behind two door wings, with a showcase on the top, in which were exhibited particularly representative showpieces. Each drawer contained about 30 samples, each with a label, indicating the number of the specimen, its complete characteristics, its size, the initials or full name of its donator, and its place of origin. It is evident that these minerals mostly originated from abroad, as the domestic specimens were united in the local collection. The systematic collection comprised specimens from all European countries in many varieties, some of them even originating from India, Brazil or elsewhere, having been collected on expeditions. The collection thus represented an ideal basis for any profound oryctognostic studies.

The local collection followed another principle, much more apt for illustrating the occurrence of specimens in the Bohemian geological landscape. Zippe, who was also a thoroughly informed geognost, organized the minerals according to their places of origin, and arranged these places according to their topographic location among the Bohemian mountain ranges and formations. Parallel with that set up he placed the species of rocks of each mountain range and each formation. He classified the formations according to Alexandre Brongniart (1829). Again, a label was added to each mineral sample, briefly telling its crystallographic and mineralogic characteristics. Therefore, at a glance it was possible to recognize, which mineral occurs at what geographic

location and in which mountain formation. The collection gave an impressive and didactically perfect instruction on the connection between the geognostic circumstances and the mineral resources of the native country.

The collections increase

On 18th April 1818, Kolowrat-Liebsteinský issued an appeal "An die vaterländischen Freunde der Wissenschaften" (to the patriotic friends of sciences), and called upon the whole Bohemian population to collect and donate specimens of interest in all fields, that should be represented in the museum. These were to be passed on to the museum in Prague in order to centralize Bohemian artifacts and make them accessible to the public. Donors should become donating members of the museum, no matter whether they were Bohemian or not. They could later join the museum's association as so-called active members provided they were either born in Bohemia or possessed the Bohemian nationality. Eventually they became honorary members, that had been elected by the administrative committee of the museum, no matter whether they were native or not. Such honorary members, who again raised the prestige of the museum, were represented, for example, by Johann Wolfgang von Goethe, a personal friend of Caspar Sternberg, Prince Christian from Denmark and Grandduke Carl August from Sachsen-Weimar-Eisenach. He was also personally friendly with Alexander von Humboldt, Georges Cuvier, Ami Boué, Leopold von Buch, William Buckland, Friedrich Hoffmann and other famous contemporary scientists.

It was in the national interest for the newly founded museum to become as rapidly as possible well known throughout Europe. The mechanism that guaranteed the fast spread of its name, was the purchase and exchange of minerals from other collections scattered throughout the continent. A network of contacts was built up, that extended from Scotland to Russia and from Sweden to Italy. At the same time, the collection was growing. It developed from a collection of essentially local importance to one of not only national, but also scientific relevance, ultimately as a propagandistic item. On the basis of specific gifts and purchases, that had been acquired by the museum, the collection's increase in size during the first ten years can be followed, at least with respect to the most important acquisitions. From the social historical point of view, it is quite informative to consider, from where gifts, purchased specimens and collections originated.

Gifts were mainly donated by Bohemian nobility and, more rarely, by members of foreign aristocracy. In 1823, two new crystallographic forms of proustite (or pyrargyrite), catalogued as Rothgiltigerz, from Joachimsthal (Elbogen-district) were discovered. One of them had been a gift from Count Chorinsky, the other one, a beautiful show piece, was a present from the emperor Franz I (Fig. 2). It weighs *c.* 3 kg, and is 15.24 cm long, 12.70 cm broad and 10.20 cm high. The specimen contains very little arsenic and traces of crystallized siderite. That this piece is not associated with pyrite and therefore could not have been weather-beaten in the course of the last two centuries made it all the more precious. In 1825, Archduke Johann von Habsburg sent minerals from Styria and Carynthia, and in 1826 the Bohemian Baron Franz von Koller contributed several sets of minerals from Vesuvius and Sicily. In 1827, two pieces of Siberian crocoite, catalogued as "sibirisches Rothbleierz", have been donated

by Karl Count Clam-Martiniz, and the two counts von Schönborn and von Klebelsberg had sent a piece of pyrope, enveloped in serpentine. In the same year Count Vargas-Bedemar from Copenhagen gave rare minerals from north Europe and Sardinia to the museum, and the well-known Swedish chemist Jakob Berzelius sent a set of rare species from Sweden. A large contribution was made in 1828, when the Bohemian Society of Sciences donated its entire mineral collection to the museum and thus became an active member of the museum's association in the same year. This collection was outstanding for its variety of Bohemian specimens originating from the Riesengebirge (Bunzlau- and Bydžov-districts), that had been collected in the 1780s. In 1829, selected Bohemian specimens from the area at Giftberg near Komorau in the middle Bohemian 'Übergangsgebirge' were a present from Eugen Count Wrbna and, in 1832, the Russian councillor Heinrich von Struwe added Norwegian and Siberian minerals to the systematic collection.

