Scripta Geologica Special Issue 4

Winkler Prins, C.F. & Donovan, S.K. (eds.)

Proceedings of the VII International Symposium 'Cultural Heritage in Geosciences, Mining and Matallurgy: Libraries - Archives - Museums' "Museums and their collections" held at the Nationaal Natuurhistorisch Museum, Leiden (The Netherlands), 19-23 May, 2003

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an international series of geological papers

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Introduction

The Nationaal Natuurhistorisch Museum Naturalis at Leiden, The Netherlands, was host to the VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums' (Fig. 1). It was a rather special place for such a meeting since it is near the North Sea, whilst most previous symposia were in mountainous regions, apart from the III Symposium, which was held in Saint Petersburg on the Baltic coast. Further, it is a general natural history museum with no special connection to mining. Although the archives and library play an important role in the museum, the emphasis was different in comparison with the other symposia, which was made clear by the theme of the meeting, "Museums and their collections."

Although mining has not a long tradition in The Netherlands, if one ignores the prehistoric flint industry, some important collections of our Museum, and part of its library and archives, are directly linked to it (Winkler Prins, 2004). A good example is the Jongmans collection, which was brought together by the first director of the 'Geologisch Bureau voor het Mijngebied' (Geological Bureau for the Mining Area) of the 'Rijks Geologische Dienst' (Geological Survey of The Netherlands). Professor W.J. Jongmans (1878-1957) is famous as the initiator of the International Congresses on Carboniferous Stratigraphy, the so-called 'Heerlen Congresses.' The Jongmans collection gives a complete documentation of the Carboniferous stratigraphy and plant fossils from the coal mines in south Limburg (The Netherlands), and is one the richest collections in the world of Carboniferous-Permian plants (van Waveren, 2004). With the collection came important archival material and the Jongmans library, which is famous for its coverage of Carboniferous stratigraphy worldwide and its palaeobotanical literature, especially of the Carboniferous-Permian interval.

Fig. 1. The participants at luncheon in Naturalis.

The meeting

Some 40 delegates from twelve countries were welcomed at the Museum by the then Director of Naturalis, Wim van der Weiden. Cor Winkler Prins followed with an elaborate overview of the collections of the National Museum of Natural History, stressing its links with the mining industry and the important recent acquisitions from the universities (see also de Clercq, 2004; Kriegsman, 2004) and the geological survey (Netherlands Institute of Applied Geoscience, TNO). During the meeting colleagues from all over Europe gave wide-ranging talks on the collections in their museums, archives and libraries, thus presenting the stories behind their collections, illustrating developments in mining and the geosciences. On the last day of the meeting, Lieselotte Jontes, one of the two initiators of these symposia, presented an overview of ten years of 'Erbe Symposia', the colloquial name for these symposia. Cor Winkler Prins presented the third 'Peter Schmidt award' (named after the late, much missed second initiator of the 'Erbe Symposia') to Joanne Lerud (Head Librarian of the Arthur Lakes Library of the Colorado School of Mines) for organising in such an excellent way the fifth 'Erbe Symposium' at Golden, Colorado.

Most papers presented at the Symposium can be found in this volume; of those that were not handed in, the abstract is included. Additionally, a few papers are published herein that were not presented at the meeting because the authors were unable to attend.

Excursions

Delegates had free access to the exhibitions of Naturalis during the symposium. The library, archives and rare book room were visited also under the expert guidance of the librarians.

Other museums in Leiden were visited as well, first and foremost the "Rijksmuseum voor de Geschiedenis van de Natuurwetenschappen en de Geneeskunde Boerhaave" (National Museum for the History of Science and Medicine 'Boerhaave'). At this museum, named after the famous physician Herman Boerhaave (1668-1738), historical instruments, documents and old books related to science and medicine could be seen. These included the equipment of Nobel Price laureates and their awards, such as J.H. van 't Hoff, who was Professor of Chemistry and Geology at the University of Amsterdam. At the end of the Symposium, on Friday afternoon, an optional visit was available to the "Rijksmuseum van Volkenkunde" (National Ethnographical Museum), which was also greatly appreciated.

The Symposium dinner at the Restaurant "De Zwaan" on the beach in Katwijk provided pleasant surroundings to get to know each other better.

On Thursday May 22, an excursion was organised to Haarlem in order to visit the Teylers Museum. On the way, the Holland Tulip Park was visited and the old city centre of Haarlem was briefly shown. Teylers is a rather unique museum, being an early 18th century scientific museum which has kept, for a large part, its original atmosphere, reminding visitors of the old encyclopedical cabinets. Its eclectic collections range from old drawings, including some by Michelangelo and Rafael, and coins to geological objects and pieces of scientific apparatus. The old lecture room brings one back to the past and the library is an important source of old scientific literature (we say 'if we don't have it, there is always Teylers'). A good example of its cultural value is the following. A Swiss participant had spoken on Scheuchzer's research in Switzerland (Bouheiry, 2004) and at Teylers we could not only see the original book (Scheuchzer, 1731-1735) in which he described the *'homo diluvii testis'* ('the man who saw the flood'), but also the original specimen of the giant salamander (*Andrias scheuchzeri* (Holl, 1831)) from the Miocene of Oeningen (Switzerland) on which the description was based (Fig. 2). Another rare book that attracted much attention was the 'Lithographiae Wirceburgensis' (Beringer, 1726) in which the famous "Beringer Lügensteine" were described. Some original specimens of the "Lügensteine" could also be seen at the exhibition.

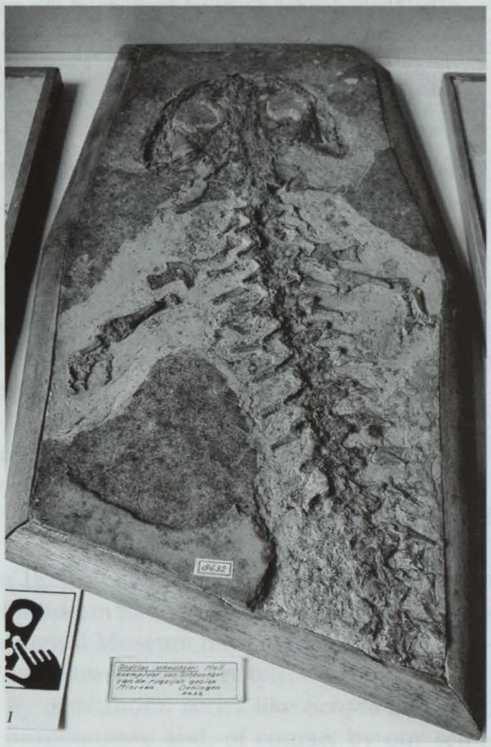

Fig. 2. Holotype of *Andrias scheuchzeri* (Holl, 1831), originally described by Scheuchzer in 1735 as the *'homo diluvii testis'* (photograph by one of the participants, Andrea Beyer).

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Welcoming address

W.G. van der Weiden

Weiden, W.G. van der. Welcoming address. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, **4**: 5-6, 1 fig.; Leiden, August 2004.

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Naturalis, the National Museum of Natural History, is very proud of hosting this important symposium. The organizers made a right choice by selecting our museum for this expert meeting because our geological collections are famous.

The collections (zoological, palaeontological and geological) are stored in the tower of the museum 20 floors high. In all more than 11,000,000 items. The geological collections have a wide scope thanks to, for instance:

- The former mining industry in The Netherlands up to 1970.
- Our former colonies, in particular the East-Indies, nowadays Indonesia.
- Geological explorations all over the world by our scientists.
- The transfer of geological collections by universities and the Dutch Geological Survey (NITG/TNO).

Some of the collections are world famous, such as the Staring Collection. Dr W.C.H. Staring (1808-1877) was the secretary of the Commission for the geological map of The Netherlands. One of the best palaeobotanical collections worldwide has been assembled by Professor Wilhelmus Jongmans (1878-1957); recently this collection has been transferred to Naturalis.

A small collection of as such unattractive minerals and fossils is of special interest, because it is the first of its kind from Japan. Philip Von Siebold acquired them during his stay on the artificial island of Deshima during the first half of the 19th century.

But how do we use the collection? The Museum's mission statement is as follows: –

'We want to use our unique natural history collections to advance the knowledge of, and appreciation for Nature, aimed at the largest possible spectrum of Dutch society.

Therefore, we want to be THE natural history museum of the nation, operating in an international network of similar organizations.

We do this:

- by curating the largest central archive of natural history in the Netherlands;
- by assembling knowledge on the diversity of Nature, now and in the past;
- by making this knowledge accessible in a differentiated manner to reach a broad spectrum of the public.'

Since the foundation of the museum in 1820 by King William I, scientific research has been prominent, though the geological museum had until 1991 its own exhibitions (The Natural History Museum and the Geological Museum have merged in 1984). Justifiably, Naturalis can be called a knowledge centre of biodiversity.

But how do we transfer knowledge? By publication series like *Scripta Geologica*, by information services and educational programmes, and, of course, by our semi-

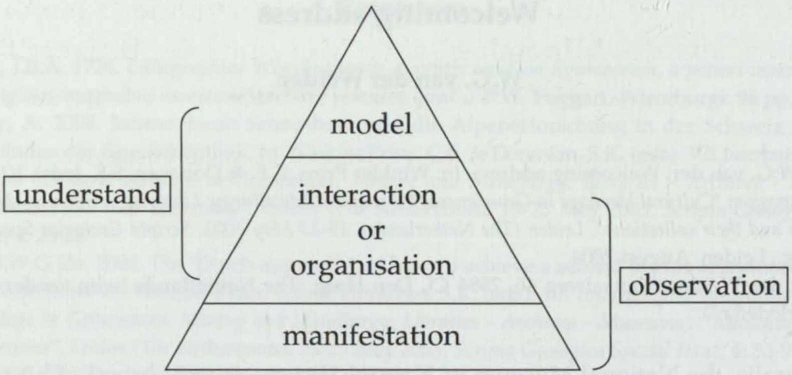

Fig. 1. Educational model.

permanent and temporary exhibitions. For all exhibitions we use the same educational model and modularity (see Fig. 1). The visitor grasps the subject from concrete (manifestation) to abstract (model). So, we try to provide a general history of the Earth as being a large, dynamic system, that is, system Earth explained.

Two huge exhibitions of 1000 m^2 each, "Primeval Parade" and "Natural History Theatre", show the diversity of the natural world of yesterday and today. The adjacent exhibits "Earth" and "Life" explain the processes that have led to this enormous diversity.

How we - mankind - view nature is very much determined by our culture. That is why I - being a historian originally - like the exhibition "Visions of Nature" so much. The Egypt of the Pharaohs, Taoism, Islam and the Enlightment are used as examples to give an idea how these four different cultures saw and approached nature. All these cultures struggled with the same kind of questions many of us today are still pondering. Questions like "what are the origins of our natural world" and "what is our place in it?" I can recommend this exhibition to you very warmly, because it makes clear that natural diversity has led and leads to diversity of opinions and thoughts about nature.

Finally, I wish you all a very fruitful symposium and I hope sincerely you will enjoy your stay in Naturalis.

Die privaten Kollektionen des XIX. Jahrhunderts in der Sammlung des Mineralogischen Museums der Universität St. Petersburg, Russland

G.F. Anastasenko, V.G. Krivovichev & O.A. Golynskaya

Anastasenko, G.F., Krivovichev, V.G. & Golynskaya, O.A. Die privaten Kollektionen des XIX. Jahrhunderts in der Sammlung des Mineralogischen Museums der Universität St. Petersburg, Russland [XIX century private collections in the Mineralogical Museum of the St.-Petersburg State University, Russia.] *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, 4: 7-13, 4 figs., 1 pl.; Leiden, August 2004.

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Key words — Minerals, collections.

The Mineralogical Museum of the St.-Petersburg State University is housed in the building of the 'Twelve Colleges'. It accomodates some of the most ancient mineralogical collections of Russia. The university mineral collection took its origin from a Mineralogical Cabinet of a Teacher's Seminary, which was established in 1783. J.G. Georgi (1729-1802) was commissioned to collect minerals for the institute and he can be considered the founder of the museum. The history of enlarging and enriching the mineral collection is inextricably related with 19th century celebrities and their private collections. At the beginning of the 19th century, when the Seminary was transformed into a Pedagogical Institute, the collection of the Mineralogical Cabinet included in total no less than 912 specimens of rocks and minerals. The first decade of the 19th century was marked by significant acquisitions: in 1804 Academician V.M. Severgin (1765-1826) donated his mineral collection; in 1805 the A. Crichton mineral cabinet was bought; and in 1807 P.I. Meder (1769-1826) presented a large collection including 7500 mineral specimens.

In 1819, the Pedagogical Institute was reorganized into the Saint-Petersburg Imperial University under a decree of Emperor Alexander I. Professor E.K. Hofmann (1801-1871) managed the Mineralogical Department and the Mineralogical Cabinet from 1845 to 1863. During his directorate the mineralogical collection continually increased. In 1851, he donated 165 mineral specimens from his private collection, which included rare and fine minerals from the Urals. Later, the University acquired the Hofmann collection (914 specimens, 23 of which are on permanent display) from his family. From 1871 to 1880, M.V. Erofeev (1839-1888) managed the Mineralogical Department and developed the Mineralogical Cabinet. In 1874, the cabinet procured a superb collection of minerals from Siberia and the Urals (*c.* 1000 specimens), which was bequeathed to the St. Petersburg University by Archbishop Nil (1796-1874). Today, Nil's collection includes 468 specimens from Russian deposits of Transbaikalia, East Siberia and the Urals, and some foreign localities. The Erofeev collection (1200 specimens) came to the St.-Petersburg University in 1889. At present it includes over 320 specimens from the Urals, Saxony, Hungary, North America, and some other countries. In 1889, the "Gazberg-Spitsin" collection came to the Museum, including 1476 specimens from the Urals. In 1909, D.I. Mendeleev's (1834-1907) mineral collection was purchased, consisting of 245 specimens, several of which are on display.

Thus, at the beginning of the 20th century the museum consisted of 12,600 specimens from private collections. They constituted about 70% of the museum's assets. The role of private persons in the formation of museum collections was predominant in the 19th century. All mentioned collections are carefully kept at the Mineralogical Museum of the St.-Petersburg State University and it is planned to show some of them in new displays.

Schlüßelwörter — Mineralien, Sammlungen.

Das Mineralogische Museums der St.-Petersburger Universität befindet sich im alten berühmten Gebäude der „Zwölf-Kollegien". Die älteste Mineralien -Sammlungen Russlands sind hier aufbewahrt. Ursprünglich war es ein Mineralogisches Kabinett eines Lehrer-Seminars., das im Jahre 1783 gegründet wurde. J.G. Georgii (1729-1802) wurde beauftragt Mineralien zu sammeln für das Institut und kann also als Gründer des Museums betrachtet werden. Die Geschichte der Erweiterung und Bereicherung der Sammlungen ist eng verknupft mit berühmte Persönlichkeiten des XIX. Jahrhundert und ihre Sammlungen. Am Anfang des XIX. Jahrhunderts, wenn das Seminar in einem Pedagogischen Institut verwandelt wurde, zählte das Mineralogische Kabinett 912 Gesteins- und Mineralproben. Im ersten Jahrzehnt des XIX. Jahrhunderts gab es verschiedene wichtige Neuerwerbungen: in 1804 die Mineralien-Sammlung des Akademikers V.M. Severgin (1765-1826); in 1805 wurde A. Crichton's Mineralien-Kabinett gekauft; und in 1807 schenkte P.I. Meder (1769-1826) eine große Sammlung mit 7500 Mineralstufen.

In 1819 wurde das Pedagogische Institut in die Kaiserliche Universität Sankt-Peterburgs verwandelt nach Erlass des Kaisers Alexander I. Von 1845 bis 1863 hatte Professor E.K. Hofmann die Leitung des Mineralogischen Instituts und Kabinetts. Er schenkte ein Teil seiner Sammlung am Museum mit schöne und seltene Stücke aus dem Ural; nach seinem Tode wurde seine Sammlung von seiner Familie erworben. Von 1871 bis 1880 leitete M.V. Erofeev (1839-1888) die Mineralogische Abteilung und Kabinett. Im Jahre 1874 erwarb das Kabinett eine großartige Mineralien-Sammlung (468 Stück aus Russland) des Erzbischofs Nil (1796-1874). In 1889 erwarb die Sankt-Petersburger Universität die Erofeev-Sammlung und auch die "Gazberg-Spitsin"-Sammlung. D.I. Mendeleevs (1834-1907) Mineralien-Sammlung wurde in 1909 gekauft.

Am Anfang des XX. Jahrhunderts bestand die Museums-Sammlung aus 12.600 Stück aus Privat-Sammlungen, ungefähr 70 % des gesammten besitzes. Die Sammlungen wirden sorgfaltig aufbewahrt und manche Stücke werden im Zukunft in neue Ausstellungen gezeigt.

Inhalt

Das Mineralogische Museum

Die Sammlung des Mineralogischen Museums der St.-Petersburger Universität ist eine der ältesten mineralogischen Sammlungen Russlands. Die Universität befindet sich an der Neva auf der Basilinsel. Das ist einer der schönsten Orte in der ganzen Stadt, der von allen Gästen unbedingt besucht wird. Die Universität befindet sich im alten berühmten Gebäude der „Zwölf-Kollegien", das im Mitte des 18. Jahrhunderts nach dem Projekt des Architekten D. Tresini gebaut worden war. Etwa hundert Jahre später ließ Zar Nikolaus I. dieses Gebäude zu einer Lehranstalt umbauen, und seit dem Jahre 1838 befindet sich hier das Mineralogische Museum der Universität. Es hat drei Säle und nimmt eine Gesamtfläche von 250 m^2 ein .

Wenn man aus den Südfenstern hinausblickt, kann man ein imposantes Panorama unserer Stadt bewundern: die breite Neva, das gegenüberliegende Ufer mit der Ermitage, die Admiralität, die Isaaks-Kathedrale und das Reiterdenkmal Peters des Großen (des Ehernen Reiters). Fast die gesamte Ausstattung unseres Museum wie Tische, Stühle, Kronleuchter und Vitrinen mit Ausstellungsstücken werden seit dem vorigen Jahrhundert sorgsam aufbewahrt.

Die Sammlungen

Unsere mineralogische Sammlung hat eine mehr als zweihundertjährige Geschichte. Sie nimmt den eigenen Anfang von dem Kabinett für Naturgeschichte des Lehrerseminars, das im Jahre 1783 in St. Petersburg laut der Befehl der Zarin Ekaterin der Großen gegründet war. Später wurde das Lehrerseminar in die Pedagogische Hauptschule und noch später in die Universität reorganisiert. Der Minister der volkseigenen Bildung Peter Vasiljevitsch Zavadovski hat im Jahre 1784 Johann Gottlieb Georgi (1729-1802; Fig. 1) beauftragt, eine Mineralien-Kollektion für das Lehrerseminar zu sammeln. Dr I.G. Georgi kam aus Deutschland nach Russland um an einer akademischen Expedition teilzunehmen. Er reiste 1770-1774 durch wenig erforschte Gebiete um Orenburg, im Ural, Altai, an der Wolga und in Ostsibirien. Auf seinen Reisen sammelte Georgi Mineralien, die er am 13. Oktober 1785 dem St. Petersburger Lehrerseminar übergab. Die Sammlung bestand hauptsächlich aus russischen Mineralien und zählte 371 Exemplare. Die Mineralien waren zufolge des gebrauchlichen Systems von Vallerius zugeordnet. Zur Zeit ist der Katalog dieser Sammlung nicht erhalten, und die Mineralien werden in verschiedenen Abteilungen des Museums aufbewahrt, doch es wird nicht vergessen, dass Johann Gottlieb Georgi als Begründer des Museums betrachtet werden kann.

Die nächste Ergänzung der Mineraliensammlung ereignete sich im Jahre 1795 und ist mit dem Namen des begeisterten Erzkenner des 18. Jahrhundert Alexander V. Rasderischin verbunden. Sein ganzes Leben arbeitete er an den Bergwerken in Ural und Sibirien und im 1785 entsprechend dem Befehl der Kaiserin Ekaterina II. wurde er auf Edelsteinsuche für den Kaisershof geschickt. Rasderischin hatte in seiner Arbeit einen großen Erfolg: ihm wurde das Glück zuteil mehrere Lagerstätten zu entdecken. Ekaterina II. hat ihm eine Tabakdose mit Diamanten und 2000 silberne Rubel geschenkt aus Dankbarkeit für die dargebrachte mineralogische Raritäte. Am meisten wurde Rasderischin berühmt durch seine Sorge über das Aufblühen der mineralogischen Kenntnisse. Um dieses Ziel zu erreichen lieferte er, aus eigener Initiative und auf eigene Kosten, alle russische Lehranstalte mit mineralogischen Kollektionen. Darunter hat das Petersburger Lehrersseminarium ein Geschenk bekommen, das aus 200 Handstücke mit kurzer Beschreibung der Mineralien und ihrer Fundorte bestand.

Abb. 1. Schattenbild von Johann Gottlieb Georgi (1729-1802), Begründer des Mineralogischen Museums. (Silhouette of Johann Gottlieb Georgi (1729-1802), founder of the Mineralogical Museum.)

Im 1798 war die Sammlung der Kolyvanische Mineralien (aus dem Altai) von Evdokim Fillippovitsch Sjablovski für 300 Rubel gekauft.

Die Mineraliensammlung erreichte im 1804 schon 912 Gesteins- und Mineralienhandstücke. In diesem Jahr hat Akademiker Vasilii Mikhailovitsch Severgin (1765-1826) seine eigene Kollektion geschenkt.

Im 1807 schenkte Peter Ivanovitsch Meder (1769-1826), Professor für Mineralogie und Geognosie, dem Museum seine herrliche Kollektion, die damals 5000 Rubel geschätzt wurde. Dank diesem unschätzbarem Geschenk konnte man die Mineraliensammlung in die Reie der meist vollständigen und repräsentativen Sammlungen in Russland stellen. Sie erreichte im 1819 schon 8000 Handstücke an der Zahl.

Als nächster sei Dr. Lorenz Pansner (1777-1851) erwähnt. Als er nach Russland fuhr, beschäftigte er sich mit Mineralogie: er hat die Bestimmung der Dichte von 200 Mineralien gemacht. Pansner machte den ersten Versuch alle Mineralien der Sammlung zu identifizieren. Er war auch einer der Begründer (1817) der Mineralogischen Gesellschaft in Russland und ihr erster Vorsitzender.

Das Jahr 1822 war durch großen Zunahmen der Museumsammlung ausgezeichnet sowohl dank den Anschaffungen, als auch durch die Geschenken: Ober-gittenverwalter Moor schenkte z.B. 500 sibirische Mineralienhandstücke und im 1827 nochmals 100.

In 1830 hat Alexander F. Postels (1801-1871) eine geognostische Kollektion von 280 Handstücke geschenkt, die er während seiner Weltumsegelung auf dem Schiff "Sinjavin" gesammelt hatte.

Professor Dmitri Ivanovitsch Sokolov (1788-1852), der Inhaber des Lehrstuhls von 1822 bis 1844 war, hatte den ganzen Museumsreichtum ausführlich systematisiert.

Schöne Exemplare von Mineralien übergab dem Museum Ernst Karlovitsch Hofmann (1801-1871; Abb. 2). Als Sohn eines sachsischen Pastors kam er mit 18 Jahren nach Dorpat, um dort in die Universität einzutreten. Als Student der medizinischen Fakultät der Universität Dorpat war er für die Teilnahme an der Weltreise (1823-1826) auf den Schiff "Betrieb" empfohlen. Er sollte die geologischen Forschungen durchführen. Zurückgekehrt aus der Seefahrt, beendet er das Studium und in 1828 reiste er mit einer neuen Expedition nach dem Ural ab. Seitdem war sein ganzes Leben mit Russland verbunden. Hofmann widmete sich der Geologie und besonders der Geologie vom Ural. 18 Jahre (1845-1863) leitete er den Lehrstuhl für Mineralogie der St.-Petersburger Universität. Seine Schenkung an das

Abb. 2. Bild von Ernst Karlovitsch Hofmann (1801-1871). (Portrait of Ernst Karlovich Hofmann (1801-1871).)

Museum enthielt 165 Ural-Mineralien von seltener Schönheit. 1867 hat das Museum bei ihm weitere 900 Mineralien für 1500 Rubel gekauft. Zur Zeit sind im Museum 265 Exemplare aus Hofmanns Sammlung vorhanden, 25 von denen schmücken die Vitrinen. Von seiner Reise um die Welt brachte Hofmann Kristalle von Augit aus der Insel Sitcha, weiter aus Finland: Labradorit, Amphibol und Apatit; aus Ungarn: Gold und Aragonit; aus Tyrol: Epidot; aus Brasilien: Diamant, Gold, Platinum, und Onyx (Tafel 1, Fig. 1); von der Insel Manila: Saphir. Es gibt auch Augit und Apatit von der Insel Hochland und Dendriten von Gold aus Ostsibirien. Doch die besten Exemplare stammen vom Ural: Gold, Platinum, Magnetit, Ilmenit, Perovskit, Rutil, Chromit, Chrisoberyll, Quarz, Zirkon, Uvarovit, Phenakit, Topas, Beryll u.s.w. Infolge diesem zahlte im Jahre 1869 die Museumsammlung schon 10.000 Handstücke.

Die höchste Blutezeit erreichte die Museumssammlung in der zweiten Hälfte des 19. Jahrhunderts. Dann wurde das Museum mit einer schönen Kollektion von Erzbischof Jaroslavski Nil ergänzt. Er vermachte seine Kollektion der Universität in 1874. Erzbischof Nil (1796-1874; Abb. 3) stand 16 Jahre lang an der Spitze des Bischofsamt. Er war als ein unermüdlicher Missionär berühmt. Er durchwanderte das ganze Jakutienland, Gebiete neben dem Baikalsee, Burjatien, Sajany und mit Begeisterung erforschte er die Geologie dieser Länder. Die meiste Handstücke hat er selbst gesammelt. Die Kollektion, die mehr als 1000 Handstücke aufzählte, bestand aus uralischen und sibirischen Mineralien (Tafel 1, Fig. 2).

Michail V. Erofeev (1839-1888; Abb. 4) hat die natürwissenschaftliche Abteilung der physik-matematischen Fakultät der St.-Petersburger Universität beendet und war

Abb. 3. Bild von Erzbischof Nil (1796-1874). (Portrait of Archbishop Jaroslavski Nil (1796-1874).)

Abb. 4. Bild von Michail V. Erofeev (1839-1888). (Portrait of Mikhail V. Erofeev (1839-1888).)

auf dem Lehrstuhl für die Vorbereitung zu dem Professor Rang gelassen. Ihm war vorgeschlagen worden, Kurse an den Universitäten Europas anzuhören und mit den Mineralien Kollektionen der besten Museen eingeführt zu werden. Der junge Gelehrte fragte die eigenen Lehrer wie man die angebotenen Kenntnisse besser aneignen kann. Erofeev sammelte während den Reisen in die Bergen West-Europas Mineralien. In 1875 war er auf die Expedition nach dem Ural, wo er bemerkenswerte Mineralien gesammelt hat. In 1889 gelangte die Kollektion von M. Erofeev in Mineralogischen Museum St.-Petersburger Universität. Sie zählte 1200 Muster der Minerale aus den Vorkommen Russlands und des Auslandes auf (Tafel 1, Fig. 3). Die besten Beryllien aus seiner Kollektion sind mit Namen bezüglich des Shakespeare Helden: König Lear (Tafel 1, Fig. 4), der Joke des Königes Lear, die Töchter Kordelia, Gonerelia und Regana benannt.

Eine der Sammlungen wird im Katalog als "Hassberg-Spizin-Sammlung" angegeben. Es ist bekannt, dass diese Mineralien im Ural vom Geologen Jegor Hassberg gesammelt wurden, der in 1833 die Berghochschule in St.Petersburg absolvierte. Der Rechtsrat an der Heidelberger Universität P.W. Spizin kaufte diese Sammlung von der Witwe J. Hassberg für 2200 Rubel und am 30.04.1889 übergab er sie dem Museum. Damals zählte die Sammlung 1500 Mineralien. Besonders schön sind unter ihnen große Kristalle von Perovskit, Almandin, Uvarovit, Ilmenit, Muskovit, Kupfer, Malachit, Zircon u.v.a. (Tafel 1, Fig. 5).

Das Museum hat in 1909 die Mineraliensammlung von Dmitrii Ivanovitsch Mendeleev (1834-1907) bekommen. Es besteht aus 245 Exemplaren, die 133 mineralische Abarten vorstellen (Tafel 1, Fig. 6).

Auf solche Weise, spielten im 19. Jahrhundert die privaten Sammlungen eine Hauptrolle in die Entwicklung des Museum. Am Anfang des 20. Jahrhunderts waren im Mineralogischen Museum der St.-Petersburger Universität 12600 Muster aus privaten Sammlungen zusammen gebracht, was annähernd 70% des ganzen Besitzes betrug.

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Tafel 1

Mineralien aus den Museums-Sammlungen (Minerals from the Museum's collections).

Fig. 1. Onyx aus Brasilien (50 × 30 × 60 mm); E.K. Hofmann Sammlung. (Onix from Brasil (50 × 30 × 60 mm); Hoffman's collection)

Fig. 2. Turmalin (90 × 90 × 10 mm), unbekannte Lagerstätte; Erzbischof Jaroslavski Nil Sammlung. (Tourmaline (90 × 90 × 10 mm), unknown locality; Archbishop Jaroslavski Nil's Collection).

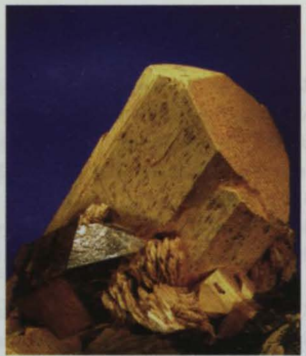

Fig. 3. Kristalle-druse von Mickroclin, Quarz und Albit aus dem Ural, Russland (150 × 100 × 90 mm); M.V. Erofeev Sammlung. (Crystals druse of microcline, quartz and albite from Murzinka, Urals, Russia (150 × 100 × 90 mm); Erofeev's collection).

Fig. 4. Kristall von Beryll aus Ural, Russland (70 × 20 × 22 mm); M.V. Erofeev Sammlung (Beryl Crystal from the Urals, Russia (70 × 20 × 22 mm); Erofeev's collection).

Fig. 5. Zirkon aus Ural, Russland (80 × 60 × 40 mm); Hassberg-Spizin-Sammlung. (Group of Zircon Crystals. Urals, Russia (80 × 60 × 40 mm); Hasberg-Spitsyn collection).

Fig.6. Mimetesit aus Sachsen, Deutchland. (50 × 15 × 20 mm); D.I. Mendeleev Kollektion (Mimetite from Saxony, Germany (50 × 15 × 20 mm); Mendeleev's collection).

The distribution of silver specimens from the Kongsberg Silver Mines, Norway, 17th and 18th centuries

B.I. Berg & F.S. Nordrum

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Key words — Silver, specimens sales, collections, history, Norway.

Specimens of native silver from the Kongsberg mines in Norway are world famous and have been distributed through sales and gifts during the whole period of mining from 1623 to 1958. Names of customers, the number of sold specimens and their silver content are documented in accounts which are preserved back to the 1620s. The Danish-Norwegian kings received the largest amounts of silver specimens.

Contents

Introduction

From their opening in 1623, the Kongsberg Silver Mines have been famous for finds of beautiful silver specimens (Berg & Nordrum, 2003). The Kongsberg ore consists mainly of native silver occurring in calcite veins. In cavities in the veins the silver has partly been precipitated as wires and crystals. Such specimens have fascinated miners, visitors and collectors throughout the centuries, and have made Kongsberg a world-famous place among mineral collectors.

Already from the first years of mining in the 1620s, beautiful specimens brought up from the mines were taken aside at the smeltery and later sold to visitors. Specimens were also popular as gifts. The distribution of silver specimens is documented in the account books, which are preserved from the very beginning of mining.

Sales-lists

The sales-lists, preserved as vouchers to the account books, are interesting reading. They usually give the names of the customers, the number and total weight of the specimens, their estimated content of pure silver, and the prices which were calculated directly from the estimated silver content. Statistics have been calculated for most of the 17th and 18th centuries, showing the yearly amounts of pure silver contained in silver specimens. The yearly average was 9.5 kg of pure silver, less than 0.3% of the total silver production.

A closer look at the names in the sales-lists for some years reveals some of the persons who were visiting Kongsberg and who were interested in such natural rarities. Let us start with some of the most prominent visitors.

Royalty

The first one to receive a rich assortment of silver ores and specimens from the mines was the King of Denmark and Norway, Christian IV, keen to visit his new mines in 1624. He and later kings received the largest amounts of silver specimens. Thousands of specimens were sent to the kings in Copenhagen, who probably used many of them for gifts to other royalties, aristocrats and merchants. In that way specimens were distributed to other countries, but many were also kept in the royal collections and can today be found in the Geological Museum at the University of Copenhagen.

King Frederik III, the successor of Christian IV, founded the royal collections called the "Art Chamber" (Danish: *Kunstkammeret*), which was first recorded in 1651. The same year the king appointed a so-called mining inquisitor responsible for collecting specimens from the mines, appraising their silver contents and sending them to the king. He was dismissed when the king found out that large collections of specimens were sent to the private shareholders. Nevertheless, the king continued to be the dominating customer, even more so after he took over the ownership of the Silver Mines in 1661.

King Frederik's collection of silver specimens at least goes back to the year of his accession to the throne, 1648, when he visited his northern kingdom and the Kongsberg mines. He then received 99 rich silver specimens and also some silver ore with pyrargyrite.

The year of the royal take-over of the Silver Mines (1661) was an important one in the statistics of silver specimens, with a sale of 70 kg pure silver contained in specimens. Most of this (65 kg) can be identified as deliveries to the King and the Crown Prince. King Frederik III also had an interest in other silver minerals such as pyrargyrite and argentite. At the Rosenborg Castle in Copenhagen, he employed alchemists who operated a laboratory, possibly dreaming of producing gold from the silver ores of the Norwegian mines.

The following years, the king received a great number of silver and even gold specimens. As an example, in 1665 no less than 1210 specimens were sent to the king. From such an impressive number just for one year, we might suggest that the distribution through the kings has been a major source for silver specimens in present collections not only in Denmark, but probably in many countries. During the nearly 200 years of mining operation under Danish sovereignty, literally thousands of specimens must have made their way from Kongsberg to Copenhagen and probably from there, sooner or later, to many other destinations.

Occasionally, very big silver specimens were sent to the king. Two such big specimens have been portrayed. The first painting made by the Dutch painter Adam van Breen shows a big, but otherwise not very beautiful lump of silver found in the "God's Blessing" ("Segen Gottes") Mine in 1630, shortly after this deposit was discovered (Fig. 1). This lump weighed 409 marks or 95.6 kg. The other big portrayed specimen was found in 1695 and contained 41.5 kg of pure silver (Fig. 2).

Fig. 1. Silver specimen found in the "Segen Gottes" ("God's Blessing") Mine 1630, weighing 409 marks (95.6 kg). Contemporary painting by Adam van Breen in Kongsberg church.

Fig. 2. Silver specimen found in the Juel's Mine 1695, containing 41.5 kg of pure silver. In the background: Kongsberg town and the mining area with different surface buildings such as conical horse whims, dams and aqueducts, water wheels and lines of wooden power transmission rods. (Norwegian Mining Museum.)

A rich collection was sent to the king in 1769, including a spectacular, 25 cm high specimen formed as a big C, the first letter of King Christian VII's name, headed by a royal crown. This is one of the most beautiful and valuable specimens of the Geological Museum in Copenhagen (Fig. 3).

So far our paper has focused on the kings, but the sales-lists reveal many other

Fig. 3. "The big C", wire silver specimen found in the "Gottes Hülfe in der Noth" ("God's Help in Need") Mine 1769, 25 cm high. (Photo: Ole Johnsen, Geological Museum, Copenhagen.)

customers, some of them buying significant numbers of specimens. So far only a few of the lists have been analysed in detail. The best period examined is 14 years in the first two decades of mining, the 1620s and 1630s (Table 1). The customers may be divided into different groups. Most of the names are probably unknown to other than Nordic historians, but the social structure of the customers groups is perhaps of a more general interest. (The numbers of specimens given in Table 1 are not complete, as indicated by the ± signs, because by many purchases only the silver content is given in the sales-lists.)

Officials and merchants

King Christian IV was the largest customer. The second largest, measured by silver content, was the King's viceroy or governor in Norway, Christoffer Urne. He bought more than 92 specimens containing in total 102.4 kg pure silver. A dominating group of customers were the private shareholders of the Silver Mines, some of them belonging to the leading society of top officials and merchants in Norway.

Mining officials

Persons directly employed in mining were also among the buyers. These have been divided into two groups, the first one consisting of the top officials, the other of their subordinates. In the first group we find the single person buying the greatest registered number of specimens was the treasurer and chief accountant of the Mining Company, Hans Nilsen. He bought more than 278 specimens with a total silver content of 4.7 kg. He was perhaps an eager collector, but it may be imagined that he also might have resold specimens.

It is not surprising to find top officials among the buyers. More surprising is perhaps that some of the subordinate mining officers, who had low salaries, also bought a number of specimens. A couple of them may be regarded as collectors of professional or scientific interest. Among the most eager collectors are two assayers, who analysed silver ore, smelting products and coins. The assayer Hans Hempel was the responsible for the appraisal and sales administration of the silver specimens. He and the smelting director also had educational tasks and they may be viewed as predecessors of the later professors at the mining academies.

Table 1. Some buyers / receivers of Kongsberg silver specimens, 1625-8 and 1630-9.

Name	*Profession*	*Number of specimens*	*Silver content kg pure Ag*
Royals:			
Christian IV	King of Denmark and Norway	22++	174.7
Christian	Crown Prince of Denmark and Norway	0++	6.3
Top officer of the Crown:			
Christoffer Urne	viceroy (governor) of Norway 1629-42	92++	102.4
Shareholders of the Silver Mining Company (and associates of them):			
Jens Bjelke	the Norwegian chancellor	146++	6.6
Nils Toller	merchant and mayor of Christiania (Oslo)	85++	4.0
Johan Garmann	the Mining Company's food provisioner	45+	4.7
Peter Hansen	(Johan Garmann's servant)	20	0.2
Herman Garmann	(Johan Garmann's son, viceroy Urne's clerk)	55	0.7
Ove Gjedde	admiral of the Realm, county overlord	60+	1.3
Dorothea Urne	(Ove Gjedde's wife)	30	0.3
Jens Juel	viceroy until 1629, president of the Mining Co.	6++	2.8
Christen Bang	city councillor of Christiania (Oslo)	6++	1.0
Nils Hansen	presiding judge in Christiania (Oslo)	14++	0.2
Top mining officials:			
Hartvig Huitfeldt	royal mining inspector (Berghauptmann) 1620-4	2	0.2
Adolph Friedrich Grabou	royal mining inspector (Berghauptmann) 1624-6	12	0.2
Johan Friedrich Nortmann	royal mining inspector (Berghauptmann) 1628-31	82	0.7
Johan Diegel	royal mining inspector (Berghauptmann) 1630-2	52++	1.5
Samuel Weiss von Schalen	royal mining commissioner 1627-9	(a few)	0.9
Hans Nilsen	treasurer / accountant of the Mining Co. 1630-	278++	4.7
Nils Ebbesen	treasurer / accountant of the Mining Co. 1630	2++	0.6
Mining professionals:			
Hans Hempel	assayer (Probierer) 1630- (and teacher 1633-)	49+	1.0
Erik Jäger	assayer at the Royal Mint (Guardein)	67++	0.9
Caspar Helbich	smelting director (Hüttenschreiber) (and teacher)	19	0.1
Lorentz Lossius	accountant (Schichtmeister)	12	0.1
Jacob Daube	mining director's deputy (Geschworner)	1	<0.1
Jacob Wölner	mining director's deputy (Geschworner)	5+	0.1
Daniel Lippert	assistant inspector (Einfahrer)	6	0.1
Georg Celius	accountant (Schichtmeister)	21	0.1
Sebastian Span	accountant (Schichtmeister)	10	<0.1
Foreign visitors (not Danish):			
Dr. Christian Smilou	from Rostock (1626)	?	0.1
Thomas Schmack	merchant from Rostock (1633)	2	<0.1
Peder Clausen	merchant from Lübeck (1635)	13	0.3
Herman Backh	from Lübeck (1638)	?	0.5
Peter Eisenberg	from Hall(e) in Saxony (1635 and 1636)	22+	0.2
Christoff Friedrich Herman	from Dresden (1639)	?	0.1
Thomas Hunter	from Edinburgh, Scotland (1638)	18	0.2
NN	a Frenchman who visited the mines (1636)	?	<0.1
Peiter vann Geneie	from Geneva? (1632)	27	0.4
Anthoni v. Delden	Delden, small town in the Netherlands (1631)	?	0.1

+ : plus some not specified; ++ : plus probably many not specified by numbers.

Visitors

Lastly we have a group of more or less casual, foreign visitors, predecessors of modern tourists. Germans dominate, but some persons of other origins are also noted; Scotland, France and possibly one person from Switzerland, and one from The Netherlands (van Delden).

Conclusions

An examination of more sales-lists would surely reveal interesting names. The few lists examined so far do not give a firm basis for calculation of the total number of sold specimens, but figures of around 200 for some normal years indicate that it is not unlikely that the total number of sold specimens exceeded 30,000 and possibly reached 50,000 specimens during the great period of mining until 1805. This fascinating business continued after the Silver Mines reopened in 1816 until they finally closed down in 1958.

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The collection of Meteorites in the Vernadsky State Geological Museum of the Russian Academy of Science (19th-20th centuries - the history of its origin and study)

Z.A. Bessudnova

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Key words — meteorites, collection, catalogue, museum, Russia.

The history of the meteorite collection of the Vernadsky State Geological Museum of the Russian Academy of Science from 1759 to the present day is discussed.

Contents

Introduction

The Vernadsky State Geological Museum is the successor of the Moscow University Natural History Museum (MUNHM), the first natural history museum of Moscow, founded in 1759. At the beginning of the 19th century it was considered to be one of the best museums of its type in Europe. The collection of meteorites is among the oldest in the museum. The first meteorite, of native iron from Siberia, was donated to the MUNHM as part of a large collection bestowed by the well-known patron of the arts and lover of natural sciences, Pavel G. Demidov. This specimen was first described in the systematic catalogue of the minerals (Fischer, 1806) by Johann Gotthelf Fischer von Waldheim (1771-1853; Fig. 1), a disciple of Abraham Werner and director of the Museum from 1804. In his textbook *Orictognosie* (1818-1820), Fischer cited the results of five different analyses of the meteorite's composition, made by various European chemists. This alone demonstrates the considerable interest awarded to extraterrestrial substances at the beginning of the 19th century.

Early Russian publications on meteorites

In the first catalogue made after the museum's restoration following the Moscow fire of 1812, Fischer (1824) described an iron meteorite from Krasnoyarsk. According to a later catalogue collated by the curator of the museum Grigory E. Shchurovsky

Fig. 1. Johann Gotthelf Fischer von Waldheim (1771-1853).

Fig. 2. Grigory E. Shchurovsky (1804-1883).

(1803-1884; Fig. 2), in 1858 the Museum had four meteorites in its collection of minerals.

After 1861, the collection of meteorites was regularly replenished by Michael A. Tolstopyatov (1836-1890). In 1863 he published a paper entitled *Aerolites*, in which he depicted the evolution of scientific views on the nature of meteorites, and described their appearance, properties and composition. Among the aims of Tolstopyatov's work was to calculate the number and mass of meteorites falling annually on the Earth.

Alexey P. Pavlov (1854-1929) was also very interested in meteorites, and published a popular book (Pavlov, 1889). In 1890, the Keeper of the Museum, Evgeny D. Kislakovsky, made the first detailed analysis of the "Bishtyube" meteorite at Moscow University (Fig. 3).

The meteorite collection

By the beginning of the 20th century, the Museum possessed 68 meteorites (Table 1). Vladimir I. Vernadsky (1863-1945) and his disciples made especially big contributions to the collection in the period from 1891 to 1911. In 1906, meteorites were separated as a special collection.

In 1912, this collection counted 117 meteorites, not only from Russia and Europe, but also from North and South America, Australia, Africa, and Asia (Japan). Meteorites were purchased from European and American mineralogical firms, acquired by exchange with other museums, or received as donations.