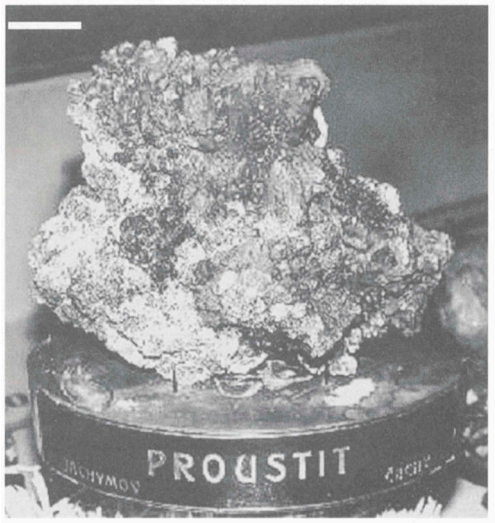

Fig. 2. Proustite from Joachimsthal (gift from Franz I, 1824). Scale bar represents 2 cm.

Those specimens and collections purchased in Bohemia were sold by those who needed money and at the same time had minerals to their disposal. Poor by tradition were curators of museums' collections. Also mining officials could occasionally do with some more money. So, in 1825, the collection has been enriched by the purchase of Zippe's own private collection and of the collection of the mining official Franz Rombald von Hohenfels. Zippe had collected his minerals over a period of eight years, and he had continuously exchanged and bought minerals, even whole collections, from Bohemia and abroad. But, when he became curator at the museum, he was no longer allowed to keep his own private collection. It comprised 2500 specimens and about 300 smaller crystals. These minerals came from England, Sweden, Norway, Siberia and North America, and whole suites originated from Bohemia, Moravia, Silesia, Tyrol, Carinthia and the Faroes Islands. By the purchase of this collection, the museum's mineral stock increased by 30 more species. The Hohenfels collection comprised approximately 300 mainly Bohemian specimens, mostly from Joachimsthal and Schlackenwald (Elbogen district). The chemist Karl August Neumann at the Polytechnical Institute in Prague delivered his collection, which had been organized after Goethe's classification, of the minerals from around Karlsbad in the Elbogen district from 1806. In 1827 Caspar Sternberg bought a mainly Bohemian collection from the mining official Franz Peška of Joachimsthal.

Also of considerable importance were exchanges of minerals with foreign collections for two reasons; as a possibility to increase the systematic collection in its number of species, varieties and showpieces, and to make the museum more well known

Table 1. Enlargement of the collection (1824-1829). Data have been investigated from the current informations on new acquisitions to the collections in the *Verhandlungen der Gesellschaft des Vaterländischen Museums in Böhmen*, 1824-1829.

Systematic collection			Local collection		
year	specimens	species	year	specimens	species
1824	4600	180	1824	1200	no data available
1826	5660	219	1826	1570	103
1827	5766	235	1827	1588	no data available
1828	6217	251	1828	1803	114
1829	6395	288	1829	2000	130
Increase 1824-1829 (approx. values):			Increase 1824-1829 (approx. values):		
Specimens: 40%			**Specimens: 67%**		
Species: 60%			**Species: 26%**		

abroad. So, by exchange for Bohemian minerals, two rather precious sets from Cornwall and Scotland were acquired in 1829 from Robert Allan in Edinburgh. In the same year, by exchange for a meteorite, a whole suite of rare minerals from the Royal Mineral Cabinet in Berlin has been integrated into the collection, which increased it by 15 species. Eventually, in 1831, rare Irish minerals were again aquired from Robert Allen. The data in Table 1 show the enlargement of the collections in the course of the museum's first administration period. It is evident that, within this period, the systematic collection increased its number of specimens by approximately 40% and its number of species by 60%. In 1829 this collection was comprised of 288 out of 340 species of Mohs' mineral system. The local collection's specimens were augmented within the same period by 67%, comprising 130 species in 1829, i.e., 26% more than in 1826. With regard to the increase in the number of specimens these results suggest, that there had been more efforts taken to augment the local collection in the interest of making it as representative as possible for the exhibition of national mineralogic products. Out of a total of 130 Bohemian mineral genera known at the time, i.e., one third of the total of mineral genera in Mohs' system, 50 have been economically used in Bohemia, and ten were exclusively found in the native country. These relatively high numbers correspond to the high variety of geognostic formations, spread over a total area of only 2600 km^2.