The Museum houses meteorites from the private collections of Rudolf Hermann

Fig. 3. The plate with the image of the meteorite "Bishtyube", along with section and polished surface with figures of etching (Kislakowsky, 1890, pl. 7).

Table 1. Collection of meteorites of the Moscow University Natural History Museum; dynamics of its formation in 19th and early 20th century.

Years	Number of meteorites	Gifts	Purchase	Purchase of aerolit models	The amount of meteorite falls	Pseudo-meteorites
1806	1					
1824	1					
1858	4			1		2
1868		2				
1870		1				
1871				9		
1887			7			
1888	16	1				
1889		1				
1892		3				
1893		1				
1895			2 (exchange)			
1898	51	7	1			
1899	65	14	1		48	
1901	68				49	4
1906	82	2			55	
1907	89	5			61	
1908	90	1			62	
1909	94	1			63	
1910	114	7			64	
1912	117					
1915	115					

(1805-1879), the Princes Gagarin, Count Alexander Keller (1886-1946), and from the collection of the Rumyantsev Museum, which came to the MUNHM in 1900.

Many private collections were donated to the museum in 1930, after the reform of education in the Soviet Union. Some meteorites have appeared in the collection as a result of exchange with other museums. The catalogue of meteorites (126 samples) made by E.S. Sinegub in 1952 became a part of the general information on meteorites stored in museums of our country. During the last 50 years, the collection of meteorites has hardly increased at all.

At present, the collection contains meteorites from Chile, Brazil, Mexico, the USA, Canada, Japan, Australia and Africa, but the majority of the meteorites are from European countries. Beginning from 1923, generous rewards were offered in exchange for newly-found meteorites. Of all the meteorites, 70% are foreign, 20% are Russian, 7% have an unknown origin and 3% are pseudometeorites. Stone meteorites (76 specimens) constitute the greater part of the collection. Apart from these, there are 40 iron meteorites and 10 iron-stony specimens.

Part of the meteorite collection is now included in the permanent exhibition. The pride of the collection are samples of the 1749 "Pallas' iron" meteorite, the first meteorite ever found in Russia. In Siberia in 1980, a monument was erected on the site of this historic find. Another valued exhibit in the collection is a small piece of the 1492 "Ensisheim" meteorite, the first falling meteorite ever recorded. Two large specimens on display in the permanent exhibition (the "Sikhote Alin" (Fig. 4) and "Tsar's"

Fig. 4. Iron meteorite "Sikhote Alin"; weight 98 kg, height 30 cm. Part of a 'meteoric rain' of February 12, 1947; gross weight about 80 tons.

meteorites) come from the Meteorite Committee of the Russian Academy of Science. This committee was created at the initiative of Vladimir Vernadsky.

Nowadays, the museum has no funds available for the purchase of meteorites, and so in recent years the collection has not been expanded. Occasionally, private individuals bring meteorites to the Museum for examination. During the last 10 years, the collection has increased by only one specimen - a meteorite donated in 1997 by the director of the Magadan Geological Museum (at Chukokta), Yury Kolyasnikov.

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Johann Jacob Scheuchzer (1672-1733) und die Alpenerforschung in der Schweiz – aus den Beständen der Eisenbibliothek

Annette Bouheiry

Bouheiry, A. Johann Jacob Scheuchzer und die Alpenerforschung in der Schweiz – aus den Beständen der Eisenbibliothek [Johann Jacob Scheuchzer and the research in the Swiss Alps based on the collection of the Iron Library]. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, **4**: 25-34, 5 figs.; Leiden, August 2004.

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Key words — Iron Libray, Scheuchzer, Alpine geology, metals.

A short introduction provides some information about the Iron Library, a foundation of Georg Fischer Ltd, at Schaffhausen, which was established in 1949, to enable scientists and students the study of its historic collection, which is mainly concentrated on mining and metals, but includes all other related fields. Some outstanding details about the collection will be presented.

The main topic of the contribution will be the research of Johann Jacob Scheuchzer (1672-1733) in the Swiss Alps. His research interests were similar to those of the well known universal scientist Conrad Gessner (1516-1565) and Johann Jakob Wagner (1641-1695), considered to be pioneers of the Alpine research in Switzerland. It is followed by biographical statements about Johann Jacob Scheuchzer and some comments about the recognition he has found in scientific circles. Furthermore, his theories about the history of the earth and the diluvium will be mentioned as well as his scientific error in the misclassification of the „Homo diluvii testis", which has to be regarded under the aspect of the theological views about cosmology in the 17th and 18th century.

More detailed is the information about the research in the Alps and the geological studies during his different expeditions, which Scheuchzer has described in his main work, „Naturgeschichte des Schweizerlandes", published at the end of the 17th and the beginning of the 18th centuries. Special attention will be given to Scheuchzer's observations about ore deposits and the production of gold, silver, iron, copper, lead, tin, and brass.

Schlüsselwörter — Eisenbibliothek, Scheuchzer, Geologie der Alpen, Metalle.

Der Beitrag beginnt mit einer kurzen Einführung über die Eisenbibliothek, einer Stiftung der Georg Fischer AG, Schaffhausen, die 1949 gegründet wurde, um Wissenschaftlern und Studenten die unentgeltliche Forschung auf dem Gebiet des Montanwesens zu ermöglichen. Es folgen Angaben über die verschiedenen Sammelschwerpunkte und den Bestand.

Dem Zentralthema, der Forschungstätigkeit Johann Jacob Scheuchzers (1672-1733) im schweizerischen Alpenraum, wird eine kurze Würdigung des Universalgelehrten Conrad Gessner (1516-1565), den eigentlichen Wegbereiter für die Alpenerforschung in der Schweiz, vorangestellt. Es folgen biographische Angaben über den Werdegang Johann Jacob Scheuchzers, seine Bedeutung in wissenschaftlichen Kreisen und über seine Theorien bezüglich der Erdgeschichte und der Sintflut. Der wissenschaftliche Irrtum Scheuchzers bezüglich des „Homo diluvii testis" wird erwähnt, ferner, dass die Forschungstätigkeit Scheuchzers noch im Weltbild des 17. und 18. Jahrhunderts zu betrachten ist.

Ausführlicher werden Scheuchzers Forschungsreisen und geologischen Studien in der *Naturgeschichte des Schweizerlandes* behandelt, die der Eisenbibliothek in drei inhaltlich voneinander abweichenden Ausgaben vorliegt. Den Erzvorkommen und der Metallgewinnung von Gold, Silber, Eisen, Kupfer, Blei, Zinn und Messing werden besondere Aufmerksamkeit geschenkt.

Inhalt

Die Eisenbibliothek

Am 30. Mai 1952 durfte sich die Eisenbibliothek nach einer dreijährigen systematischen Aufbauphase als Stiftung der Georg Fischer AG, Schaffhausen, in den Räumen des Klostergutes Paradies (Abb. 1) erstmals in der Oeffentlichkeit präsentieren. Eine Institution, oder besser gesagt, ein Refugium war geschaffen worden, wo Forschung auf dem Gebiet des Montanwesens nach den bitteren Auswirkungen des zweiten Weltkrieges wieder uneingeschränkt möglich war. Seither haben viele Wissenschaftler, Studenten und Forschende in der Eisenbibliothek gearbeitet und deren guten Ruf in die Welt hinausgetragen.

Abb. 1. Klostergut Paradies bei Schaffhausen: Westflügel, Domizil der Eisenbibliothek. (West wing of convent "Paradies" near Schaffhausen, seat of the Iron Library.)

Der hohe Bekanntheitsgrad dieser Fachbibliothek erklärt sich aus dem reichhaltigen Bestand bibliophiler Buchausgaben, wie er wohl kaum an einem anderen Ort zu den Fachbereichen der Montanwissenschaften und der Technikgeschichte allgemein zu finden ist. Der Bestand umfasst gegenwärtig rund 38.000 Bände. Der Katalog ist online (www.eisenbibliothek.ch) einsehbar. Der Schwerpunkt der Sammlung liegt im Bereich Bergbau, Geologie, Mineralogie und Lagerstättenkunde, wobei der europäische Alpenraum den breitesten Platz einnimmt. Einen ähnlichen Stellenwert nehmen das Hüttenwesen und die Metallbearbeitung bzw. –verarbeitung ein. In diesem Zusammenhang sind als Sondersammlungen das Archiv des Gonzenbergwerkes mit der wissenschaftlichen Hinterlassenschaft von Prof. Dr. Willfried Epprecht zu erwähnen sowie das Archiv der Studiengesellschaft für die Nutzbarmachung schweizerischer Lagerstätten mineralischer Rohstoffe, welches 1992 von dem schweizerischen Geologen Dr. Franz Hofmann für die Aufbewahrung in der Eisenbibliothek erschlossen wurde.

Ein ausführlicher Bestandesbeschrieb über die Eisenbibliothek wird in absehbarer Zeit im "Handbuch der historischen Buchbestände in der Schweiz" erscheinen, eine Internet-Version (www.hhch.unizh.ch) ist bereits verfügbar.

Wegbereiter der Alpenforschung

Unter den zahlreichen Schätzen der Eisenbibliothek zur Erkundung der Alpen und über den Bergbau in der Schweiz sind frühe Werke des 16.-18. Jahrhunderts, sogenannte Helvetica, zu finden, die auch heute noch eine besondere Beachtung verdienen. Wenn man von der frühen Alpenforschung in der Schweiz spricht, die ihre eigentliche Bedeutung erst im 18. Jahrhundert durch Johann Jakob Scheuchzer (1672-1733) erhielt, so müssen in diesem Zusammenhang zwei weitere grosse Naturforscher des 16. und 17. Jahrhunderts, sogenannte Wegbereiter der Alpenforschung erwähnt werden, die ebenfalls in Zürich als Aerzte wirkten.

An erster Stelle ist hier der Universalgelehrte Conrad Gessner (1516-1565) mit seinen naturwissenschaftlichen Arbeiten über Versteinerungen und die Gruppierung der Mineralien (Gessner, 1565) zu nennen. Sein naturkundliches Interesse galt vorrangig der Biologie. Den Fossilien und Mineralien wandte er sich im besonderen Masse in späteren Jahren zu, in Anlehnung an die Forschungs- und Klassifizierungsarbeiten der sächsischen Gelehrtenfreunde Georgius Fabricius (1516-1571) und Johannes Kentmann (1518-1574). Gessners Forschungen fanden mit seinem jähen Tod im Jahre 1565 ein frühzeitiges Ende. Johann Jacob Scheuchzer (1746, 2. Teil, S. 1) leitet seine Berichterstattung über die erste große Berg-Reise im Jahre 1702 mit folgenden Worten ein: „Ich habe mir vorgenommen nach dem Exempel unsers grossen Schweitzerischen Gelehrten D. Conrad Gessners, die Natur-Geschichten des Schweitzerlandes überhaupt und insbesondere die Seltenheiten der Bergen zu erforschen, und dieselbe zu etwelchem Nutzen des Vaterlandes und der gelehrten Welt zu beschreiben. Dieses wichtige und sehr mühsame Werck habe ich aus eignem und gleichsam angebohrnem Triebe vorgenommen, bin aber, insbesondere durch das hohe Ansehen E. Hochedlen Magistrats, welcher mein Unternehmen beschützet, unterstützt worden. ..."

Ein Jahrhundert später erschien ein erstes bedeutendes Buch über die Naturgeschichte der Schweiz von Johann Jakob Wagner (1641-1695), die *Historia naturalis Helvetiae curiosa* (Wagner, 1680), das für Johann Jakob Scheuchzer (1672-1733) wegbereitend für die Alpenforschung wurde, zumal dieser Gelehrte für Scheuchzer ein Lehrmeister und grosses Vorbild war (Balmer, 1984, S. 16ff).

Johann Jacob Scheuchzer – Werdegang und Weltanschauung

Am 2. August 1672 wird in Zürich der spätere Mediziner, Naturwissenschaftler und Historiker Johann Jacob Scheuchzer geboren. Bereits der Vater war Arzt und auch die Mutter entstammte einer angesehenen Gelehrtenfamilie. Schon im frühen Kindesalter wird Johann Jakob Scheuchzer auf den Besuch der damaligen humanistisch orientierten Zürcher Hochschule, das Collegium Carolinum, vorbereitet. Von bedeutenden gelehrten Männern aus dem Freundeskreis seines Vaters, wie Salomon Hottinger (1649-1713), Heinrich Lavater (1611-1691), insbesondere aber Johann Jakob Wagner, dem derzeitigen Verwalter des Raritätenkabinetts in der Wasserkirche, nimmt Scheuchzer Anregungen entgegen. Als 20-jähriger beendet er die Hochschule in Zürich und beginnt seine naturwissenschaftliche Ausbildung an der Universität in Altdorf bei Nürnberg. Hier konzentriert er sich vermehrt auf die Fächer Physik und Mathematik bei dem Lehrer und Rector Johann Christoph Sturm (1653-1703). Ausserdem war die Umgebung von Altdorf reich an Fossilien und bot hinreichend Gelegenheit zum Sammeln und zum Diskutieren mit Studienkollegen.

Bereits ein Jahr später (1694) erwirbt Scheuchzer in Utrecht in den Niederlanden den Doktortitel der Medizin. Für kurze Zeit zieht es ihn noch einmal nach Altdorf, um sich Kenntnisse in der Astronomie anzueignen. Im folgenden Jahr kehrt er in seine Heimatstadt Zürich zurück. Im Dezember 1695 stirbt der Arzt und Naturforscher Johann Jakob Wagner und Scheuchzer tritt dessen Nachfolge als Stadtarzt und Verwalter des Naturalienkabinetts und der Kunstkammer an. Weitere Ehrenämter werden ihm zuteil, 1696 wird Scheuchzer Kurator der Bürgerbibliothek und Mitglied der naturkundlich interessierten Gelehrtengesellschaft der Wohlgesinnten. In diesem gelehrten Kreis referiert und diskutiert er über Themen der Gesteinskunde und Mathematik.

Scheuchzer naturwissenschaftliche Interessen gelten hauptsächlich der Erd- und Gesteinskunde, der Biologie und Botanik. Er arbeitet an einem ausführlichen Katalog des Naturalienkabinetts (Scheuchzer, 1716) und sammelt gezielt Material für die schweizerische Landeskunde. 1701 erscheint erstmals sein Lehrbuch *Physica oder Naturwissenschaft,* das der Eisenbibliothek in der zweiten Auflage vorliegt (Scheuchzer, 1711). Scheuchzers Wissensdurst und Forschungsdrang sind weitläufig, konzentrieren sich aber doch sehr auf seine helvetische Heimat. Ihm schwebt ein umfassendes Werk über die Naturgeschichte des Schweizerlandes vor. In seinem jüngeren Bruder Johannes (1684-1738) findet er einen gleichgesinnten, naturkundlich interessierten Forscher, der ihn auf seinen grossen alpinen Reisen begleitet.

Johann Jacob Scheuchzer war ein Verfechter der Sintfluttheorie, ein Diluvianer, d. h. er führt die Entstehung der Alpen darauf zurück, dass riesige Gesteinsmengen mit dem Wasser der Sintflut mitgeführt wurden, sich angesammelt und aufgetürmt haben. Bei seinen petrogenetischen Forschungen sind ihm Irrtümer unterlaufen, die nach späterem Erkenntnisstand der Naturwissenschaften widerlegt, bzw. mit Nachsicht hingenommen wurden, in zwei Fällen jedoch anekdotisch in die Geschichte eingegangen sind. Im ersten Fall verteidigte Scheuchzer in heftigen Diskussionen mit seinem Studienfreund Johann Jakob Baier aus Altdorf zwei versteinerte Wirbel eines *Ichthyosaurus* aus dem Juraschiefer als Wirbel eines Menschen, der seiner Meinung nach in der Sintflut umgekommen war.

Ein ähnlicher Fehler unterlief ihm bei einem Fund in der Nähe der badischen Ortschaft Oehningen am Bodensee. Bereits im frühen 16. Jahrhundert wurde hier Kalkstein abgebaut, in dessen Schichten Versteinerungen von Pflanzen und Tieren aus der Tertiärzeit zu finden sind. Die fossilen Funde erregten das Interesse der Wissenschaftler, und auch Scheuchzer erhielt einen grossen Anteil dieser Schätze. 1725 wird ihm das versteinerte Vorderteil eines tertiären Riesensalamanders zugeführt, in welchem er das „Beingerüst eines in der Sintflut ertrunkenen Menschen" zu erkennen glaubt. Er benennt diesen Fund wissenschaftlich „Homo diluvii testis" („Mensch, Zeuge der Sintflut") und schreibt 1726 eine Arbeit darüber. Die besagte Versteinerung, *Andrias scheuchzeri,* wurde später vom Teylerschen Museum in Haarlem erworben, wo sie auch heute noch zu sehen ist. Immerhin sollte nahezu ein Jahrhundert vergehen, bis Cuvier (Balmer, 1984, S. 28) dieses Fundstück als ausgestorbenen Riesensalamander erkannte. Ein grosser Teil der Petrefaktensammlung Scheuchzers ist ebenfalls erhalten geblieben und wird im Paläontologischen Museum in Zürich aufbewahrt.

Bezüglich der verbreiteten Sintfluttheorie ist zu bemerken, dass das naturwissenschaftliche Weltbild zu Lebzeiten Scheuchzers noch stark von der Theologie beeinflusst war und die technischen Möglichkeiten der wissenschaftlichen Analyse waren beschränkt. Scheuchzer (1723, S. 332) selbst schreibt: „Ja es ist offt schwer zusagen, ob ein in den Felsen oder dero Lageren gefundenes Stück Bein oder Holtz seye".

Dennoch genoss Scheuchzer hohes Ansehen in der Gelehrtenwelt. Ehre und Anerkennung über die Landesgrenzen hinaus zeigen sich in seinen zahlreichen wissenschaftlichen Abhandlungen, in seinen Mitgliedschaften bei großen Akademien in London, Berlin, Halle/Saale und Bologna, nicht zuletzt aber auch in seinen Verbindungen zu anderen Gelehrten wie Gottfried Wilhelm von Leibniz (1646-1716) und Johann Bernouilli (1667-1748).

Geologische Forschungen

Im Alter von 22 Jahren unternimmt Scheuchzer (1723; Abb. 2A-B) seine erste Alpenreise, der weitere grosse Expeditionen in die Gebirgswelt in Begleitung seines Bruders Johannes folgen. Er sammelt, forscht, kartographiert, stellt Höhenberechnungen an, macht meteorologische Aufzeichnungen und erfasst mündliche wie schriftliche Überlieferungen. 1712 erscheint Scheuchzers aus vier grossen Blättern bestehende Karte der Schweiz (Abb. 3), die für ein Jahrhundert als beste Landeskarte bezeichnet wird. Die Titelverzierungen zeichnete der Zürcher Maler Johann Melchior Füssli (1677-1736), ein bekannter Maler, dessen gefällige Darstellungen in verschiedenen Scheuchzer-Ausgaben zu finden sind.

Abb. 2A. Autorenporträt zu Joh. Jac. Scheuchzers *Itinera Alpina*, 1723. (Author's portrait of J.J. Scheuchzer's *Itinera Alpina* of 1723.)

Abb. 2B. Titelkupfer zu Joh. Jac. Scheuchzers *Itinera Alpina*,1723. (Title plate of J.J. Scheuchzer's *Itinera Alpina* of 1723.)

Abb. 3. *Nova Helvetiae Tabula Geographica* .... Landeskarte der Schweiz von J.J. Scheuchzer, mit allegorischer Titelverzierung von Joh.Melchior Füssli, herausgegeben im Jahre 1712. *(Nova Helvetiae Tabula Geographica* ... Map of Switzerland from J.J. Scheuchzer with allegorical title illustration by Joh. Melchior Füssli, published in 1712).

Johann Jacob Scheuchzers,
Weyland Profess. der Natur-Lehre und Mathematic / Canonici in Zürich, wie auch Mitgliedes der Kayserlichen, Königlich-Englisch- und Preussischen Gesellschaften der Gelehrten, &c.

Natur-Geschichte
des
Schweitzerlandes,
Samt seinen
Reisen über die Schweitzerische Gebürge.
Aufs neue herausgegeben, und mit einigen Anmerkungen versehen
Von
Joh. Georg Sulzern.
Erster Theil.

Zürich, bey David Geßner, Gebdr. 1746.

Abb. 4. Titelseite zu J.J. Scheuchzers *Natur-Geschichte des Schweitzerlandes* 1746. (Title page of J.J. Scheuchzer's *Natur-Geschichte des Schweitzerlandes* of 1746.)

Der 'Natur-Geschichte des Schweitzerlandes' (1746; Abb. 4), dem Hauptwerk Scheuchzers ging eine mehrjährige Vorbereitung voraus. Von 1705-1708 wurden die einzelne Beiträge in einem Wochenblatt vorabpubliziert, 1708 erschien das Gesamtwerk, thematisch unterteilt, in einem Band in Zürich. Der Eisenbibliothek liegen drei teils inhaltlich voneinander abweichende Zürcher Ausgaben vor (Scheuchzer, 1706-1708, 1716-1718, 1746). Auch das Erstlingswerk 'Specimen lithographiae Helveticae curiosae, ...' (Scheuchzer, 1702) ist in der bibliophilen Sammlung zu finden.

Gold- und Silberfunde

Scheuchzer (1716-1718, S. 347ff) schreibt in seiner 'Natur-Geschichte des Schweitzerlandes ...', "dass das Gold und andere schimmernde Metall-Schätze an grossen Klumpen unmittelbar aus der Erde müssen hervor geblincket haben, so dass man ohne sonderliche Mühe derselbigen habe können theilhaft werden". Mit der Erdveränderung sei viel von dem Reichtum der edlen Metalle verloren gegangen, wörtlich: "... daß vorher Klumpenweise zusammengeführte metallische Theile in der Sündfluth zerstücket, zertrümmert, und unter die irdischen und steinichten zerstreuet, ja gleichsam Stücklein- oder Fetzleinweise begraben worden ..." und fügt hinzu "...als gerechte Strafe Gottes für die frevelhafte Menschheit...". Er teilt weitgehend die grundlegende Ansicht seines englischen Kollegen John Woodward (1665-1722), dass mit der Zertrümmerung und Zermürbung der Erde durch die erste Sintflut große metallische Teile mit den Wassermengen mitgeführt wurden und der Schwere wegen in die Tiefe abgesunken seien, wo sie sich als Lagen und Adern "köstlicher Metalle" formiert haben (Woodward, 1695, S. 217ff). Von dieser Theorie klammert Scheuchzer die Alpenwelt aus. Die Schweizerischen Lande bezeichnet er als einen Schauplatz der Überbleibsel der Sintflut und fügt an: "...Es verwundern sich die Sächsischen Berg- und Metall-verständigen Ertz-Knappen über der grossen Verschiedenheit der Situation oder Lagerstelle unserer und ihrer Metallen. In dasigen Landen liegen die Metalle tief in die Erde eingesenckt ... Hingegen sind in den Tieffen unserer Gebirgen mehr Wasser- als Metall-Schätze...." Das Metall liegt seiner Meinung nach vermehrt in der oberen Erdschicht, je tiefer man gräbt, desto geringer wird die Ausbeute. Auch führt Scheuchzer die vegetative Fruchtbarkeit der Alpenwelt darauf zurück, dass metallische Kleinstteilchen mit dem aufsteigenden Wasser in Wolken, Flüssen und Seen mitgeführt werden und sich beim Verdunsten niederschlagen.

Eigentliche Goldminen in den Schweizer Landen werden nicht erwähnt. Das so begehrte gediegene Gold findet sich mit wenigen Ausnahmen im Sand der Flüsse, muss ausgewaschen werden und wird deswegen "gewaschen Gold, gewaschene Goldflitzschen, Goldkörner, geseifft Gold, Goldsand, Seiffengold", auch „Goldstüfflein" genannt. Menschen, die in den Flüssen nach Gold suchen, nennt man "Golder, Göldner, Goldfischer". Über aussergewöhnliche Funde ist kein Hinweis zu finden. Scheuchzer hebt hervor, dass in der Eidgenossenschaft das Goldsuchen von der Obrigkeit nicht monopolisiert wurde wie in anderen Ländern, sondern dass das alte Naturrecht beibehalten worden sei, kraft dessen jeder behalten kann, was er findet, allerdings mit dem Vorbehalt, dass ein gewisser "Zehender oder alles Gold in gewissem Werth der Obrigkeit oder dem Landvogt" zuzustellen sei.

Ähnlich verhält es sich nach Scheuchzer (1716-1718, S. 358ff) mit dem Silber. Er schreibt dazu, "... dass sich in unsern Gebirgen kostbare und weichflüssige Silberstuffen nicht finden, nirgends kein gediegen, gewachsen Haar-Silber, kein Rothgülden-Ertz, oder Glass-Ertz, oder Horn-Ertz, sondern unsere Silber-Ertze sind meistentheils hart, streng in spathige Steine eingesprengt, oder mit dem Bley-Ertz untermengt, mehr Bley- oder Kupfer- als Silber-Ertze zu nennen, also daß sich niemand grosse Ausbeuten versprechen sol ...". Dennoch wurden im 16. und 17. Jahrhundert Silber-Erze mit guten Erträgen in Graubünden, im Schamser Land, abgebaut. Der sächsische Gelehrte, Georgius Agricola (1556, S. 279), beschreibt im VIII. Buch von *De re metallica* lange Pochtröge mit bis zu 20 Stempeln in einer Reihe, die zum Nasspochen dieser Erze in den Julischen und Rätischen Alpen aufgestellt seien (Abb. 5).

Abb. 5. Pochwerk in Georg Agricola „Zwölf Bücher vom Berg- und Hüttenwesen", Berlin 1928, p. 279. (Crushing mill from the German translation of Georg Agricola's *De Re Metallica*, Berlin 1928, p. 279.)

Zu Fundorten und Bergwerken in den Kantonen Bern, Uri, Unterwalden, Wallis, Glarus und Graubünden zitiert Scheuchzer wiederholt den Zürcher Arzt und Naturwissenschaftler Johann Jakob Wagner, dessen Werk *Historia Naturalis Helvetiae curiosa* (Wagner, 1680) der Eisenbibliothek ebenfalls vorliegt.

Eisen

Scheuchzer ist überzeugt, dass sein Vaterland ein so großes Eisenerzvorkommen aufzuweisen hat wie kaum ein anderes Land und dass der "Jurassus" bereits im Altertum für seine großen Eisenerzvorkommen bekannt war. In seiner ganzen Ausdehnung vom Schaffhauserland bis an die französische Grenze waren Eisenerze zu finden, die als Bohnerze im Tagebau oder im Felsgestein in den Gruben der Bergwerke abgebaut wurden. Da das Eisen in der Alchimie dem Planetenzeichen des Kriegsgottes Mars zugeordnet wird, ist es für Scheuchzer (1716-1718: 361ff) nur natürlich zu behaupten, dass "... Schweitzersche Gemüther und Leiber von oben herab durch kräftige Einflüsse aus dem Planeten-Himmel gestählet würden, gestählet von unten durch Martialische aus unserm Eisenreichen Land aufsteigende Dünste, gestählet durch eigne im alten Römisch-Oesterreichisch-Burgundisch- und heutigen, sowol ausländisch- als einheimischen Kriegen, so vielfältig geübte Kriegs-Erfahrenheit, zu deren auch unsere Kinder angeführet werden, ehe sie recht aus der Schale geschloffen ..." Wer mag ihm diesen Patriotismus wohl verübeln, verbinden sich in der Mythologie mit dem Eisen doch von jeher Vorstellungen von Kraft, Stärke, Mut und Tapferkeit. Der Wirkungsgrad des Eisens ist seiner Ansicht nach so groß, dass "im Sarganser-Land, da die reichen Stahl-Bergwercke sind, das aufwachsende Holtz selbst gleichsam gestählet wird."

Kupfer, Blei, Zinn und Messing

Kupfer war im Altertum der guten Bearbeitungseigenschaften wegen ein gefragter Werkstoff. Die Gewinnung bzw. Aufbereitung allerdings war aufwendig. In erster Linie wurde Kupfer für den Bronzeguss verwendet in einem ungefähren Mischungsverhältnis von drei Teilen Kupfer und einem Teil Zinn. Kupfer ist in geringen Mengen in gediegener Form zu finden, während Messing ausschließlich auf künstlichem Wege hergestellt wird und im vereinfachten Sinne eine Kupfer-Zink-Legierung ist. Alchimisten und andere Naturforscher haben verschiedentlich den Beweis für Messing in gewachsener Form erbringen wollen. Auch Scheuchzer untersucht ein ihm überlassenes Marcasit-Gestein aus dem Walliser Gebirge, das sogenannte Katzengold, welches dem Messing farblich sehr ähnlich ist, sich in seiner Zusammensetzung aber doch als Schwefelkies erweist. So vermutet Scheuchzer, dass es sich bei dem von Wagner (1680, S. 354) beschriebenen Messing im Weggis, das sich auch bei größter Hitze nicht schmelzen lässt, gleichwohl nur um Schwefelkies handele. Schwefelkies wird als Halbmetall bezeichnet und ist im weiteren unter den Begriffen Pyrita, Marcasita, Kupferkies, Kupferstein oder Goldkies bzw. gelbe Kiese erwähnt.

Kupfererze wurden hauptsächlich in Graubünden am Fläscher Berg, in den Ferrara Tälern, im Unteren Engadin und in der Gegend von Davos gefunden, ferner im Schamserthal, im Rheinwald, in der Grafschaft Sargans auf dem Gallanda Berg und im Palenzer Tal. (Die geographischen Bezeichnungen entsprechen dem Originaltext.)

Von ähnlicher Bedeutung wie Kupfer ist auch Blei für das 17. Jht, das man zur Herstellung von Kugeln für Musketen, zur Einfassung von Fensterscheiben, für Heilmittelzwecke und vieles andere braucht. Bleierze bzw. Bleiglanz finden sich in der Regel im Gemenge mit anderen Mineralien wie Kupferkies, Kupferglanz, Schwefelkies, Zinkblende, Arsenik und Quarz. Als besonders ergiebig werden auch hier die Täler von Ferrara, Schams und die Gegend von Davos, wo der Berg über 400 Klafter tief ausgehauen wurde, genannt (Wagner, 1680, S. 352).

Zinn ist gemäß den Angaben von Scheuchzer nicht zu finden, während Quecksilber in so geringen Mengen vorhanden ist, dass es keiner besonderen Erwähnung bedarf. Scheuchzer ist Arzt und weist auf die Gefährlichkeit von Quecksilber und Spießglas bei der Arzneiherstellung hin. Im Kloster Engelberg hält er sich während seiner Reise zwei Wochen lang auf und behandelt die krampfartigen Leibschmerzen des Abtes, die er auf den schlechten Zustand der kupfernen Kochgefäße zurückführt.

Am 23. Juni 1733 verstirbt Johann Jakob Scheuchzer in Zürich. Die Amtsnachfolge als Stadtarzt (Balmer, 1984, S. 31ff) übernahm der jüngere Bruder Johannes, der ebenfalls verdienstvoll in die Stadtgeschichte eingegangen ist.

Zeitgenössisch war Johann Jakob Scheuchzer ein großer Gelehrter, der seinen Ruhm nicht vornehmlich in anderen Ländern suchte. Seine Verdienste sind eng mit dem Heimatland verbunden. Seinen chronologischen landeskundlichen Aufzeichnungen, insbesondere über die Erforschung der Alpenwelt, ist es zu verdanken, dass der helvetischen Naturgeschichte der gebührende Stellenwert beigemessen wurde. Trotz seiner Gelehrsamkeit schrieb Scheuchzer in einer verständlichen, gelegentlich blumigen Sprache, lässt in lebendiger Form Beobachtungen, Begebenheiten, Vermutungen einfliessen und übermittelt hinreichend Stoff, um auch bei künftigen Generationen das Interesse an der Naturgeschichte des Schweizerlandes weiterleben zu lassen.

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Written reports on the effects of mining activities on the natural environment in Idrija in the 19th Century

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The environmental conditions in the Idrija Mercury Mine and its broader surroundings were strongly affected in the first half of the 19th century by two disastrous pit fires. The fire could only be extinguished by flooding of the pit. The consequences of such flooding was extensive poisoning with mercury vapours, not only among those miners who participated in the fire extinguishing effort and later in the rehabilitation of the pit, but also among the inhabitants of Idrija. During rehabilitation works, the highly polluted water was discharged directly into the Idrijca River, killing all the fish species thriving there. After 1835 the Mine gradually intensified its production. The dumping of increasingly larger quantities of smelting wastes directly into the Idrijca River considerably aggravated the environmental conditions in the river and along its banks. The Mine had begun to pay indemnities in 1788 to affected landowners in the vicinity of the smelting plant. The Mine Administration, supported by the competent ministry and the Higher Mining Office in Klagenfurt, rejected all accusations and proved, evidently with false data, that smelting gases did not contain mercury vapours and that smoke gases were not harmful. Only in 1881 did they finally begin to pay affected landowners a regular annual support in place of indemnity.

Contents

Historical overview and environmental conditions at the end of the 18th Century

Idrija holds a special place among mercury mine localities. Carboniferous shales intercalated with native mercury crop out at the surface in the very bottom of the basin where, soon after the discovery of mercury in 1490, a small settlement first appeared and later developed into the town of Idrija (Fig. 1). In the initial decades of mining activities, even those areas where shales containing native mercury were excavated and ore-processing was conducted, in the form of washing and burning in piles, were later completely built up. Throughout history, the primary (geogenic) and secondary

Fig. 1. Idrija, painted by Goldstein in 1840.

(anthropogenic) mercury compositions became closely interwoven, bringing enormous environmental consequences for the population and environment of Idrija. For this reason Idrija is rightfully called a "mercury laboratory" (Čar & Dizdarevič, 2003).

A considerable amount of information on mercurialism among miners of the Idrija Mine has been preserved in official mine documents. However, the knowledge about and 'recognition' of the effects of mining and ore processing on the natural environment and inhabitants of Idrija and its surroundings developed much more slowly.

The first known writings about the consequences of mercury poisoning in Idrija were published in the 16th century by the reputed physician Paracelsus who visited Idrija in 1527 (Lesky, 1956). The published reports of occasional visitors to Idrija in the 17th century already contain the first remarks on the harmful effects of 'mercury' gases on the environment in the vicinity of the smeltery. Of major significance for evaluating the growing awareness of the harmful effects of mercury and smelting gases on the environment were the reports of Keyssler (1740), a German travel writer, Scopoli (1761, 1784), a naturalist and the first mine physician, and Hacquet (1781), a mine surgeon. Due to the exceptional rise in mercury production after 1785 (agreement between Austria and Spain on the supply of mercury from Idrija), the environmental conditions in Idrija deteriorated rapidly. Landowners in the close and distant surroundings of the smeltery complained about the damage caused to land, crops and livestock. The Mine recognized the damage and began to pay indemnity in 1788. To our knowledge, the indemnities represented the first 'environmental annuity' that began to be paid regularly for several years in the region of Carniola (Čar & Dizdarevič, 2003).

Environmental consequences of the 1803 pit fire

According to the second six-year agreement concluded between Austria and Spain in 1792, Spain would be supplied with mercury from the Idrija Mine until 1798. However, due to the war conditions prevailing in Europe, the agreement was terminated one year before its expiry date, i.e., in 1797. Although the Mine began to reduce its mercury output, 560 tons of mercury were nevertheless produced in the said year due to accumulated stocks. It was not until after 1799 that the production of mercury actually began to fall, amounting to some 370 tons in 1802. Around the year 1800, the Mine introduced new Leithner vertical smelting furnaces with improved efficiency rates. The number of employees was also reduced. Evidently, the decrease in production and the introduction of new, technologically improved furnaces had a favourable effect on the environmental conditions. In 1798 a special mine committee expressed the opinion that livestock was less threatened and fell ill less frequently, while landowners in the surroundings of the smeltery repeatedly began to breed sheep (Pfeifer, 1989). In 1802, indemnity was being paid to only 13 landowners as a result of - in the opinion of the special committee - the improved conditions.

On 15th March, 1803, a fire broke out in the central part of the Idrija Mine. All the miners, except for one, were rescued. All the entrances to the pit, except for Francisca's Shaft, were built up. Six weeks later, the mine entrances were finally reopened and smoke containing poisonous mercury gases began to spread uncontrollably into the environment. Despite enormous efforts, the fire could not be stopped and, in the night from 14th to 15th May, the pit was flooded with water. When the water reached the centre of the fire, a strong explosion occurred, demolishing even the above-ground facilities around Theresa's Shaft. After the fire was finally extinguished, the pit water (yellow in colour) began to be pumped out and was released directly into the Idrijca River (Karsten, 1821).

The pit fire obviously had disastrous consequences for the health of miners. This was reported in detail by Pfeifer (1989) in his book about the health service in Idrija. The fire and explosion destroyed a large part of the pit, whose rehabilitation, aggravated by the severely impaired health of Idrija miners, lasted for a full three years (Mohorič, 1960).

General information about the fire and its consequences in the pit, as well as the effects of mercury gases on miners, was quite frequently published in various reports, newspapers and publications (Karsten, 1821; Rassell, 1825; Hizinger, 1860; Arko, 1931; Mohorič, 1960; Pfeifer, 1989). However, only a few brief comments about the consequences of the fire on the natural environment have been found (Rassell, 1825; Hizinger, 1860; Pfeifer, 1989). By all means the pit fire had disastrous consequences for the natural environment in Idrija and its surroundings, as well as for the banks of the Idrijca River.

A highly suggestive description of the 1803 pit fire was published by the English travel writer John Rassel, who visited Idrija in 1822. In additional to a dramatic account of the entire fire-extinguishing procedure, Rassel adds a few words at the end of his report about the environmental consequences of the fire: "It took them two years to make the device and pump out the water. It was placed in the Idrijca River, which was found to contain only a small quantity of mercury, but a large share of sulphuric acid and such large quantities of iron that the bottom and banks of the river were coated with a crust of iron ochre along its entire course - from Idrija to its confluence with the Soča River. It was then that all the fish disappeared from the river, with the exception of eels, which evidently resist everything, except, of course, grilling or roasting."

The historian Hizinger (1860) was also unable to avoid describing the catastrophic pit fire and its consequences in his small book on the history of the Idrija Mine. Hizinger concluded his description with the following words: "In connection with the described pit fire, it became evident that all those persons who came into the vicinity of emitted mercury vapours were more or less shaking or had stiff limbs (Steifheit der Glieder). I should mention that the waste water was completely yellow and for this reason all the fish along the entire course of the Idrijca River died." (translation by Dr. Metka Perič, 1997).

The gravity of the environmental conditions in Idrija in 1803 and subsequent years was also reported by Pfeifer (1989). According to archival data, the mortality rate in Idrija in 1804 and 1805 increased slightly, while the birthrate decreased in comparison with previous years. Although no data are available on the direct connection between increased mortality / reduced birthrate and the fire, the occurrences in this period are characteristic and the same consequences were registered in the 1846 pit fire, which is described in more detail below.

First decade of the 19th century

The 1803 pit fire had a strong impact on excavations in the pit and, consequently, on the quantity of mercury produced in subsequent years. The annual mercury output was reduced from almost 400 tons around the year 1800 to approximately 200 tons in 1803. In the period from 1807-1809, on average around 190 tons Hg and 10-20 tons of cinnabar were produced yearly (Arko, 1931). During the French occupation, the unfavourable conditions in the pit gave the occupiers considerable difficulties in increasing Hg extraction to around 260 tons per year. After the disintegration of Napoleon's empire, Idrija was occupied by the Austrian army in October 1813. Exhausted from warfare, Austria immediately began to introduce strict cost-saving measures in the Mine's operating expenses and in its food expenses. Workers were discharged. The already extremely poor social conditions of Idrija miners worsened. The consequence of comprehensive cost-saving measures was the reduction of production to, on average, 175 tons of mercury per year in the period from 1814 to 1820.

The decrease in production by all means had a favourable effect on the environmental conditions in the Idrija region. This is evident from the published travel writings of the reputed metallurgy expert, Karsten (1821): "The smelting facilities lie approximately 1000 steps north of Idrija in the valley of the Idrijca River, along its left bank. The facility is not very large and is quite unique, work in the smeltery begins in November and continues until the end of March. The facility is not operational in summer, as the smelting fumes would destroy the grass and crops, and would also be a reason for salivation. Moreover, the condensation of mercury vapours is quicker and more thorough in winter than in summer."

Karsten's writings indicate that there were no major environmental problems in the vicinity of the smeltery towards the end of the second and the beginning of the third decade of the 19th century. The fact that ore was burned only five months a year in this period was understandably not an 'environmental measure,' but the consequence of a strict restrictive policy imposed by Vienna due to the recession in the international mercury market. Another reason was also the very poor mining-geological conditions existing in the ore deposit at the time. Although new investigative and opening works in the pit had already been begun in 1819, the situation did not normalize until after 1823, when the entire Idrija pit was inspected by a special committee of Viennese experts, who gave instructions for further work in the pit.

The production of mercury in the period from 1820 to 1846 was relatively constant. Slightly over 160 tons of mercury was extracted annually. However, in order to maintain this constant rate of production, increasingly greater quantities of ore had to be extracted each year, as the average mercury content in ore decreased from 9% in 1820 to 2% in 1846. Approximately 1800 tons of ore was extracted in 1820 and as much as 7200 tons in 1846 (Arko, 1931; Mohorič, 1960). The burnt ore that was dumped along the banks of the Idrijca River was carried away by flooding waters and deposited in pools along the river course.

Environmental disaster caused by the 1846 pit fire

On 3rd November, 1846, a fire broke out on Hauptmann's level in the central part of the Idrija mine, claiming the lives of 17 miners (Fig. 2). As was the case in 1803, firefighters were unable to extinguish the fire with the usual measures. The fire was finally put under control after all the shafts had been closed and the pit flooded with water. On 26th November the shafts were reopened and the pit water began to be pumped from the pit. Before sending down the first miners to commence rehabilitation works, caged animals (birds and certain mammals) were lowered into the pit to determine whether the air was suitable for the entry of miners. The rehabilitation works lasted several months. Despite the four-hour workday and frequent rotations of miners in highly poisoned working areas in the pit, numerous cases of acute mercurialism were reported. A particularly extensive and detailed description of events following the 1846 fire was prepared by Arko (1931) on the basis of documents from the Mine archives.

Owing to its tragic consequences, the fire aroused considerable attention and was reported by all writers of historical discussions on the Idrija Mine (Hizinger, 1860; Arko, 1931; Mohorič, 1960). However, there were no reports of any eventual consequences in the natural environment. It is, of course, logical that steam and smoke gases containing mercury vapours were once again emitted from mine entrance shafts and mainroads. Pfeifer (1989) reported that entire families residing in the vicinity of mine entrances suffered from poisoning with Hg vapours. Eleven miners' wives were treated for salivation and tremor, which are typical symptoms of mercury poisoning. The highly polluted pit water was again released directly into the Idrijca River.

Although the number of fish killed was not as large on this occasion, the banks of the Idrijca River were coated with limonite far downstream.

Once again, the unfavourable environmental conditions caused by the pit fire led to the deterioration of the general state of health in Idrija. They also affected fertility, which in 1847 decreased substantially in comparison with the period preceding the fire. No data are available on increased mortality in this period.

Fig. 2. Tombstone to the 17 Idrija miners died in pit fire in 1846.

Struggle for recognition of the harmful effects of metallurgical activities on the natural environment

The indemnities which the Mine began to pay in 1788 to affected landowners in the vicinity of the smelting plant were abolished after the 1803 fire due to reduced production and the introduction of strict cost-saving measures. After the departure of French occupying forces from Idrija (1813), landowners in the Idrijca River valley repeatedly, but without success, filed indemnity claims in the period from 1814 to 1818. Afterwards, as the result of reduced mercury production and the performance of smelting activities only in winter, there were no more complaints about damage to livestock and crops for the next 20 years.

After 1831, the gradual rise in mercury prices on world markets led the Mine to increase its production and extend its ore-smelting activities into the spring and summer months. In 1837, landowners in the vicinity of the smeltery repeatedly began to complain about the damage caused by smelting gases to meadows, crops and livestock, but the Mine Administration refused to recognize any indemnity claims. The struggle for the recognition of indemnity claims came to a critical point in the mid 19th century. In 1848, landowner J. Leskovec and 35 cosignatories sent a complaint to the Ministry regarding the damage caused to crops and in particular livestock. The Ministry responded that the complaint was unfounded, claiming that the furnaces in Idrija allowed for the 'complete condensation of mercury.' The landowners refiled the complaint, this time requesting an analysis of the red dust accumulating on the windows, ledges and roofs of houses in the vicinity of the smelting plant. A 'precise analysis' was prepared by the Association of Pharmacists in Ljubljana. According to its expert opinion, red dust is comprised of "a mixture of iron oxide and pitch, glass fragments, brick and plaster particles, hair and straw," which is why the dust is completely harmless (Perger, 1873). This 'brilliant' analysis prepared by Ljubljana's 'experts' was for many years used by the Mine Administration as a basis for rejecting indemnity claims for damage to crops and livestock.

During the long recession period after 1850, the Mine reduced its mercury production, which then remained relatively constant until 1866 (approximately 190 tons annually). Ore was burned only in winter. This was reported by Henty (1866), a journalist and writer who visited Idrija and its mine in October 1866: "The mercury extraction plants are located at a distance of about one mile from the town, but the furnaces are not operational at this time of year because the vapours are so poisonous that they would cause extensive damage to the vegetation and livestock feeding on it. For this reason, works are conducted only in winter, when the vapours fall on the snow cover and are not washed away until spring, when the snow begins to melt" (translation by Metka Petrič, Idrijski razgledi 47/2, 2002). Henty did not have a good opinion about the effectiveness of condensation chambers (Fig. 3), saying: "It is obviously highly deficient, as there would otherwise be much less harmful vapours spreading to the surroundings than there are now."

The rise in production in 1867 aggravated the already poor environmental conditions in Idrija, and the complaints and rightful claims of landowners for indemnity payments reappeared in the period from 1867 to 1871. The Mine Administration rejected all claims with the explanation "...that smoke affects the environment primarily with its smell" and "experience has shown that Hg vapours subside very quickly" (Perger, 1873, p. 156). Provincial newspapers wrote extensively about Idrija's environ-

Fig. 3. Shaft furnace (Exeli system, 1872).

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für

Berg- und Hüttenwesen.

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Ueber die Schädlichkeit des Idrianer Hüttenrauches (Fortsetzung) — Unterirdische Wasserhaltungsmaschinen. — Die Steinkohlen Australiens. — Notizen. — Amtliches. — Ankündigungen

Abonnement

auf die

„Oesterreichische Zeitschrift für Berg- und Hüttenwesen"

für II. Semester 1873.

Mit 1. Juli begann das II. Semester. Wir erlauben uns zur Pränumeration auf dasselbe hiermit höflich einzulade und um gefällige rechtzeitige Einsendung des Pränumerations-Betrages von 5 fl. 40 kr. ö. W. mittelst Postanweisung zu ersuchen, um in der Zusendung des Blattes keine Unterbrechung eintreten lassen zu müssen.

Die Expedition.

Ueber die Schädlichkeit des Idrianer Hüttenrauches.

Von Hugo Ritter v. Perger, k. k. Professor.

(Fortsetzung.)

Derartig gibt die k. k. Berghauptmannschaft ihrer Entrüstung Ausdruck, und vergisst dabei ganz die sonderbaren Begriffe „stinkende Wirkung" und „giftige Schädlichkeiten" im eingeleiteten Gutachten zu corrigiren!

Da die Klageschrift der Gemeinde von Unteridria vor Allem eine Beschränkung des Hüttenbetriebes auf die kältere Jahreszeit verlangt, so fordert die hohe Landesregierung den Vorstand des k. k. Bergamtes Idria auf, sich darüber äussern zu wollen, ob eine gewünschte Beschränkung des Hüttenbetriebes durchführbar sei, ob überhaupt diesbezüglich keine bestimmten Concessionen gemacht werden könnten. Eine Rücknote erklärt, es sei eine Beschränkung des Betriebes aus dem Grunde ganz unmöglich, weil dadurch die Production vollständig beeinträchtigt würde. Uebrigens könnte aus jeder Concession, die das Bergamt macht, der Schluss gezogen werden, es sei die Montanbehörde von der Schädlichkeit des Hüttenrauches selbst überzeugt. Um das Gegentheil zu bekräftigen, versucht das Gutachten der Bergwerksdirection neue Thatsachen geltend zu machen und erzählt, dass das Quecksilber erst bei 80° R. und selbst bei dieser Temperatur nur mit Hilfe von Wasserdämpfen verflüchtigt. Bekanntlich ist con statirt, Mercur kann bei jeder Temperatur über 0° R. ver dampfen, ein einfaches Experiment genügt, um sich von diese Thatsache zu überzeugen. Doch das Gutachten sagt selb später, „wenn auch wirklich Mercur aus den Oefen entweich so werden die Dämpfe bei 30° R. sicher sogleich verdichtet. Wäre die neue Theorie der Mercurflüchtigkeit richtig, dan könnte bei der niederen Temperatur, welche die Condensatore haben (8° R.), nicht die Spur des flüchtigen Metalles ent weichen, darin liegt ein Widerspruch, den das Gutachten nich aufklärt. Die specifische Schwere der Mercurdämpfe ist fü den Verfasser der Rücknote eine volle Garantie für das rasch Verschwinden des Mercurs aus dem Hüttenrauche. Mit diese Ansicht wird abermals zugestanden, der aus den Oefe kommende Rauch ist quecksilberhaltig. Aber abgesehe von den Widersprüchen, ist diese zweite Theorie nicht richtig denn eine totale Sonderung des Mercurs, das im Rauche ent halten ist, von den übrigen Stoffen desselben (der Act nenn sie „gasförmiges Bitumen") zufolge des höheren specifische Gewichtes, widerspricht allen physikalischen Gesetzen.

Ganz sonderbar nimmt sich nach allen dem die Mitthei lung der Bergbehörde aus, nach welcher sie selbst im Hoch sommer den Ofenbetrieb einstellt „zur Verminderung de Verlustes" an Mercur! Nach der entwickelten Theori verdampft das Quecksilber erst bei 80° R. und im Hochsomme

Fig. 4. Oesterreichische Zeitschrift für Berg- und Hüttenwessen (Perger, 1873).

mental problems. Yet the true attention of the public was finally won by an excellent analytical article written by Prof. H. Perger in 1873. The article, comprised of seven contributions published in the specialized journal *Oesterreichische Zeitschrift für Berg- und Hüttenwessen*, informed the professional public on the critical environmental issues in Idrija (Fig. 4). Prof. Perger analyzed the long-standing 'struggle' of landowners in the nearby and distant surroundings of the Idrija smelting plant for recognition of the harmful effects of smoke gases containing Hg vapours, and their rightful claims for indemnity. He revealed the transparent, feigned ignorance of the Mine Administration, which had lasted for several decades and was supported by competent ministries and the Higher Mining Office in Klagenfurt. In a private letter sent to Perger, the Mine Administration stated ".. that it would have to formulate a theoretical opinion on the basis of scientific-chemical investigations on ore and smelting gases and that improved smelting methods would have to be introduced" (Perger, 1873, p. 297). However it was not until the early 1880s that the Mine Administration abandoned its unacceptable opinion about the harmlessness of smelting gases and in 1881 began to pay affected landowners a regular annual support in place of indemnity.

New environmental problems

As already mentioned, ore contained on average 2% of mercury in the 1840s. In the years that followed, the mercury content of excavated ore decreased rapidly, amounting to a mere 0.66% at the end of the century. In this period, however, the quantity of extracted mercury increased gradually from approximately 160 to over

Fig. 5. Smelting plant (Idrija Mercury Mine Archive, 1960).

500 tons per year. Such an enormous rise in production naturally called for the continuous modernization of smelting procedures, the acquisition of additional furnaces and the intensified excavation of ore. In the 1840s only 7000 tons of ore was burned, while at the end of the century approximately 88,000 tons of ore was processed annualy. All burnt ore was deposited along the banks of the nearby Idrijca River, which inevitably worsened its already poor environmental conditions (Fig. 5). The pollution of the Soča River and the Gulf of Trieste with mercury also intensified. The gradual pollution of the environment with increasing quantities of burnt ore continued until the 1970s, when the dumping of smelting remains into the Idrijca River was finally prohibited.

The relocation of smelting furnaces (Fig. 6) to the right bank of the Idrijca River was conducted gradually up to the year 1880. A chimney was also built high above the smelting plant, on the slopes of Golica hill. Although this improved the environmental conditions in the direct vicinity, the constant winds spread the smelting gases far along the Idrijca River valley and, in poor weather conditions, the entire Idrija basin was covered with smoke. Today, attic dust and soil have been found to be considerably polluted for at least 10 km along the Idrijca River (Gosar & Šajn, 2001).

In the second half of the 19th century, the increased scope of mercury production opened a new problem, the sinking of ground above the Idrija Mine. This was not a negligible problem, as the greater part of the mine lay directly below the populated borders of the town. The first houses and mine buildings on the broader territory of Barbara's wood storehouse, Smukov grič (Mine hill) and the Pront had to be demolished at the end of the 19th century. "In 1912 Theresa's shaft was backfilled and the

Fig. 6. During high waters, the Idrijca River carried away the burnt ore deposited on its banks (Idrija Mercury Mine Archive, 1970).

large chimney was demolished because the hill is sinking" (Arko, 1931, p. 249). The sinking of ground above the pit was particularly intensive in the 1970s and 1980s, as in some areas it amounted to as much as 10 cm per year. Following the discontinuation of works in the pit and the commencement of shutdown works in 1988, the sinking of ground is gradually stabilizing and today amounts to approximately 17 mm per year. The demolition of sinking houses was continued up to the 1990s and is not yet completed.

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Geological Study Collection of the Mercury Mine in Idrija

Jože Čar & Bojan Režun

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Key words — Mercury mine, history, Geological Study Collection.
The collection and classification of various geological samples has a long tradition in the Idrija Mercury Mine. In the second half of the 19th century geological collection was prepared and arranged by M.V. Lipold. In 1956, a rich petrographic-palaeontological collection was created at the Municipal Museum in Idrija. Due to the exceptional genesis and development of the Idrija ore deposit, many of the petrological, structural and ore samples are, from the professional aspect, quite unique. The collected materials, which were mostly unclassified and deposited in the quarters of the former mine geological service, were formed into a Mine Geological Collection comprised of 7 thematic collections presenting an overview of all aspects of the geological structure and genesis of the ore deposit, and testify to its exceptionality and complexity. During the arrangement, structural classification and naming of rocks, consideration was given to those classifications that have been tested and internationally recognized as the best existing classifications. The mine geological collection of the Idrija Mercury Mine and the accompanying documents are arranged in the form of a study collection, and the displayed samples have been collected, arranged and presented in a manner that will also prove interesting to the general public and tourists.

Contents

Historical overview

Although no written records exist of possible 'fossil' collections (minerals, rocks, fossils and ores) at the Idrija Mine up to the second half of the 18th century, there is no doubt that the mine administrators of the time already had reference collections of Idrija minerals and ores. Perhaps even one or more unusual rocks from the Idrija ore deposit could be found among the selected ore samples (Čar & Pišljar, 1999).

J.A. Scopoli, the first mine physician and an acclaimed, European natural scientist, who spent sixteen years in Idrija, had quite an extensive and, for that time, well-arranged collection (Scopoli, 1761). Scopoli used the samples of minerals, rocks and ores in his lessons at the Idrija secondary technical school, where he taught chemistry and metallurgy from 1763 to 1769.

Idrija rocks and ores also occupied an important place in the impressive naturalist collection of Baltazar Hacquet. In the second volume of his extensive, encyclopaedic book *Oryctographia Carniolica*, Hacquet (1781, p. 133) said the following about the Idrija Mine; "I collected all the generations, types and classes of rocks and ores from the Idrija Mine described so far over a period of 12 or more years, and everyone is welcome to come and see them; every mine official of the said mine is acquainted with them. That is why I must mention this, so no-one will have any doubts as to the genuineness of these beautiful and unusual samples." After his departure from Idrija, Hacquet took his naturalist collection, which also comprised samples from the Idrija Mine, to Ljubljana and later to Poland, where he lectured at the Krakow University (Pilleri & Mušič, 1984).

In the second half of the 18th century, amateur rock collecting began to flourish in Idrija. A report published by B.F. Hermann (1784) informs us that he visited two collections of minerals and ores during his visit to Idrija. The first collection, which was the larger and more impressive, was owned by mine administrator Schaber, and the second, which in Hermann's opinion was "nothing special", was kept by forester Leitner.

In the period from 1853 to 1858, the respected Slovene geologist M.V. Lipold conducted his first geological expeditions to the surroundings of Idrija and collected several rock samples still preserved today, as well as the first fossil specimens (Lipold, 1874). These formed the basis of the palaeontological part of the mine's geological collection (Čar & Pišljar, 1999).

In the years that followed, numerous fossil remains were collected in the broader surroundings of Idrija and the mine by the then director, Sigmund von Helmreichen (1853-1867). When M.V. Lipold took over the administration of the Idrija Mine in 1867, a rich collection of fossils and rocks already existed. Over the next few years, Lipold considerably enriched the petrographic-palaeontological collection (Fig. 1), which, by its size and content, acquired national importance. Thirty years later, the mining engineer J. Kropáč (1912), who was primarily interested in the geology of the Idrija Mine, wrote that it was largely owing to Lipold that the mine had a valuable palaeontological collection. Lipold's collection included, of course, numerous samples of various minerals, rocks and ores. That part of Lipold's collection which survived the First World War, 25 years of Italian occupation and the Second World War is today unclassified, and is kept at the Munipical Museum in Idrija.

In 1956, a new, extensive, stratigraphic-lithological and palaeontological collection and an impressive collection of mercury ores were set up by mine experts at the Municipal Museum in Idrija. Over the next few decades the collection was enriched with several new samples and today comprises over 2000 specimens. In 1992 the collection was expertly renewed, considerably enriched and set up in newly renovated rooms in the Idrija Castle (Čar & Pišljar,1999).

Professional basis for the creation of the Study Geological Collection

The first geological investigations in the mine and surroundings of Idrija, whose data still have validity today, were conducted by M.V. Lipold in the second half of the 19th century (Lipold, 1874). In the decades preceding the First Word War, new and interesting views on the geological structure of the ore deposit were contributed by

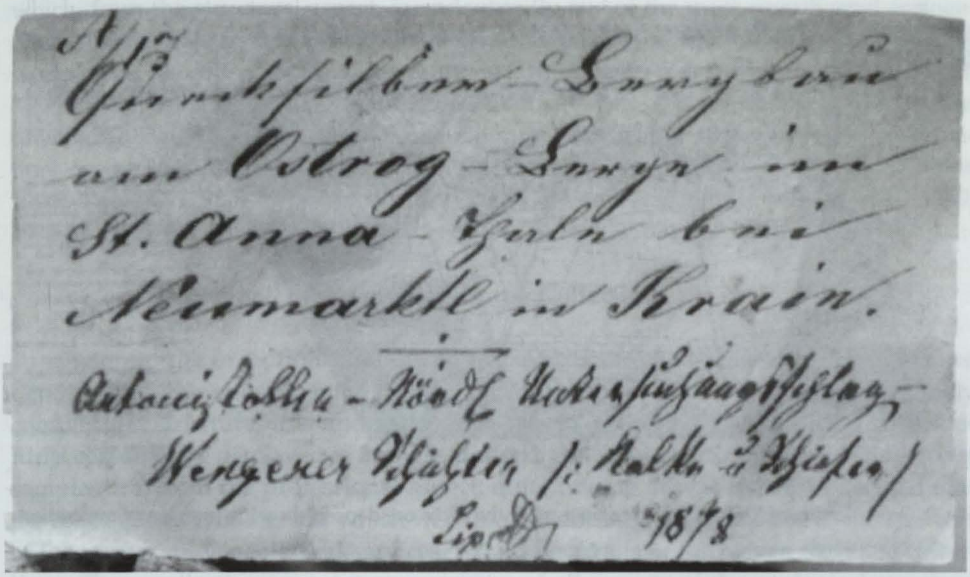

Fig. 1. Original inventory list from Lipold's collection.

Kossmat (1899,1911) and Kropáč (1912), and on the genesis of the mercury ore deposit by Schrauf (1891). Their investigations of the Idrija ore deposit and the broader surroundings of Idrija were continued in the period from 1955–1985 by a team of mine geologists in collaboration with external experts.

As early as in 1959, I. Mlakar resolved all the major open lithostratigraphic problems remaining in the Idrija region. In 1967 the same author presented completely new and original views on the structure of the Middle Triassic Ladinian layers in the Idrija ore deposit (Mlakar, 1967). In Mlakar (1969), he explained the complicated thrust structure of western Slovenia and determined the position of the Idrija ore deposit within this structure. Two years later, Mlakar and M. Drovenik explained the structural and genetic particularities of the Idrija ore deposit (Mlakar & Drovenik, 1971). They discovered that the ore deposit had been formed in the Middle Triassic, approximately 235 million years ago. The mercury ore deposit is partly syngenetic (sedimentary) and partly epigenetic in origin. Mlakar and Drovenik investigated the origin of individual types of mercury ores and described the characteristics of the ore deposit.

This was followed by a reconstruction of the Idrija Middle Triassic tectonic system with the central fault trough in which the Idrija ore deposit was formed. The positions of all ore bodies in the area during the Middle Triassic were also determined (Placer & Čar, 1975, 1977). Finally, the origin and formation of the Idrija Middle Triassic tectonic system was reconstructed on the basis of sedimentological and lithostratigraphical investigations (Čar, 1985), and the development of the former Middle Triassic structure of the ore deposit into its extremely complicated, present-day state (Fig. 2) was explained on the basis of structural analyses (Placer, 1982). The results of these investigations were supported by numerous lithostratigraphical, sedimentological, structural, tectonic and mineralogical studies, and studies of mercury ores. The investigations

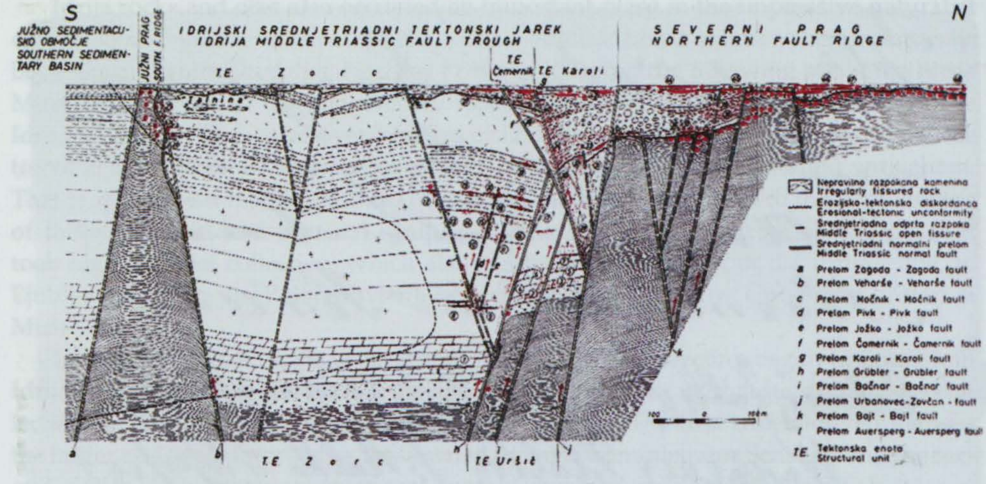

Fig. 2. Cross-section of Middle Triassic structure of the Idrija ore deposit showing position of ore bodies.

Fig. 3. Middle Triassic erosional unconformity. Ladinian pyritized kaolinite sandstone lying on eroded Anisian dolomite (light).

Fig. 4. Typical sedimentary (syngenetic) ore in tuffite. Light grains: chalcedony intercalated with cinnabar.

were accompanied by the extensive collection of samples. The findings of mine geologists are collected in three doctoral dissertations and over 30 geological papers.

In the opinion of numerous, internationally recognized experts who have visited it during the past fifty years, the Idrija ore deposit is one of the most structurally and genetically complex metal ore deposits in the world. As Mlakar (1990) reported, the Russian Academician Professor V.I. Smirnov wrote; "I have seen many ore deposits in various parts of the world, and some of them were very complicated. But I must admit that I have not yet seen an ore deposit with such a complex structure as the one in Idrija, which, from the structural aspect, is undoubtedly one of the most complicated endogenous ore deposits in the world." Professor Matija Drovenik, a leading expert on the world's ore deposits, also had some interesting remarks about the situation in Idrija; "Everything that occurred in the Idrija ore deposit has been assessed by scientists as an unusual, extremely interesting creation of nature." (Drovenik, 1989). The main contributions on the Idrija ore deposit include the following: Čadež (1980), Čar (1975, 1985, 1989, 1990), Čar *et al.* (1980), Drovenik & Čar (1975), Drovenik *et al.* (1990), Mlakar (1967, 1969, 1975), Mlakar & Drovenik (1971), Placer (1974-75, 1976, 1982) and Placer & Čar (1977).

Geological Study Collection

Owing to the exceptional Triassic tectonic structure and genesis of the Idrija ore deposit, and the subsequent tectonic development into the present-day extremely complicated structure, it is understandable that all of the geological particularities of Idrija could not be displayed in a single, uniform collection, particularly since numerous samples are, from the professional aspect, quite unique. It was therefore decided that the collected study materials, which were mostly unclassified and stored in the quarters of the former mine geological services, would be arranged into seven thematic collections. These collections present an overview of all aspects of the geological structure of the ore deposit, and testify to its exceptionality and complexity.

The names and descriptions of samples are in line with the classifications and nomenclature used in Slovenia, as explained to students in lectures at the Geology Department of the Faculty of Natural Sciences and Technology in Ljubljana. The classifications used are the same as those employed in other countries of the world (for carbonate and volcanoclastic rocks), or have been enriched and adapted to the present situation (clastic rocks).

Lithostratigraphic collection of rocks in the Idrija and Cerkno regions — In the Idrija and Cerkno regions, specific conditions prevailed in a uniform area of sedimentation up to the beginning of the Middle Triassic. In the Middle and Upper Triassic, rocks began to be deposited on the shallow-water Carboniferous platform in the Idrija region, and in the deep-water basin in the Cerkno region. The collection comprises 60 of the most important lithostratigraphic samples from both sedimentation areas. Detailed mineralogical, petrological and geochemical analyses were made for all samples.

Collection of rocks of the Idrija ore deposit — The Idrija mercury ore deposit was formed in a fault trough in the central part of the so-called Idrija Middle Triassic tectonic system. The development of the fault trough and the formation of rocks in it were accompanied by complicated tectonic and extensive volcanic activity. These conditions allowed for the formation of special, highly specific rocks, which are a particularity of the ore deposit and cannot be found elsewhere in Slovenia (e.g., various kaolinite rocks, gravels, bog layers ('Skonca'), etc.). The collection is comprised of 108 types of rocks.

Collection of samples of structural and tectonic characteristics of the Idrija ore deposit — The present-day extremely complex structure of the ore deposit is the result of intensive tectonic activity in the Middle Triassic period (erosion, tensile tectonics) and the complicated Tertiary tectonics (overthrusts and strike-slip faulting). The tectonic phases strongly 'mixed' the rocks from different geological periods, creating various contacts (erosive surfaces, contacts of tensile and strike-slip faults, thrust deformations), which are well-preserved in the present-day structure of the ore deposit (Fig. 3). The collection is comprised of 40 samples.

Collection of minerals of the Idrija ore deposit — From the aspect of mineral composition, the Idrija ore deposit has a very simple structure. Only 18 minerals were found. Elemental mercury (native Hg) and cinnabar (HgS) are present in economically important quantities, while other minerals are very rare. From the mining and geological standpoint, the Idrija ore deposit is therefore a monometal and monomineral deposit. In addition to the very rich cinnabar forms, there is also an interesting mineralogical peculiarity, a crystalized, pistaccio green, aromatic hydrocarbon called idrialin (idrijalin).

Ore collection — The Idrija ore deposit was formed as the consequence of the degasification of the Earth's mantle. The hydrothermal solutions enriched with mercury, which flowed through open faults and fractures from the interior of the Earth 235 million years ago (Middle Triassic), had a temperature of only about 100° C. Owing to the faults and numerous fractures, some of the thermal waters passed through older layers. The rocks were partly replaced by cinnabar, which led to the formation of more or less rich epigenetic ore bodies in Carboniferous, Permian, Scythian, Anisian and older Langobardian layers. Part of the rich hydrothermal solutions flowed out in the form of hot springs directly into the marsh that existed there at the time, where synsedimentary syngenetic ores were formed. Extremely rich and attractive gel ores (up to 78% Hg) were formed from the cinnabar gels, and numerous varieties of sedimentary cinnabar ores were deposited from the disintegrated, richly mineralized chalcedonous layers in the Middle Triassic bog.

The ore collection is divided into two parts. The first part comprises 96 samples of the basic types of syngenetic (sedimentary) ores in Ladinian rocks, particularly 'Skonca' layers (Fig. 4). The second part features 95 samples of epigenetic cinnabar ores arranged in a stratigraphic overview of mineralized rocks, from the oldest Carboniferous lithological rocks to the youngest Cordevolian dolomite. The richest cinnabar ores have typical 'mining' names such as 'jeklenka' (steel ore), 'opekovka' (brick ore), 'jetrenka' (liver ore), 'coral ore', layered ore and rich ore. Carboniferous shales intercalated with economically important quantities of native mercury represented another particularity of the ore deposit. This ore was named 'shale ore'.

Collection of ores from various ore bodies of the Idrija ore deposit — One hundred and fifty eight ore (mineralized) areas were found in the Idrija ore deposit and have been partly or fully investigated. Experts at the Idrija Mine traditionally named these areas ore bodies (OB). The 141th OB was primarily comprised of cinnabar ores (syngenetic and epigenetic), while the 17th OB contained only native mercury (epigenetic ore). In 14 of the cinnabar OB, only or predominantly syngenetic cinnabar ores were extracted, while in the remaining 127 OB, only or predominantly epigenetic ores were extracted.

Different ore types appeared in specific or similar patterns depending on how they were formed, and where they were situated in the lithostratigraphic rocks and tectonic structures. The mercury content in individual ore bodies varied considerably. Very poor ores (0.05% Hg) to extremely rich ores (over 70% Hg) were excavated. In the period after the Second World War, ores were classified according to quality into the following categories; very poor ore (0.05 to 0.1% Hg), poor ore or 'ba l perh' (0.1 to 0.5% Hg), rich ore (0.5 to 5% Hg) and steel ore (>5% Hg).

Syngenetic ores were located in various Ladinian layers, e.g., kaolinitic sedimentary rocks, conglomerates, bog layers (local name; 'Skonca' layers) and in the lowest part of volcaniclastic rocks. Epigenetic ores appeared in all rocks from Carboniferous to Cordevolian. Numerous mining fields extended through various structural units or ore areas in a manner enabling the excavation of both syngenetic and epigenetic ores within the same mining field. The sixth collection represents ore specimens from fourteen ore bodies (174 samples) and 26 samples from various ore bodies in the same lithostratigraphic rocks.

Collection of Special Samples — The thematic collection of special samples is comprised of various specimens collected or obtained by mine geologists on various occasions. The collection features samples from other ore deposits around the world, some ores from the Idrija mine, various lithological-palaeontological and special tectonic samples, souvenirs and demonstration samples. The samples of ores from the Idrija ore deposit are mostly large in format and intended for special presentations. The remaining samples are only partly related or unrelated to the ore deposit, and were therefore not directly included in the thematic collections.

Conclusions

The extreme complexity of the Geological Study Collection and its seven thematic groups is apparent. The collection not only presents the genetic aspects of all geological elements participating in the ore deposit structure (mineralogy, petrology, sedimentology, ore geology, structure and tectonics), but also their development in time and space from the Middle Triassic to the present (Tertiary transformation of ore deposit into the present state). All the genetic and structural occurrences are professionally and comprehensively explained. The professional decisions required for the classification of the collection are based on extremely detailed and fully preserved geological documents. Some of the key documents are also exhibited and of course the mercury itself (Fig. 5).

Fig. 5. Vessel (stone bowl built into the floor) containig mercury, exhibit on the ground floor of the new mine collection.

The entire geological collection has also been prepared in computer form.

Visitors can facilitate their work by searching for individual samples from the database in a special computer file containing the entire mine collection. The database of samples includes professional descriptions and information on the particularities and location (coordinates, map) of each sample. Photos of each sample have been added. The geological collection of the Idrija Mine represents a unique resource of Slovenia. No doubt there are very few such detailed and precisely classified geological collections in the world devoted to a single geological phenomenon, in our case the Idrija Mercury Mine.

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Imperial visits of the Habsburgs in the collection fund of the Slovak Mining Museum in Banská Štiavnica

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Key words — Imperial visits, Habsburghs, gold and silver mining in Slovakia, Slovak Mining Museum, hereditary shaft Glanzenberg, artefacts from visits.

The members of the Habsburg royal family visited Banská Štiavnica several times. As Banská Štiavnica belonged to a number of significant mining towns in the Austrian-Hungarian Monarchy, emperors paid attention to its development and progress in mining. The imperial visits were always connected with pompous arrangements for the emperors and their entourage. Since then many collection items have been preserved and are displayed in the Kammerhof of the Slovak Mining Museum in Banská Štiavnica. The article contains the list of all collections items exhibited in the museum.

Contents

Banská Štiavnica – the centre of precious metal mining

Precious metal extraction and processing, particularly of gold and silver, in the central Slovakia mining area was considered to be an important branch of industry in the Austrian Monarchy. It used to be a source of income of the royal treasury and, naturally, it deserved great attention from the rulers. From 1424 to the middle of the 16th century it formed a dowry of Hungarian queens. Ferdinand I Habsburg took over control of this industry from his sister Marie, a long process of mining management centralization began, as well as a process of state penetration into the sphere of precious metal processing. The process included publication of the Maximilian Mining Code in 1578 and establishment of the Main Chamber Earl Office in Banská Štiavnica at the end of the 16th century, which was subordinate to the Mining Chamber in Vienna. Development of mining towns in central Slovakia depended on the level of mining, development of mining science, technique, and later, mining education. Banská Štiavnica, like Kremnica or Banská Bystrica, played a significant role in all mentioned branches. The towns extended their influence in the fields of industry and culture. Gradually, they became centres of spiritual and artistic life. From this point of view, the 18th century was considered a golden era, the era of the greatest development, which lasted until the middle of the 19th century with some brief interruptions.

Collection items from the visit in 1751

In order to get to know the mining regions better and with a deep interest in natural science German Emperor and co-ruler Franz Stephan von Lothringen, husband of Maria Theresia, and his entourage visited Banská Štiavnica and Kremnica, as well as some other mining centres in the neighbourhood like Štiavnické Bane, Svätý Anton and Žarnovica from 3 to 13 June 1751. Several written documents from the visits are preserved in the State Central Mining Archive and in the State Archive in Banská Bystrica, the branch in Banská Štiavnica, as well as dozens of collection items of the Slovak Mining Museum in Banská Štiavnica.

Jozef Dollenstein: portrait of Maria Theresia in life-size with coronation jewels (oil, on canvas, un-signed, 210 2 130 cm, original frame, 1751). The picture was donated to the museum in 1932 from the meeting hall in the Kammerhof in Banská Štiavnica (registration number UH-907, number of acquisition NA/2137/68). This and next two portraits were painted at request of Court Chamber Chairman Charles Ferdinand Konigsegg von Rothenfelds in Vienna because of imperial visit from 3 to 13 June 1751. Nowadays, it is in the permanent exhibition of baroque art (Zedinger, 2000; Kowalska & Čelková, 2001).

Ján Jozef Dollenstein: portrait of Emperor Franz Joseph von Lothringen in life-size with coronation jewels (oil, on canvas, initials I.D. on the handle of an armchair, 210 2 130 cm, original frame, 1751, a pendant, registration number UH 908; Fig. 1).

Ján Joseph Dollenstein: portrait of Court Chamber Chairman in Vienna for mining and minting - Charles Ferdinand Königsegg von Rothenfelds (oil, on canvas, 230 2 130 cm, original frame, authors signature in the left lower corner on the ledge of pilaster: "J.J. Dollenstein pinxit 1751", registration number UH-909) (Čelková, 1994).

Austrian painter - a court replica: portrait of young Maria Theresia with coronation jewels (oil, on canvas, un-signed, 105 2 74.5 cm, without original frame, registration number 915). Nowadays, permanently exhibited in the exhibition of imperial visits on the 1st floor of the Kammerhof building. The portrait of significant art quality from the time of Maria Theresia's coronation to become a Hungarian queen, after 1742.

Unknown painter: pendant, portrait of Emperor Franz Joseph von Lothringen (oil, on canvas, 105 2 74.5 cm, without original frame, un-signed, the middle of the 18th century). Nowadays in the permanent exhibitions of imperial visits in the 1st floor of the Kammerhof.

Copy of a picture by Matteo Gabrielo: Franz II Duke of Tuscany (catalogue number 4.06; see Zedinger, 2000, p. 74; Florence Palazzo Pitti Gallery Palatina, number of inventory 2678, about 1737, 79 2 65, registration number 918, NA 2152/68).

Home painter: portrait of Maria Theresia (oil, on canvas, unsigned, 72 2 58 cm, original black frame with gold ledge, bought for collections of the Town museum in 1929 from the heritage of Mining Academy principal in Banská Štiavnica professor

Štefan Farbaky. The portrait might have originated from the house of Mining Academy. Registration number 1689, NA 2105/68).

Home painter: pendant, portrait of Emperor Franz Stephan von Lothringen (oil, on canvas, original frame, 75 2 45 cm, unsigned; transferred from the town hall house in Banská Štiavnica in 1927 to collections of the Town museum; registration number 993, NA 2288/68).

Viennese painter: portrait of Empress Maria Theresia (oil, on canvas, unsigned, 97 2 73 cm, without frame, the middle of the 18th century; the work was transferred form the town hall in Banská Štiavnica to collections of the Town museum in 1931; registration number 1725).

Viennese painter - a replica: pendant, portrait of Emperor Franz Joseph von Lothringen (oil, on canvas, unsigned, 111 2 88 cm, without frame; registration number 1818). An official portrait of the emperor in a steel armour, long grey wig with a medal of The Golden Fleece. The picture was transferred from the town hall in Banská Štiavnica in 1931 to collections of the Town museum.

Fig. 1. Dollenstein, J.J. 1751: portrait of Emperor Franz Stephen Lothringen (oil on canvas).

Viennese painter: portrait of Empress Maria Theresia in mourning (oil, on canvas, 62 2 45 cm, unsigned, after 1765, registation number 1716). The picture was obtained in 1929 from the heritage of Mining Academy principal professor Štefan Farbaky. The picture is exhibited in the permanent exhibition of the Mining Academy in the Kammerhof.

Unknown Austrian painter: portrait of main Chamber Earl Franz von Sternbach (1750-1757 in duty), (oil, on canvas, 1751, unsigned, 105 2 90 cm, registration number 887). It originates form the meeting hall in the Kammerhof. An official portrait of the Chamber Earl displayed to waistline in precious brown uniform with rich embroidery, sitting by the table with ore and minerals and in his hand with mining map of seven mining towns territory. In the left upper corner there is a family coat of arm with German sign: "Illustr. D. Franciscus Xav. Libe: Baro/á Sternbach, Stok, Luttach, Anger:/Burg = Sonegg. Sup. In Montanis/Camergrafius."

Johan Gottlieb Kramer (1716-1771): portrait of Vice-Chamber Earl Bartholome Ludwig von Hechengarten, (oil, on canvas, 106 2 87 cm, painter's signature on the pilaster "J.G. Kramer pinxit." "Bartolome. /Ludvig/Edler v. Hehengarten/des keyl. Romis:/Reichs und S: Stephani ord:/Ritter"; registration number 901).

Fig. 2. Schmidt, A. 1751: design for the gate of glory for Emperor Franz von Lothringen and Maria Theresia (paper, aquarel).

Johan Gottlieb Kramer (1716-1771): portrait of Vice-Chamber Earl Bartholome Ludwig von Hechengarten in the court overcoat of Saint Stephan Order, (oil, on canvas, 105 2 95 cm, registration number 886). In the right part of the drapery and on the pilaster there is a German signature, the same painter's signature and notice, a coat of arm of the Hehengartens as well as a notice "J.G. Krammer pinxit", in the left upper corner there is a family coat of arm, about 1751.

Fridrich Gedohn: Main Chamber Earl Ignác Kempf ab Angret, (oil, on canvas, 1751, author´s signature at the back "F. Gedohn, Kays. König. Hofkammer mahler pinx. 1751" In the lower part of the picture on the ledge there is a coat of arm and a notice: „Ig. Kempf ab Angret S.C.R.M./Cam. Aul. Cae/at Collegy/in Monet/et Mont: et: ins./aul.Ref.vs/insi: L.R:M:C:I:/H.Supr: Camergrafius ac per/pet Comisarius Ano M:D:C:C:L:I.". 105 2 90 cm, registration number 881). The Chamber Earl was an official and a member of the Court Chamber and the Council of mining and minting in Vienna, a main Chamber Earl from 1st September 1750 to 1st of December 1751, a superintendent of Hungarian mining towns and significant celebrity during imperial visit in Banská Štiavnica.

Wood polychromatic relief frame of ellipse shape with rich rococo decoration, roses, with a top of Hermes head (gilded, 152 2 75 cm, originally from German church in Banská Štiavnica, the picture of Virgin Mary is absent, registration number 1833, NA 11405-registration number I. 551).

Upper relief extension in the shape or archivolt, above the altar picture (lime tree, high wood carving, rococo decoration, gilded, silvered, length 202 cm, height 65 cm, registration number 2360, NA 5410/68). It originates from the church of Saint Catharine, brought to the Town Museum in 1923 in Banská Štiavnica.

Unknown painter: (A. Schmidt?): Hell – Christ on the Olive Mount, oil, on canvas, 74 2 114 cm, middle of the 18th century, registration number 931). Obtained by remittance in 1935 from Roman-Catholic church – German church in Banská Štiavnica.

Anton Schmidt (1706 Vienna – 1773 Banská Štiavnica): draft of triumphal arch for Banská Štiavnica (paper, on canvas, drawing by India ink, coloured by watercolour, 64.9 2 48 cm, author´s signature "Schmidt dell", 1751, registration number UH 1070).

Anton Schmidt: draft of triumphal arch for Banská Štiavnica (paper, line drawing, coloured by watercolour, 86 2 63 cm, registration number UH 1071, author´s signature in the left down corner: "Anton Schmidt del et pinxit 1751").

Anton Schmidt: draft of triumphal arch for Imperial pair Maria Theresia and Emperor Franz Joseph von Lothringen (paper, line drawing coloured with watercolour, 64.5 2 47.5 cm, registration number UH 1072; Fig. 2).

Unknown carver: bust of Maria Theresia and Franz Joseph von Lothringen (woodcarving polychromatic and gilded, 48 2 31 cm, middle of the 18th century, registration numbers 1563 and 1564).

Dionýz Ignác Stanetti (1710 Dolní Benešov – 1767 Kremnica) and his company: fragments of main altar extension of Virgin Mary from the German church in Banská Štiavnica (lime wood, polychromatic, silver-plated and gilded, about 178 2 35 cm, thickness 5 cm, registration number UH 1830, NA 5408/68/1-4).

Town flag with coat of arm of Banská Štiavnica and date 1751 (blue brocade with silver tassels, 75 2 75 cm, registration number SH 1038). At the back side there is a sign of Hungary embroidered.

Juraj Himmelreich: ceremonial mining overcoat for Emperor Franz von Lotrhingen (red-gold brocade with Chinese decoration, length 95 cm, width 70 cm, registration number SH 891).

Franz Xaver Haussegger: cap (green velvet for mining overcoat, height 14.5 cm, diameter 19 cm, registration number 2430).

Unknown master: mining apron "ošliador" (black leather with copper brooch on the belt, length 85 cm, registration number N 2484).

Unknown master: mining axe "fokoš", (wood handle, pewter axe, height 65 cm, width 20 cm).

Minerals from central Slovakia mining towns. Banská Štiavnica, the Slovak Mining Museum, (registration numbers G-21298, 20655, 20779, 21602, 20485, 21872, 20654, 23594, 21117, 24414, 25164, 12711, 12715, 24054: quartz, amethyst, galena, gold, silver, limestone, barite, etc.).

With 250th anniversary of the imperial visit an international conference named "Gold and Silver Route of Emperor Franz Joseph von Lothringen in Central Slovakia Mining Towns" was held in Banská Štiavnica from 6 to 9 June 2001, which dealt with contacts of mining towns with the centre of the Habsburg Monarchy.

At the conference 22 lectures were presented including 4 from Austria and 1 from the Czech Republic. The exhibition took place in the Gallery of Jozef Kollár from 6 June to 30 September 2001, displaying 135 originals and 15 digital copies from Austrian museums and galleries. The exhibition was linked to an event in the Austrian castle Schallaburg named "Lothringens Eerbe" (Lothringens' coat of arms) from 28 April to 28 October 2000. The events were advertised in Austria and Slovakia.

Collection items from the visit in 1764

Imperial visitation of central Slovakia mining towns extended in Banská Bystrica was repeated from 20-31 July 1764 by children of rulers pair – prospective Emperor Joseph II, duke Leopold and Saxon duke and son-in-law Albert. Also from this visit many items are preserved, especially The Gold Book of Mining, an original document from the visit, but also several collection items (Vozár, 1983; Kašiarová, 1997):

Viennese painter: Baron Jozef Mechtl von Engelsberg (oil, on canvas, 100 2 78 cm, without signature, middle of the 18th century, registration number UH 883. Portraits are displayed in the meeting hall of the Kammerhof in Banská Štiavnica).

Viennese painter: Main Chamber Earl Johann Franz von Lauern (1749-1750) (oil, on canvas, 106 2 91 cm, unsigned, about 1764, registration number UH 2349).

Banská Štiavnica painter: Matej Zipser, mining geometer and surveyor (oil, on canvas, 127 2 109 cm, unsigned, 1768, UH 882).

Andrej Zallinger: Chamber Earl Jozef Colloredo (1778-1790), (oil, on canvas, 96 2 79 cm, unsigned, UH 880).

Vienna court replica: Roman King Joseph II with medal of Maria Theresia (oil, on canvas, 102 2 81 cm, unsigned, 1764, UH 885).

Banská Štiavnica painter: Imperial Royal Advisor Johann Amadeus Stampfer, principal of Mining Academy in Banská Štiavnica in 1764-177 (oil, on canvas, 102 2 78 cm, unsigned, middle of the 18th century, UH 892).

Banská Štiavnica painter: Franz Xaver Schöner, mining surveyor and author of mining maps in Banská Štiavnica (oil, on canvas, 96 2 77 cm, unsigned, end of the 18th century, UH 904).

Juraj Gotz – Vavrinec Dando: model of Holy Trinity sculpture in Banská Štiavnica (woodcarving, polychrome, height 142 cm, without signature, 1756, UH 1091).

Juraj Himelreich: mining overcoat of Roman King Joseph II, in which he went into hereditary shaft Glanzenberg in Banská Štiavnica together with Leopold and Albert (pink-gold silk, black velvet, length 106 cm, width 66 cm, unsigned, 1764, SH 892).

Juraj Himelreich: mining overcoat of Duke Leopold (pink-gold brocade with damask plant decoration, green silk, length 100 cm, width 66 cm, unsigned, 1764, SH 926).

Juraj Himelreich: mining overcoat of Saxon Duke Albert (same material, length 101 cm, width 60 cm, unsigned, 1764, SH 927).

Mining overcoat of Joseph II during his second visit of Banská Štiavnica in 1783, where he stopped in his journey to Poland (pink-gold material, light blue silk, length 106 cm, width 66 cm, unsigned, 1783, SH 928).

Caps to ceremonial mining overcoats (green velvet, silk, height 19 cm, diameter 18 cm, unsigned, 1764, N 2440, N 2430, N 3235, SH 970).

Mining apron "ošliador" to mining uniform (black leather, belt with brooch of mining symbols, length 42 cm, unsigned, 1764, N 2484, N 2452).

Mining apron "ošliador" to mining overcoats (black velvet lined with silk, length 42 cm, unsigned, 1764, N 2453, N 2458).

Mining stick "fokoš", a part of official mining uniform (black wood handle, pewter relief, bronze-plated, length 65 cm, top 20 cm, unsigned, N 1910, N 1918, N 1903, N 1924, N 3718).