Bohemian mineral deposits

The Bohemian native collection presented four groups of specimens that formed characteristic focal points in native oryctognostics; meteorites, metal ores and jewels, as well as hard- and brown coal.

Bohemia seems to be privileged by partly heavy meteoric precipitations (Steinmann, 1830). Since the beginning of the 17th century, at least seven meteoric falls have been registered in Bohemia; a metallic meteorite in 1618 of unknown location, 33 meteorites at Libeschitz in the Leitmeritz district on 22nd June, 1723, several meteorites on 7th July, 1753 at Strkow near Tabor, four meteorites near Lissa in the Buntzlau district on 3d September, 1808, one meteorite near Žebrak in the Beraun district

on 14th October, 1824, and an iron meteorite near Bohumilitz in the Pachin district in 1829. In addition, a very old meteorite was found in the Elbogen district, its date of precipitation is unknown, but it wasn't identified until 1811. From all these meteorites only samples from the Elbogen meteorite, the meteorite from Žebrak and the one from Bohumilitz belonged to the museum at the time. From the Elbogen meteorite, originally 95.5 kg in weight, 40 kg remained in Elbogen, 36 kg were sent to the Natural Cabinet in Vienna, 9 kg remained to the Natural Cabinet in Prague and merely 33 small samples were integrated into the collection of Karl August Neumann, who sold it to the museum in 1824. In addition a 175 g piece of it has been given to the museum in 1826.

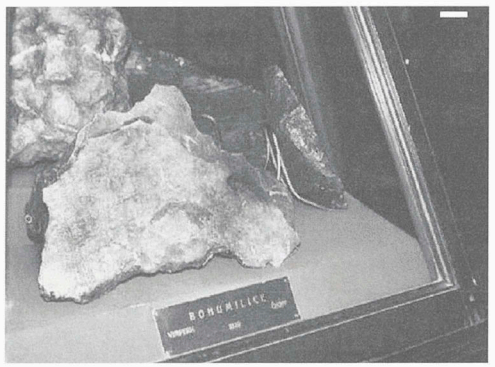

Fig. 3. Meteor from Bohumilitz (1829). Scale bar represents 2 cm.

In 1824, Eugen Count Wrbna bought the Žebrak meteorite from its finder and presented it to the museum. Its weight is 1.9 kg. It consists of two parts that are said to have been found lying approximately 150 m apart, so the meteorite probably burst in the air while falling; a third part is missing. Zippe chemically analysed it and found 20.30% Ni-containing iron, 18.82% sulfuric iron, and 60.7% of a "conglomerate", consisting of hemimorphite, corundum, magnesite, iron protoxide and water.

In 1829, the meteorite from Bohumilitz (Fig. 3) was excavated; it was described by Zippe and chemically analysed by Steinmann. Its weight was 51.5 kg, its surface is hump-backed, and its meteoric mass is covered by a prominent layer of brownish goethite. The meteoric mass itself is granular and divisible. Its central cavities are filled with graphite. Its chemical analysis resulted in 94.06% iron, 4.01% nickel, 1.12% graphite and 0.81% sulphur.

Bohemia is also well-known for its riches of metals. Deposits of gold, antimonite, and pyrite are found in the hemilytic talc formation in the area of Luditz, Chiesch, Rabenstein, Manetin, Weseritz, Czernoschin and Mies (all in Pilsen district). The area around Przibram (Beraun district) is rich in silver-rich galena, silver, freibergite, stephanite, tennantite, malachite and azurite. In the (agalysic) mica-formation, sphalerite, stibarsen, stibnite, pyrite, siderite, uranitite, massicote, sphaelerite, goethite, calcite, barite and quartz are found. The area of Mies and Kladrau presents galena, massicot, sphalerite, pyrite, barite and quartz. In the mica-slate of the mica formation around Joachimsthal and Abertam there is silver, acanthite, proustite, stephanite, sternbergite, scutterudite, marcasite, realgar, arsenic, nickeline, bismuth, bismuthinite, galena, massicot, uranitite, pyrite, calcite, ankerite, fluorite and quartz, while near Bleistadt galena, massicot and sphalerite occur. The Riesengebirge exhibits goethite, löllingite, bornite and pyrrhotite. Schlackenwald and Zinnwald show cassiterite, bornite, copper, azurite, arsenopyrite, sphalerite, ankerite, pseudomalachite and azurite. Furthermore, cassiterite is found in deposits in Graupen (Leitmeritz district), pyrolusite and galena in Kuttenberg (Kaurim district), galena, sphalerite, proustite, stephanite, silver and