Memorable little hammers of Leopold and Albert for extraction of Banská Štiavnica ore (surface of hammers is silver-plated, handle of mahogany wood, 1st hammer: length of handle 34 cm, top 16 cm, 2nd hammer: length of hammer 27 cm, top 16 cm, 1764, UH 2337, UH 2338, two pieces; text: ALBERTUS. AUGUSTUS. POL. PRIN. REG. DUX. SAX. 1764 PETRUS. LEOPOLDUS. ARCHIDUX. AUSTRIAE. 1764; family coat of arms on the back side).

Pouch – handbag for coins of chamber earls (knitted from silver wire, jewel work of silversmith, signature N.P: Banská Štiavnica, end of the 18th century, length 19 cm, width 15 cm, weight 162.1 g, UH 2575) (Slotta & Labuda, 1997).

Matej Donner: premium study medals awarded by Maria Theresia to students of the Mining Academy for subjects: mining surveys, minting, testing and mining (diameter 4.3 cm, 1745-64, NUM 5853 5854 5855, 5856).

Copper frame with Lothringen Tuscan coat of arms (copper plate, height 160 cm, width 130 cm, weight 100 kg, unsigned, 1764). It originates from the Holy Trinity sculpture in Banská Štiavnica.

Copper frame with a symbol of the Mining Chamber (copper plate, height 160 cm, width 130 cm, weight 100 kg, unsigned, 1764).

Copper frame with a Banská Štiavnica coat of arms (copper plate, height 160 cm, width 130 cm, weight 100 kg, unsigned, 1764).

In 1994-1996 three remarkable exhibitions took place in Banská Štiavnica, Bratislava and Vienna named "His Majesty arrives....", which displayed all collection items linked to visit in the museums and the Slovak Institute in Vienna.

Joseph II, already Roman Emperor, arrived in Banská Štiavnica for the second time on 6 and 7 July 1783. He visited the town during a journey lasting several weeks in Croatia, Transylvania, Bukovina, Belarus and Halič. He came also to Banská Štiavnica. His visit was much less pompous than 19 years earlier. The emperor decided to visit the town unexpectedly, he stayed in the Holy Trinity square - the inn "U Jeleňa" (nowadays the gallery). The emperor was shown round the town, the Holy Trinity Column, he gave audiences. On the second day of his visit he visited the Main Chamber Earl Office, which was also a seat of the Mining Academy and chamber earl Jozef von Colloredo was its principal. The emperor saw the collection of minerals, and in Belházýs house he observed practical chemistry work. A ceremonial coat, much more beautiful than 19 years before and decorated with golden threads, and green cap were sewed for him. Today it is exhibited in the Kammerhof, registration number SH 928.

Another member of an imperial family who visited Banská Štiavnica was duke Maximilian, the youngest son of Maria Theresia, an elector in Cologne on Rhine. He visited the town during his journey in Hungary, which he started on April 15 from Vienna. He stayed in Banská Štiavnica form 13 to 16 June 1777. Main arrangers were again a president of the Court Chamber in Vienna and a Main Chamber Earl in Banská Štiavnica together with mining management in Kremnica, Banská Bystrica and Vindšachta. In Banská Štiavnica he visited the hereditary shaft Glanzenberg, where there was installed a commemorative plate with a text. Further, he watched shredders, ore washing, production of lead smelter, visited testing laboratory, chemistry laboratories and offices, treasury and accountant office in the Kammerhof. In Vindšachta he went down into the water shaft, he watched an incinerator, ore separation hall and storage area. Then he was shown activity of water pumping device in the Bíber shaft, one day he devoted to study of fire engines and factory production. A ceremonial back mining coat was sewed, richly decorated hammer and gopher were brought from Vienna. Unfortunately, they are not preserved. The duke stayed in Hellenbach's house according to suggestion of mining trainee Adam Durmer and for state expenses the commemorative plate of Duke Maximilian was set by the plates of prince Joseph and Leopold on the facade of the house.

Collection items from the visit in 1852

The last important imperial visit was held on 7 and 8 July 1852 by young Austrian Emperor Franz Joseph I, who alone visited Banská Štiavnica, Štiavnické Bane, Svätý Anton and Kremnica during his round tour when he got acquainted with industry and mining in monarchy centres. Some precious collections were preserved also from this visit.

Carl Schneck: coronation portrait of Emperor Franz Joseph I (oil painting on canvas, 110 × 90 cm, 1852, registration number UH 927).

Picture: portrait of Emperor Franz Joseph I in uniform with medals (oil painting on canvas, unsigned, probably same painter, 1852, 116 × 95 cm. Both portraits originate from Chamber court during imperial visitation of Banská Štiavnica, registration number UH 926).

A. Fernhorn: bust of Emperor Franz Joseph I (cast steel, 30.5 × 18.5 cm, 1862,

Fig. 3. Ceremonial mining uniform of Franz Jozeph I and his lady entourage, 1852 (black velvet, silk).

registration number UH 1145).

F. Martwich (Vienna) – J. Wendland (Berlin): portrait of Empress Elizabeth (Sisy) (paper, lithography, 1867, 72 × 57.5 cm, registration number UH 2308, text: Verlag v Eigenthum von Werner Grosse in Berlin Elisabeth – Kaiserin von Österreich – Königin von Ungarn).

Shooting target: birth of throne successor Rudolph Habsburg (wood, oil, text: Salve vetis espetite! Zur Feier der Glücklichen Entbindung Ihrer Majetät der Kaiserin. Schemnitz den 29. August 1858. Measures: 63 × 74 cm, registration number UH 62. Targets originate from the town shooting range and they were given to the town museum in 1965).

Shooting target: centralization – Austrian-Hungarian alignment (wood, oil, 52 × 66 cm, text: Jos. Paudler / customer / Den 15' Sept. 1867. Centralisation).

Jószef Ováry: coronation portrait of Emperor Franz Joseph I (oil painting on canvas, 1899, Budapest, 240 × 140 cm, original wood frame with acanthus leaves on the top, with Hungarian crown. The old emperor displayed in red Hungarian Hussar uniform by a table with coronation jewels. Registration number UH 2222. It originates from the district house in Šahy, transmitted in 1925).

Gyorgy Vastagh: Pendant, coronation portrait of Austrian Empress and Hungarian Queen Elisabeth, (oil painting on canvas, 1899, same gilded frame with a crown, 240 × 140 cm. The empress wears Hungarian folk costume with diadem. Registration number UH 2225. It originates from the district house in Šahy, transmitted to Banská Štiavnica in 1925).

Graphic group portrait: Emperor Franz Joseph I with family (coloured lithography, paper, 39.5 × 52 cm, unsigned, about 1910, registration number UH 429, number of printing No 2328 / Austrian graphic / text: OESTERREICHISCHE KAISERFAMILIE. A KIRÁLYI CSALAD. CÍŠAŘSKÁ RODINA RAKOUSKÁ. CESARSKÁ RODZINA).

Black mining uniform of emperor Franz Joseph I (Fig. 3; dark brown velvet with white furring and long black trousers of silk satin. The coat has twisted laces in shoulder parts, black buttons of cut glass, length 94 cm, trousers length 118 cm, registration number 2414).

Women mining overcoats of ladies entourage (grey silk or grey-black stripes, length to the ground, shaped in waistline with buttons in all length, a hood on the back, lined with pink folded ribbon with pink buttons, made by Jähne, Vienna, length 130 cm, width 45 cm (in waistline), registration numbers N 3209, 3208).

Commemorative tablet to 25th anniversary of wedding of Franz Joseph I and Elisabeth (cast steel, 24 April 1879, registration number UH 602, measures 80 × 60 cm).

Jakub Trauer: mining insignias (silver hollow plate in the shape of gopher and hammer belonging to the Mining fraternity treasury in Banská Hodruša with carved date 1852, which was presented to the emperor. Measures: hammer 17.5 × 4.8 cm, length 38.5 cm, diameter 3.8 cm, registration number NH 3744, signature of fraternity).

Commemorative tablets in the hereditary shaft Glanzenberg

Commemorative tablets were installed in the hereditary shaft Glanzenberg in the memory of imperial visits in Banská Štiavnica. The hereditary shaft Glanzenberg enters in the centre of Banská Štiavnica in 554 m above sea level and it used to drain water from mines under the hill Glanzenberg (the Old town) and from the oldest mines in this area established on the Špitaler vein, which came to the surface in this territory. The first written notes come from the 16th century, when the town faced mine decline for problems with drainage of ground water. In 1561, the Viennese Court Chamber announced no care of flooding the mines as they already found another source of cheap lead. Lead and silver were main products of Glanzenberg shafts. Later only hereditary shaft Glanzenberg was kept working on town and state expenses, as well as expenses of a factory Horná Bíber's shaft. As they led by the main road in a shallow depth. The first part ended by the shaft Kaufhaus on the square opposite the church of Saint Catharine in the centre of Banská Štiavnica. The shaft's depth was 8 m. Further the shaft was divided along the veins. The shaft was used again in 1730, when Main Chamber Earl Jozef Andrej Wenzel von Sternbach (1723-1734) found ore of very high quality there. The hereditary shaft itself is interesting also because it is connected with so called imperial steps with Holy Trinity shaft situated deeper. Due to its advantageous position it became famous as it was visited by other emperors and historical tradition linked last and recent centuries when on 6th June 2001 in honour of visitation of president of Slovakia R. Schuster and on 29th may 2002 in honour of prince Albert Grimaldi from Monaco and on 7th July 2002 with 150th anniversary of Franz Joseph I visit a commemorative plates were installed at the entrance of the Glanzenberg shaft.

Commemorative plates installed in the Glanzenber shaft

1. Stone plate with anniversary of Franz Stephan Lothringen, who went into the shaft on 7 June 1751, sandstone, measures 67 × 50 × 5 cm, text: FRANCSISCUS I. ROMANORUM HIC PERSONALITER EXSTITIT DIE 7:JUNII ANNO 1751.
2. Stone plate installed with anniversary of princes visit on 20 July 1764, natural stone, measures: 90 × 80 × 10 cm, text: JOSEPHUS II. ROMANORUM REX, CUM FRATRE SERENISSIMO ARCHIDUCE LEOPOLDO, DUCE SERENISSIMO SAXONIAE ALBERTO, PERSONALITER HIC EXSTITERUN XX. JULII ANNO MDCCCLXIV.
3. Stone plate installed with anniversary of Austrian pro-magister Maximilian on 13 June 1777, measures 88 × 50 × 10 cm, text: MIXIMILIANUS AUSTRIACUS PROMAGISTER TEUTONICUS VIDIT, PROBAVIT, FODIT DIE 13. JUNI 1777. All the plates are displayed in the space under "imperial steps".

4. Stone plate installed with anniversary of royal officer Joseph, a son of Emperor Leopold II from 17 August 1822, measures 65 × 75 × 10 cm, text: CONIGE CUM TEMERA PRO REX JOSEPHERE COR DOR MUNYADUMI INGRESSUS GRATTA FODINA UIOS DIE 17. AUGUSTI 1822.
5. Stone plate installed on 24 June 2002 with 150th anniversary of emperor's visit Franz Joseph I on 7 July 1852, granite, measures 68 x 50 x 2.5 cm, text: MEMORIAE FRENCISCI JOSEPHI I., IMPERATORIS AUSTRIAE AT REGIS HUNGARIAE, QUI FODINAM GLANZENBERG DIE VII. JILII ANNO MDCCCLII TRNSIVIT. ANNO DIMINI MMII.

Collection items from the time of imperial visits of the Habsburgs belong to the Slovak Mining Museum in Banská Štiavnica, to the most significant and precious art-historical and technical collections, a part of them is open to public in exhibitions in the chamber court Kammerhof, the gallery and historical exhibition in the Old castle in Banská Štiavnica.

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Die Schloenbach-Reisestipendien-Stiftung: ein wertvoller Beitrag für die geowissenschaftliche Forschung und Acquisition für die Sammlungen der Geologischen Reichsanstalt in Wien

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The "Geologischen Bundesanstalt" (GBA: Austrian Geological Survey) still holds hidden treasures. A good example is a collection of bills and other papers labelled "Schloenbach-Reisestipendien-Stiftung" (SF: Schloenbach Foundation for travel grants) accidentally found in the attic. Also in the register of the archives of the GBA, many references to the SF are found. In the "Verhandlungen der Geologischen Reichsanstalt" from 1873 to 1921 the Director of the survey reported on the finances of the SF. The collapse of the Austrian-Hungarian Monarchy meant the end of the SF and the similar, but younger, "Robert-Jaeger-Preisstiftung" and "Friedrich-Teller-Studienfonds".

Georg Justin Carl Schloenbach was born in 1841 in Liebenhalle (Hannover, Germany). His father, Albert Schloenbach, was inspector of the saltworks. After his studies at the universities of Göttingen, Tübingen, München and Berlin, Georg took his Doctor's degree in 1863 at the University of Halle. Having travelled widely in Europe, he took a position as "Sektionsgeologe" in the "Geologische Reichsanstalt" (GRA) in Vienna, refusing a position as professor at the mining academy in Peru. By 1870 he was professor at the "Deutsche Polytechnikum" (Technical University) at Prague. In the same year he died due to the extreme conditions at the military front in the Banat, where he was mapping.

His broad interests included the Cretaceous and Jurassic of northern Germany, and later also the Cretaceous of Bohemia and its brachiopod faunas. He made important contributions to Bohemian stratigraphy. His manuscript maps of the Cretaceous of Bohemia can still be found in the Library of the GBA. He published many papers, 50 of which in the journals of the "Geologischen Reichsanstalt", and many others remained unfinished.

In 1873, Albert Schloenbach provided a large amount of money to create a fund, the SF. The interest of the money should be used for travel grants to do fieldwork, collect fossils and study collections. At the board meeting of the GRA on the 20th November 1877, a report was presented on the unveiling of a plaquette in memory of the deceased Schloenbach. Originally it was planned to install it in the Banat, near the place where he died, but it was considered more convenient to put it in the meeting room of the GRA, now housing a large part of the archives for the geology of raw materials, where it still can be found.

The SF was a welcome source of money for research travels in the Austrian double monarchy and abroad. In the list of its beneficiaries one finds famous geologists, such as Dionys Štur, Friedrich Teller, Guido Stache, Alexander Bittner, Georg Geyer, Franz Eduard Suess, Wilhelm Hammer, Otto Ampferer, Franz Kossmat, Bruno Sander and, after 1918, as the last one Erich Spengler.

Schlüßelwörter — Schloenbach, Urban <1841-1870>, Reisestipendien, Österreich (Monarchie), Geologische Reichsanstalt.

An der Geologischen Bundesanstalt liegen noch immer verborgene Schätze. So hat sich durch Zufall am Dachboden ein Faszikel aus dem Archiv der Geologischen Bundesanstalt mit der Aufschrift "Schloenbach-Stiftung" gefunden. Dieser Faszikel enthält vorwiegend Abrechungen und Verwendungsnachweise der "Schloenbach-Reisestipendien-Stiftung". Auch haben sich in der Registratur des Archives der Geologischen Bundesanstalt zahlreiche Nachweise über die Schloenbach-Reisestipendien-Stiftung gefunden. In den Verhandlungen der Geologischen Reichsanstalt von 1873 bis 1921 berichtete der jeweilige Direktor der Anstalt über die Verwendung der Mittel der "Schloenbach-Reisestipendien-Stiftung".

Neben dieser ältesten Stiftung der Geologischen Reichsanstalt gab es Anfang des 20. Jahrhunderts noch die Robert-Jaeger-Preisstiftung und den Friedrich-Teller-Studienfonds. Sie alle fanden durch den militärischen und politischen Zusammenbruch der Österreichisch-Ungarischen Monarchie ihr Ende.

Georg Justin Carl Schloenbach wurde 1841 in Liebenhalle (Hannover, Deutschland) geboren. Sein Vater war Obersalineninspektor. Nach dem Besuch des Gymnasiums studierte er zunächst in Göttingen, später in Tübingen, München, Berlin und promovierte 1863 an der Universität Halle. Nach ausgedehnten Reisen in Europa erhielt er einen Ruf an die Bergakademie Peru im Jahre 1867, den er ausschlug. Noch im gleichen Jahr trat er als Sektionsgeologe in die Geologische Reichsanstalt in Wien ein. Schon 1870 wird er an das Deutsche Polytechnikum in Prag (Praha, Tschechische Republik) berufen. Zur Beendigung seiner begonnenen Kartierungsarbeiten begab er sich noch im selben Jahr in die Banater Militärgrenze, wo er, bedingt durch die extremen Verhältnisse, verstarb.

Seine weitgesteckten Interessen erstreckten sich auf die Kreide und Jura Norddeutschlands, später auch auf die Kreide Böhmens und deren Brachiopodenfauna, zu deren stratigraphischen Gliederung er Wesentliches beitrug. An der Bibliothek der Geologischen Bundesanstalt werden noch heute seine geologischen Manuskriptkarten der Böhmischen Kreide aufbewahrt. Er machte auch einige Unika erstmals bekannt und hinterließ zahlreiche Publikationen, davon allein 50 Veröffentlichungen in der Geologischen Reichsanstalt, obwohl er viele erfolgversprechenden Ansätze nicht vollenden konnte. Nach seinem unerwartetem Tod stiftete im Jahre 1873 sein Vater Albert Schloenbach eine ansehnliche Summe, damit der Zinsertrag für ein Reisestipendium Verwendung fände. Im Jahre 1877 wird in der Sitzung der Geologischen Reichsanstalt vom 20. November 1877 über die Enthüllung einer Gedenktafel für Urban Schloenbach berichtet, die zur Erinnerung an ihren "dahingeschiedenen" Freund geschaffen worden war. Ursprünglich sollte diese Tafel im Banate in der Nähe seines Todesortes angebracht werden. Es erschien doch zweckmäßiger diese Gedenktafel im damaligen Sitzungssaal der Geologischen Reichsanstalt anzubringen, wo sie heute noch vorhanden ist, obwohl dieser Saal schon verschiedenen Zwecken gedient hatte. Heute beherbergt dieser Saal den größten Teil des Archivs der Fachabteilung Rohstoffgeologie der Geologischen Bundesanstalt.

Die Schloenbach-Reisestipendium-Stiftung war ein willkommener Geldtopf, aus welchem verschiedene Forschungsreisen in das In- und Ausland finanziert werden konnten. Die Verwaltung des Vermögens oblag dem jeweiligen Direktor der Anstalt. Erst 1879 wurden die Verhältnisse der Stiftung durch einen Stiftungsbrief definitiv geregelt. Die Gelder wurden für Aufnahmen im Gelände, für das Studium verschiedener geowissenschaftlicher Sammlungen und für das Aufsammeln von Objekten im Gelände verwendet. In der Liste der bedachten Personen finden sich Namen, die in späterer Zeit für die Geowissenschaften und für die Geologische Reichsanstalt/Bundesanstalt von besonderer Bedeutung werden sollten: Dionys Štur, Friedrich Teller, Guido Stache, Alexander Bittner, Georg Geyer, Franz Eduard Suess, Wilhelm Hammer, Otto Ampfer, Franz Kossmat, Bruno Sander u.a., und nach 1918 als einziger und letzter Erich Spengler.

Die Schloenbach-Reisestipendium-Stiftung war ein wesentlicher Beitrag zur geowissenschaftlichen Forschung der Österreichisch-Ungarischen Monarchie. Sie diente auch der Fortbildung ihrer Geologen einschließlich auswärtiger Mitarbeiter und ermöglichte dort und da systematische paläontologische Aufsammlungen, die noch heute in den Sammlungen der Geologischen Bundesanstalt aufbewahrt werden.

Inhalt

Vorwort

Seit zehn Jahren treffen sich Bibliothekare, Archivare und Kustoden mit Wissenschaftshistorikern, Berg- und Hüttenleuten und Geowissenschaftlern, um über das kulturelle Erbe in unseren der Erforschung und Nutzung der Erdkruste verbundenen Wissenschaften zu diskutieren. Das Echo unserer Bemühungen scheint eher gering zu sein, zumal viele Mitstreiter aus Altersgründen bzw. Tod – erinnern wir uns an den überraschenden Tod von Peter Schmidt (1939-1999) - ausgeschieden sind. Dennoch gibt es dort und da überraschende Reaktionen von jenen Leuten, mit welchen wir bisher keinen Kontakt hatte. Die Tagungsbände der "Erbe-Symposien" landen in den europäischen Antiquariatsläden und werden auch gekauft! Die Käufer wenden sich dann nicht selten mit Fragen an uns. So erscheinen mir unsere Bemühungen für die Erhaltung des kulturellen Erbes in den Bergbau-, Geo- und Hüttenwissenschaften nicht vergeblich gewesen zu sein. In Österreich hat sich eine Arbeitsgemeinschaft für die Geschichte der Erdwissenschaften etabliert, die aus der Zusammenarbeit des Montanhistorischen Vereins für Österreich (MHVÖ), der Österreichischen Gesellschaft für Wissenschaftsgeschichte und der Österreichischen Geologischen Gesellschaft entstanden ist. Es hat auch die INHIGEO (Internationale Kommission für die Geschichte der Geowissenschaften) unseren Aktivitäten mehr Interesse und Aufmerksamkeit und Anerkennung gezollt. So konnten für diese internationale Kommission fünf neue österreichische Mitglieder nominiert werden, sodass die Kontinuität der österreichischen Mitgliedschaft bei dieser internationalen Kommission gewährleistet sein wird.

Die auswahlweise Veröffentlichung der Tagungsbeiträge hat unsere Bemühungen unterstützt und das Interesse jener Personen erweckt, für die wir Archivare, Bibliothekare und Kustoden unsere Arbeit machen. Nicht oder noch nicht haben unsere Ideen - zumindest ist es in Österreich so – die politischen Entscheidungsträger erreicht. Sie sollten als Repräsentanten des "Mäzens" - und das ist die Summe aller steuerzahlenden Bürger des Staates – für unsere Anliegen mehr Verständnis haben. Erschreckend wirkt es auf uns, wenn ein zuständiger Minister einem Sammlungsleiter über die Tagespresse ausrichten lässt, er möge sich bei der Beschaffung von Mittel für eine Ausstellung um Sponsoren selbst kümmern. In einer Zeit wie dieser mit einer galloppierenden Arbeitslosigkeit, verursacht durch die Abwanderung der Industrie in Billiglohnländer, muss man sich auf Grund dieser Aussage ein wenig gefrotzelt fühlen. Trotz der zunehmenden in finanzieller Hinsicht schwierigen Zeiten, gelang es uns immer wieder Tagungen und Publikationen mit Hilfe von Sponsoren auf die Beine zu stellen. Ihnen sei auch von dieser Stelle aus für ihre Großzügigkeit sehr herzlich gedankt.

In meinem folgenden Referat möchte ich Ihnen über die Geschichte einer Stiftung berichten, die vor 130 Jahren im 19. Jahrhundert an der Geologischen Reichsanstalt (heute Geologische Bundesanstalt) eingerichtet worden war. Ihre Errichtung hat sich als Segen für die wissenschaftliche Arbeit der Geologischen Reichsanstalt erwiesen, zumal auch beträchtliche Anteile der gegenwärtigen Sammlungen der Geologischen Bundesanstalt durch diese Stiftung zu Stande gekommen sind. Der Verlauf ihrer Geschichte lässt sich aus den veröffentlichten Berichten in jeweiligen Jahresbericht des Direktors der Geologischen Reichsanstalt, in der Verhandlungen der Geologischen Reichsanstalt und auf Grund eines erst kürzlich aufgefundenen Faszikels im Archiv der Geologischen Bundesanstalt rekonstruieren. Die Auffindung einiger vor Jahrzehnten entnommenen Materialien waren der Anstoß dem Verlauf und Erfolg dieser Stiftung nachzugehen. Einige Zeilen haben sich auch in der Festschrift anlässlich des 150. Geburtstages der Geologischen Bundesanstalt im Jahre 1999 niedergeschlagen (Cernajsek, 1999).

Einleitung: der Begriff Stiftung

Unter Stiftung versteht man die Verwaltung und Widmung von Sondervermögen, das gemäß dem Willen eines Stifters bzw. einer Vereinigung von Stiftern zur Förderung eines bestimmten Zweckes verwendet wird. In Österreich ist eine derartige Rechtsform in der gegenwärtigen Rechtsordnung nur für gemeinnützige Zwecke möglich (Brockhaus-Enzyklopädie). Im Rahmen der Geologischen Bundesanstalt ist es mehrere Male zu Gründung von Stiftungen gekommen, um wissenschaftlichen Mitarbeitern finanzielle Mittel als Förderung zukommen zu lassen. Otto Ampferer war außerhalb der Geologischen Bundesanstalt Namen gebend für eine Stiftung der Österreichischen Geologischen Gesellschaft (vormals Geologische Gesellschaft in Wien).

Die historische Entwicklung der Dr. Urban Schloenbach-Reisestipendium-Stiftung

Die Dr. Urban Schloenbach-Reisestipendium-Stiftung erfolgte durch einen Brief des k. Salinen-Ober-Inspectors in Liebenhall bei Salzgitter in Hannover Albert Schloenbach, in welchem er die Absicht mitteilt, der Reichsanstalt ein Reisestipendium zu überlassen (von Hauer, 1873). Dies erfolge im Andenken an seinen früh verstorbenen Sohn Dr. Urban Schloenbach (Abb. 1), der eine besondere Anhänglichkeit für die Geologische Reichsanstalt zeigte, welche durch das Wohlwollen von Direktor Franz von Hauer hervorgerufen worden sei. In seinem Schreiben (Stiftungsbrief) an Hauer heißt u.a.: "Konnte ich nun leider mein unausgesetztes Interesse und

Abb. 1. Dr. Urban Schloenbach, geb. 1843 in Salzgitter, gestorben 1870 in Bersaska, Banat, Rumänien. [Dr. Urban Schloenbach, Salzgitter, 1843 - Bersaska (Banat, Rumänien), 1870.]

Abb. 2. Gedenktafel für Dr. Urban Schloenbach im alten Gebäude der Geologischen Bundesanstalt (Palais Rasumofsky). [Memorial tablet for Dr. Urban Schloenbach in the old building of the 'Geologischen Bundesanstalt' (Rasumofsky Palace).]

meine dankbaren Gesinnungen für die Anstalt nicht unmittelbar bethätigen, so ist es mir umsomehr Bedürfniss, wenigstens mittelbar zur Förderung der Zwecke desselben nach Kräften beizutragen. Ich vermag dies gegenwärtig nur, indem ich andere jüngere begabte Kräfte in die Lage zu versetzen suche, diejenigen wissenschaftlichen Untersuchungen und Reisen vornehmen zu können, welche meinem lieben Sohne wegen seines frühen Todes auszuführen nicht vergönnt sein sollten." Zu diesem Zwecke stellte er 60 Stück "3perc. Österr.Lomb. Südbahn-Prioritäten à 200 Gulden" gewissermaßen als Vermächtnis seines Sohnes für die Geologische Reichsanstalt zur Verfügung. Für die damalige Zeit ein beträchtliches Vermögen. Der Zinsertrag möge zu einem Reise-Stipendium verwendet werden. Das Geld sollte auch für Reisen der Anstaltsgeologen in das Ausland verwendet werden. Damit sollte der kosmopolitischen Richtung seines Sohnes Rechnung getragen werden. Im Übrigen überlasse er es der Anstalt, dass auch andere sonst nur der Geologischen Reichsanstalt nahestehenden Personen der Anstalt ein Stipendium gewährt werde (von Hauer, 1877b).

Eine im Jahre 1877 im damaligen Sitzungssaale (heute Archivdepot der Fachabteilung Rohstoffgeologie) wurde eine Gedenktafel für Dr. Urban Schloenbach auf Veranlassung der wiener Geologen dort angebracht (Abb. 2).

Urban Schloenbach kam nach Studien an verschiedenen deutschen Universitäten und mehreren Reisen durch Europa 1867 als Sektionsgeologe an die Geologische Reichsanstalt, nachdem er eine Berufung an eine neu zu gründende Bergakademie in Peru abgelehnt hatte. 1870 wird U. Schloenbach an das Deutsche Polytechnikum in Prag als Professor für Mineralogie berufen. Im Zuge der Fortsetzung bzw. Beendigung begonnener Kartierungsarbeiten im Banater Militärgrenzgebiet starb er wegen der dort herrschenden extremen Lebensverhältnisse. Urban Schloenbach hat sich vor allem auf dem Gebiet der Paläontologie große Verdienste erworben. Er studierte die Paläofaunen des norddeutschen Jura, später auch die Kreidefaunen von Böhmen. Hier bearbeitete er die Brachiopodenfaunen und trug Wesentliches zur stratigraphischen Gliederung bei. Daneben war er Entdecker von paläontologischen Unikas, z.B. von Belemniten aus Grünbach/Schneeberg in Niederösterreich oder der *Sepia* im Neogen von Baden bei Wien. Trotz seines kurzen wissenschaftlichen Wirkens hinterließ Urban Schloenbach eine Fülle von Veröffentlichungen, davon allein über 50 in den Publikationen der Geologischen Reichsanstalt. Die tiefe Verbundenheit mit der Geologischen Reichsanstalt war dafür ausschlaggebend, dass der Vater Urban Schloenbachs – der k. Salinen-Ober-Inspector A. Schloenbach – ein Reisestipendium der Geologischen Reichsanstalt zur Verfügung stellte (Stojaspal, 1992).

Die Verwaltung des Vermögens und die Verleihung des Reisestipendiums erfolgte allein durch den jeweiligen Direktor der Geologischen Reichsanstalt. Schon im 19. Jahrhundert bestand also eine Art Teilrechts- oder Vollrechtsfähigkeit, die der Direktion die Verwendung von Mitteln fast ohne Zustimmung bzw. Mitsprache eines Ministeriums ermöglichte. Im Jahresbericht des jeweiligen Direktors wird genau über die Verleihung des Reisestipendiums berichtet und es scheinen die Namen jener geförderten Personen auf, die in späteren Jahren durch besondere wissenschaftliche Leistung hervorstachen oder gar die Leitung der Anstalt erhielten. Selbst die Registratur der Geologischen Reichsanstalt enthält eine große Zahl an Schriftstücken, die sich mit dem Dr. Urban Schloenbach-Reisestipendium-Stiftung auseinandersetzen. Sie hier zu behandeln würde den hier gesteckten Rahmen des Vortrages sprengen. Die Mittel wurden meistens für Reisen in Inland oder für Studienreisen ins Ausland aufgewendet, die Exkursionen in geologisch bedeutenden Gebiete führten oder Studien in bekannten und wichtigen Sammlungen betrafen.

Hauer berichtet 1876, dass zunächst der erste Zinsertrag als auferlegte Steuer entrichtet werden musste. Schon 1874 kam Dionys Stur (1827-1893) als erster Geförderter in den Genuß des Reisestipendiums. Er konnte seine Studien in den Steinkohlenablagerungen Böhmens, Mährens und österreichische Schlesien fortsetzen und mit den Mitteln diese auch in Preußen und Sachsen besuchen. Gleichzeitig konnte er die Phytopaläontologischen Sammlungen in Dresden, Halle, Leipzig, Berlin, Bochum, Bonn, und Breslau eingehend studieren. Seine Untersuchungen hat Dionys Stur mit einem ausführlichem Bericht veröffentlicht (Stur, 1875): "Durch die abermalige Verleihung eines Stipendiums jener Stiftung, welche Herr Albert Schloenbach in Salzgitter zur Erinnerung an seinen dahingeschiedenen Sohn, unseren unvergesslichen Freund, Urban Schloenbach, unserer Anstalt widmete, hat es unser hochverehrter Director, Hofrath Dr. Franz Ritter v. Hauer, mir möglich gemacht, eine größere Studienreise auszuführen." In diesem wortreichen Stile beendet Stur seinen Bericht, in welchem er noch einmal sich beim Stifter und Direktor Hauer überschwänglich bedankt. In ähnlicher Diktion merkt Direktor Franz Hauer in seinem Jahresbericht an, welche Erfolge durch die "hochherzige Stiftung des Hrn. A. Schloenbach" hervorgebracht werden konnten (von Hauer, 1876, S. 4-5). [In der Regel wird "Schloenbach" mit "oe" (Österreichisches Biographisches Lexikon) geschrieben. In der Korrespondenz und auch in Zitaten wird der Name auch mit "ö" geschrieben, was zu Verwirrungen führen kann.]

Im Jahre 1879 wurden die Verhältnisse der Urban-Schloenbach'schen Reisestipendienstiftung durch die Ausfertigung des Stiftbriefes definitiv geregelt. Nach dem Tod des Stifters versicherte der Schwiegersohn des Stifters Regierungsrat Kauth in einem Brief an Direktor Franz Hauer im Namen der Erben, dass die Mittel ganz im Sinne des Stifters verwendet werden sollen, um die Geologische Reichsanstalt und ihre Mitarbeiter zu fördern (von Hauer, 1879, S. 6-7). Im gleichen Jahr wurde Michael Vacek (1848-1925) für Studien der Kreide in der Schweiz und deren Vergleich mit Vorarlberg und Westtirol verliehen. Friedrich Teller (1852-1913) reiste nach Mailand und Esino, um dort die berühmten Esino Schichten in der Natur und in Sammlungen zu besichtigen. Guido Stache (1831-1921) besichtigte Sammlungen in Paris, Bern, Genf und Würzburg, um dort die Süßwasserfaunen seiner liburnischen Stufe zu vergleichen (von Hauer, 1879, S. 7).

Im Jahre 1881 wird über die Verleihung von zwei Reisestipendien berichtet. Edmund Mojsisovics (1839-1907) hatte die Gelegenheit erhalten, anlässlich des 50jährigen Bestehens der französischen geologischen Gesellschaft in Paris Vergleiche mit Triasfaunen Spaniens mit denen der Alpen zu anzustellen. Michael Vacek (1848-1925) folgte einer öffentlichen Aufforderung Albert Heim's die berühmte Glarner Doppelfalte zu besuchen (von Hauer, 1881, S. 6).

Emil Tietze (1845-1931) erhielt erstmals 1882 die Gelegenheit in Italien Vergleiche mit Karpathensandstein und den Macigno-Bildungen im Beisein italienischer Kollegen vorzunehmen. Hier traf Tietze den italienischen Geologen Giovanni Capellinini (1833-1922) – ein Begründer des Internationalen Geologenkongress – und konnte die großen geowissenschaftlichen Sammlungen in Bologna besichtigen. Darunter die Fischfaunen des Flysch, die von Bosniaski beschrieben worden waren, die zahlreichen Fossilien aus Appeninischen Sandsteinen, die ähnliche Entwicklungen wie die des Karpathensandsteinens von der Kreide bis ins Neogen erkennen ließen (von Hauer, 1882, S. 8).

Viktor Uhlig (1848-1925) konnte 1884 in München an der paläontologischen Staatssammlung (Hohenegger'sche Sammlung) Kreidefossilien studieren Im gleichen Jahr führte ihn auch eine Reise nach Pest, wo er Kreidefossilien der Coquand'schen Sammlung besichtigte. Carl von Camerlander (1861-1892) untersuchte die Umgebungen von Brünn und Olmütz und stellte Vergleiche in Preussisch Schlesien an. Karl Frauscher (1852-1914) studierte Eozänfossilien in München, die bei Zittel liegende Pauer'sche Sammlung vom Kressenberg. Im Salzburger Vorland untersuchte er die Sandsteinszone (Flyschzone) und in Kroatien befasste er sich mit Fossilaufsammlungen (von Hauer, 1885, S. 13).

1886 erhielt Baron Heinrich Foullon (1850-1896) ein Reisestipendium für Griechenland. L. Tausch (1858-1899) reiste nach Tessalien (Griechenland). Georg Geyer (1857-1936) wurde durch ein Reisestipendium das Studium des Lias in den Bayerischen Kalkalpen ermöglicht. Ein viertes Stipendium in diesem Jahr wurde Alfred Rodler (1861-1890) für eine Reise nach Maragha, östlich vom Umriasee in der persischen Provinz Azerbeidjan (Iran) bewilligt. Er sammelte vorwiegend Säugetierreste für das Naturhistorische Museum auf. Das Stipendium erhielt Michael Vacek (1848-1925) für eine kleine Reise nach Italien um den Gardasee, um stratigraphische Verhältnisse im Jura zu klären (Stur, 1886, S. 32).

Für die Untersuchungen von Brachiopoden der Trias erhielt Alexander Bittner (1850-1902) 1888 von Direktor Dionys Stur ein Stipendium, um in München an der paläontologischen Staatssammlung das dort vorhanden Material kennen zu lernen: "Im Verfolge seiner Studien über die Brachiopoden der Trias hatte Herr Dr. Bittner gleich im Frühjahre den Wunsch ausgesprochen, nach München zu reisen und dortselbst in dem berühmten paläontologischen Staatsmusem das an Trias-Brachiopden vorhandene Materiale kennen zu lernen. Ich habe ihm zu diesem Behufe aus den Mitteln der Schlönbachstiftung [!] ein kleines Reisestipendium anweisen können" (Stur, 1889, S. 41). Durch die abermalige Verleihung eines Stipendiums an Leopold Tausch (1858-1899) konnte ein Vergleich der älteren tertiären Faunen der Alpenländer mit denen Süddeutschlands vorgenommen werden und mit Fachgenossen aus dieser Region zusammentreffen. Carl Camerlander (1861-1892) bereiste Preußisch Schlesien, z.B. das Spieglitzer Schneeberggebiet, für Vergleichsaufnahmen (Stur, 1891, S. 17).

Den in Washington (DC) 1891 stattfindenden Internationalen Geologenkongress konnte oder wollte das Ministerium für Kultus und Unterricht nicht finanzieren. Es forderte einen Bericht an und bemerkte, dass die Auslagen von dem Betreffenden selbst oder aus den Mitteln Geologischen Reichsanstalt zu bestreiten seien. "Glücklicherweise ist jedoch die k.k. geologische Reichsanstalt im Besitze der Schloenbach-Stipendien-Stiftung und hat die Direction mit den Zinsen dieser derart gespart, dass die Möglichkeit vorlag, dem Chefgeologen Dr. E. Tietze achthundert (800 fl.) Gulden als Subvention zur Reise nach Washington zu übergeben". Direktor Dionys Stur (1892, S. 13) setzt in seinem Jahresbericht für 1891 fort: "In Beantwortung eines Berichtes vom 23. April 1891, Z.146, hierüber, hat seine Excellenz Herr Dr. Paul Gautsch von Frankenthurn im Erlasse vom 26. Mai 1891, Z.8557, verfügt – indem ich erstattete Anzeige, betreffend Ihre Verhinderung, an dem Ende August d.J. in Washington stattfindenden internationalen Geologen-Congresse theilzunehmen, zur Kenntnis nehme, ermächtige ich Euer Hochwohlgeboren den Chefgeologen Oberbergrath Dr. E. Tietze als Vertreter der k.k. geologischen Reichsanstalt zu dem erwähnten Congresse auf Kosten der Schloenbach-Stiftung zu entsenden und theile dies gleichzeitig dem löblichen k. und k. Ministerium des Aeusseren behufs der entprechenden weitern Verständigung mit." Im gleichen Jahr konnte Georg Geyer (1857-1936) eine Studienreise machen, um am münchener k. paläontologischen Museum Studien zu machen und Heinrich Foullon (1850-1896) konnte die Lagerstätten von Avala in Serbien besuchen (Stur, 1892, S. 12-13).

Hinsichtlich der Veranlagung des Vermögens der Schloenbach-Reisestipendium-Stiftung kam es zu einer Änderung der Veranlagung des Stiftungsvermögens, das mit Hilfe der k.k. Niederösterreichischen Statthalterei durchgeführt wurde. Als Ergebnis dieser komplizierten Transaktion erhielt die Direktion statt der bisherigen halbjährlich ausgezahlten Zinserträge in der Höhe von 175-1877 Gulden von nun an 210 Gulden, was sicherlich eine Verbesserung der Förderungsmöglichkeiten nach gezogen hatte (Stur, 1892, S. 13).

Direktor Guido Stache (1893, S. 23) veröffentlichte in seinem Jahresbericht für 1892 – als Stiftungsverwalter und Verleiher – noch einmal den Stifterbrief vom 10. März 1873 in den Verhandlungen, um das Andenken an den edlen Stifter und an seinen ihm (Stache) innigst befreundet gewesenen Sohn zu ehren und wieder neu zu beleben, da er (Stache) das Amt des Stiftungs-Verwalters und Verleiher übernommen habe (Stache, 1893, S. 23-25).

Georg Geyer und August Rosiwal (1860-1923) wurden im Jahre 1893 mit Reisestipendien bedacht, die sie erst im Frühjahr 1894 nutzen konnten. Geyer machte eine Studienreise in das Silurgebiet Mittelböhmens und Rosiwal besuchte das Kristallingebiet in Sachsen (Stache, 1894, S. 22).

Für 1895 wurde Julius Dreger (1861-1945) ein Stipendium für Vergleichsstudien im Oligozän Mittel- und Norddeutschlands und Belgiens vergeben. Zusätzlich erhielt er ein Stipendium für die Exkursion in die pflanzenführenden Schichten der alpinen Steinkohlenformationen mit den Anthrazitschiefer-Lokalitäten Frankreichs (Stache, 1895, S. 27).

Alexander Bittner (1850-1902) wurde die Möglichkeit geboten, triadische Bivalven im Museum von Mailand zu studieren. Für petrographische Studien wurde Hermann Veit Graber (1873-1979) ein Reisestipendium verliehen (Stache, 1896, S. 29).

Direktor Stache lässt 1895 ein Bild im Sitzungszimmer vom Namengebenden der Stiftung anbringen: "Um das Andenken an Dr. Urban Schloenbach, unseren liebenswürdigen und ausgezeichneten einstigen Collegen auch den Kreisen der jüngeren Geologen-Generation, welche keine persönliche Erinnerung mehr mit dem in voller Jugendkraft von uns geschiedenen trefflichen Freunde verbindet, näher zu bringen und es für die Zukunft eindrucksvoller zu gestalten, habe nach einer kleineren Photographie .... um demselben als Zierde unseres Sitzungssaale einen dauernden Platz einzuräumen." (Stache, 1897, S. 37-38).

1895 erhielt Leopold Tausch (1858-1899) eine Förderung zum Studium des Tertiärs von Nieder- und Oberbayern und Oberösterreich. In diesem Jahr erhielt als auswärtiger Mitarbeiter H.V. Graber vom mineralogisch-petrographischen Universitätsinstitut in Prag Mittel, um im westlichen Südtirol olivinhältige Gesteine zu studieren. Emil Tietze (1845-1931) wurde es ermöglicht am hydrographisch-geologischen Kongress in Clermont-Ferrand teilzunehmen und konnte damit zugleich Studien im Vulkangebiet der Auvergne verknüpfen (Stache, 1897, S. 38).

Die Teilnahme an der Versammlung der deutschen Naturforscher und Aerzte in Braunschweig wurde 1897 Julius Dreger (1861-1945) ermöglicht, der sich bei dieser Gelegenheit dem norddeutschen Tertiär widmete. Hermann Veit Graber wurde die Fortsetzung seiner Untersuchungen der Olivingesteine in Stüdtirol ermöglicht. Franz Eduard Sueß (1867-1941), Sohn des berühmten ersten wiener Professors für Geologie an der Universität Wien Eduard Sueß (1831-1914), erhält 1898 ein Stipendium um eine Studienreise in das Französische Zentralplateau zu machen. Im folgenden Jahr führte er Vergleichsstudien im Bayerischen und Böhmischen Wald und im Französischen Zentralplateau durch. Er stellte fest, dass die Leptynite des Französischen Zentralplateaus nicht den Granuliten der Böhmischen Masse entsprächen (Stache, 1898, S. 28).

Für das Studium außerösterreichischer Kreidegebiete mit den alpinen Karstgebieten waren 1899 Fritz Kerner-Marilaun (1866-1944) und Franz Kossmat (1871-1938) ausersehen. Die Studien wurden 1900 in die Kreidegebiete der Karstgebiete Südwesteuropas fortgesetzt. Ein drittes Stipendium erhielt Wilhelm Hammer für petrographische Untersuchungen in den Kristallingebieten von Südwest-Tirol. 1900 erhielt Wilhelm Hammer (1875-1942) eine Subvention für Übersichtsbegehungen des Blattes Bormio und Tonale 1:75.000, die sich in erster Linie auf die Abgrenzung der kristalline Gesteine bezogen (Stache, 1901, S. 21).

Richard Johann Schubert (1876-1915) unternahm 1901 eine geförderte Reise in das vicentinische Tertiärgebiet. Otto Ampferer (1875-1947) erhielt die Gelegenheit Ergänzungen der Neuaufnahme des Karwendelgebirges und des Sonnwendgebirges auf dem Blatte Innsbruck–Achensee 1:75.000 durchzuführen, die er auf das bayerische Gebiet ausdehnte (Stache, 1901, S. 34-35).

Julius Dreger (1861-1945) wurde durch die Schloenbach-Stiftung 1902 Gelegenheit gegeben, die in München befindlichen Stücke aus Häring in Tirol zu untersuchen. Wilhelm Hammer (1875-1942) wurde im Sommer 1902 ein Stipendium zugewiesen, um in dem an sein Aufnahmsgebiet in Südwesttirol anstoßenden italienischen Gebiet vergleichenden Untersuchungen anstellen zu können. Ein besonderes Augenmerk war auf die Ortlergruppe zu legen, wo die Stratigraphie der Phyllite und des Ortlerkalkes und die in sie eindringenden dioritischen und porphyritischen Gesteine zu untersuchen waren. Schließlich wurde auch Wilhelm Josef Petrascheck (1876-1967) eine Studienreise in die Kreidegebiete Norddeutschlands genehmigt. Johann (Giovanni) Baptist Trener (1877-1954) konnte die im Vorjahr begonnenen Studien im Vicentinischen und in den Euganeen mit Hilfe des Schloenbach-Reisestipendiums fortsetzen (Tietze, 1903, S. 28).

Im nächsten Jahr 1903 konnte Karl Hinterlechner (1874-1932) eine Reise nach Sachsen durchführen, wo er die dortigen Granitkontakthöfe besuchte. Zusätzlich hatte er die Gelegenheit erhalten, das reiche Sammlungsmaterial des mineralogisch-geologischen Museums im "Zwinger" zu besichtigen. Um Vergleichsstudien in der Kreide von Feltre und Belluno und den Fazieswechslen von Scaglia und Biancone beobachten zu können, erhielt G.B. Trener Mittel aus der Schloenbach-Stiftung.

Auch die geologisch-paläontologische Erforschung Bosnien-Herzegowinas profitierte von Mitteln der Schloenbach-Stiftung. So konnte R.J. Schubert das Eozän in der Umgebung von Mostar studieren, wo Alveolinen und Nummulitenkalke vorkommen (Tietze, 1905, S. 22-23). Mit V. Hawelka untersuchte der die stratigraphischen und tektonischen Verhältnisse des Gackopoljes. Im gleichen Jahr unternahm O. Ampferer eine Reise in das oberbayerische Grenzgebirge. Auch konnte er das Quartär auf dem Blatt Achensee 1:75.000, in den bayerischen Voralpen und im Inntal untersuchen. G.B. Trener besichtigte mit einem Stipendium die öffentlichen und privaten Sammlungen in Padua, Vicenza und Verona.

Bereits als Voluntär erhielt 1905 Heinrich Beck (1880-1979) eine Unterstützung zur Untersuchung von Neutitschein und Frankstadt in den mährischen Karpaten, die er auch in den damaligen ungarischen Teil (heute slowakisch) fortsetzte. Theodor Ohnesorge (1876-1952) konnte ein Betrag für die Untersuchungen in Gebieten an der italienisch-kärntnerischen Grenze zum Vergleich mit seinen tirolerischen Aufnahmsgebiete gegeben werden. Er konnte Übereinstimmungen des Paläozoikums vom Brixental mit dem der Karnischen Alpen feststellen. R. J. Schubert studierte in der Umgebung im Miozän von Modena und im Pleistozän vom Monte Gibbio Otolithen bzw. deren Sammlungen an der universität Modena. Außerdem verglich er Lepidocyclinen und Miogypsinen aus dem Aquitan von Krain (Slowenien) mit denen des Apennins. L. Waagen wurde das Schloenbach-Stipendium die Gelegenheit gegeben in München Fossilaufsammlungen der Seiseralpe (Südtirol) zu studieren. Letzterer erhielt 1906 eine Stipendium für eine Reise nach Budapest (Tietze, 1907, S. 34-35), um Budapester Museum Bivalven der Trias einer Durchsicht zu unterziehen. J. (G.) B. Trener (1877-1954) erhielt außerhalb seiner Aufnahmstätigkeiten die Gelegenheit für Orientierungsbegehungen. Franz Kossmat konnte mit einem Zuschuss aus dem Zinserträgnis der Stiftung eine Studienreise in die Schweiz machen.

Im Jahre 1907 wird berichtet, dass Johann Vratislav Želisko (1874-1938) die öffentlichen und privaten Sammlungen in Bologna, Florenz, Rom, Neapel und anderen italienischen Städten besuchen konnte (Tietze, 1908, S. 33): H. Beck durfte seine im Vorjahr begonnene Untersuchungen in den Karpaten fortsetzen. O. Ampferer und W. Hammer konnten einen geplanten Alpenquerschnitt in der Schweiz und in Italien studieren. Im Unterengadin und im Samnauntal konnten sie das damals noch sogenannte "Engadiner Fenster" besuchen. Außerdem konnten beide ihre Arbeiten in ihren Aufnahmsgebieten erfolgreich fortsetzen. Diese Arbeiten setzten Ampferer und Hammer 1908 fort. Gustav Götzinger (1880-1969) bekam die Gelegenheit für Untersuchungen bei Freistadt und Lukas Waagen (1877-1959) konnte das Studium der Triasfossilien des Bakonyer Waldes beginnen.

Im Jahr darauf 1909 konnte O. Ampferer im bayerischen Gebiet der Allgäuer Alpen seine Studien über den Querschnitt durch die Alpen fortsetzen. G. Götzinger konnte die quartären Sedimente im österreichisch-preußischen Grenzgebiet nördliche der Beskiden vergleichen. O. Ampferer setzte seine Arbeiten 1910 im bayerischen Allgäu fort, wo er sich hauptsächlich mit der Molasse in der Wertachschlucht befasste und hiermit seine Arbeiten für den Alpenquerschnitt abschließen konnte. Zur Teilnahme am internationalen Geologen-Kongress in Stockholm konnten F. Kossmat und W. Petrascheck mit Hilfe des Schloenbach-Stipendiums entsandt werden, wobei sie sich auch Exkursionen nach Lappland usw. anschließen konnten. G. Götzinger konnte seine vergleichenden Untersuchungen im Quartär des österreichisch-preußischen Grenzgebietes fortsetzen.

G.B. Trener unternahm 1911 eine Studienreise nach Val Camonic um Vergleiche mit der Adamellogruppe anstellen zu können. G. Götzinger erhielt die Möglichkeit für eine Vergleichsexkursion auf den Blättern Troppau 1:75.000 und Freistadt 1:75.000, um das Quartär zu studieren.

R. Schubert wurde durch das Schloenbach-Stipendium 1912 die Gelegenheit gegeben, Vergleichsstudien für die Nummulitenschichten Mährens und Niederösterreichs durchzuführen, indem er die bayerischen Eozänschichten des Kressenberges und das Eozän Salzburgs und Oberösterreichs (Mattsee) besuchte. K. Hinterlechner konnte im gleichen Jahr die Graphitvorkommen von Passau und Umgebung und auch die damals österreichischen Vorkommen in Böhmen besichtigen.

W. Hammer setzte 1913 seine Studien in den Bündner Schiefern Graubündens, im Unterengadin und im Prättigau fort. R. Schubert konnte für seine Nummulitenmonographie die italienischen Sammlungen besuchen und so wichtige Vergleichsstudien bezüglich der faunistischen Beziehungen der Flyschzone der Appenninen und der Karpatenländer durchführen. B. Sander erhielt nur eine kleine Unterstützung zur selbst finanzierten Exkursion nach Finnland, um dort die tektonische Durchbewegung des kristallinen Grundgebirges kennen zu lernen.

Das schicksalhafte Jahr 1914 schlägt sich schon in den Verhandlungen 1915 (Tietze, 1915, S. 24) negativ nieder. Nur J.V. Želisko konnte ein Reisestipendium nach Skandinavien genehmigt werden, wo er silurische Ablagerungen studierte.

Die Jahre 1915 und 1916 enthalten keine Hinweise auf die Verwendung der Zinserträgnisse aus dem Schloenbach-Reisestipendium. K. Hinterlechner wurde das Studium der Antimonitvorkommen im ungarischen Grenzgebiet (heute Burgenland) erleichtert. Direktor E. Tietze berichtet in den Verhandlungen 1919, dass für 1918 kein Stipendium verliehen werden konnte. Eine Erläuterung hierzu erübrigt sich. Die rasche Geldentwertung, die Auflösung und der Zusammenbruch der Donaumonarchie und schließlich auch die politische Lage machten die Verleihung des Stipendiums aus den Zinserträgen unmöglich. Das gleiche berichtet Direktor G. Geyer (1920, S. 31) für 1919, wobei er noch optimistisch von einem Zuwachs durch unverbrauchte Zinsen spricht.

Erstmals nach Beendigung des 1. Weltkrieges und nach der Gründung der Republik Österreich wurde E. Spengler ein Betrag von 1500 Kronen genehmigt, was ihm die Teilnahme an der Exkursion in den italienischen Teil der Karnischen Alpen ermöglichte. Das ist die letzte gedruckte Mitteilung über die Verwendung der Mittel aus der Schloenbach-Reisestipendiumstiftung. Die Registratur (Amtsarchiv) enthält eine Reihe von schriftlichen Mitteilungen zum Schloenbach-Reisestipendiumstiftung, was auf das rege Interesse und den reichlichen Nutzen dieser Geldmittel vermuten lässt. Für die Arbeit der Geologischen Reichsanstalt, insbesondere für die Weiterbildung durch Exkursionen und Teilnahmen an Geologenkongressen, waren diese Zuwendungen zweifellos von größten unschätzbaren Wert. Einige Sparkassenunterlagen (Einlags-Buch der Neuen Wiener Sparcasse) haben sich in einer Lade eines alten Geologenschreibtisches gefunden. Am 15. April 1924 betrug das Vermögen nur mehr 8.186 Kronen. Infolge der Sanierungsmaßnahmen durch Bundeskanzler Seipel war diese Geldsumme praktisch wertlos. Die in diesem Jahr erfolgende Umwechslung von Krone in Schilling lässt die rasante Geldentwertung seit Kriegsende in drastischer Weise erkennen. Seit diesem Jahr hat es keine nennenswerte private Zuwendung an die Geologische Bundesanstalt gegeben.

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How old maps are used to investigate modern environmental issues in the Czech Republic

Tillfried Cernajsek, Christoph Hauser & Karel Posmourny

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Key words — Maps, land reclamation.

The Austrian Geological Survey and Czech geological organizations have in their archives source materials that can be used for the landscape restoration. At many places in the Czech Republic, considerable changes of the environment took place due to building and other industrial activities, especially the mining of mineral raw materials. Changes of relief, river networks and hydrogeological conditions are conspicuous. The largest changes and damages are due to open-cast mining in the North Bohemian and Sokolov brown-coal basins. Other damage was caused by underground black coal-mining, exploitation of uranium and building materials.

During huge floods in northern and central Moravia in July 1997, the morphology of the landscape underwent conspicuous changes. Maps and other historical materials are priceless for specialists to solve problems of landscape reclamation and rehabilitation. They document the original morphology, geography and geology of the areas. Not only topographical, but also geological, maps are important enabling estimation of the original situation.

In 1989 the Austrian and Czech Geological Surveys proposed a project to use the historical map resources of the Austrian Institute in Vienna and other organisations for rehabilitation and reclamation of the landscape, as part of the long-standing Czech-Austrian co-operation „The history of geology – common work on the condition of geological mapping of the Czech countries up till the years 1918". Historical sources will be further analysed for reconstruction mapping in the area of the Becva and Morava rivers in central Moravia. On basis of the agreement for cooperation with Austrian Geological Survey, the Czech Geological survey has obtained colour copies of historical topographic map material from the so-called Joseph (1763-1768) and Francis (1810-1866) mapping periods from the area of the river beds of Morava and Becva, between Litovle and Uherske Hradiste, that have been most intensively damaged by huge floods. These will enable comparison of changes in the landscape after more than 200 years.

Contents

Environmental change

Information technology enables the presentation of map layers for different useful objectives such as GIS analysis. A comparison of historical maps with modern ones (overlay, intersection) might be useful for the solution of environmental problems.

The Austrian Geological Survey in Vienna and the Czech Ministry of the Environment organizations have many precious source maps and other materials in their archives that can be used for the solution of complicated environmental problems and for a restoration of the original landscape. Many places of the Czech Republic have historically suffered considerable changes of environment due to building and other industrial activities, especially exploitation of minerals. Among the most pronounced impacts on the environment are changes of relief of the land surface and alterations of river networks and hydrological conditions The largest changes and greatest damage to the environment occurred in areas of open pit exploitation of brown coal in the North Bohemian and Sokolov basins, where the largest displacement of material has taken place. Other damaged areas also fall into this category, especially underground pit coal mining areas (Ostrava and its surrounding, Karvina and surroundings), areas of uranium exploitation (Stráz pod Ralskem and Hamr na Jezere, Pribram and its surroundings, the area of Rozinka and Jachymov), large scale quarrying of building materials such as limestone (Bohemia Karst, Moravia Karst), and winning of gravel, sands (the area of Trebon, Litomerice, Melnik, Olomouc, Kromeriz) and agglomerate (Ceske stredohori Mountains). The landscape also underwent conspicuous changes of morphology during large scale floods and related landslides that occurred in the area of northern and central Moravia in July 1997, and in southern, central and northern Bohemia in August 2002. Massive sedimentation on the flood plains occurred and sometimes river channels were displaced.

In these cases, old maps (Figs. 1-2) and other historical documents were of enormous value to the specialists who solved the problems of reclamation and rehabilitation of the landscape. Such maps provided documentary evidence of the original character of the morphological, geographical and geological features of the devastated areas. Thus, not only topographical, but also geological, bases become important because they enabled the estimation of the original situation, and are of basic importance in discovering the historical geodynamic, hydrological and hydrogeological situation.

Such materials commonly record the geological and geomorphological features of a disappeared landscape. They record the position of old quarries, mines and pits, the image of the area before large anthropogenous interferences into the landscape (such as building of towns, industrial enterprises, dams, changing the river courses), the situation of exposures, and, tectonic structures and sediments, together with much additional relevant information that completes the picture of old landforms.

Austrian-Czech cooperation

In the Austrian and Czech Geological Surveys in 1989, a project proposal for using unique historical map materials filed in the present Austrian Institute in Vienna and in the other organisation of the Austrian state, for example Austrian State Archives

Fig. 1. Part of the hand-coloured geological map at the scale of 1 : 144,000 made by Johann Jokely in 1856 (the geological mapping of the Imperial Geological Institute, Vienna) depicting the old geological situation in the vicinity of Most (Brüx), North Bohemia. The area has completely changed due to intensive open-cast mining in the second half of 20th century.

(Österreichische Staatsarchiv) was formulated for rehabilitation and reclamation of the landforms. The planned cooperation was facilitated by the Czech and Austrian Geological Surveys, and many other European geological surveys, being partners united in the international organisation FOREGS. One of the important points of the Czech-Austrian co-operation is the theme 'The history of geology; joint work on the geological mapping of the Czech countries until 1918.' This project has been in operation since 1990.

Czech-Austrian cooperation continues, building on the results of previous stages (summarized in Cernajsek & Posmourny, 1993). The present stage is evaluating historical geological maps as a source of data and their use in contemporary practise, particularly an evaluation of geological, mining and thematic small scale maps and other historical archive materials from industrial areas of Northern Bohemia, the surroundings of Kladno, Pribram and Ostrava.

Applied studies based on historical maps guide, for example, reconstruction of areas with major human-induced changes of the geological environment. They directly contribute to landscape reclamation and solutions of topical problems of everyday life, such as the influence on the hydrogeological situation of and landslide hazards. Historical maps play an important role in urban studies and facilitate mitigation of damage caused by contamination from old dumping grounds.

Organisations cooperating with relevant sections of the Ministry of the Environment of the Czech Republic have expressed an interest in the results of the above mentioned research and related information. The Czech Geological Survey made their own studies in cooperation with the Austrian historical archives and Geological Survey. Good examples of results can be found in the studies of Benes *et al.* (1993) and Bruna *et al.* (2002, 2003).

Future research

Ongoing research focuses on reconstruction mapping, under the auspices of the Czech Geological Survey, for the area of the Becva and Morava rivers in central Moravia. Changes of the river network are being traced, as are the influence of hydrogeological condition, changes of geomorphology, the development of the relief and microclimate, the influence of melioration, the impacts of landslides, urbanism and impacts connected with old mining activity all being investigated for the longest possible time span. On basis of the agreement to cooperate with the Austrian Geological Survey, the Czech Geological Survey obtained colour copies of historical topographic map materials from the so-called Joseph (1763-1768) and Francis (1810-1866) mapping periods from the area of the river courses of Morava and Becva, between Litovel and Uherske Hradiste, that have been most intensively damaged by floods in July 1997. These maps will enable reconstruction of the landscape, based on what is known from the past 200 years.

◄ Fig. 2. An example of a geological field map at the scale of 1 : 28,800 from NE Bohemia, showing the eastern part of the Krkonose Mts. (Riesengebirge) (Johann Jokely, 1861). Much detailed information about historic outcrops, quarries and geological measurements can be obtained here.

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The 'Dutch approach', or how to achieve a second life for abandoned geological collections

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Key words — Collections, universities.
This paper is part of a 'diptych' describing the 'life-cycle' of geological collections from Dutch universities against the background of developments in education and research. Whereas this paper focuses on the development of the collections, the rise and decline of their use in research and teaching and the process that finally led to combined, national effort to decide on the future of these collections, Leo Kriegsman's paper will discuss the process of making choices which collections will be kept for the future and how to deal with selection and de-accessioning.
The worldwide shift from the field to the laboratory in both education and research, combined with massive reorganisations, led to many orphaned collections, totalling some two million objects.
Sponsored by the government, the five oldest Dutch universities engaged in a collaborative action to tackle this problem with the aim to improve the overall quality and accessibility of the collections, as well as to intensify their present and future use through selection, de-accession, collection mobility, or even disposal. Some experiences, pitfalls and recommendations will be discussed.

Contents

Introduction

Ever since the late Renaissance, natural history, including geological, palaeontological and mineralogical samples, can be found in cabinets of curiosities all over Europe. Usually they are referred to as 'fossilia'. Most universities however did not own natural history collections of any significance until the late eighteenth century, apart from their botanical gardens and anatomical cabinets. These '*naturalia*' and '*fossilia*' were kept in cabinets of curiosity. Most of these early cabinets were the private property of the nobility and they were exclusively accessible to the owners and their carefully selected guests. During the second half of the sixteenth century we gradually see an intellectual elite establishing their own cabinets. Some of those 'naturalists', like Ulisse Aldrovandi (1527-1605), become professors. Aldrovandi donated his collections to the University of Bologna; where today, his collections are beautifully displayed in the restored Palazzo Poggi, Bologna's magnificent university museum. Of a more private nature are the collections of *materia medica* of many pharmacists and medical doctors. Famous examples are those of the Neapolitan pharmacist Ferrante Imperato (1550-1631) or Berhardus Paludanus (1550-1633) in Enkhuizen, The Netherlands. Both used their collections, which existed of 'fossilia, naturalia & artificialia", for their own studies and for the education of their apprentices.

Leiden University was one of the earliest universities North of the Alps to collect and keep specimen for the education of their students. In 1587 Leiden decided to follow the example of Pisa and Padua and develop its own *Hortus Medicus*. Paludanus was invited to come to Leiden to become the first Director of the Garden and to take

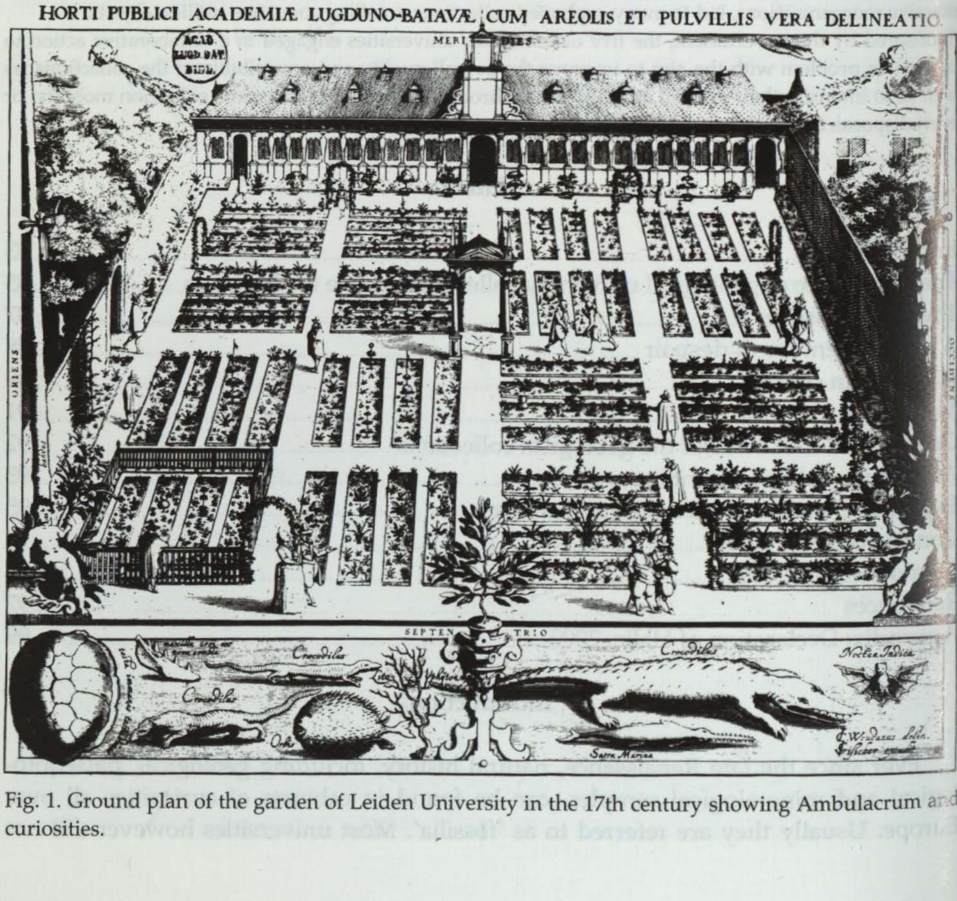

Fig. 1. Ground plan of the garden of Leiden University in the 17th century showing Ambulacrum and curiosities.

charge of its arrangement. The Curators asked him to bring along his collections "... for the promotion of scholarship and education, as well as the honour of the university ..." (Molhuysen, 1913, pp. 124, 192) (Fig. 1). Only a few years later – in 1593 – Leiden University built its famous Theatrum Anatomicum, where preparations and skeletons of human and animal origin were kept; in the winter of 1599 the *Ambulacrum* was built against the southern wall of the Botanical Garden. During the summer months, a number of so-called 'fossilia' was kept in the *Ambulacrum*, whereas it served during winter to keep plants from southern, mostly Mediterranean origin (Tjon Sie Fat, 1992). These activities illustrate how much importance was given to objects as source of information, and how much collections contributed to the standing of the university. For a general overview of the history of university collections, see also Boylan (1999), Lewis (1984) and Lourenço (2003).

In The Netherlands, during the seventeenth century, most natural history collections were the private property of learned gentlemen, whose appointment as university professor often depended on the quality of their collections. To some extent, these collections – often containing both minerals and fossils – survive up to the present day in the collections of universities. The close connection between mineralogy and pharmacy is evident in the *materia medica* and fossils were often included in the comparative anatomy collections. Today, probably the most important surviving early natural history collection in The Netherlands is kept at the Geological and Mineralogical Cabinet of Teylers Museum, Haarlem. In the years 1782-1826, its first keeper, Martinus van Marum (1750-1837), devoted much time and money in amassing a considerable collection *fossilia*, including crystal models by Romé de l'Isle and the Abbé Haüy, as well as the famous *Homo diluvii testis*, a fossil found and described by Scheuchzer (1726) as the sinner that was rightfully drowned by the biblical flood. Only in 1811 Georges Cuvier (1814) correctly identified it as an amphibian, later named *Andrias scheuchzeri* Holl, 1831, a giant salamander.

When we think about these early 'geological' collections, it is good to keep in mind, that according to The Shorter Oxford English Dictionary the word 'geology' is first mentioned in 1735, whereas the first entry of 'geology' in the *Encyclopaedia Britannica* had to wait for its fourth edition in 1810. In 1815 William Smith (1769-1835) published the first geological map that was ever made of country (*A Delineation of The Strata of England and Wales with part of Scotland*). He was also the first to recognise that fossils were not just beautiful and curious stones, but that they could be used for the identification and relative dating of strata (= stratigraphy). His collection is now at The Natural History Museum, London.

It is important to keep this in mind when we look at our old, historical collections after all such collections are the material evidence of the birth of geology as an independent discipline. Finally, a university degree in geology was not possible until the second part of the nineteenth century.

The emergence of geological university collections in The Netherlands

The first formal reference to geological collections for educational purposes in The Netherlands is to be found in the post-Napoleonic law on higher education ("Organiek Besluit" 2 augustus 1815). This law prescribes that each university should have – apart from a library – seven 'cabinets' on subjects like anatomy, comparative anatomy, zoology, botany, geology, physics and astronomy. The establishment of a 'geological cabinet' heralds systematic collecting of palaeontological, mineralogical and geological samples, and of casts and crystallographic models for educational purposes. Many, if not most, of the objects in these collections were in some way or another related to research. However, research as such was not formalised until the 1876 Law on Higher Education ("Wet tot Regeling van het Hooger Onderwijs", 28 april 1876), when it was recognised as one of the two academic core-tasks.

As a result of this law, chairs in geology were established at the universities of Groningen (1877), Leiden (1878) and Utrecht (1879); mining engineering was taught from 1864 at the Technical Highschool in Delft. During the first decades, the number of students was small, but there were funds for the formation of collections. The geological collections of the National Museum of Natural History were entrusted to the Professor of Geology at Leiden, Dr Karl Martin, thus the 'Rijksmuseum van Geologie en Mineralogie' was created (see Winkler Prins, this volume). Gradually two types of collections emerged:

Systematic collections for education in specific subjects (mineralogy, petrology, geology, palaeontology, stratigraphy). Photographs and architectural drawings show that these collections were kept in the museum and were organised in cabinets according to the method used at the time. The Systematic Palaeontological Museum in Utrecht, for example, was kept in drawers, which were organised in taxonomic order. Objects were often purchased from renowned houses like Kranz and Stürtz, which flourished in the second half of the nineteenth century, or they were obtained during field trips or through exchange.

Regional collections for research. Material was usually collected in the field during field trips to classical locations or as a result of participation in exploratory expeditions.

Around 1900, some major scientific expeditions to the colonies were organised, aiming at surveying the natural treasures (flora, fauna, geography, geology and minerals) of the hitherto unknown interior of these territories. In Indonesia, the "Dienst van het Mijnwezen" (Geological Survey) was often charged with the organisation and logistics in the field. Often a duplicate collection was made to be kept overseas in the colony of origin. On their return to Europe, the collections could be split up for further research en distributed over the universities for further research along the lines of their specialisation. Illustrating the international character of research, collections could also be sent to colleagues from abroad.

Gradually the number of students increased as a result of the growing demand for geologists and mining engineers. These students would participate in the expeditions mentioned above and subsequently contribute to the study of the material as part of their master's or Ph.D. degrees. In this way, each student would make his 'own' (student) collection as a result of field training, which would be added to the collections of the faculty, when the student left the university. The growing demand for geologists and mining engineers was reflected in the increasing number of professors and staff and, in 1929, in the establishment at the University of Amsterdam of the fourth fully equipped geological institute.

Professors continued to organise expeditions and extended field campaigns to areas of their specific scholarly interest. The character of these expeditions, however, changed as a result of a more active participation of students. This, combined with the increasing involvement of students in the research programme of the department, led to numerous collection-based publications and Ph.D. theses. Over the years, the number of collections grew considerably.

The roaring sixties

This practice continued more or less unaltered until the 1960s. By then, The Netherlands had four fully equipped geological institutes (Amsterdam, Groningen, Leiden, Utrecht) for not more than some 50 first-year students, and one school for mining engineering (Delft) with some 15 new students each year.

In 1965 this already luxurious situation became untenable when the Free University of Amsterdam claimed – and got – the right to establish its own geological institute. The four older universities felt that they could not stay behind and claimed more funds for modern equipment and extra chairs. This more or less coincided with a number of rather independent developments that had an enormous impact on the universities as a whole:

i an explosive growth of students and, consequently, of staff and housing;
ii budget cuts for higher education;
iii democratisation and management reform;
iv reorientation on research and education;
v new expensive and voluminous laboratory equipment.

In the Earth sciences this led to the introduction of new fields like geophysics and geochemistry, and a marked shift in research and education from the field to the laboratory, from macro to micro, from description to experiment. In the wake of this process it became fashionable to play down the status and importance of collections. It became fashionable to say: "we have by now sufficiently mapped the world and descriptive sciences are from now on out of date." Moreover, driven by a dip in economic growth, these developments brought the Government to initiate the process "Herstructurering Aardwetenschappen" (= Reorganisation Earth Sciences). This was the first initiative for a reorganisation on the national level of an entire discipline. As a student in geology at the University of Amsterdam, I witnessed this process and, in fact, actively participated in it.

In this paper, I will discuss the consequences these developments had for the collections. In short, these were disastrous, as there was no general plan for the collections and they were hardly mentioned during the entire process, if at all. In other words, the fate of the collections was entirely left to the personal engagement of a handful of dedicated individuals. The entire process lasted from 1967 to 1979 and resulted in the following situation:

- Amsterdam: the faculty of the University of Amsterdam was forced to merge with the new faculty at the Free University, which only accepted a marginal part of the collections. The remainder (well over 1,000,000 objects) was stored in a basement of which about half was given on loan to the Geological Museum of the Amsterdam Zoo (Artis).
- Groningen: the faculty was closed down and gradually, the university disposed off most collections; some of them were transferred to what is now Naturalis.

Thanks to the efforts of an emeritus Professor, a core-collection of about 30,000 objects was kept, including historical objects collected during the eighteenth century by the comparative anatomist Professor Petrus Camper (1722-1789).

- Leiden: the faculty was closed down and staff split up, some moving to Utrecht (together with their collections), while others were transferred to the National Museum of Natural History (now Naturalis), also in Leiden. Most collections were saved due to the long-standing and close link between the faculty and the museum.
- Utrecht: a new building on campus was necessary to house the new faculty, which grew considerably due to the merger with part of the former Leiden staff. From the beginning, however, the building was too small and as a result many collections had to be left behind in the former building. (The initial plan was that they would become the nucleus for a regional natural history museum, together with the orphaned collections of the Department of Zoology. This never materialised.) More then a decade later, part of the collections was handed over to the Utrecht University Museum, whereas the remainder was offered to local museums or disposed of after Naturalis had made a selection.
- Delft: survived this round of reorganisations unharmed.

After the dust of the reorganisation had more or less settled, well over two million geological samples were left as orphans, some still in the odd corners of their institute, others in abandoned laboratories or temporary storages. Although the reasons why such collections became 'orphaned' vary, the results are always the same; gradually the interest, attention and care diminished, the collections were moved to the cellar or a remote corner of the attic, or were just left behind. Sometimes, a collection was split into different parts and the documentation became separated from the collection. Apart from 'psychological' (who wants to continue the work of his predecessor?) and political reasons (the abolition of the subject due to reorganisation and budget cuts), the most important factor was probably the change in research methodologies and techniques; a shift from the field to the laboratory, from description to experiment. This shift was also echoed in a decrease in the use of teaching collections.

A quarter century of despair

Most staff members were happy to survive this upheaval and to get back to work. They had lost interest in the collections and struggled to survive, as there were more changes and reorganisations to come. Nevertheless, there were a few initiatives, like the above-mentioned establishment of a geological museum at the Amsterdam Zoo and the failed attempt in Utrecht to transform the former Geological Institute into a regional natural history museum. Although the latter never materialised, it did cause pressure on the Board of the University Today, a selection of both collections is housed at the Utrecht University Museum, while parts have been transferred to Naturalis.

In 1984, the keepers of collections of most Dutch universities joined forces and established LOCUC. Their first and most effective action was to compile the first comprehensive inventory of existing university collections (LOCUC, 1985). The Ministry of Culture sponsored the initiative and published the report. A total of 224 collections were identified, ranging from huge ones of well over a million objects to small ones consisting of just a handful of items. Those in charge were asked to assess the future of their collections. Eighteen were reported as 'threatened', among them the geological collections from the five old universities. Embarrassed by the outcome of this report, the Ministry of Culture asked the State Advisory Committee on Museums to look into the matter and to come forward with suggestions. Their report (Rijkscommissie voor de Musea, 1986) confirmed the situation and made recommendations for the future of each of the collections.

The result of these activities was that both Government and universities felt uncomfortable with the situation. Although massive loss of the collections was prevented, there was still no real solution. It is interesting to further explore the reasons why these efforts had little effect. Apart from familiar arguments such as 'low priority' and 'lack of money', two things really seemed to matter. First of all, although the Minister of Education and Science was responsible for the universities and hence for their collections, the Minister of Culture claimed the overall responsibility for cultural heritage. However, the latter refused to pay for collections that belonged to the other ministry. In turn, the Minister of Education and Science argued that he could not do anything either, because the responsibility had been claimed by the Ministry of Culture. A more practical reason was that the geological collections were just too big and contained too many objects, which made it impossible to find one single solution for all collections and objects.

A change in climate

Funding of Dutch universities is based on output in research and teaching. This system does not take into account the responsibility of the classical universities to maintain their museums and collections, old libraries, botanical gardens, and monumental buildings, in other words, their academic and scientific heritage. Furthermore, the so-called classical universities are also responsible for a range of small (and therefore costly) disciplines, like Icelandic language, history of science and ethnomusicology; in other words, subjects with just a handful of students per year, whereas we all agree that there should be at least one place to study them. As a result, these universities find it increasingly difficult to cope with pressures to invest in modern equipment in order to keep up the competition with more recently established universities, which are not faced with such traditional responsibilities.

The cultural responsibilities of universities are explicitly mentioned in the 'Magna Charta' of Universities. [The 'Magna Charta' was signed by more then 250 rectors of European universities in Bologna in 1988 (see http://www.unige.ch/cre/activities/Magna%20Charta/magna_charta.html).] These include the care for academic heritage, both tangible and intangible.

At the international level, four initiatives focusing on academic heritage have recently been taken:

1. In 1998, the Council of Europe accepted a Recommendation (1998, No. 1375, Document 8111) focussing on the vulnerable position of scientific collections. The Council distinguishes "incidental" collections. "These are collections ... owned by persons or bodies (like universities) whose main or major activities are in areas other than collecting or caring for collections." Since incidental collections "... are

often subject to pressures, which the owner is not able to stand against..." it is recommended to ask member countries:

- "to implement comprehensive legislation designed to encourage the non-dispersal of selected incidental collections;
- to establish a general scheme to give assistance ... to owners of collections ... when there is a demonstrated need for this."

2. In 1999, the Council of Europe initiated the project 'Heritage of European Universities', aiming at creating a *route* of historical universities in Europe (Sanz *et al.*, 2002);
3. In 2000, 12 of the oldest and most renowned European universities established the network 'Academic Heritage and European Universities' – now known as 'Universeum' (see Brmer & Wegener, 2001) – and signed the 'Declaration of Halle' (see Appendix: Declaration of Halle, 2000)
4. In 2001, the International Council of Museums (ICOM) established an International Committee on university museums and collections, UMAC (see: http://www.icom.org/umac).

In The Netherlands, the Ministries of Education and Science and that of Culture were merged in 1995, thereby theoretically placing the responsibility for academic heritage at the national level in one hand. The classical universities seized the opportunity and drafted a rescue plan (de Clercq *et al.*, 1995) in which they claimed funds for their endangered collections. In reply, the Ministry ordered a detailed inventory of academic heritage under the care of Dutch universities and related scientific institutions (Rijksdienst Beeldende Kunst, 1986). This survey confirmed that the five old universities (together with the national museums in Leiden) keep the large majority of Dutch academic heritage. Many of these collections still serve as active resources for teaching and research. It is likely that at least part of it will continue to do so. Furthermore, these collections act as unique and irreplaceable historical, cultural and scientific records, and contain material of national and international importance. We may call this our 'scientific heritage.' In many cases, this material is kept under poor conditions and conservation is urgent. The survey made two additional points:

- Not all collections are worth keeping.
- The intrinsic significance of a collection is not determined by the fact whether, or not it is being used within the Faculty; in other words, 'orphaned collections' can be of great scientific importance!

These observations, in combination with the accumulation of problems around collections, political pressure, growing awareness of the unique and often irreplaceable resources they contain, and of the cultural role and responsibility of universities towards their heritage, led to the conviction that action had become inevitable. This subsequently led to the establishment by the five old universities of the 'Stichting Academisch Erfgoed' (Foundation for Academic Heritage; c/o Bureau Communicatie, Universiteit van Amsterdam, Postbus 19268, 1000 GG Amsterdam). In 1996, the Ministry of Education, Culture and Science decided to sponsor this initiative with a once-off budget of 6 million Euros for the years 1997-2000, provided that the universities would contribute an additional 9 million. This budget was meant for the improvement of the most important or endangered university collections in The Netherlands. The Mondriaan Foundation, Amsterdam, administered the grant. One million euros were allotted to each of the five participating universities, whilst the remaining one million was divided among the three national projects, the orphaned geological collections, the medical collections and the botanical gardens. In each case all relevant university collections in The Netherlands were involved in the project.

University museums, in particular those with natural history collections are increasingly under pressure to scale down the size of their collections, or even to dispose of them entirely (AAM Position Statement, 2003). This pressure is triggered from both inside and outside, and the result of the high cost of maintenance, the decrease in the use of teaching and research collections and the growing conviction that reduction of collections is possible without irreparable loss of information. Keepers of such collections find themselves caught in the dilemma, wanting to preserve and study as much as possible of the collections they and their predecessors have amassed over the years, but being unable to save it all. Performing reduction implies selection and subsequent disposal, in other words the risk that valuable material will get lost. This particular dilemma is well described by Thomson (2002).

Methods & Procedures

Two of the national projects – the geological and the medical collections – focussed on the improvement of the collections by raising the profile through reduction and collection mobility. All involved were thoroughly aware of the fact that the sheer number of objects was such that it was impossible to take care of all of them in a proper way. The collections contain a large number of duplicates, for example in the mass-produced medical instruments of the nineteenth and twentieth century. In addition, there were collections of little or no use for ongoing research and teaching in the faculties, in particular the geological student collections and the 'orphaned collections' that were left behind after discontinuity of specific fields of research (e.g., vertebrate palaeontology), the ceasing of the use of specimens in teaching (e.g., anatomy, pathology), or even the closing down of entire faculties (dentistry, geology). In other words, de-accessioning, collection mobility and even disposal have become inevitable instruments in the management of scientific collections.

Therefore, the aim of the project was twofold:

- to improve the overall quality of the collections through specialisation, the development of 'collection profiles', selection and disposal (a possible reduction of 35-50 % was estimated); and
- to enhance the use of the collections or to give them a 'second life' by physically handing over the collection to a new user ('collection mobility' and the use of IT).

More or less the same procedures were followed for each of the two national projects.

1. A working group composed of the keepers of collections was set up, with an independent chair, that understood both the subject and the role of collections. For the geology project, the project coordinator did most of the work and was in charge of communication, development, etc;
2. In order to be able to cope with the enormous number of objects, it was decided to work on a higher level of abstraction and the concept 'sub-collection' was introduced;

3. An inventory of the sub-collections, including general information, type, origin, a valuation of quality, and suggestions for possible future use and action, was entered into a database;
4. Legal status was carefully checked. Sub-collections on loan, but no longer used, were returned;
5. A 'protocol of de-accessioning' was developed, outlining the conditions under which collections should be offered to new owners and how to decide in case more than one candidate would be interested. Institutions that intended to keep the collection together and use it for future research were given a higher priority than those that only looked for exhibition material for local museums, even if this meant that the collection would go abroad;
6. Second opinions by consulting specialists from the national museums, the Mondriaan Foundation, the Netherlands Institute for Cultural Heritage, among others were sought;
7. The Boards of universities were asked to approve these lines and procedures and to act accordingly.

Deciding on the future of the geological collections

A special feature of the geological project was that the collections of the former Geological Institute of the University of Amsterdam had been left orphaned for many years. Earlier efforts to hand over the entire collections to a new owner had failed. These efforts that aimed at keeping all collections together in order to maintain the internal logic had failed because potential new owners could not afford taking all collections and were only interested in smaller parts. We had to be realistic and therefore went for the 'second best' solution, which meant splitting up the collections in 'sub-collection' and offering those to potential new owners. We decided to use the concept of 'sub-collection' in a very pragmatic way. In our view a sub-collection can be any group (between 10 and several 1000s) of objects with an internal logic, which is readily understood by the professional field. In the case of geology, sub-collections are usually identified by the name of the collector, the year, a geographical site or a subject, generally a combination, for example 'Subbetic Zone, Sierra de Maria (Spain), de Clercq, student-collection, 1968'.

Because of the complexity of the matter and the size and novelty of the project, two phases were envisaged:

- inventory, search for new owners and decision-making
- execution.

The first thing that had to be done was to draw up an inventory of the sub-collections. Together, the universities of Amsterdam, Delft, Groningen, and Utrecht kept well over two million geological samples. Working along these lines, these could be grouped into 842 sub-collections. The majority of the 'threatened collections' belonged to the University of Amsterdam, where the faculty had been closed 25 years ago. About half of that collection was on permanent loan to the Amsterdam Zoo, Artis for its Geological Museum.

These data were entered in a database together with useful general information, like origin, owner, legal status, type, condition and a valuation of the scientific quality and suggestions for possible future use and action. The assessment of the quality of the collections was given in four categories (A-D), earlier developed by the Ministry of Culture (Krikken, 1997).

We could distinguish three categories of sub-collections of roughly the same size:

1. Those, which remained in use by the faculty for education and research.
2. Those, which no longer played a role in present-day education or research, but were considered of high scientific and/or cultural importance and should therefore be kept as 'academic geological heritage' (the 'orphaned collections').
3. Those, which were considered to be of insufficient, or no relevance.

Before offering the collections to potential new owners, we developed a 'protocol of de-accessioning', outlining the conditions under which collections could be offered to new owners and how to decide in case more than one candidate would be interested. We also carefully checked the legal status. Material on loan, but no longer used, was returned. Priority was given to institutions that intended to keep the collection together and use it for future research, even if this meant that the collection would go abroad. Material collected in a specific country would first be offered to the geological survey of that country. Basically, the collections were offered for free (including all relevant information); only transportation etc. had to be paid by new owner.

Subsequently, the database with the sub-collections mentioned under 2) and 3) was put on the website of the Technical Museum of the University Delft, and then offered to a broad range of institutions, including the major universities and natural history museums, both in The Netherlands and abroad and to all the geological surveys or equivalent institutions in countries of origin. These institutions were selected according to the origin and composition of the material, and the characteristics of the (potentially) receiving institute. Formal letters were sent to the directors of each of these institutions, inviting them to express their interest, whereas personal contacts were used to give this process the widest possible publicity.

Although some reactions from abroad were received, the final result was not impressive. Nevertheless, it was encouraging that the geological surveys of Indonesia, France and Spain expressed interest for material collected during field campaigns in their respective countries. In fact on the 28th of April 2003 the formal transfer took place of collections from the University of Amsterdam to the Geological Survey in Indonesia. However rewarding it is that some collections will indeed get a second life in its country of origin, we must face the fact that only a small number of collections will in the end gain a second life in this way.

This left the question of what to do with the remainder, mainly at the University of Amsterdam. The easiest part were of course the collections, which remained in use by the faculty (category 1), and the collections judged of little importance (category 3), notably those with poor or no documentation and the so-called the 'student collections'. It was decided that these could be disposed of after a rather superficial selection of objects that could be used for exhibitions or for educational purposes, for example in schools, etc., was carried out.