acanthite, bornite in Altwoschitz and Ratieboržitz, silver at Rudolphstadt, and galena in the south of Bohemia. In Michelsberg (Leitmeritz district) antimony and nickeline are found, cassiterite is in Schlackenwald and Schönfeld, and cobaltite and bismuth around Sangerberg (Elbogen district) (Zippe, 1831).

Boghead coal and brown coal are of economical importance in Bohemia. Boghead coal is richly represented in the Rakonitz district beginning at the river Vltava, leading to the 'Übergangsgebirge' in the west and also to the north. Furthermore, in the Pilsen district, brown coal is mainly found in the calcareous siltstone formation of the Rakonitz, Leitmeritz, Saaz and Elbogen districts (Zippe, 1831).

An important Bohemian trade was and still is jewellery, although many gems appear only in small crystals. From the 16 known genera at the time, ten occured in Bohemia. Well-known Bohemian gem minerals are topaz, known as Bohemian aquamarine, quartz with the varieties yellow (goldtopas) (Iserwiese; Bunzlau district), dark grey (rauchtopas) and violet quartz (amethyst), fine-grained banded quartz (achat), fine-grained banded calcite (onyx), and red fine-grained quartz (carneol). Chrysolite and garnet appear in the area of Tillenberg/Eger (Elbogen district) and Zbislaw (Časlau district) as well as Kuttenberg and Kolin. Outstanding and characteristic for Bohemia are the varieties pyrope (Dlaschkowitz, Tržiblitz, Bilin), zirkone (hyacinth) (Dlaschkowitz), corundum (saphyr), and grossular (canelstein) (Zippe, 1837). Obsidian is found in the (agalysic) gneiss formation in the Tabor district and opal in the same formation in the Budweis district (Zippe, 1837).

Mineralogical research at the Museum

During all the years of collecting and maintaining the specimens, the museum was at the same time a research institution (see above). The contributions to Bohemian oryctognostic research between 1824 and 1833 by Franz-Xaver Zippe can be summarized. In 1824 a piece of stibarsen, sent from Pzribram, was considered of significance and also a piece of uranitite from Joachimsthal; both were identified and described for the first time by Zippe (1824) as new species, i.e., as "Arsenikspießglanz" for stibarsen and as "Uranblüthe" for uranitite. In the same year two new crystallographic forms were described for calcite, found near Prague. Other new mineral species were discovered and described, by Zippe, such as zippeite, sternbergite and galena as steinmannite (Zippe, 1824, 1827, 1832, respectively).

Also of mineralogic significance were the specimens from a number of genera that were so far unknown to appear in Bohemia. Until 1824 these were actinolite, allophane, analcime, iron-rich grossular, harmotome, laumontite, iron-rich spinel and zoisite (Zippe, 1837). Until 1829 another eight species, previously unknown in Bohemia, were found; ankerite, enstatite, heulandite, levyne, several varieties from thompsonite, albite, chalcocite and mellite (Zippe, 1829). Bohemian genera and species that were already known, such as almandine, aragonite, beryl, tabular calcite, chabazite, chromite, fluorapophyllite, brown graphite, heulandite, manganite, and fine-grained quartz, were found at unexpected places all over the country, where they had not been seen before. The examination of these species also comprised their chemical analysis (Zippe, 1837).

In 1830 Zippe published his crystallographic findings on azurite under the title *Die*

Kristallgestalten der Kupferlasur. His crystallographic studies were the first made in the country. Zippe's oryctognostic research on Bohemian minerals and his care of the oryctognostic collections at the Vaterländisches Museum testify, that he might well be regarded as the founder of modern scientific mineralogy in Bohemia in the tradition of Friedrich Mohs and, together with Wilhelm Haidinger, a former student of Mohs, he was the native representative of mineralogy in the monarchy.

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