Academic geological heritage

The orphaned collections belonging to the 'academic geological heritage' (category 2) were serious matter of concern. These collections are judged of national and even international quality because they had been extensively studied and the results were published, often in internationally renowned journals. Many of these collections can be regarded as reference collections in their own right and quite a few contain type specimens; they embody our scientific heritage. Although decline in interest in the collections is no measure for their potential value, the question remained whether such collections should be kept and, if so, by whom. A frequently voiced, but rather superficial and unsatisfactory answer to this question is, "a collection is only worth keeping if someone is willing to pay for it." However, we must acknowledge that as museum-professionals we have not produced a more satisfactory answer so far, nor the necessary tools to tackle this archival function, and, therefore, we lack the necessary support and funds. In practice, the answer to that question is largely dictated by the question who will pay. In this respect, university collections all over the world suffer from the fact that they are funded on the basis of output of research and teaching, meaning that there is no regular funding for the scientific heritage. Like many other countries, The Netherlands also lacks a general policy regarding scientific heritage. What happens is largely left to the initiative of the 'field'. It is therefore fortunate that our National Museum of Natural History, Naturalis agreed to participate intensively in discussions leading to the final outcome. Generally speaking, efforts were made to strengthen already existing collection-profiles both in the geological collections of the universities involved as well as other national history collections. During the course of the process, second opinions were sought among others from consulting specialists from universities and national museums, the Mondriaan Foundation, the Netherlands Institute for Cultural Heritage (ICN) and the Inspectorate of Cultural Heritage of the Ministry of Education, Culture and Science. Finally, the approval was sought – and found – from the Boards of universities to act accordingly and to start with the second phase, the execution.

In this process, the National Museum of Natural History Naturalis played a very important role in deciding to store all remaining orphaned collections of national importance for which we did not find a new owner (aiming at a future 'National Geological Archive'). Selection criteria were set up in close collaboration with the staff of Naturalis. Some collections will be kept in their entirety given their provenance, while removing bulky objects and concentrating on thin-sections will reduce other collections. In other cases keeping only a representative selection was deemed satisfactory (see Kriegsman, this issue).

This exercise, which led to an overall reduction in volume of around 30-35 %, is evidently both expensive and time-consuming and can only be carried out by well-trained geologists. The job was cleared within the fixed budget by 31st December 2002. Formal handing over of the collections to their new owners and users was scheduled for 28th April 2003. Naturalis will take care of registration and access to the collections according to its own standards. Most material will be described at the level of sub-collection or coherent unit, and only type material will be described at the object level. The results will be published in order to inform the international geological community on the whereabouts of these collections.

Experience, pitfalls and recommendations

Thinking about selection and de-accessioning is a neglected aspect of the museum profession. Disposal (= the permanent removal of an object from a museum's permanent collection, involving the intentional termination of ownership; de-accessioning is the process that leads to the decision) is generally considered 'not done' in any well-managed 'normal' museum, where collection policies aim at adding objects felt to be missing. This is, and should be, fundamentally different in many university museums and collections, which gather objects primarily as 'tools' for learning and research (de Clercq & Lourenço, 2003). However, this does not legitimate the disposal of all collections after they cease to be used. On the contrary, many objects derive their significance from the fact that they have been studied and the results published, whereas others have become useless (e.g., demagnetised palaeomagnetic samples). In other words, thinking about selection and disposal ought to be a natural part of the professional practice in university museums and collections. In fact, curators are continuously faced with the question as to which objects or collections should be kept for future use, because scientists' inquisitiveness is driven to new 'hunting grounds' once their questions have been solved. Ideally, selection and subsequent de-accessioning should be the final stage of each research programme, and what is kept is to be regarded as scientific heritage. This implies an archival function, but this function has not yet been thoroughly defined. We can learn tremendously from the experience of professional archivists in this respect. Archives are meant to be kept and used. We must therefore also think clearly about the potential use of the collections that we want to keep. In the case of type collections (and, to a lesser extent, reference collections), this is evident because of international conventions on the matter. But what about the potential use for new fields yet unexplored? These can be purely scientific (e.g., the discovery of a new species), commercial (e.g., ore reserves), but also highly practical. For example, samples from abandoned Cornish coal mines were used for comparison in a study of present day contamination of groundwater. Finally, collections also have a historical dimension and they can tell us about the history of research and teaching. Potential users of our collections are therefore scholars, students, historians of science and industry. Ideally, these considerations have to be taken into account whilst performing an exercise such as that of the 'Stichting Academisch Erfgoed'. This should not only be true for the participating universities, but also for potential new owners.

Generally speaking, all involved agreed that this major operation worked out well and can perhaps serve as an example. It is satisfactory that new owners are willing to take care of such a significant number of orphaned collections, pay for their maintenance and are eager to use them, in other words, to give them a second life.

However, there are pitfalls. The most important relates to the consequences of the division into sub-collections. For 20 years, we had failed to find a solution for collections as a whole and it is obviously impossible to take one unique decision on some two million individual objects. Therefore, reducing the total to 842 sub-collections was an essential step in tackling and solving the problem. However, it turned out that we did not always pay sufficient attention to the collection as a whole, to its context or to the added value of the sum of collections. For example, due to reorganisations at one university, a small specialist group was closed down and its vertebrate palaeontology collections orphaned. The evolution of island faunas was one of their specialisations (for which the group was known worldwide) and their collections contained material from all over the world. Registration and organisation of these collections was based on the location of origin. However, the unique quality of the collection was that it enabled comparison of identical anatomical components from different sites, which in turn allowed investigation into the functional adaptation to a variety of environments. Splitting up such a collection according to the locations of origin evidently destroys its internal logic and relevance. In hindsight, we must acknowledge that insufficient attention was paid to such situations. The example illustrates that it is not at all evident who should raise such questions, neither in which stage of the process that should have been done, nor what action was required and who would have been in the position to take decisions.

Conclusions

As the project now has come to an end, some general reflections are due:

- The project served its purposes because all involved:
  - were prepared to look at their own collections against the background of the national (and indeed international) academic geological heritage;
  - were interested to raise their profile through raised the profile of participating institutions as a result of specialisation & collection mobility;
  - see collaboration as a way to cope with basic problems like shortage of time, staff, money, space, etc.;
- The chosen methodology worked well because:
  - the working group in charge of co-ordination included representatives of all relevant collections involved;
  - had an independent chair and an efficient project coordinator;
  - obtained a mandate to take decisions;
  - achieved commitment by faculties and keepers;
  - sought second opinions;
  - obtained crucial involvement of national museums and other relevant institutions; and
  - worked on the basis of an agreed 'protocol of de-accessioning'.
- The concept of sub-collections proved essential to break a 25 year deadlock.
- The exercise as such:
  - led to an overall reduction in volume of around 30-35 %;
  - is evidently both expensive and time-consuming;
  - can only be carried out by well-trained geologists;
  - the job was cleared within the fixed budget and by 31st December 2002.
- Decision making takes much time.
- Approaching potential new owners and reaching agreement on the conditions of transfer takes even more time.
- 40 % government sponsoring triggered > 60 % own input.
- Collaboration was crucial for success 'Dutch Approach'.

Generally speaking, all involved agree that this major operation worked out well and can perhaps serve as an example. The willingness to look at one's own collections against the background of the national (and, indeed, international) academic geological heritage is the essence of the Dutch approach's success. This is neither self-evident nor philanthropic, but signals a pragmatic approach; how can we do more with less? After all, we all have to cope with the same basic problems; shortage of time, staff, money, space, etc. Collaboration and a division of tasks is one possible solution, allowing us to specialise and, as outlined above, has proven to be quite successful. Specialisation raises the profile, but is only possible if clear choices are made regarding the identity of the institution. It is satisfactory that new owners are willing to take care of such a significant number of orphaned collections, pay for their maintenance and are eager to use them, in other words, to give them a second life. This requires an engagement, not only by one's own institution, but also by the professional community at large. Although there remains much to be improved, looking back we all realise that we would not have achieved these results without this collaborative effort and initial governmental funding.

Acknowledgements

The credits for the project's success go to Diederik Visser (project coordinator), Kees de Jong and Nico Janssen (project co-workers), Wouter Los (chairman), and to the keepers of the collections, and to the Mondriaan Foundation, Amsterdam for their encouragements and financial support.

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Appendix: Declaration of Halle, 2000

The declaration reads: "Universities must acknowledge their wide cultural roles. Academic collections and museums provide special opportunities for experiencing and participating in the life of the University. These collections serve as active resources for teaching and research as well as unique and irreplaceable historical records. In particular, the collections of the oldest European universities provide windows for the public on the role of the university in helping to define and interpret our cultural identity. By valuing and promoting this shared academic heritage, our institutions demonstrate a commitment to the continued use of these resources by a broad public." The declaration was signed by representatives of the universities of: Amsterdam, Berlin (Humboldt), Bologna, Cambridge, Groningen, Halle-Wittenberg, Leipzig, Oxford, Pavia, Uppsala, and Utrecht and by the Royal College of Surgeons of England (London) (see http://www.universeum.de).]

Small is beautiful? Progress and collections of the Geology Museum, University of the West Indies, Mona

S.K. Donovan, T.A. Jackson, I.C. Brown & S.J. Wood

Donovan, S.K., Jackson, T.A., Brown, I.C. & Wood, S.J. Small is beautiful? Progress and collections of the Geology Museum, University of the West Indies, Mona. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, 4: 100-107, 4 figs.; Leiden, August 2004.

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Key words — University of the West Indies, Jamaica, geology, museums, collections.

Geology has been taught at the University of the West Indies, Mona, since 1961. The associated Geology Museum (UWIGM) opened to the public in 1969/1970, although the idea for such a museum was over 100 years old at that time. The collections of the UWIGM share many hazards with those in museums in other parts of the world, such as dust, insect pests and indifferent specimen records, and some that are less common, such as earthquakes and hurricanes. The curatorship is not tenured. Since the mid 1980s the UWIGM has become a more dynamic visitor attraction in many ways, shaking off its 'old-fashioned' appearance and expanding the displays to include, for example, its first mounted vertebrate skeleton. An aggressive collections policy involves establishing a type and figured collection, supplemented by rearranged historical collections, such as that of the 19th century geologist Lucas Barrett (1837-1862), and improving holdings of significant Antillean groups such as Cretaceous rudist bivalves, which includes part of the collection of Lawrence J. Chubb (1887-1971).

Contents

Introduction

The only geological museum in the English-speaking Caribbean, located on the Mona campus of the University of the West Indies (UWI) in Kingston, Jamaica, is only about 35 years old (Wood, 1995), but includes specimens and collections of historical significance (Draper, 1976; Wood, 1997; Brown & Langner, 2002; Donovan, 2004). It is worthwhile introducing the University of the West Indies Geology Museum (UWIGM) to a wider audience through this paper, if for no other reason than it has so far failed to be noticed by some of the major international reference works on palaeontological and geological collections. Webby (1989) failed to recognise the existence of a geological museum in Jamaica, even though the UWIGM opened in 1969/1970. Cleevely (1983, pp. 82, 361) included information on L.J. Chubb's rudists in the Institute of Jamaica collections (see below), the rock and fossil specimens from which had been transferred to UWIGM in 1979-1980, and noted (p. 82) that "Rudists in the museums of the Geological Survey of Jamaica and the Geology Dept., Univ. of the West Indies, Kingston were transferred [to the Smithsonian Institution, Washington, D.C.]." Cleevely (1983, p. 101) also noted Lucas Barrett's collection in the Sedgwick Museum, Cambridge, which were also transferred to UWIGM in 1975 (Draper, 1976).

Fig. 1. Plaster bust of Sir Henry Thomas De la Beche (1796-1855) on display in the UWIGM.

The UWIGM is housed in the basement of the De la Beche Building on Mona Campus, home of the Department of Geography and Geology. The museum could easily be missed, particularly as it is away from the main entrance of the building. One of the most delightful features of the museum is the bust of Sir Henry Thomas De la Beche (1796-1855) (Fig. 1), after whom the building was named. De la Beche was the first geologist to publish on Jamaican (and Antillean) geology (as opposed to earlier travellers' reports of caves and scenery; reviewed in Fincham, 1997) and his map of eastern Jamaica (1827) is considered to be the oldest geological map of anywhere in the western hemisphere (Draper & Dengo, 1990; Draper, 1996). De la Beche (1827, pl. 21) also figured an internal mould of the giant gastropod *Campanile*, and used it to correlate the rocks that yielded it with the *Campanile*-bearing London Clay and the sedimentary rocks of the Paris Basin. This may be the first example of intercontinental biostratigraphic correlation (Donovan, research in progress). De la Beche's contribution to Jamaican geology has been discussed by Draper (1996), Donovan (1996a), Sharpe (1997) and Sharpe & McCartney (1998).

University of the West Indies Geology Museum

In early 1986, when the senior author first arrived at the Mona campus of UWI as a new lecturer, the UWIGM was cramped, poorly lit and uninviting. The public display, arranged in a long room in the basement, about one third the length of the building, was maze-like, crammed full of cabinets and display boards, with a relief map of Jamaica at the far end cutting out most of the light and a dismal paint scheme adding to the gloom. Although the first curator of UWIGM in 1969-1970 was Peter Jung from the Natuurhistorisches Museum in Basel, in Jamaica on sabbatical leave, subsequent appointments had been graduate students on one year contracts, who were understandably more interested in finishing a thesis than curating a museum. The displays and administration of the museum started to change in the late 1980s, when the museum was rearranged in a more open style and repainted. By the time it was illustrated by Wood (1995, fig. 2), the display area was less cramped and altogether more inviting to visitors. Since then, the arrangement of the museum has continued to change while adhering to a similar philosophy (e.g., see Brown & Langner, 2002, fig. 1). With the recent arrival of the first mounted skeleton for public display (see below), the museum has been further rearranged to exhibit this specimen in a display case. Some displays, such as the invertebrates from a 'Modern Jamaican coral reef,' have been revitalised with new cabinets, bought with a grant from the Environmental Foundation of Jamaica. Recent conference posters by staff and graduate students provide a changing backdrop around the walls. Though small, the UWIGM has maintained a thrust towards public education through tours for students from preparatory through high schools, as well as mounting displays outside the Museum.

Collections in the UWIGM were originally arranged stratigraphically and by reference to geographic areas of Jamaica. An aggressive collections policy over the past 10 years has resulted in a significant increase in holdings of palaeontological and lithological specimens from Jamaica. However, the wider Caribbean including Central America is also represented, particularly collections from the eastern part of the region. The current arrangement will probably give way to a taxonomic organization of the palaeontology collections and a geographic arrangement of petrological specimens.

Funding

Since the time of its inception the UWIGM has received the bulk of its financial support from the budget of the Department of Geology (now Geography & Geology). The post of museum curator is a university appointment and overhead costs are met through the department's maintenance account. Hurricane Gilbert in 1988 badly damaged the entire University campus and the Geology Museum did not go unscathed. Collections and displays were affected and it was a slow process to restore the museum to its former state.

In the 1990s a concerted effort was made to seek outside funding to rebuild and refurbish the museum, and in the past decade there has been financial assistance from the Environmental Foundation of Jamaica (EFJ) (an agency funded by USAID, the U.S. Agency for International Development) and the University of the West Indies Development & Endowment Fund (UWIDEF) totalling just over 2 million Jamaican dollars (J$35=US$1 at that time). The money has been used primarily to modernize the museum. Two computers were purchased, one of which was dedicated to establishing a computerized database for the museum's collections. A television and VCR were acquired to show educational videos to visitors, in addition to a series of interactive

Fig. 2. Polished, oblique transverse section (viewed under water) of Jamaican Eocene *Campanile* sp. infested by *Entobia* sp. cf. *E. laquea* Bromley & D'Alessandro (after Donovan & Blissett, 1998, fig. 1), UWIGM 1997.17, part of the type and figured collection. Scale bar represents 10 mm.

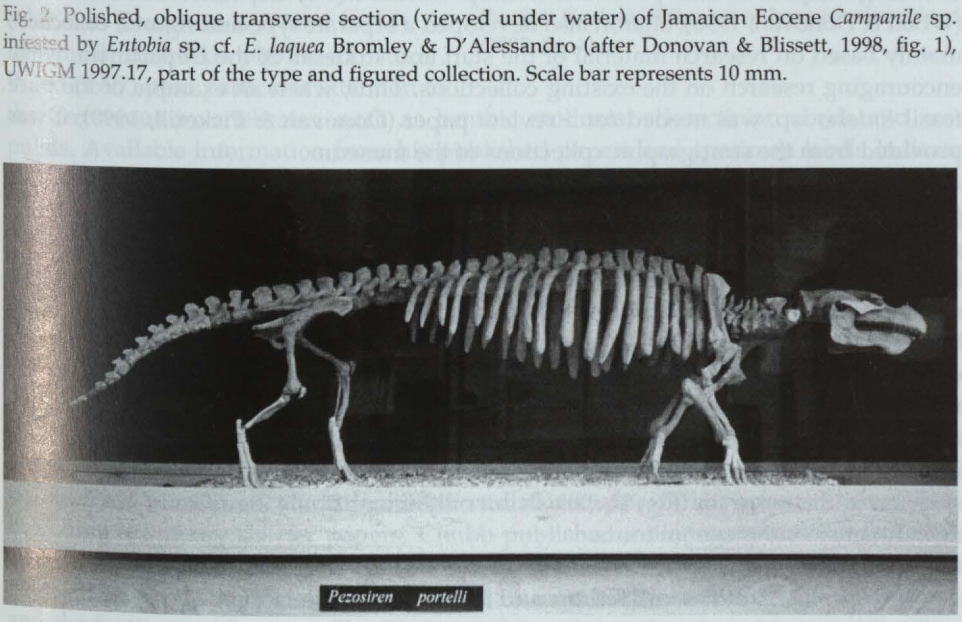

Fig. 3. Cast of reconstructed skeleton of the Eocene quadrupedal sirenian *Pezosiren portelli* Domning, on display at the UWIGM. An identical cast is exhibited at the Florida Museum of Natural History, Gainesville.

computer software programmes. The shelving in the dead storage area was replaced, more visitor-friendly cabinets were introduced in the display section and a small 'rock shop' was established. The purpose of the shop was to generate money to make the museum sustainable and less dependant on departmental funds. Awards from the British Council and UWIDEF enabled museum curator's to visit the Camborne School of Mines Geology Museum (UK), and the Smithsonian Institution Centre for Education and Museum Studies, respectively.

The curators

The criteria for the appointment of curators changed in 1993, when the decision was taken not to appoint graduate students, but to hire graduates who would have the inclination to focus their attention and efforts on the collections. This has done much to secure the collections and improve curatorial standards. The arrangement of a type and figured collection (see below) has encouraged a newly refined focus of palaeontological and historical research in the UWIGM. Sharon Wood was the first 'new' curator of the museum under this scheme, from November 1993-July 1996, followed by Deborah M. Langner and, since September 1997, Ian Brown.

Sharon Wood's contribution included organising new displays, applying for funding in collaboration with Trevor Jackson, then head of the Department of Geology, and writing papers on the collections of the museum. For example, the minimal and inadequate information associated with a septarian nodule was used as an example to encourage improved data provision with specimens newly deposited in the museum (Wood & Donovan, 1996). Sharon also developed a separate type and figured collection, mainly based on research material of the staff and students of the Department, while encouraging research on the existing collections. Thus, when an example of the trace fossil *Entobia* isp. was needed for a review paper (Donovan & Pickerill, 1999), it was provided from the stratigraphic collections of the museum.

Ian Brown has been curator since September 1997 and has carried on the programme initiated by Sharon. The type, figured and historical collection continues to grow. It includes fossil invertebrates collected in Britain and Jamaica by Lucas Barrett in the mid 19th century (see below). New additions have been varied. For example, research on Jamaican Eocene *Campanile* (see above) continues and a rare cast, infested by the sponge boring *Entobia* sp. cf. *E. laquea* Bromley & D'Alessandro, has been deposited as a figured specimen (Donovan & Blissett, 1998) (Fig. 2). The type and figured collection also includes casts and original specimens of vertebrates, none more revered than the recently described Eocene walking sea cow, *Pezosiren portelli* Domning, 2001. A cast of the skeleton of *Pezosiren portelli* is on display, the first mounted skeleton in the museum (Fig. 3). This is not only scientifically significant, but it adds a new dimension to museum tours.

The collections and two notable collectors

The collections of the UWIGM share many hazards with those in museums in other parts of the world. Dust is a nuisance for nine months of the year; the remaining three months are in the two rainy seasons that encourage growth of mould on damp labels. Insect pests include silverfish and cockroaches that eat labels or just the ink. The UWIGM is at risk from flooding during tropical storms and hurricanes (see above), and the position of Jamaica within the North Caribbean Plate Boundary Zone ensures that earthquakes are a constant potential hazard (Ahmad, 1996, fig. 7B).

The UWIGM is home to two historical collections of some note (Brown & Langner, 2002). One is that of Lucas Barrett (1837-1862), first director of the first geological survey of Jamaica (Fig. 4). Barrett's collection, the oldest known from Jamaica, was presented to the museum by the Sedgwick Museum, Cambridge, in 1975. Draper (1976), Donovan & Wood (1995) and Donovan (1996b) examined aspects of the Barrett collection. For example, tests of the echinoid *Hemiaster* sp. represent the oldest known collection of Jamaican Cretaceous echinoids (Donovan & Wood, 1995). In the most detailed published study, Wood (1997) paid particular attention to the Cretaceous invertebrates, such as benthic molluscs, scleractinian corals and serpulids. Available information from his published papers and specimen labels indicate that Barrett's collecting sites in eastern Jamaica were restricted to the areas with limited exposure and poor access in the Blue Mountains (Draper, 1976, fig. 1). Wood's (1997) determination of the known stratigraphic ranges of taxa in Barrett's Jamaican Cretaceous collection demonstrate that these rocks are probably mainly from the Upper Cretaceous, in keeping with other available data.

Fig. 4. Lucas Barrett (1837-1862), first Director of the first Geological Survey of Jamaica, after Wood (1997, fig. 1).

The second notable collection is that of Lawrence J. Chubb, who came to Jamaica in 1950 as an expert on the Pacific islands and the Lower Carboniferous of the British Isles. Chubb had recently retired from University College London. He joined the new Jamaican Geological Survey, and spent the last 21 years of his life researching the Cretaceous stratigraphy and rudist bivalves of the island (Robinson, 1973). His collection of Caribbean, particularly Jamaican, rudists remains an important research tool. In addition to many shorter papers, Chubb published a monograph of the Jamaican Cretaceous rudists in 1971. His collection was dispersed between the British Museum (Natural History), the National Museum of Natural History, Smithsonian Institution, and the Institute of Jamaica. The Institute of Jamaica rock, mineral and fossil collections were transferred to the UWIGM in 1979/1980, including Chubb's rudists. Some of Chubb's specimens form part of a rudist display at UWIGM, exhibited in a new cabinet purchased using funds provided by the EFJ.

Future developments

There is no documented development plan for the UWIGM. However, anticipated developments include improving collection facilities, formulating a collections management policy and expanding the displays of large vertebrates. The first Collections Management Policy (CMP) of the UWIGM is currently being drafted following the introduction of a Research Collections Policy in 2001. The latter document is mainly aimed at postgraduate students who are preparing to deposit their research collections in the museum. The CMP will be a general guide for future curators and collectors to ensure proper management and use of the collections.

Funds are currently being sought to improve the collections facilities. It is intended to provide sealed metal storage cabinets for the protection of all collections, creating a stable environment with humidity controls.

To supplement the display of the cast of *Pezosiren portelli*, the UWIGM is currently seeking a complete skeleton of a modern manatee. These two sirenians will form the basis of a new permanent display of ancient and modern tetrapods of Jamaica.

Conclusions

Although the above discussion is concerned with one small museum in Jamaica, some of the arguments and observations made herein can be extrapolated to similar institutions in Third World settings. We consider that the following general points, arising from the above discussion, may have general applicability.

1. A small geological museum in the Third World can thrive with a dedicated curator and support from within (and outside) a parent institution.
2. International collaborations can be a source of exciting specimens, otherwise beyond the reach of such a museum.
3. Curatorial continuity is important.
4. All of the above enhance the museum's profile with the public locally and professionals internationally.

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Das Sächsische Blaufarbenwesen und der Handel mit Kobaltfarben – nach Unterlagen der Bücherei der Bergakademie Freiberg

Peter Hammer

Hammer, P. Das Sächsische Blaufarbenwesen und der Handel mit Kobaltfarben – nach Unterlagen der Bücherei der Bergakademie Freiberg. (Source material in the University Library of Freiberg (Saxony) on the blue cobalt colour and its trade.) *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, **4**: 108-117, 5 figs.; Leiden, August 2004.

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Key words — Cobalt, Saxony, blue-colour industry.

The German word 'Kobold' is the term for gnomes and goblins. It appeared for the first time in connection with minerals in Agricola's *Bermannus* (1530). The first practical use was in the form of zaffer or cobalt-blue. Zaffer will not melt alone, but accompanied by vitreous substances it melts into an azure colour and so used as 'Smalte' for glazed earthenware, for glass and china.

Since 1470 the Saxony ore mountains, especially the Schneeberg district, was the most important supplier of cobalt ores. Main products of the 'Blaufarbenwerke' were zaffers (Safflor) cobaltoxides of different colours and smalte (Smalte) a mixture of cobaltoxides with quartz. The Electoral-Saxon blue colour was greatly appreciated.

The Dutch managed in their country eight colour-mills and received the cobalt ores from Schneeberg; perhaps in the beginning of the 17th century no mills existed in Saxony. The first mill in Saxony was in 1635 in Pfannenstiel (Schneeberg district). The cobalt-resources were so profitable that the Elector of Saxony privileged the trade and imposed taxes. Private export was strongly prohibited. Cobalt-thiefs were hanged from the gallows.

In 1654, 34 mines produced 264.6 t cobalt-ore with a value of 20,513 Dutch florins. Holland was the greatest trade partner. In the last years of the 18th century, the colour-industry in Saxony and Holland received from the districts of Annaberg and Schneeberg 300-400 tons cobalt-colour per year. Since the middle of the 19th century Saxony imported cobalt-ores from Norway, Italy and Hungary.

Schlüsselwörter — Kobalt, Sachsen, Blau-Farben.

Das deutsche Wort "Kobold" wurde für Gnome und Berggeister verwendet. Die erste schriftliche Erwähnung im Zusammenhang mit dem Mineral findet man in Agricola´s *Bermannus* (1530). Die erste praktische Anwendung war in Form von Zaffer oder Kobalt-Blau. Zaffer schmilzt nicht allein, erst in Verbindung mit Glasschmelzen schmilzt es zu einer azurblauen Farbe und wird so als Smalte zum Glasieren von Tonwaren, für Glas und Porzellan verwendet.

Seit dem Jahre 1470 war das sächsische Erzgebirge, speziell das Schneeberger Gebiet, der bedeutendste Lieferant von Kobalterz. Hauptprodukte der Blaufarbenwerke waren Safflor, Kobaltoxide verschiedener Farbe und Smalte, eine Mischung von Kobaltoxid und Quarz. Die Blaufarben des Sächsischen Kurfürstentums waren hoch geschätzt.

Die Niederländer betrieben in ihrem Land 8 Farbmühlen und erhielten das Kobalterz von Schneeberg, da zu Beginn des 17. Jahrhunderts noch keine Farbmühlen in Sachsen existierten. Die erste wurde 1635 in Pfannenstiel (Schneeberger Gebiet) gebaut. Die Kobalt-Quelle wurde so profitabel, dass der Kurfürst von Sachsen das alleinige Privileg des Kobalthandels übernahm und Steuern auferlegte. Privatexport war streng verboten. Kobaltdiebe wurden am Galgen aufgehangen.

Im Jahre 1654 förderten 34 Bergwerke 264,6 t Kobalterz mit einem Wert von 20513 holländischen Gulden. Die Farbindustrie in Sachsen und Holland erhielt in den letzten Jahren des 18. Jahrhunderts

von den Annaberger- und Schneeberger Gebieten 300 bis 400 t Kobaltfarbe pro Jahr. Seit der Mitte des 19. Jahrhunderts importierte Sachsen Kobalterze von Norwegen, Italien und Ungarn.

Mit der Erfindung des künstlichen Ultramarins und dessen Herstellung aus Ton, Quarz, Soda, Schwefel und Holzkohle, war das "Zeitalter" der Smalte abgelaufen, und ein bedeutendes Kapitel der Sächsischen Metallurgie-Geschichte kam zum Abschluss.

Inhalt

Einführung

In Sachsen waren sowohl auf Grund der natürlichen Vorkommen von Kobalterzen als auch der damit verbundenen Dokumentationen umfangreiche Erfahrungen und Kenntnisse zum Blaufarbenwesen vorhanden. Der Katalog der Bibliothek der Königlich Sächsischen Bergakademie Freiberg umfasste bereits im Jahre 1879 17836 Werke mit 35268 Bänden. Einen unschätzbaren Wert stellen dabei ein Teil des Nachlasses von A.G. Werners (1749-1817) von 4325 Bänden (Thiergärtner, 1967), der schriftliche Nachlass von 78 Foliobänden (Zillmann, 1967) dar, sowie die auf Anordnung Werners entstandenen "Bergmännischen Specimina" (Befahrungsberichte nach bestimmtem Schema, 2939 Berichte zwischen 1770 und 1907) der Königlich Sächsischen Bergakademie zu Freiberg (Manuskripte über Blaufarben Nr.423 bis 428 und 433, 434 und 436, Specimina Nr.2/2217; 2/2229; 2/2264, Reisen nach England, Schweden und Norwegen betreffend).

In einer Bilderreihe "Das Saechsische Blaufarbenwesen um 1790" wird der Vorgang der Blaufarbenherstellung von August Fürchtegott Winckler (Winckler, 1790) anschaulich dargestellt.

Geschichte des Namens Kobalt

Die Bergleute des sächsischen Erzgebirges wurden durch einen Kobold genarrt, der es nicht zuließ, dass aus bestimmten Erzen Metall ausgeschmolzen werden konnte. Zu diesen Erzen gehörte der Kobaltglanz (Cobaltin = CoAsS), in dem der schwedische Chemiker Georg Brandt (1694-1768) im Jahre 1735 das Element Kobalt entdeckte ("Kobalt-König ist das Halbmetall, welches aus den Kobalterzen erhalten wird.") und das demnach dem Kobold seinen Namen verdankt.

Die erste schriftliche Erwähnung in Verbindung mit dem Mineral erschien 1530 in Agricolas "Bermannus". Einen praktischen Nutzen hatte das Kobalterz in Form des Kobaltblaus oder des Safflors, auch Zaffer genannt. Safflor hat die Eigenschaft, nicht allein zu schmelzen. Erst in Verbindung mit Quarz und Pottasche bildet sich eine aufschmelzbare Substanz, die sog. Smalte. In dieser Form ist die Kobaltfarbe zum Glasieren von Steingut und Porzellan und zur Färbung von Glas geeignet.

Herstellung der Blaufarben

Die Herstellung der Smalte basiert auf umfangreichen hüttentechnischen Erfahrungen (Hesse, ohne Jahr) in mehreren Stufen:

- Kobalterz scheiden, trocken pochen, sieben;
- Wismut durch Rösten abscheiden (Wismut ist der Blaufarbe schädlich und kommt stets in Verbindung mit Kobalterzen vor);
- Kobalt calcinieren, Rösten und Arsenik austreiben (geringer As-Gehalt kann verbleiben, er wirkt sich günstig auf die Färbung aus);
- Bereitung der Smalte mit calciniertem Kobalt, Pottasche und Quarz (Pottasche muss rein sein, Kalk ist schädlich, Quarz muss rein sein).

Wie umfangreich und beschwerlich die Arbeiten sind, soll die Beschreibung zur Herstellung der Smalte im Pfannenstieler Werk (Hesse, 2. Teil, ohne Jahr) zeigen: "Beschreibung des Schmelzprozesses. Wenn das Glasschmelzfeuer seinen Anfang nehmen soll, so werden die in der Trockenhaube gut getrockneten Häfen in den Temperofen eingetragen ... dann auch in einen der beiden Schmelzöfen ... wo die allmählich stetig werdende Hitze den vollkommensten Grad der Weißglühhitze Häfen und Öfen nach 3 Tagen erreicht haben müssen. Beim Eintragen der Häfen in den Schmelzofen sind 12 Mann beschäftigt. Sind die eingetragenen Häfen gerichtet und hat der Schmelzofen nach Verlauf von ? bis ? Stunde seinen vollkommenen Hitzegrad wieder erlangt, so bringt man das Gemenge ebenfalls mittels eiserner Kelle ... in die Häfen ein. Was den Gang des Schmelzprozesses selbst betrifft, so bricht man alle Schmelzhäfen nach 5 Stunden Schmelzzeit mit .... Eisen auf. Sind sämtliche 8 Häfen aufgebrochen, so wird von neuem gefeuert bis zur Weißglühhitze.... und rührt die Masse mit oben erwähntem Gezäh, um gut ausgeschmolzenes Smalteglas zu erhalten." Daran schließen sich das Ausschöpfen der Häfen und die Neubeschickung an. (Wöchentlich produzierte man hier 140 Zentner Glas, wobei 16 Klafter 8/4 ell.? Holz verbraucht wurden. Der Wochenlohn eines Arbeiters betrug 2 Taler 1 Groschen.)

Hauptprodukte der Blaufarbenwerke waren: Safflore (Kobaltoxyde) und Smalte unterschiedlicher Farbe und Qualität sowie Nebenprodukte von Wismut und Arsenik und ab 1850 Nickel.

Die blaue Farbe war unterschiedlich in der Tönung (Flandrisches Blau, Holländisches Blau, Preußisches Blau, Sächsisches Blau) und Qualität (O.H. = ordinär hoch, M.H. = mittelhoch, F.H. = feinhoch, O.C., M.C., F.C. ...color, O.E. = ordinär Eschel .... F.S. = feinster Safflor) (Lehmann, 1761). Die Chursächsische Blaue Farbe wird für die schönste und feinste gehalten (Krünitz, 1788, 5. Teil, S. 612).

Bei der Blaufarbenherstellung war besonders der Röstprozess, das Abrauchen des Arsens, äußerst gesundheitsschädlich, und man schritt erst relativ spät ein, um die Schäden zu begrenzen. Rößler schreibt um 1700: "In vorigen Zeiten hat man sowohl in königlich-böhmischen als auch in den meißnischen Erzgebirgen von oben beschriebenen Rauchfängen nichts gewußt, sondern es ist der wilde giftige Rauch von Bren-

Abb. 1. Die Blaufarbenwerker in ihrem Paradehabitus mit Hüttenwerkzeugen. Der Künstler ließ es sich nicht nehmen, die starke Rauchbildung des Prozesses in das Bild mit aufzunehmen (Winckler, 1790). (Workers of the blue-colour industry in parade costume with their equipment. Note the strong smoke development.) ▶


ZEICHNVNGEN
VEBER
DAS SAECHSISCHE
BLAVFARBENWESEN
GEFERT. V. A. F. WINCKLER.

nöfen weg und in die freie Luft geflogen, dabei aber den anliegenden Feldern und Viehweiden merklichen Schaden geschehen/bis im vorigen Seculo der berühmte glückliche Bergmann David Haidler zu St. Joachimsthal im Königreich Böhmen das arsenikalische Schmelzwerk der giftigen Cobalte und anderer wilden Erze erfunden und solche Rauchfänge daselbst erstmals angerichtet hat." "anno 1670 wurde am Weipert eine Gifthütte gebauet und der Cobalt gepuchet, davon wurde der Pilbach so verwüstet, dass kein Fisch mehr darin war ..." "2 Pferde leckten in der Gifthütte, es starben beide ..." "ich habe unterschiedliche Bergleut (Gift- und Kobaltarbeiter) auch Calcinierer gekannt, welchen der Gift Haut und Lungen zerfressen, dass sie geleidet und elende gestorben" (Lehmann, 1699, S. 875).

Von den 17 Bildern der Bilderreihe "Das Saechsische Blaufarbenwesen" von August Fürchtegott Winckler (Winckler, 1790) zeigt das Erste (Abb. 1) die Blaufarbenwerker in ihrem Paradehabitus mit Hüttenwerkzeugen. Der Künstler ließ es sich nicht nehmen, die starke Rauchbildung des Prozesses in das Bild mit aufzunehmen. Abbildung 2 (Nr. 4) zeigt die gesundheitsschädigende Arbeit am Flammofen, dort wo der Röstprozess, die Entfernung von Schwefel und Arsen unter Bildung von Oxyden statt-

Abb. 2. Die gesundheitsschädigende Arbeit am Flammofen, dort wo der Röstprozeß, die Entfernung von Schwefel und Arsen unter Bildung von Oxyden stattfindet (Winckler, 1790). (The unhealthy work at the furnace, where the sulphur and arsen is removed and the oxides are formed, the so-called roasting.)

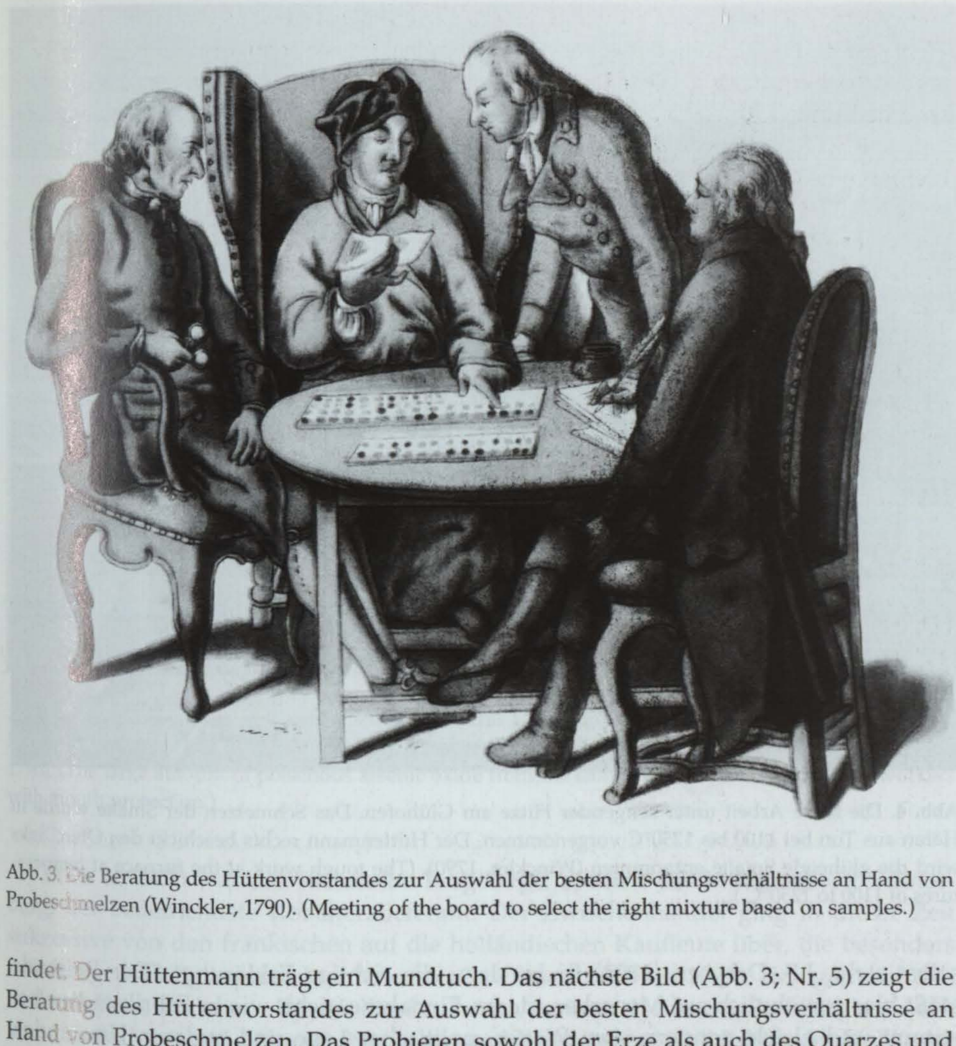

Abb. 3. Die Beratung des Hüttenvorstandes zur Auswahl der besten Mischungsverhältnisse an Hand von Probeschmelzen (Winckler, 1790). (Meeting of the board to select the right mixture based on samples.)

findet. Der Hüttenmann trägt ein Mundtuch. Das nächste Bild (Abb. 3; Nr. 5) zeigt die Beratung des Hüttenvorstandes zur Auswahl der besten Mischungsverhältnisse an Hand von Probeschmelzen. Das Probieren sowohl der Erze als auch des Quarzes und der Pottasche spielte eine entscheidende Rolle für die Festlegung der Mischungsverhältnisse, um bestimmte Forderungen in bezug auf die Farbe und Qualität zu erfüllen. Die verschiedenen Blaufärbungen sind deutlich zu erkennen. Die Arbeit unter sengender Hitze am Glühofen war hart (Abb. 4; Nr. 17). Das Schmelzen der Smalte wurde in Häfen aus Ton bei 1100 bis 1250°C vorgenommen. Der Hüttenmann rechts beschickt den Ofen, links wird die glühende Smalte entnommen. Große Menge des angefallenen Giftmehls (Arsenik: As_2O_3) sammelte sich in den Rauchkammern und wurde von den Arbeitern mit Mundschutz herausgeschaufelt (Abb. 5; Nr. 19).

Der Handel mit Blaufarben

Es ist nun erstaunlich, dass Holland trotz seiner Erzarmut mit an führender Stelle nicht nur des Handels mit der blauen Farbe, sondern auch der Blaufarbenherstellung

Abb. 4. Die harte Arbeit unter sengender Hitze am Glühofen. Das Schmelzen der Smalte wurde in Häfen aus Ton bei 1100 bis 1250°C vorgenommen. Der Hüttenmann rechts beschickt den Ofen, links wird die glühende Smalte entnommen (Winckler, 1790). (The tough work at the furnace at temperatures of 1100 to 1250°C.)

selbst steht. J.F. Droysen (1802) findet dazu die richtige Erklärung: "Der Reisende stößt hier gewöhnlich auf Menschen, deren Einnahme nicht, wie in Fabrikstädten bestimmt und gleich, sondern vom Wetter, politischer Lage und anderen Umständen abhängig und precär ist; sie müssen den Augenblick des Verdienstes benutzen, um sich für die ungewisse Zukunft sicher zu stellen, und nehmen, was sie erhalten können. Die meisten Städte sind Handelsstädte."

So verstanden es die Holländer, Safflor aufzukaufen und die Verarbeitung in Smalte in die eigenen Hände zu nehmen, denn mit der Smalte war ein wesentlich höherer Gewinn als durch den Safflor zu erzielen. Safflor ließ sich preiswert einkaufen und in der verarbeitbaren Stufe der Smalte teuer weiterverkaufen. Jedoch beschränkte sich diese Tätigkeit auf die Anfangszeit bis die Kobalterz exportierenden Länder erkannten, selbst dieses Geschäft zu machen. Unter diesem Gesichtspunkt ist zu verstehen, dass strenge Gesetze und Verbote zum Kobalthandel erlassen wurden. Begünstigt wurde der Handel mit Holland durch in Sachsen, besonders in Leipzig, sesshaft gewordene antwerpische Kaufleute und Manufakturisten, die durch Herzog Alba (Statthalter der Niederlande 1567-1573) vertrieben wurden (Fischers, 1785, S. 657).

Abb. 5. Die große Menge des angefallenen Giftmehls (Arsenikoxyd: As_2O_3), das sich in den Rauchkammern gesammelt hat, wird von den Arbeitern mit Mundschutz herausgeschaufelt (Winckler, 1790). (The large amount of poisenous arsenic oxide from the smoke chambers is removed by workers with mouth protection.)

Etwa ab 1470 war das sächsische Erzgebirge, speziell das Montangebiet Schneeberg, der bedeutendste Kobalterzlieferant. Der Zwischenhandel ging in dieser Zeit sukzessive von den fränkischen auf die holländischen Kaufleute über, die besonders mit fertigen Farbglasprodukten enorme Gewinne von über 100%, bezogen auf den Einkaufspreis, erzielten. Die Holländer hatten in ihrer Heimat 8 Farbmühlen, noch bevor in Sachsen und Böhmen Blaufarbenwerke bestanden. "Die Fabrik der Holländer befindet sich in der Mitte der Wälder, 12 Meilen von jeder großen Stadt entfernt" (Kapff, 1792, S. 101) "Der Graf von Beust glaubt, mit Beihilfe des Baron von Dietrich das Verfahren der Holländer - wovon sie bisher allein im Besitze waren - entdeckt zu haben." "Die meiste böhmische blaue Farbe geht nach Holland, ungeachtet man in Böhmen eben so gute Kobalte gewinnt als in Sachsen: so kennt man doch dort noch nicht die erforderlichen Handgriffe und Vorteile bei Bereitung der Smalte, wodurch die Sachsen nach dem Muster arbeiten, dessen Farbe ohne Fehler verfertigen und die Beschickung darauf einrichten, welches die Böhmen nicht wissen, sondern die Art der erzeugten Schmalte erst nach der Bereitung und durch Vergleichung mit den Mustern festsetzen. ... Holland ist, wie von anderen Metallen und Halbmetallen, also auch von Kobalt-Gruben ganz entblößt".

Das erste Blaufarbenwerk in Sachsen war das Pfannenstieler 1635. Im Jahre 1644 gab es 3 Farbenwerke in Sachsen. Sebastian Oehme baute 1649 das Blaufarbenwerk im

Sehmagrund unter Buchholz. Zschopenthal bestand von 1685 bis 1848. Im Jahre 1830 bestanden in Sachsen 5 Blaufarbenwerke, auf dem europäischen Kontinent insgesamt 20 (Sieber, 1935). Ab Mitte des 19. Jh. wurden in Sachsen ausländische Kobalterze aus Norwegen, Italien, Ungarn u.a. verarbeitet.

Um 1540 kosteten 1 Zentner Blaufarbe in Sachsen 7 Taler 12 Groschen, in Holland 50 bis 60 Gulden (Gerber, 1864), wobei 1 Gulden 2/3 Taler entsprach. 1654 förderten 34 Gruben 264,6 t Erz im Wert von 20513 Holländischen Gulden.

In Sachsen verschärften sich ständig die Anweisungen, Auflagen und Abgaben zum Kobalthandel. An den sächsischen Hof mussten 1602 der "Zwanzigste" abgeführt werden. Dann wurde der gesamte Verkauf landesherrschaftliches Privileg. 1625 erfolgte die Freigabe des Verkaufs an die Besitzer verbunden mit beträchtlichen Abgaben. 1656 wurden Kobalt-Inspektoren eingesetzt. Die Ausfuhr wurde untersagt. Für "Kobalt-Diebe" wurden Galgen errichtet. Ob einer viel oder wenig gestohlen hatte war egal, es führte unwiderruflich zum Strang. Am 17. und 18. Dezember 1790 wurden 6 Kobalt-Diebe eingebracht (Gerber, 1864, S. 50).

Nach allerhöchster Verordnung von 1724 durfte kein Fremder die Farbmühlen betreten (Gerber, 1864, S. 40). Das Betreten der Blaufarbenwerke ohne Genehmigung zählte als Werksspionage. Selbst für die Studenten der Bergakademie Freiberg war eine Genehmigung der obersten Hüttenbehörde notwendig. Carl Friedrich Böbert, Bergmeister von Kongsberg in Norwegen, erhielt keine Genehmigung, das Schindlersche Blaufarbenwerk (Bergamt Schneeberg/Erzgeb.) zu besichtigen. Heimlich besuchte er seine Komilitonen und den Farbenmeister Hesse. Es wurde angezeigt, und Böbert wurde zu 8 Talern Strafe vom Bergamt Freiberg 1831 verurteilt. Auch Hesse und Krell wurden hart bestraft (Emons, M. & H.H., ohne Jahr).

Mit der Erfindung des künstlichen Ultramarins $Na_8(Al_6Si_6O_{24})S_{2-4}$ und dessen Herstellung aus Ton, Quarz, Soda, Schwefel und Holzkohle, war das "Zeitalter" der Smalte abgelaufen. Im Jahre 1854 schrieb J.P. Dippel "In England und Holland sollen in neuester Zeit fast alle Schmaltefabriken die Ultramarin-Produktion eingeführt haben". Auch in Sachsen wurde im Jahre 1855 auf dem bedeutenden Schindlerschen Blaufarbenwerk eine Ultramarinfabrik eingerichtet (Gerber, 1864, S. 52), und ein bedeutendes Kapitel der Sächsischen Metallurgie-Geschichte kam zum Abschluss.

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Palaeontological collections at the Geological Museum, University of Copenhagen: from Cabinet of Curiosities to databases

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Key words — Palaeontological collections, Denmark, Greenland, databases.

Geological collections were established in the University of Copenhagen during the early 1700s with the presentation of fossil, mineral and rock collections by Count A.G. Moltke, mainly assembled by Ole Worm (1588-1654) in his Museum Wormianum. Currently the palaeontological collections in the Geological Museum, alone, contain over 1 million specimens, including 26,000 types. The focus of the collection remains on material from Denmark and Greenland. Highlights from Greenland include evidence of early life from the Archaean Isua Complex, the early Cambrian Sirius Passet fauna, Devonian amphibians, Triassic dinosaurs, mammals and pterosaurs, Jurassic and Cretaceous ammonites together with Jurassic and Cretaceous plants. The Danish collections are dominated by marine invertebrates from the Maastrichtian and Danian of Zealand; spectacular fishes and insects together with less common birds and whales occur in the Paleogene and Neogene rocks of Jutland. The diverse geology of the island of Bornholm has provided rich Early Palaeozoic invertebrate faunas together with abundant brachiopods and molluscs from the Jurassic and Cretaceous together with the first evidence of a dinosaur in the Danish region. Despite this wealth of material the museum faces many challenges associated with the more efficient storage and care of material, computer registration and the encouragement of specimen-based research programmes through both domestic and international networks.

Contents

Introduction

The Geological Museum is an administrative unit within the Faculty of Science of the University of Copenhagen. In addition the museum forms, together with the Geological and Geographical institutes, the Danish Lithosphere Center (DLC) and the

Geological Survey of Denmark and Greenland (GEUS), part of the Copenhagen Geocenter (Harper & Rosing, 2001); and from 2004 will form part of a new, larger administrative unit, The Natural History Museum of Denmark, University of Copenhagen. The Geological Museum fulfils a wide variety of functions involving research, collection care and management, exhibitions, outreach programmes and the education and supervision of graduate students. The majority of staff and students at the museum are engaged in specimen-based research and belong to one of six separate departments: Mineralogy, Petrography, Meteorites, Quaternary-Palaeobotany, Invertebrate and Vertebrate Palaeontology. The collections originated around 1650 and were moved to their present location in 1893. The collections are estimated to contain about 8 million specimens of which about 1 million are fossils.

Short History

The history of Danish Geology has been narrated in some detail (Noe-Nygaard, 1979) in connection with the celebration of the University of Copenhagen's Quincentenary. The university was founded by King Christian I in 1479, but it was unlikely that geology appeared on the curriculum until after the reformation in the late 1530s, when Peder Sørensen (also known as Petrus Severinus) advanced the development of the natural sciences in Copenhagen. Many of these early scholars had good international networks promoting mobility and academic exchange programmes. In particular Thomas Bartholin (1616-1680) made fundamental advances in anatomy including the study of fossil shark teeth. His geological studies were, however, eclipsed by his pupil Niels Stensen (also known as Nicolaus Steno: 1638-1687). Stensen was born in Copenhagen and following studies in anatomy and medicine at university both in Copenhagen and Paris, was appointed court physician to the Grand Duke Ferdinand II in Florence. He later took holy orders and after his death was sanctified. Stensen was, nonetheless, responsible for some remarkable discoveries that helped form the basis for the early development of the earth sciences. Steno's careful anatomical comparisons between fossil sharks' teeth and those of living forms further developed the researches of his mentor Bartholin.

More holistic, and perhaps more influential, were his studies in the Appenines, exposed in the hills and valleys of Tuscany. Here Steno unravelled the Law of Superposition of Strata, still the most fundamental concept in any stratigraphical investigation. Although the folded rocks of the Appenines now form part of the Alpine chain, the strata were originally deposited horizontally with oldest rocks forming the base of the sedimentary pile and the youngest rocks on top. In his last and probably most famous treatise, *De solido intra solidum naturaliter contento dissertationis prodromus*, published in Florence, Steno (1669) established the primary relationships between various groups of strata in Tuscany; clear in this study was his understanding of sedimentary processes and importance and significance of marine and terrestrial fossils. Mountains and volcanoes had not existed since the beginning of time, but were part of an evolving world modified by escaping gases, fire and running water.

Some hundred years later teaching programmes in geology were established in the University of Copenhagen aided by the presentation to the university of fossil, mineral and rock collections from Count A.G. Moltke. It is almost certain that palaeontological specimens were present in the private collections of Ole Worm. The Museum Wormianum, established in the 1620s, was one of the better-known European Cabinets of Curiosities (Weschler, 1995). The collection was assembled by exchanges or gifts and brought a new concept to Danish culture (Bendix-Almgreen, 1993), a showcase of organized natural history material displaying both order and a sense of wonder. Following Worm's death, the collections eventually passed into the hands of King Frederik III, where they constituted part of the Royal Cabinet of Curiosities. Apart from some insects in amber, little palaeontological material can be traced back to these spectacular royal cabinets (Gundestrup, 1991). Nevertheless, by the mid 1650s Thomas Bartholin had established a new collection within the Domus Anatomica. Sadly these collections were lost in the Fire of Copenhagen in 1728, but palaeontological collections again surfaced some thirty years later in the Moltke Cabinet, assembled by Count A.G. Moltke in the 1750s. This material almost certainly included some 500 specimens still extant from Albert Seba's (1665-1736) cabinet; some of this material was subsequently sold to Tessin and became part of the Queen of Sweden's own cabinet. It was Count Joachim Moltke (1746-1818; Fig. 1), however, who pulled together the various collections to establish in 1810 the combined natural history collections within the university. When the Faculty of Science was formally established in 1850, geology was centred on 'Grev Moltkes Universitetet tilhørende Mineralogiske Museum' in Frue Plads (Fig. 2). J.G. Forchammer (1794-1865), a student of the famous physicist H.C. Ørsted, held the chair in mineralogy and 'geognosi' together with the directorship of the Mineralogical Museum.

During the latter part of the 19th Century geology was again relocated. J.F. Johnstrup (1818-94) was instrumental in the establishment of the Commission for the Scientific Study of Greenland in 1876, and the founding of the Danish Geological Survey (DGU) in 1888. The new museum building (Fig. 3) on Øster Voldgade 5-7 was completed during 1893, a year before Johnstrup's death. During the later stewardship of the influential Arne Noe-Nygaard (1908-1991) geology continued to expand. But the core of geological activity was fragmented during 1967 with the expansion and movement of the teaching environment to Øster Voldgade 10, where within the Geological Institute, the departments of General Geology, Historical Geology and Palaeontology, Mineralogy and Petrology evolved soon afterwards. The museum building, however, was retained and renamed 'The Geological Museum' in 1976, more

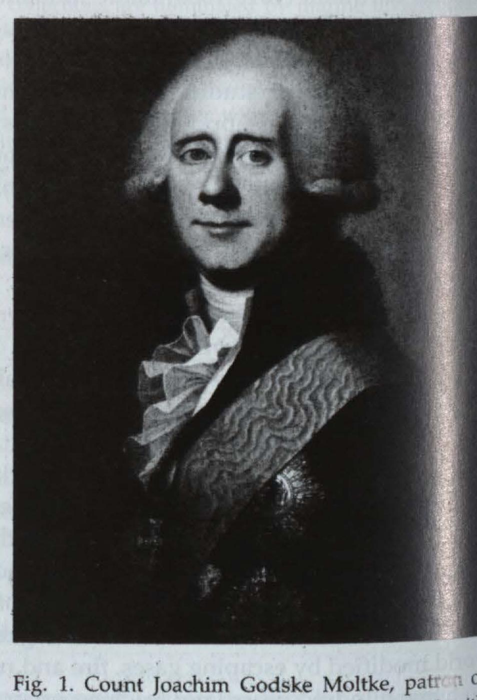

Fig. 1. Count Joachim Godske Moltke, patron of the University of Copenhagen and credited with the establishment of the natural history collections in 1810 (reproduced from Noe-Nygaard, 1979).

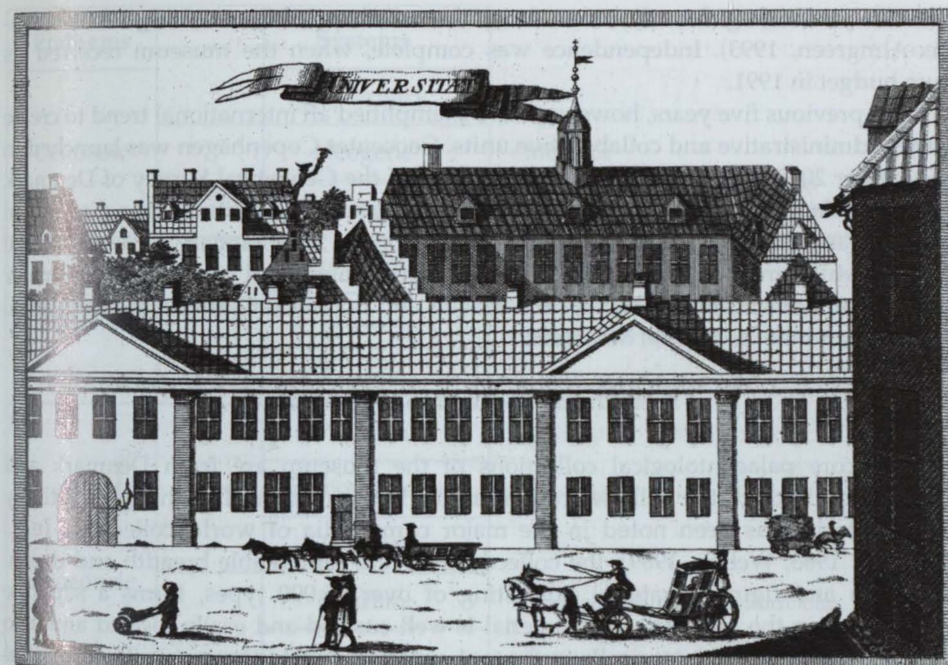

Fig. 2. The Natural History Museum in Nørregade, *c.* 1780 (reproduced from Noe-Nygaard, 1979).

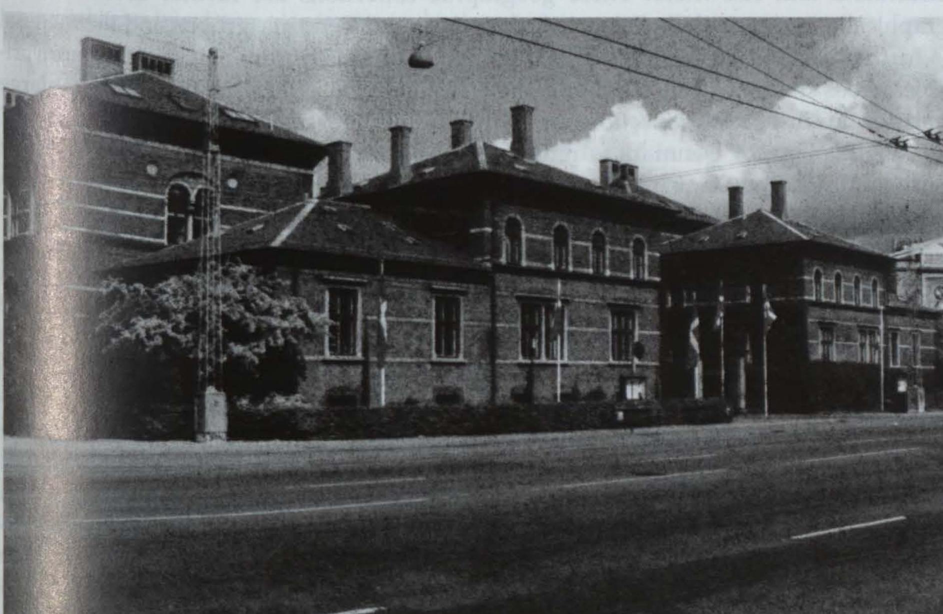

Fig. 3. Purpose built 'Geological Museum', on Øster Voldgade; constructed in 1893. Photograph taken during the museum's centenary (photo: Walter Kegel Christensen).

accurately reflecting the collections, functions and scope of Øster Voldgade 5-7 (Bendix-Almgreen, 1993). Independence was complete, when the museum received its own budget in 1991.

The previous five years, however, have exemplified an international trend to create larger administrative and collaborative units. Geocenter Copenhagen was launched in September 2002 (initially a loose amalgamation of the Geological Survey of Denmark and Greenland [GEUS], the Geological and Geographical institutes, the Geological Museum and the Danish Lithosphere Center) and on the 1st of January 2004 the Natural History Museum of Denmark, University of Copenhagen will commence as a major new institute including the Botanical Museum and Botanical Gardens, the Geological Museum and the Zoological Museum.

Breadth and depth of the collections

The core palaeontological collections of the museum are from Denmark and Greenland although the galleries contain much foreign material. Although relatively little material has been noted in the major compendia of world collections (e.g., Cleevely, 1983; Webby, 1989), the collections have a remarkable breadth and depth. The type and figured material, consisting of over 26,000 types, forms a separate department in the museum. The material is well curated and easily located and also contains a number of historically important specimens including some illustrated by Carl von Linné (Nielsen & Jakobsen, 1993) and Charles Lyell (Bjerreskov, 1993). In broad terms, the very large main collections are divided into those from Denmark, Greenland and elsewhere. These geographic collections are further divided stratigraphically into essentially Palaeozoic, Mesozoic and Cenozoic groups and the material is further divided on the basis of taxonomy. Standards of care and curation are variable across the main collection and there is a need to centralize and conserve large parts of this important collection.

The geology of Denmark is remarkably varied (Rasmussen, 1968; Håkansson & Surlyk, 1997). The Danish collections are derived from a number of key areas from Zealand, the Jutland Peninsula and Bornholm (Fig. 4). The island of Bornholm has provided much material from its relatively complete Lower Palaeozoic successions, developed mainly in deeper-water facies. Both graptolite and shelly faunas have been described in a series of publications. The Mesozoic formations contain diverse ammonite, belemnite and bivalves faunas together with brachiopods; terrestrial facies developed during the mid Jurassic and early Cretaceous contain plants and some vertebrates, including evidence for dinosaurs in the Danish area. Collections from Bornholm have been a focus for scientific study for over a hundred years whereas the material has formed the basis of a number of popular articles (Nielsen, 1988; Hamann, 1988) and provide some of the core material for the museum's permanent exhibition on the 'Geology of Denmark'. On the mainland, exposures south of Copenhagen, particularly along the coast at Stevns Klint and Møns Klint together with those in Faxe Quarry, have yielded abundant and diverse late Cretaceous (Maastrichtian) and Paleogene (Danian) material; the unusual cool-water carbonate facies contains brachiopods, bryozoans, corals and echinoderms together with a wide variety of molluscs and arthropods. West, on the Jutland Peninsula, Paleogene and Neogene rocks,

Erathems		Systems	
Cenozoic		Quaternary	
	Tertiary	Neogene	+ Molluscs +Insects, birds, fishes and whales
		Palaeogene	+ Maastrichtian and Danian marine fossils
Mesozoic		Cretaceous	
		Jurassic	+ Diverse floras from Bornholm + Ammonites and bivalves from Bornholm
		Triassic	
Palaeozoic	Upper	Permian	
		Carboniferous	
		Devonian	
	Lower	Silurian	+ Graptolite faunas from Bornholm
		Ordovician	+ Graptolite and shelly faunas from Bornholm
		Cambrian	+ Mollusc and trilobite faunas from Bornholm

Fig. 4. Highlights from Denmark's fossil record (original).

particularly those in the Eocene 'Mo Clay' facies have yielded extraordinarily preserved bird and insect fossils; occasional whales are found in the younger Oligocene-Miocene strata. Acquisition of material depends not only on research programmes but also on amateur and semi-professional collectors together with local interest groups. An essential part of the acquisition process is Denmark's danekræ ('Danish creature') legislation that allows for the purchase of specimens of exceptional display or scientific value for the Danish State.

Palaeontological collections from Greenland (Fig. 5) have been assembled over a hundred years from the many and various expeditions to different parts of the island by a large variety of Danish and foreign researchers (Escher & Watts, 1976). Exceptional are the early Cambrian, 'Burgess Shale' type faunas from Sirius Passet in North Greenland, the late Devonian amphibians from Kap Stosch, East Greenland, the Triassic mammals from the Carlsberg Fjord region and the spectacular Triassic and Jurassic floras of Scoresby Sound together with the Jurassic and Cretaceous ammonites of East Greenland. The Cretaceous of West Greenland has yielded one of the world's largest mussels (Jakobsen, 1993) and some spectacular floras, including early angiosperms. Such material has provided some important windows on many key events in the history of life on our planet including its origin (Rosing, 1999).

Erathems		Systems	
Cenozoic		Quaternary	
	Tertiary	Neogene	+ Tropical floras
		Palaeogene	
Mesozoic		Cretaceous	+ Early angiosperms
		Jurassic	+ Jurassic ammonites from Jameson Ld + Late Triassic - Early Jurassic floras
		Triassic	+ Late Triassic dinosaurs, mammals and pterosaurs
Palaeozoic	Upper	Permian	+ Early Triassic amphibians and sharks
		Carboniferous	+Permo-Carboniferous marine fossils
		Devonian	+ Late Devonian Kap Stosch tetrapods
	Lower	Silurian	+ Ordovician-Silurian reefs
		Ordovician	
		Cambrian	+ Early Cambrian Sirius Passet fauna

Fig. 5. Highlights from Greenland's fossil record (original).

Role of a Geological Museum within both a Geocenter and Natural History Museum Complex

Although most university museums have teaching responsibilities together with the supervision of graduate students, a museum's basic products are usually quite different from those of related teaching departments. The care of collections, development of exhibitions and outreach programmes together with research determine the core activities of a museum. Much research is specimen-based and commonly taxonomic. Nevertheless geological research is commonly more process based than that of the biologically-orientated museums. The key products of a museum involve typically the numbers of visitors (including school, college and society groups) to exhibitions, guest scientists to the collections together with the numbers of public enquiries and acquisition and registration of material; additionally the rate of development of new and relevant exhibitions together with the numbers of field excursions and popular lectures are important indicators of the success of a museum system. The Geological Museum has already defined its role within Geocenter Copenhagen as the focus for the promotion of new data and discoveries within the earth sciences (Harper & Rosing, 2003) through exhibitions, publications and the media. The museum will bear all responsibility for the fossil, mineral and rock collections within the new Natural History Museum of Denmark, University of Copenhagen and will drive exhibition and research programmes in these areas.

Towards a web-based database

A high priority is the computer registration of the palaeontological collections in Copenhagen. Increasing numbers of enquiries from the global scientific community has promoted an increase in both loans and visitors, particularly through the EU funded COBICE (Copenhagen Biosytematics Center) scheme. A relational database based on Microsoft ACCESS built around subsets of information targeting the taxonomy together with the stratigraphical and geographical location and distribution of the taxon has been developed. The database also combines the ability to generate loan forms, various styles of labels and tracks outstanding loans. The palaeontological type collection is currently being converted into electronic data with an aspiration to generate a web-based system in the next few years. The type collection alone involves the computerization of some 26,000 specimens together with all relevant information on associated labels and in the museum's protocols.

Concluding remarks

Increasing interest in fossil collections from Denmark and Greenland has promoted a reorganization of many parts of the collections and the development of a computerized database. A greater awareness that museum collections are not just objects for curation but the basic scientific tools of specimen-based researchers, has prompted a more responsible attitude to the collections. But should museums be characterized by their existing collections or should they now develop new and more relevant acquisition strategies (Thomson, 2002)? The palaeontological collections in Copenhagen are principally from Denmark and Greenland; the museum is a centre of excellence in this area. The museum remains a focus for collections from these regions together with data and information relevant to the cultural aspects of the material and the acquisition. Within the last number of years palaeontological collections that developed from a sense of wonder displayed in Worm's Cabinet of Curiosity, have emerged as objects of intensive and serious scientific study, ready to take their place in global databases.

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The Tegelen clay-pits: a hundred year old classical locality

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Key words — Tegelen, Tiglian, Pleistocene, fossil mammals.

Having been described in 1904 by Dubois as a locality for fossil mammals, the Tegelen clay-pits are nowadays considered a 'classical' locality. It is the type locality of the Tiglian, a warm period of the Early Pleistocene or Late Pliocene. The pits are primarily known for their mammalian remains, but have also yielded seeds, pollen and freshwater snails. A century of collecting has resulted in extensive collections of large mammals in various museums, the most important of which are the Teylers Museum, Haarlem and the National Museum of Natural History Naturalis in Leiden. The latter museum also holds a large collection of microvertebrates, collected during campaigns in the 1970s. These campaigns showed that, in spite of the numerous fossils, the Tegelen Clay is in fact a relatively fossil-poor locality. Collections were assembled by workers, processing vast amounts of clay for the local ceramic industry. Thus, although technically an *in situ* locality, the exact provenance of the various fossils is largely uncertain.

Contents

Introduction

Palaeontology knows many so-called classical localities, that is, renowned fossil sites that have helped shape our ideas about the evolution of life on earth. More often than not, these sites are no longer accessible. The fossiliferous levels may have been exhausted or the quarry where these layers were exposed may have been turned into a waste-dump. Also, some of the sites owe the discovery of their fossil contents to the primitive quarrying techniques used in the 18th and 19th centuries, when a lot of the excavation work was still done by hand. Even if these quarries are still in use, the modern machinery may destroy the fossils before they are discovered. Thus, museum collections play a key role in keeping these sites available for study by preserving the fossil specimens they yielded.

But what is it that makes a fossil site a classical locality? First of all, they are usually old localities, already known in the 19th or early 20th century. Sites that have been discovered early in the history of palaeontology stand a bigger chance of becoming well known. Thus, the Burgess Shale is labelled a classical site, certainly after the publication of Gould's "Wonderful Life" (1989), whereas the Chinese locality of Chengjiang (Province of Yunnan) is not as well known, even though it yielded similar fossils that are even older and more complete. Nevertheless, even localities that have been discovered in recent times may already have entered the books as 'classics'. Because of the exceptional feathered dinosaurs of the Yinxian Formation in the Chinese Liaoning province, these fossiliferous levels rank among the best-known fossil sites in the world.

The Burgess Shale and the Yinxian Formation show a second characteristic of classical localities; they yield exceptional fossils. Most of the famous localities are Lagerstätten, in which soft body parts are also preserved. Good examples are the German Jurassic localities of Solnhofen and Holzmaden, known for their flying reptiles and *Archaeopteryx* fossils and beautifully preserved ichtyosaurs and plesiosaurs, respectively (Pinna & Meischner, 2000). To give a further example, but outside of vertebrate palaeontology, the Devonian starfishes and other echinoderms from the Hunsrück Schiefer are of international importance. The combination of long histories and beautiful, interesting fossils give sites their claim to fame, making them classical localities.

Despite the Pleistocene of The Netherlands having yielded an enormous number of mammal fossils, Dutch mammalian palaeontology knows only one classical locality, the clay-pits near the town of Tegelen (Province of Limburg). Tegelen certainly answers to the criterion of being an old locality, being discovered as a site for fossil mammals at the beginning of the 20th century. Here fossils are found *in situ*, which is rare for The Netherlands since most mammal fossils are either suction dredged or have been found by fishermen in the North Sea and Scheldt Estuary. Tegelen has not yielded exceptionally well-preserved fossils, the material consisting of disarticulated (fragments of) bones and teeth. However, it is exceptional in having yielded a wide variety of types of fossils. Both macromammals and micromammals have been found (which is by no means usual for a mammal locality); it has yielded a rich seed flora, and has been extensively sampled for pollen; and a freshwater fauna of molluscs has been obtained from the clay. Finding different types of fossils in one locality provides a tie point for various stratigraphies. For Tegelen this is particularly important, since the clay-pits are the type locality for the Tiglian, an interglacial stage widely used in the chronostratigraphy of northwestern Europe. This, of course, has greatly contributed to it becoming well known among (mammal) palaeontologists.

In this paper I look at the history of Tegelen and the role of various museum collections in the study of this classical locality. The focus lies with the mammals, the group for which the locality is most famous. Knowledge of how these collections came into being is important for studies pertaining to the locality. After all, museum collections are all we have, now that the Tegelen clay-pits, like so many other old localities, are no longer accessible.

Tiles, bricks and pottery

The first fossils from the Tegelen Clay were discovered about a century ago. By then, the clay beds themselves were already well known. They had been used for ceramic purposes for nearly 2000 years. A Roman pottery kiln, excavated in the nearby town of Venlo, shows that the qualities of the Tegelen Clay have long since been known. This is, in fact, also recognisable in the name Tegelen, which is derived from the Latin word 'tegula' meaning roof tile.

Possibly the Tegelen Clay was already used in medieval times for making bricks or at least in the 16th century. In the middle of that century brick factories appeared throughout The Netherlands wherever clay was found. Bricks were in popular demand, since the construction of wooden houses was forbidden because of the fire hazard. Nevertheless, the first record of a ceramic factory in Tegelen, is not of a brick, but of a tile factory, viz. Houba & Kamp, founded in 1773. Again, it was a building regulation that provided the industry with a market. The Duchy of Gulik, of which Tegelen was part, had ordained in 1759 that roofs should be covered with tiles. Until that time, in times of drought, the thatched roofs regularly caused entire villages to be burned to the ground (van den Hoek Ostende, 1990).

There are no records of potters in the Tegelen area since Roman times up to 1733, nor have many shards from that interval been found. Nevertheless, it is likely that pots and pans were formed from the clay prior to the 18th century. At least we know from the archives that in 1733 three potters had their workshop in Tegelen, Godefridus Driessen, Laurentius Kempges and Dominicus Spohr (Ernst *et al.*, 2003). Considering that Tegelen had only 400 inhabitants in those days, this was a major industry and a growing one at that. In 1812 Tegelen counted 12 potter workshops, and in 1830 the number had risen to 20. These were the heydays for the potters. Tegelen was famous for its black pottery as well as for its three-coloured ceramics. The latter was made using different types of clay, which after heating took either a red, yellow or black colouration. Tegelen pottery was made both for the Dutch market and for export. Ships sailed up the Meuse to nearby Steijl, such as the 'Teclanette' from Hannover, which loaded 33,000 pounds of black pottery in 1835 (van den Hoek Ostende, 1990).

This industry fell into decline in the middle of the 19th century, as a competitor in Maastricht started producing imitation China. Soon pottery was no longer a major industry, although Tegelen never forgot its tradition and potters are still active in the region, creating ceramic works of art. However, as the demand for kitchen utensils from the Tegelen Clay fell, the demand for other products rose. The high quality of the clay made it ideal for roof tiles, and the industry gradually increased from its first start in 1773. In 1812 there were three 'tile shops' and in the second half of the 19th century the small village held nine companies manufacturing tiles. Apart from tiles, the clay was also suitable for making chimney bricks, a market for which arose as the Industrial Revolution took place in The Netherlands and the nearby Ruhr area in Germany. Particularly around 1870, the German market was very important for Tegelen, since at the time much of the German labour force was mobilised for the war against France. Germany tried to protect its own industry by demanding high import fees for tiles, but this was circumvented by the Tegelen firms by simply opening a workshop just across the border. In the end the German market was lost after all to the domestic industry, and Belgium became increasingly important as a tile market. Export came to a halt in World War I, but bloomed again afterwards, as Belgium and northern France started repairing the war damage.

In order to fulfil the demands, enormous amounts of clay were extracted. An estimated 30.000 tons of clay were processed each year. Around 1900, 8.5 million tiles were made. In 1928, the firm Teeuwen alone produced 28 million tiles. Extracting the clay was mainly done by hand by clay diggers. Traditionally autumn and winter were the digging season, and summer was used to dry the clay. As more and more artificial drying installations came into use, the digging could continue all year round. And while the diggers were delving the clay, they regularly encountered bones, antlers and teeth. The large collections of Tegelen fossils could be made as a direct result of this manual labour. As Schreuder (1945) wrote, "we owe it to the spade-digging by the firm of "Canoy-Herfkens" that in the last decennium new mammals, such as *Desmana tegelensis*, *Hypolagus brachygnathus* and *Pannonictis pliocaenica* have been recorded." The method of collecting also had its drawbacks. The bones were not always easily recognised and very vulnerable in the wet clay. As Schreuder (1945) remarked, "The bones of the elephant, when wet, are so little resistant that the spade cleaves them without the workman observing this." This may have lead to some painful losses. From parts of skull and a fragmentary dentition of *Hyena perrieri* collected in 1943, Schreuder (1949) surmised that an entire skull with mandible must have been present, but had been destroyed while collecting the fossil.

Schreuder (1945) already recorded that mechanical digging was coming more and more into use. In the 1960s the ceramic industry reached its peak. Each year, among other products, 60 million tiles were made. The huge amounts of clay needed no longer came from the clay pits in the vicinity alone, but were also imported. However, as other building materials became available, the industry rapidly declined. Some firms switched to concrete and plastics for the fabrication of tiles, others simply closed down. Today, some small digging operations in the area still continue, but those firms still producing ceramic products largely obtain their raw materials from elsewhere. The former clay-pits between Tegelen and Venlo are now flooded, and form a small nature reserve.

The Teylers Museum collection

The first collection of bones from the Tegelen Clay was made by a student of medicine, Laurens Stijns. In 1897 he contacted Eugène Dubois (Fig. 1), who had just returned from the Dutch East Indies, where he sought and found fossil evidence for a missing link between ape and man (de Vos, 2004). After having published the first description of his Java man, *Pithecanthropus erectus*, Dubois returned to Europe to participate in the scientific debate caused by his find. Dubois' star was rising rapidly, and in 1899 he obtained a position as geology professor at Amsterdam University and became curator at Teylers Museum in Haarlem. At the time Stijns contacted him, Dubois was still preoccupied with the discussions on *Pithecanthropus*. It wasn't until 1902 that he visited the Tegelen clay pits. As he was travelling with two students towards the Pietersberg near Maastricht to look at the Dutch Cretaceous, Dubois made a stop at Tegelen. Later he reported to the directors of Teylers Museum in his

Fig. 1. Eugène Dubois was the first to describe the fossil locality of Tegelen.

annual report, "On route to Sint Pieter, with your permission, I made a visit to a recently discovered locality for fossil mammals from the end of the Tertiary or the beginning of the diluvial period at Tegelen near Venloo. I was granted the opportunity to collect some fossils with great scientific value, which now have been incorporated in the cabinet. As a result of the finds, you instructed me to inspect a larger collection that was previously gathered by Dr. Stijns in Venloo and, if possible, to obtain it at least as a loan for a comparative study."

The newly discovered locality was indeed of great scientific importance. Up to the beginning of the 20th century, the Dutch fossil mammal record consisted of solitary finds (Rutten, 1909). The collection made by Stijns showed that in Tegelen an entire fauna could be collected from a single locality. Securing Stijn's fossils for Teylers Museum gave Dubois a head start in building up a collection. To expand it, he had found a useful partner in August Canoy. During his first visit to Tegelen he had contacted this director of the firm Canoy & Herfkens. Theirs was a fruitful partnership and one that was strengthened by family ties, as Dubois' brother Alphons was married to Marie Canoy. Canoy kept track of the fossils that were found in his clay pits and regularly sent shipments to Haarlem. Dubois did not excavate himself, but just waited for the finds to come to him. Still, he occasionally visited the clay pits. We know from a letter to the directors of the museum that on the 12th of October 1905 the find of a complete antler prompted him to immediately travel to Limburg "to prevent that this valuable find would be damaged by the workers or be lost to us." The trip cost Dfl 28.50, which besides travel expenses included purchasing the antler and some other fossils. This shows that Dubois rewarded finds quite handsomely, which certainly was an incentive to workers to keep a close look-out for fossils.

Dubois published his first account of the new locality in 1904. He argued that the mammal fauna from Tegelen showed a strong resemblance to that of the Cromer Forest Bed, indicating a similar age for the two localities. Even though the deer differed, the English and the Dutch locality held the same species of horse, rhinoceros, extinct beaver and hippopotamus. In fact, the presumed presence of a hippopotamus in Tegelen was based on the misidentification of a canine of the pig *Sus strozii*. Even though the fauna showed some resemblance, the flora did not, leaving the Dubois' correlation open to doubt. A year later Dubois (1905) published a paper on the deer fossils from Tegelen. He never described any of the other fossils. Sitting down and patiently producing descriptions was not in line with his character, as is also apparent from the lack of description of the huge faunas he found on Java. Nevertheless, Dubois was still very much interested in Tegelen. In 1906 he made a bore hole in the clay pit of Canoy & Herfkens. The core showed that a gravel bed underlay the clay deposits. According to Dubois, this indicated that the warm period in which the clay was deposited had been preceded by a glacial. This was at the time quite a revolutionary thought, since this would imply a glacial occurred already before the Pleistocene.

The Tiglian, its flora and fauna

The paper by Dubois (1904) was noted by Clement Reid, who together with his wife Eleanor worked on the seed flora from the Cromer Forest Bed in Norfolk, England. Reid was invited by Dubois to study the seeds from Tegelen. They visited the clay pits together in 1905, but this certainly was not the beginning of a lasting friendship. In an article on the Tegelen flora (Reid & Reid, 1907) C. Reid related how he and Dubois took an equally sized sample of clay. From it, Dubois retrieved eight to ten species only, whereas Reid found 51 different types of seeds, as well as remains of small vertebrates, including rodents. Publishing this anecdote was not appreciated by Dubois. Moreover, Reid's studies resulted in various conclusions which directly opposed Dubois' ideas.

Reid came to the conclusion that Tegelen and the Cromer Forest Bed were not of a similar age, as Dubois (1904) had suggested. The Tegelen flora consisted for 15% of exotic elements that in Europe were known from the Tertiary only and were not found in the Cromer Forest Bed. Sampling clay beds near Reuver, to the south of Tegelen, which by Dubois were considered to also belong to the Tegelen Clay, Reid found that these exotics accounted for 50% of the flora. He considered therefore that the Reuver beds were older than the clay in the Tegelen clay pits. There was, however, one conclusion of Dubois that Reid endorsed. He explained the differences in the proportion of exotics, which can now be found in subtropical regions in Asia and the eastern United States, as a result of consecutive glacials. The east-west orientation of the European mountain ranges prevented a simple southward shift of vegetation zones during cold periods. Since a first drop in the percentage of exotics occurs in Tegelen, Reid assumed, like Dubois, that the deposition of the Tegelen Clay must have been preceded by a glacial period. Based on the percentages of exotics, Reid and his wife defined stages, Reuverian for the older clay beds to the south and the Teglian (= Tiglian) for the period in which the clay near Tegelen was deposited (Reid & Reid, 1915). A glacial following the Tiglian drove all of these exotics, with a few exceptions only, from Europe.

The Tegelen collection in Teylers Museum grew steadily as a result of shipments from the Limburg village, but Dubois was quickly loosing interest in the subject. When van Regteren Altena (1951) made a catalogue of the Tegelen collection in Teylers Museum, he found a box of fossils sent in 1913 that had not even been opened. Quoting Schreuder (1928), Zagwijn (1998, pp. 26-27) wrote that around 1908 at the time "wagon-loads of dear antlers and other remains" from the pit Canoy Herfkens were shipped to Germany. Certainly the "wagon-loads" from the quote have to be interpreted to signify the small lorries commonly used in the pits (Zagwijn, pers. comm., 2003). I did not find the original quote in Schreuder (1928), but the anecdote seems unlikely. German collectors were active in the area, and a collection of fossils did find its way to Berlin, but these collectors were mainly active in other pits (van den Hoek Ostende, 1990). On the other hand, Schreuder (1945, pp. 158-159) relates that some parts of the Tegelen Clay were clearly richer in fossils than others, and it is possible that around 1908 an accumulation of fossils was found.

Dubois was probably loosing interest because he got fed up with the discussions. Apart from his differences of opinion with Reid, his geological interpretations were now also being questioned. Tesch (1909) did not find the 'fluvial-glacial' gravel Dubois had encountered in his boring. Finally, Dubois (1911) wrote one final paper in which argued that the palaeontological evidence for the age of Tegelen was being disregarded by the geologists working in the area. As to Reid Dubois remarked in the same article that his methodology was so precise, that surely his results could not be compared with other floras, since these would not have been sampled with the same scrutiny.

What needed to be done was to properly present the palaeontological evidence provided by the mammals. This, however, involved making detailed taxonomic descriptions, a task that did not fit Dubois flamboyant character. As with his extensive Indonesian collection, he left this tedious work to his assistants. Father Bernsen, a Jesuit priest, was appointed as Dubois' assistant in the collection "Indian fossils" in the 'Rijksmuseum van Natuurlijke Historie' in Leiden. Bernsen had studied under Dubois, completing his Ph.D. thesis on the Tegelen rhinoceroses in 1927. Schreuder (Fig. 2) was the assistant of Dubois at the University of Amsterdam. She, too, finished a Ph.D. on Tegelen fossils and produced an excellent description of the remains of the beavers from the Tegelen Clay (Schreuder, 1928).

Fig. 2. In the 1930s and 40s Antje Schreuder was recognised as the leading specialist on the Tegelen fauna.

After his study of the rhinoceroses Bernsen set out to describe the remainder of the fauna in a series of articles published in *Natuurhistorisch Maandblad*. After his untimely death in 1933, Schreuder finished the series. She herself had been left without a formal position after Dubois retired and remained as a guest scientist at the 'Zoologisch Museum' Amsterdam. Her palaeontological work earned great respect, both nationally and abroad. Not only did she continue working on the Tegelen fauna, but she also pioneered in the study of fossil rodents and insectivores that were retrieved from bore holes set by the Geological Survey. Since she was recognised as the specialist on Tegelen, it was logical that collections were now sent to the 'Zoologisch Museum'. The museum possesses a small collection made by Father Weingärtner between 1909 and 1912, which was studied by Schreuder for her thesis, and also obtained fossils collected at Tegelen by Böhmers and van Bemmel between 1928 and 1934 (van Det & van den Hoek Ostende, 2002). In the same period, Teylers Museum obtained its last donation of Tegelen fossils from the local headmaster, Storms. A third museum that regularly received fossil mammals from the Tegelen clay-pits was the 'Natuurhistorisch Museum Maastrich'. In particular, Rector Jos Cremers, the founder of the Limburg Natural History Society, was instrumental in securing a collection of these Limburgian fossils for the Maastricht museum.

The Leiden collection

In the 1940s there was still no standard stratigraphy for the Dutch continental Pleistocene. The development of a stratigraphic framework was started by van der Vlerk, who was appointed Professor of Geology in Leiden in 1938, and would later become the director of the 'Rijksmuseum van Geologie en Mineralogie'. Before coming to Leiden, he had worked in the Dutch East Indies, where he had developed a stratigraphical framework using foraminifera for the oil industry. Van der Vlerk co-operated closely with Florschütz, a palynologist. Since van der Vlerk himself worked on mammals, the two could combine the vertebrate record and the pollen record for their stratigraphy. Obviously, Tegelen, as type locality of the Tiglian, played an important role in this enterprise (van der Vlerk & Florschütz, 1950).

Throughout the 1950s, excursions to the Tegelen clay pits were made by the curators of the mammal collection of the 'Rijksmuseum van Geologie en Mineralogie', which forms now part of the National Museum of Natural History, Naturalis. Although the clay beds were by this time exploited mechanically, fossils were still being found. Van der Vlerk, Brouwer and most of all Kortenbout van der Sluijs (Fig. 3) rounded up a large number of fossils during their visits to the clay pits, and over the years gathered the largest collection of Tegelen mammal fossils. The labels of these collections feature all kinds of different locality names, suggesting that they are derived from different pits. Indeed, there were various pits in which clay was exploited (Kortenbout van der Sluijs & Zagwijn, 1962). However, the name on the label could also refer to the one of several companies holding a concession for a particular section in a single

Fig. 3. Kortenbout van der Sluijs was largely responsible for gathering the collection of Tegelen fossils in the Leiden collection.

pit (Freudenthal, pers. comm. August 2003). Although a lot of material was thus collected, very little was published on the fauna. During the same period, a student of Florschütz, Zagwijn, was studying the pollen record. The palynological studies of Zagwijn (e.g. 1963a, b), who was at that time the palynologist of the Geological Survey, over the years provided the stratigraphical basis for the subdivision of the Dutch Pleistocene as it is currently still in use.

The few publications on Tegelen mammals that appeared at the time were on the tapir from the Maalbeek pit (Kortenbout van der Sluijs, 1961), which is somewhat older than the fauna found near Tegelen, and the first description of a fossil panther found near Tegelen (von Koenigswald, 1961). The reason so little was published, is that the study of the Tegelen Clay and its fossiliferous content was intended as a Ph.D. thesis for Kortenbout van der Sluijs. His notes, including work on micromammals, were, however, never published (Zagwijn in litt, November 2003). Although little appeared in terms of scientific publications, the Leiden collection provided the inspiration for a reconstruction of the Tiglian landscape (Fig. 4). This large painting, showing both the flora and fauna of Tegelen, was made by Ben Collet under the directions of the scientists of the 'Rijksmuseum van Geologie en Mineralogie' (Schalke & van der Wilk, 1995). Other than that, a paper appeared on the stratigraphy of the Tegelen clay pits (Kortenbout van der Sluijs & Zagwijn, 1962). As the industry dwindled, most clay pits were abandoned and flooded, so no more fossils of large mammals were found. The Pit Russel Tiglia Egypte was turned into a nature reserve and geological monument.

The remains of small mammals were known to occur in the Tegelen Clay since 1905. Reid had encountered some vertebrate remains, including rodent molars, in the sample he took for his seed studies. These were described by Newton (1907). Schreuder (1940) even named a subspecies of watermole after Tegelen, *Desmana thermalis tegelensis*. However, small mammal fossils were a rarity in the Tegelen collections. In 1970, Thijs Freudenthal of the Rijksmuseum van Geologie en Mineralogie was tipped by Zagwijn that the water levels in the pit Russel-Tiglia-Egypte were to be lowered for a month, making the site accessible once more (Freudenthal *et al.*, 1976). Freudenthal decided to seize what seemed to be the last opportunity to collect small mammals from Tegelen. His goal was twofold. Freudenthal intended to make a large collection of rodents and insectivores to complete the faunal list of Tegelen, but also wanted to develop a method of sieving that could be used to process large quantities of sediment in search of small mammal fossils (Fig. 5). The expeditions took place yearly between 1970 and 1977, and were successful on both counts. Over 5000 molars of rodents, insectivores, bats, and hares were collected for the Leiden museum, and the sieve that was developed at Tegelen is now used, with some modifications, throughout the world for collecting small mammals.

Given the large amounts of sediments processed in the pursuit of micromammals, it is surprising how few (<10) larger mammal fossils were found during this campaign. These expeditions were the first true excavations in the Tegelen Clay, the other collections having been obtained by gathering chance finds of clay workers. Thus, the work of Freudenthal and his team showed that in fact the Tegelen Clay is very poor in fossils. This even holds true for the micromammals. Even though *c.* 5000 molars were found, this amounts to on average just 28 molars/m^3.

Fig. 4. Reconstruction of the Tiglian landscape based on the fossils from the Tegelen clay pits (painted by Mr. B. Collet of the former 'Rijksmuseum van Geologie en Mineralogie').

New life to old collections

Since Freudenthal's principal research interests were the Tertiary faunas of the Mediterranean, he did not occupy himself with the Tegelen fauna other than an account of the field campaign (Freudenthal *et al.*, 1976). Van der Meulen, a palaeontologist at Utrecht University who had joined in the excavations at Tegelen, was working on Pleistocene faunas at the time, and thus part of the samples went directly, and unsorted, to him in Utrecht for further study. There the shrews and desmans were described in the Ph.D. theses of Reumer (1984) and Rümke (1985), respectively, and the voles were described by Tesakov (1998). The shear bulk of sediment processed at Tegelen – 180 m^3 of clay were sieved – resulted in large residues, the last of which were sorted in 2001. Recently papers have appeared on the flying squirrels (Reumer & van den Hoek Ostende, 2003) and dormice (van den Hoek Ostende, 2003). The remainder of the micromammal fauna is still under study.

Like the micromammal collection, the large mammals from Tegelen in the Leiden collection remained unstudied for a long period of time. As was mentioned above, they were intended as part of the Ph.D. thesis of Kortenbout van der Sluijs, which, however, never came to be. In the 1980s the descriptions of most mammals

Fig. 5. In the 1970s huge amounts of clay were sieved in the search for micromammals.

dated from at least thirty years before, and were badly in need of revision. Most of the fossil mammals from classical European localities had been described separately, and many (sub)species had been defined. In order to facilitate comparisons between the various localities, new taxonomical descriptions were needed. As de Vos became curator of the Pleistocene mammal collection in the museum, he enticed specialists to study the Tegelen material. The *Trogontherium*, an extinct beaver, had at that time already been re-studied (Mayhew, 1978). Now, material from the Tegelen collections was used in studies on the rhinocerosses (Guérin, 1980), the pig (Faure & Guérin, 1984), the elephant (Guenther, 1986), the mustelids (Willemsen, 1988), the deer (Spaan, 1992), and the panther (O'Regan & Turner, in press). Due to these studies, it becomes more and more clear that the Tegelen fauna is the type of fauna one would expect in the Villafranchian, and shows large similarities to localities such as St. Vallier and Senèze (France), Val d'Arno (Italy) and various other localities across Europe. The paper on the deer (Spaan, 1992) is a clear example on how taxonomical revisions help us to get a full overview over the Late Pliocene/Early Pleistocene ecosystems. The genus *Eucladoceros* contained 14 different species, among which *E. tegulensis*. Spaan (1992) showed that the large deer of Tegelen was conspecific with the species described from the Auvergne. Since he had no access to the Italian material, he could only suggest that the Val d'Arno contained the same species as well. Indeed, later on it was shown that out of the 14 species, 13 represented a single species, *E. ctenoides* (de Vos *et al.*, 1995). Another issue raised by the revision, is that there is some doubt about the homogeneity of the fauna. Guerin (1980) agreed with Bernsen (1927), that the Tegelen fauna also contained the large-sized *Stephanorhinus kirchbergensis*, a species otherwise only known from the Middle Pleistocene. Loose (1975) earlier postulated that only one species of rhino, *S. etruscus*, was present. O'Regan and Turner (in press) found one of the specimens of the panther to be too large with respect to the rest of the assemblage, which could be explained by having material of different ages mixed. They reject this possibility as Tegelen is considered a tie-point in the stratigraphy, but it fits the pattern suggested by the rhino's. Schreuder's (1949) casual remark that there seem to be two size classes in the hyenas shows that these predators may give a similar pattern. Thus, there is still a lot to be gained by studying the Tegelen collections.

Conclusions

Tegelen partly owns its reputation as a classical locality for being the only Dutch site in which Pliocene/Early Pleistocene fossils can be found *in situ*. Over the years sizeable collections have been built, the most important of which are housed at the Nationaal Natuurhistorisch Museum Naturalis and at Teylers Museum. However, if one considers the number of fossils found in relation to the enormous amounts of clay processed in the Tegelen ceramic industry, the impression is inevitable that the clay is not rich in fossils at all. This is confirmed by the expeditions of the 1970s when, while sieving for rodents and other small mammals, very few macromammal remains were found indeed. Thus gathering incidental finds of clay workers, as was done by Dubois, Kortenbout van der Sluijs, and others was the only way to obtain sizeable museum collections. The clay was probably too poorly fossiliferous for palaeontological excavations. In this respect it is noteworthy that Lorié, a Utrecht based palaeontologist, had visited the Tegelen clay pits in 1887. In his note books there are absolutely no references to fossils from the clay (Zagwijn, in litt., November 2003). In a way, the collection method used does not differ from the way the collections of the Brown Bank have been built (Kortenbout van der Sluijs, 1983). Only at Tegelen it were the clay workers that accidentally stumbled upon the fossils, in the case of the Brown Bank the fishermen of the North Sea.

Over the last decades, taphonomy has played an increasingly important role in the field of mammal palaeontology. Taphonomical studies traditionally focus on the processes between the death of an organism and the start of the fossilisation process, or the fossilisation process itself. However, the history of a fossil after it has been retrieved from the sediment may be equally important for a researcher. The taphonomy of museum collections can be studied through the archives and data on the labels of museum specimens. In the case of the Tegelen collections, these studies may prove equally important as the study of the actual specimens themselves.

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Collections in libraries:
a collection of travel-books in the University Library Leoben

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Collecting seems to be a topic, which has become more and more interesting during the last years. It is not only the passion that seizes people of all parts of our society, it is more than some sort of eccentricity, it goes back to our roots, when we were hunters and gatherers to gain our living. Nowadays hunters and gatherers can be found in antique shops, but they are also to be found in museums and libraries. Collecting in museums has started with 'Cabinets of curiosities' ('Kunst- und Wunderkammern'), which housed "wonders" ranging from rare shells and coins to narwhal horns, coral carvings and perhaps mummified mermaids.

Libraries always collected not only the scientific books of their times, they always strove for the bigger, wider, the universal library. The first one to meet this high standard was the antique library of Alexandria, where all the knowledge of the time was collected in about 400,000 papyrus scrolls, nowadays we have the universal library in the internet.

Far from being universal, the small library of Leoben has a rather nice collection of travel books, which have been sources for our geologists and mining engineers during all the years of our existence. The books have been collected since the beginning of our University in 1840, and nowadays we still complete the collection with reprints from historic travel books. The collection has books like Brückmann's *Magnalia Dei* from 1727, where the author describes all 1600 mines in the world, which were known at that time, or Emanuel Swedenborg's *Regnum subterraneum* from 1734, where he describes the copper mines in Europe. Most of the literature in our collection comes from the 19th century, one of the most interesting books is Joseph Russegger's *Travels through Europe, Asia and Africa in the years 1835-1841*. Russegger was the first to draw a geological map of Egypt and the Sudan, he was the first European, to see the springs of the Nile. Another author to be mentioned is Belsazar Hacquet de la Motte, a physician, who travelled all over Europe. He is best known by his work *Travels through Slovenia*, in which he describes amongst others the Idrija mercury mine in 1779. In our collection there are also travel books, which are not related to mining or geology, we have for instance Sven Hedin's *Transhimalaya* and Hans Meyer's report on his travel to the Kilimanjaro in the year 1890. All the books on travelling bring to us the adventure of being away, they "bring the world back into our hearts", as the geologist Russegger notes at the end of his books.

Contents

Introduction

"Collecting starts ahead of science" („Sammeln geht der Wissenschaft voran"). So wrote the great German poet Adalbert Stifter in his novel *"Der Nachsommer"* in 1857 (Stifter, 1997). This is not as curious as it may sound, because collecting data, statistics, numbers, curves, or objects are the basis of science; it is the accumulation, the collection of facts, which shows the scientist a certain regularity in things, which can lead to the real conclusion (Heesen & Spary, 2001, p. 7). But of course, collecting is more than gathering things for the scientists. Collecting is passion, it is a feeling which a passionate collector may describe as happiness.

Collecting is a topic, which has become increasingly interesting for the history of science during recent years. It is not only a passion that seizes people in all parts of our society, it is more than some sort of eccentricity, with collecting we are going back to our roots, when we were hunters and gatherers to gain our living (Muensterberger, 1995; Assmann *et al.*, 1998). Hunters and gatherers can nowadays be found in antique shops, but they are also librarians and museum curators. Things have changed! During the last ten years psychologists have become aware of the phenomenon "collecting", a theme on which numerous scientific articles and books have been written. I do not want to go deeper into that subject, there are too many differing types and motivations for collecting, which are not to be the theme of this paper.

Let us think about collecting and collections in libraries and museums. Collecting in museums has started in the 16th century with 'cabinets of curiosities' ('Kunst- und Wunderkammern'; see von Habsburg, 1997). They are rooms of art (Kunst) and marvel (Wunder). The 'Kunst- und Wunderkammer' displayed an encyclopaedic collection of all kinds of objects of dissimilar origin and diverse materials. A compilation of remarkable things was attempted as a mirror of contemporary knowledge. It was of no concern, if the objects were created by the genius of man or the caprice of nature. The rarer an item, the more attractive it appeared, be it a colossal "giant's bone" or a precious find from a mineral vein turned into a marvellous piece of jewellery. To collect extraordinary and mysterious things was interesting in all centuries but especially in the age of Renaissance, when the taste for bizarre odd things, for exotic artefacts in extravagant shapes was cultivated. It was the age of exploration, a period of rapidly expanding horizons of knowledge, influenced by the discovery of the New World.

Collecting at that time was mostly done by emperors and princes, like the famous collection in Ambras castle near Innsbruck (Tyrol) where Archduke Ferdinand II of Tyrol had his famous 'Kunst- und Wunderkammer'. Two Italian architects turned the existing medieval fortress into a Renaissance castle, where the armouries and the 'Kunst- und Wunderkammer' were designed and used as museums. The 'Kunst- und Wunderkammer' in Ambras castle is the only one which can still be seen in its original place. Others have been plundered, like those in Munich, Prague or Stuttgart, or their character has changed, like in Dresden or Kassel. In Ambras you can find corals arranged in cabinet boxes, pieces of art made of ivory or wood, glass figures, porcelain and silk paintings, which belong to the oldest collections of Asian art in Europe. There are also objects made from rhinoceros horn, drinking vessels made of coconut or rock crystal, surveying instruments, clocks and automatons.

One of the most spectacular collections of that time, was emperor Rudolf II's

'Kunstkammer', which was founded in Prague in the late 16th century. His unrivalled passion for collecting made his cabinet one of the greatest collections of his time, containing small bronzes, works in cut stone, medallions and ivories, books and drawings, coins, scientific instruments and natural objects, as well as paintings. It was often called a cabinet of curiosities intended for amusement and wonder, but it also reflected the broader scientific and artistic interests of the court. Soon after the emperor's death in 1612, his collection was largely dispersed. During the turmoil of the Thirty-Years War parts of the Kunstkammer were saved and brought to Vienna, where they are now a major part of the Collection of Sculpture and Decorative Arts in the Museum of the History of Arts in Vienna ('Kunsthistorisches Museum'). There are not only works of art ("artefacta"), but also a large variety of products of nature ("naturalia") and objects we today would call ethnographic material.

Libraries

Another type are library collections. Almost everybody in modern Europe has books in their homes. But not all of them can be seen as collectors, and not every mass of books can be called a collection. The books they have in their shelves do not have a special profile, which is the main qualification for something called "collection" (von Lucius, 2000). Collecting means first of all selecting, selecting from millions of titles, commonly those written and printed during the last centuries.

Libraries always collected not only the scientific books of the specific sciences taught at special universities, but also strove for the bigger, wider, the universal library. The first, which could attain these high standards, was the Library of Alexandria. It was meant to be a universal library, the founder, Ptolemy I Soter, wanted to equip the library with writings "of all men as far as they were worth serious attention" (Canfora, 2002). Of the means by which the books were acquired many anecdotes are told. Ships entering the harbour were forced to give up any manuscripts that they had on board and take copies instead. Ptolemy III wrote letters to all the sovereigns in the world, to borrow their books. When Athens lent him the texts to Euripides, Aeschylus and Sophocles, he had them copied, returned the copies and kept the originals. In addition to Greek literature and Egyptian records, there is evidence that the new library also incorporated the written works of other nations. The library contained the writings of Zoroaster as well as Buddhist texts from India. The number of books thus obtained is variously stated ranging from 40,000 to even 700,000 papyrus scrolls, which were housed in the grain depots near the harbour, and it was supposedly incinerated, when Julius Caesar torched the fleet of Cleopatra's brother and rival monarch. A legend speaks of a female student and mathematician, Hypatia, who was dragged from her chariot by an angry mob and burnt upon the remnants of the old library. The old library of Alexandria is gone, but the dream of a universal library has come alive today with the internet.

Travel books

Far from being universal, the small library of Leoben has a rather nice collection of rare books. Among these we have a collection of travel books which have been sources

Fig. 1. Gold washing Indians in America (Brueckmann, 1727-1734, pl. 11).

for our geologists and mining engineers during all the years of our existence. Collecting started with the foundation of the university in 1840, and we continue to complete the collection with reprints of historic travel books. Let me demonstrate something of the depth and range of the collection:

A very special description of all the mines in the world is given by Franz Ernst Brueckmann (1727-1734) (UB Leoben, call no 106). It is not a typical travel book, where an author describes his travels to a country, but a list of all mines in Europe, Africa, America (Fig. 1) and Asia. Brueckmann must have seen at least all the mines in Europe, the book gives an exact description of every mine, its geology and how the work is done. The numerous engravings that illustrate his work are very attractive.

Another very important book especially in the field of metallurgy is Emanuel Swedenborg's *"Regnum subterraneum"* printed in Dresden 1734 (UB Leoben, call no 508; Fig. 2). Swedenborg was one of the most important Swedish authors in the 18th century. He visited all the mines and smelting plants in Sweden, travelled to the Netherlands, Germany and Bohemia. A result from these travels was his book *"Opera philosophica et mineralia"* (Works in philosophy and mineralogy; Swedenborg, 1734) in three volumes, the third volume is dealing with copper mining and metallurgy especially in Sweden. Swedenborg (1688-1772) was a universal genius, and wrote books on philosophy, psychology, theology and medicine. He was the first one to demonstrate the function of the lungs, and he realized the importance of the grey cerebral cortex.

Travel books especially in the 18th and 19th centuries are very important for the

EMANUELIS SWEDENBORGII

SACRÆ REGIÆ MAJESTATIS REGNIQUE SVECIÆ COLLEGII METALLICI ASSESSORIS

REGNUM SUBTERRANEUM

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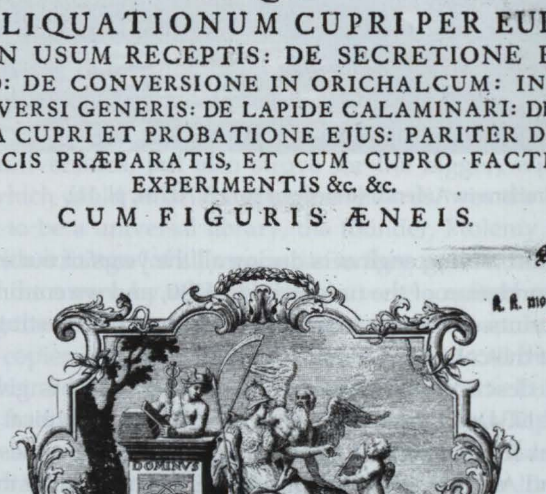
DE

CUPRO ET ORICHALCO

DEQUE

MODIS LIQUATIONUM CUPRI PER EUROPAM PASSIM IN USUM RECEPTIS: DE SECRETIONE EJUS AB ARGENTO: DE CONVERSIONE IN ORICHALCUM: INQUE METALLA DIVERSI GENERIS: DE LAPIDE CALAMINARI: DE ZINCO: DE VENA CUPRI ET PROBATIONE EJUS: PARITER DE CHYMICIS PRÆPARATIS, ET CUM CUPRO FACTIS EXPERIMENTIS &c. &c.

CUM FIGURIS ÆNEIS.



DRESDÆ ET *LIPSIÆ*,

SUMPTIBUS FRIDERICI HEKELII,

BIBLIOPOLÆ REGII MDCC XXXIV.

Fig. 2. Title page of Swedenborg's (1734) *Regnum subterraneum*.

Fig. 3. Frontispiece and title page of Hacquet's (1785) *Physikalisch-politische Reise ...*

history of sciences and bring a lot of facts and figures to the historian. The "scholarly" travellers wrote in their diaries about nature and how men exploited it.

One of the most famous writers of this genre in Austria was Belsazar Hacquet de la Motte (1739-1815; Klemun, 1988) (Fig. 3). He studied medicine, became physician in Idrija's mercury mine and at last professor for anatomy and surgery in Laibach (= Ljubljana, Slovenia). From 1767 to 1787 he travelled a lot in the Alps and in his surroundings in Slovenia. In his travel books he described the nature of the lands he had been visiting, the botanical, geological and meteorological conditions, how the mines and metallurgical plants worked, he also wrote about the people and the political history. He visited several mines of this region and climbed a lot of mountains. He probably suggested the first ascent of the highest mountain in Austria, the Grossglockner, which was carried out in 1800. His very lively description and nicely illustrated books are very important for the history of science. His lithological researches were pioneer works for the geology of the Eastern Alps, his climbing expeditions made him a pioneer for mountaineering, and his journeys to the Alpine and Carpathian countries made a beginning for the studies in ethnology in Austria.

Fig. 4. The Blue Nile (Russegger, 1841-1849, pl. 19).

Scientific knowledge was gained by the observations of travellers. All the new botanists, geologists and natural scientists were travellers who based their knowledge on the experiences they made during their travels. Geology was a subject that became more and more interesting to travellers, it was geological research that legitimated many of the journeys in these times (Jontes, 2001). One could say, that maybe geology was so interesting, because it needed a lot of travelling.

A discourse on travel books and travelling would not be complete without mentioning Alexander von Humboldt (1769-1859; e.g. Guntau, 1993; Kraetz, 1997). This very important traveller, collector, scientist made more than all the other travellers a mark on all the scientific research. Humboldt's research was centred by his lust for travelling. As a boy, his plans for the future revolved around travelling, throughout his life he longed for work in distant countries, which he wanted to explore. His travels made the dream of his life come true and above that he managed to write down his experiences in various scientific books, which were the basis for the forming of new sciences in the 19th century. He travelled round the globe, by the time he was 90 years old half of his life had been spent travelling. His travels brought him to almost all countries in Western Europe, he travelled to Russia, visited the Urals, Siberia, the Altai, and crossing the Atlantic Ocean he explored the Caribbean and the Americas. He was interested in everything, plants, animals, minerals and rocks, and his observations were laid down in his great scientific works. In 1799 he travelled with his friend, the botanist Aimé Bonpland to South America. During this journey Humboldt had lectures in geology at the Mining Academy (Colegio de Mineria, founded 1792) in

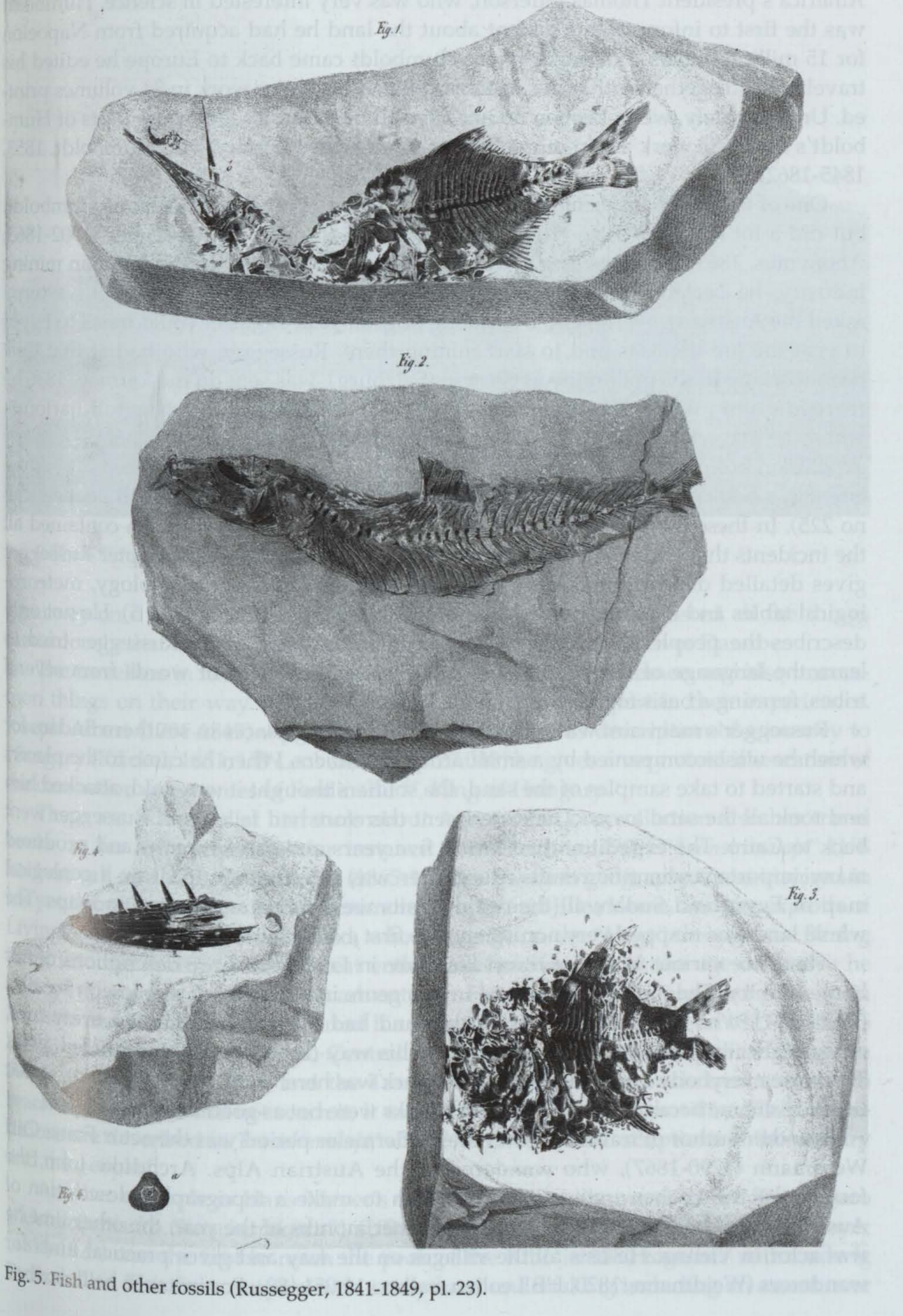


Fig. 5. Fish and other fossils (Russegger, 1841-1849, pl. 23).

Mexico, and even examined its students. Another interesting meeting was his visit to America's president Thomas Jefferson, who was very interested in science. Humboldt was the first to inform the president about the land he had acquired from Napoelon for 15 million dollars, Lousiana. When Humboldt came back to Europe he edited his travel notes. Together with other scientists he had his major work in 34 volumes printed. Unfortunately, we in Leoben do not have all his volumes, but some parts of Humboldt's scientific work are in our collection (Geoscience Library: von Humboldt, 1853, 1845-1862).

One of the Austrian scientists, who did not travel as much and as far as Humboldt, but did a lot for the Austro-Hungarian Empire, is Joseph von Russegger (1802-1863; Anonymus, 1863). Besides being a very apt miner and geologist in the Austrian mining industry, he became famous for his expedition to Africa. In 1834 Egypt's viceroy asked the Austrian government, if a mining or geological engineer could travel to Egypt to visit the ore deposits and to start mining there. Russegger, who had at that time been working in the gold mine in Gastein (Salzburg), was sent on the journey. 1836 he reached Cairo , where his adventures started. He travelled up the Nile to Khartoum, where he stayed to visit the gold washing in southern Sudan (Kordofan). Another expedition brought him to the Blue Nile in Western Ethiopia. He described his experiences in a book of seven volumes (von Russegger, 1841-49; 4 vols. in UB Leoben, call no 225). In these travel books the reader first can read the diary, which contained all the incidents that happened during the journey. At the end of each chapter Russegger gives detailed descriptions of the country's flora and fauna, the geology, meteorological tables and a description of the people living there (Figs. 4 and 5). He not only describes the people he met, he also tried to understand them. Russegger tried to learn the language of the people, in his diaries he gives lists of words from several tribes, forming a basis for later dictionaries.

Russegger's main aim was to find the gold washing places in southern Sudan, for which he was accompanied by a small army of soldiers. When he came to the placers and started to take samples of the sand, the soldiers thought it was gold, attacked him and took all the sand away. The experiment therefore had failed and Russegger went back to Cairo. The expedition had lasted five years and three months and produced many important scientific results. Russegger was the first one to draw a geological map of Egypt and Sudan; all the ore deposits were listed and drawn in maps. The whole land was mapped very accurately, the first exact plans of the Sudan.

There are various books of travel literature in Leoben that are descriptions of our home country. The most famous name in this genre in our country was Joseph Kyselak (1795-1831), who travelled all over Austria and had his name written on every rock, every higher tree and in all the grottoes on his way (Kyselack, 1829, reprinted 1982). Therefore everybody knew Kyselack ("Kyselack was here!" was a famous saying at that time). His name became known, his travel books were not as good as his reputation.

Another author of travel books in the Biedermeier period was the actor Franz Carl Weidmann (1790-1867), who wandered in the Austrian Alps. Archduke John, the founder of the Leoben university, asked him to make a topographic description of Austria, where he wandered during the warmer months of the year, the other time he was actor in Vienna. He lists all the villages on the way and gives practical hints for wanderers (Weidmann, 1820; UB Leoben, call no 11.051/82). For instance he described

Fig. 6. The Kilimanjaro (Meyer, 1890, pl. 1).

a journey on a ship from Linz in Upper Austria to Vienna and listed all the things meticulously that could be seen on the right and left bank of the river Danube.

The travellers in the 19th century had open eyes for the common and also uncommon things on their way. They invited the readers to take part in their experiences. Joseph Albert (1791-1847) was one of these writers. In his description of a journey to Hungary (Krickel, 1831; UB Leoben, call no 27.048) he gives a very vivid illustration of the coronation ceremonies of Ferdinand V, King of Hungary.

These are examples of literature about Austria, but our collection also has travel books on far away countries for instance Sven Hedin's (1909) "*Transhimalaja*" (UB Leoben, call no 4.825). Sven Hedin (1865-1952), a Swedish geographer, was inspired in his youth by the books of James Fenimore Cooper and Jules Verne, and the exploits of Livingstone and Erik Nordenskjöld, whose voyage on the "Vega" through the Bering Strait into the Pacific aroused great enthusiasm in Sweden. At the age of twelve he decided to pursue the life of an adventurer. He studied geography and geology in Uppsala and Berlin and then started his great travels to Asia. Between 1893 and 1935 Hedin made four expeditions to Central Asia. He charted maps of significant areas in Pamir, Taklamakhan, Tibet and the Transhimalaja region. He made two attempts to reach Lhasa, but he did not reach it, it was a "forbidden" city at that time. These expeditions are described in *Transhimalaja*, where he gives vivd descriptions of the country and the people.

Another example is Hans Meyer's (1890) report on his travel to the Kilimanjaro ("*Ostafrikanische Gletscherfahrten*") (UB Leoben, call no 3.517, Fig. 6). Hans Meyer (1858-1929) was the first to reach the peak of the Kibo in 1880 together with Ludwig Purtscheller. This first conquest was a very hard undertaking including an ascent over the big glacier without climbing irons. The ascent was made with ice axes, every step required some 20 strokes of the axe, and the labour at this height must have been immense. It must have been a thrilling moment when Meyer topped the rim and suddenly saw before him the huge crater with its frozen floor. He and his companion were the first men to behold this wonder and to reveal the secret that Kilimanjaro had kept concealed through ages.

There could be said much more about our collection of travel books, but these few examples give you an insight how travelling brings all the adventures, bring "the world back to our hearts", as the geologist Russegger notes at the end of his books.

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International Symposium on Cultural Heritage in Geosciences, Mining and Metallurgy
Ten years in retrospective

Lieselotte Jontes

Jontes, L. 2004. International Symposium on Cultural Heritage in Geosciences, Mining and Metallurgy; Ten years in retrospective. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries – Archives – Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue,* 4: 154-157, 1 fig.; Leiden, August 2004.

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Key words – Freiberg, Leoben, St. Petersburg, Banska Stiavnica, Golden (CO), Idrija, Leiden.

An overview is given of the symposia on the Cultural Heritage in Geosciences, Mining and Metallurgy.

Contents

The symposia

Shortly after the fall of the Berlin wall, Peter Schmidt, librarian in the Rare Books Department of Freiberg's Technical University and Lieselotte Jontes, library director of the University of Leoben, started their first talks to establish a symposium on Cultural Heritage. In 1993 the First International Symposium on Cultural Heritage in Geosciences, Mining and Metallurgy was held in Freiberg, Saxony (Fig. 1). It was for the first time a get-together of geoscientists and mining scientists, who were interested in the history of their discipline (Fig. 2). The symposium gave a definition of the position of these sciences. Librarians, archivists, museums curators and interested people from other disciplines took part, an exchange of opinions began to flow.

This very successful first symposium was followed by the second one in Leoben (Austria) in 1995. The general theme of this symposium was "Art and culture in mining and geosciences". The background for this theme was the rich collection in the Leoben University library, where pictures of mining places, works in the mines, traditions of miners have been collected. Therefore this symposium was accompanied by a very fine exhibition on these topics from the funds of the University Library.

The third symposium was held in St. Petersburg, Russia, in 1997. The famous Mining Institute was hosting the congress, many colleagues from different countries, but especially from Russia and the southeast European countries were participating. The Slovakian mining town Banská Štiavnica was hosting the fourth congress in 1998. The general theme was "World mining education traditions". In Banska Štiavnica was one of the world's oldest mining universities, the organization of the education of miners started in this town, therefore it was a good place to talk about these topics.

The fifth congress brought us to the United States, to Golden (CO) with its famous Colorado School of Mines. This old mining town in the American West, where in former times the gold rush brought lots of people to the country, gave new topics, new colleagues and a very different surrounding.

As a contrast, the sixth Symposium was held in the small Slovenian mining town of Idrija, where the famous mercury mine is still working. Very appropriately, the general theme at this congress was "Occupational health and ecological aspects of mining".

The Seventh Erbe-Symposium, at which this paper was presented, was held in the Nationaal Natuurhistorisch Museum Naturalis in Leiden and provided the surrounding for our tenth anniversary. It is my hope, that these symposia on cultural heritage will continue, and thus the rich tradition of miners, metallurgists and geologists will be preserved, helping young workers and scientists to better understand their profession.

Fig. 1. Sign announcing the first Erbe Symposium at the Bergakademie Freiberg.

We are looking forward to our next (8th) Erbe-Symposium in Schwaz in Tyrol, 3-7 October, 2005, which Dr. Hauser will be organizing (Hauser, 2003). The old mining town Schwaz in Tyrol will host - so I hope - a lot of our community. As a resume I would like to say, that those symposia have made the scientific community a bit richer, we ourselves have got a lot of new friends not only in the field of science, but real friends in our life. I do hope, that the Erbe-symposia will still go on, that younger people will bring new ideas, new enthusiasm to our group, so that the idea to preserve the cultural heritage in the fields of geosciences and mining and metallurgical sciences will be carried on.

The proceedings

All the symposia led to proceedings volumes, to keep in mind the lectures that were held at the congress. It was the merit of Tillfried Cernajsek and Christoph Hauser from the Geological Survey of Austria, to publish the first three symposium volumes. They took their time, their knowledge and last but not least a large amount

Fig. 2. Participants of the first Erbe Symposium at the grave of Abraham Gottlob Werner (1749-1817) in Feiberg.

of the budget of their institution, to print those volumes. The first one, the Freiberg volume (Cernajsek *et al.*, 1996), was the most difficult one, because there was such a lot of articles, and Peter Schmidt, the main organizer of this symposium, had his thoughts already on the next project he was planning. So the two colleagues from Vienna and people from the library in Leoben were the workers in this field. The second proceedings volume (Cernajsek *et al.*, 1997) was not so difficult to edit, there was some money left and the call for papers was done efficiently. The St. Petersburg proceedings were more difficult (Cernajsek & Hauser, 2000), colleagues from Russia thought, that the book of abstracts would meet all the needs of the participants. Drs Cernajsek and Hauser got as many manuscripts as possible for the third volume, but it contains only a sample from the many papers presented.

In Banská Štiavnica (the former Schemnitz) Elena Kasiarova and Maria Sikorova (1999) published the volume nicely with the help of the colleagues from Leoben and Vienna to translate abstracts and articles. In Golden, Joanne Lerud did the editing of the proceedings of the meeting at Golden (CO) with the help of her colleagues (Lerud *et al.*, 2001). The Idrija volume was beautifully published (Dizdarevič & Peljhan, 2003) and very quickly so it could be presented at the Symposium in Leiden.

The Peter Schmidt Award

As a new and interesting feature, in Golden the 'Peter Schmidt Award' was inaugurated. It is given to people, who in memory of Peter Schmidt's work support the aims of cultural heritage.

The first one to get the award was Lieselotte Jontes, who together with Peter Schmidt initiated the Erbe-symposia. In Idrija the award was given to Tillfried Cernajsek and Christoph Hauser. They did a lot for the printing of the proceedings volumes and played a major role in the organization of the congresses. In Leiden, the award was presented to Joanne Lerud for the excellent way in which she organised the Fifth Symposium and published its Proceedings (Winkler Prins, 2004).

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Überlegungen zu einem "Haus der österreichischen (Zeit)Geschichte"

Stefan Karner

Karner, St. Überlegungen zu einem "Haus der österreichischen (Zeit)Geschichte" [Considerations regarding a "Haus der österreichischen (Zeit)Geschichte"]. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, **4**: 158-179; Leiden, August 2004.
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Key words — Austria, history, 20th century, 'Haus der Geschichte', museum, 'Vergangenheitsbewältigung', economic history, mining.
Schlüsselwörter – Österreich, Geschichte, 20. Jahrhundert, Haus der Geschichte, Museum, Vergangenheitsbewältigung, Wirtschaftsgeschichte, Bergbau.
The installation of a „Haus der Geschichte Österreichs im 20. Jahrhundert" is incorporated in the programme of the Austrian Government, based on a preliminary study by the author. It should be realised in 2006 and will include the history of the Austrian Republic from 1918 to the present, emphasising the history of the First and Second Republic, and the Third Reich. Original sources will be collected and made available to schools, officials, the media and private persons.
The development of Austria is seen as part of the development of Europe and, as such, also as part of the history of the World. Emphasis is placed on subjects to which Austria had an obligation, such as documents on the persecution and killing of Jews, Roma and Sinti, as well as the exile of Austrians from Central European countries. Further, its special position in the 1950s at the Iron Curtain during the Cold War is of interest.
The „Haus der Geschichte der Republik Österreich" will have four aspects, to be discussed in some detail: 1) Museum with exhibitions; 2) Research network; 3) Data storage; 4) Services.
Economic history will be used as an example and in it mining history will have a special place. Local companies, their products and the captains of industry are important for society. So far, little research has been done on important events, such as the gradual change from guided economy to market economy, the influence of the Marshall plan and the „Staatsvertrag", or the availability of raw materials (ore, water, oil, and wood).
The study of the archives of the allied nations (the four occupants, Americans, British, French and Russians) would be of great interest, and company archives in Austria should be studied and preserved. The institutes for economical history are to pay attention to this problem.
Of special interest are the external contacts of the different regions of Austria, e.g., Steiermark and Carinthia with northern Italy and Slovenia; Tyrol and Vorarlberg with southern Germany, northern Italy and Switzerland; Salzburg and Upper Austria with Bavaria; and Lower Austria and Burgenland with Hungary, the Czech Republic and Slovakia.
Schlüsselwörter – Geschichte, 20. Jahrhundert, Republik Österreich.

Inhalt

Einführung

In 1997 erhielt der Autor vom damaligen österreichischen Vizekanzler Wolfgang Schüssel die Bitte, im Rahmen einer Denkwerkstatt zu Zukunftsfragen Österreichs auch einen Vorschlag zur Errichtung eines "Hauses der österreichischen Zeitgeschichte" zu erstellen. Von den rund 500 Wissenschaftlern und Experten der gesamten Denkwerkstatt arbeiteten u. a. die Historiker Siegfried Beer, Günter Bischof, Günther Burkert-Dottolo, Ulfried Burz, Claudia Fraess-Ehrfeld, Lothar Höbelt, Otto Klambauer, Robert Kriechbaumer, Karel Kubinzky, Reinhard Olt, Roman Sandgruber, Erwin A. Schmidl, Felix Schneider, Johannes Schönner, Gerald Schoepfer und Manfred Wirtitsch an dem im Folgenden beschriebenen, ersten Konzept eines "Hauses der österreichischen Zeitgeschichte" in Wien mit. 1999 folgte schließlich auf Basis dieser Ideen eine vom Autor gemeinsam mit Manfried Rauchensteiner erstellte Machbarkeitsstudie zu einem "Haus der österreichischen Geschichte", die jedoch aus verschiedenen Gründen bis heute noch nicht umgesetzt wurde (Karner & Rauchensteiner, 1999).

Der folgende Beitrag fasst daher die ursprünglichen Ideen für ein "Haus der österreichischen Zeitgeschichte", wie sie auch im Schlussbericht der Denkwerkstatt "Österreich zukunftsreich" anfangs 1999 publiziert wurden, zusammen und stellt sie der interessierten Fachwelt vor (Karner, 1999).

Seit ihren Anfängen kann die österreichische Zeitgeschichtsforschung auf beachtliche Erfolge verweisen, doch konzentrierte sie sich bisher – von wenigen, rühmlichen Ausnahmen abgesehen – auf die Zeit vor 1945. Für die Zweite Republik bestehen erhebliche Lücken sowohl in der thematischen Forschung wie hinsichtlich der Sicherung und Aufarbeitung von Quellen. Hier ist wissenschaftliche "Aufholarbeit" zu leisten, um gravierende Lücken zu schließen, zugleich zukunftsorientiert Defizite zu vermeiden (Quellensicherung) und so eine solide Basis für zukünftige Forschungen zu schaffen. In diesem Sinne regen wir die Einrichtung eines "Hauses der Zeitgeschichte" an.

Dieses "Haus der Zeitgeschichte" versteht sich als historisches Kommunikationszentrum zwischen Forschung und Publikum, als Ort der öffentlichen Diskussion, als Initiative zur Quellensicherung sowie als Drehscheibe eines "virtuellen Zeitgeschichte-Netzwerks". Moderne Präsentation (Ausstellungen, Multi-Media), die Einbringung in die öffentliche Debatte sowie die Wissensvermittlung im Rahmen schulischer und außerschulischer Ausbildung stehen im Vordergrund. Als Ort regelmäßiger Begegnung und Auseinandersetzung mit zeitgeschichtlichen Themen wird das "Haus der Zeitgeschichte" einen wichtigen Beitrag zur Entwicklung der politischen Diskussionskultur in Österreich leisten.

Forschungsdefizite können nicht durch neue Administrationen beseitigt werden. Das "Haus der Zeitgeschichte" soll daher eine Koordinierungsfunktion übernehmen und gleichzeitig – als "virtuelles Institut" – Anlaufstelle und "Clearing House" für wissenschaftliche Einrichtungen, aber auch für Bürger und Behörden sein. Durch die verbesserte Zusammenarbeit bestehender Institutionen sollen Synergien entstehen und genutzt werden. Durch die Kommunikation auf allen Ebenen tritt es nicht in Konkurrenz zu bestehenden Institutionen, sondern ist Katalysator zur Erzeugung von Synergien.

Forschung

Wissenschaftlich seriöse Erkenntnisse sollen Österreichs Positionierung und Selbstverständnis im Europa des 21. Jahrhunderts festigen. Vielfach bestehen noch Forschungslücken oder ist es – z.B. durch Quellen in Osteuropa – möglich, fehlende Aspekte auf einer weiteren Basis zu bearbeiten als noch vor wenigen Jahren. Dem Vorwurf eines geschönten Umgangs mit der Vergangenheit muss durch Ehrlichkeit und "pro-aktives" Handeln begegnet werden, statt durch Reagieren zur Schadensbegrenzung. Sensible Themen sind durch seriöse (bilaterale) Forschung "außer Streit" zu stellen.

Neue Ansätze der Erinnerungsforschung sollen Österreichs Selbstsicht als "Opfer" beider Weltkriege hinterfragen: die vereinfachte "Opferrolle" half, die (außen-)politische Verantwortung abzuwälzen. Dies gilt für die Rolle vieler Österreicher im Dritten Reich ebenso wie für die oft selektive Erinnerung an die Zeit nach 1945. Eng verbunden ist die nationale Identität. Mehrfache Brüche seit der Monarchie halfen, die Vergangenheit rückblickend verklärt zu sehen, bis hin zur Mitteleuropa-Diskussion der achtziger Jahre oder die jüngsten Debatten über die Neutralität. Historische Erkenntnis kann als Orientierungshilfe dienen. Hinsichtlich des österreichischen Verhältnisses zu Ost- und Südosteuropa sollen die "windows of opportunity" (seit 1989) verstärkt genützt werden.

Das österreichische Selbstverständnis zwischen Ost und West ist von "Sonderfall"- und "Insel der Seligen"-Mythen geprägt – auch hier sollte solide historische Forschung zur Orientierung der Politik beitragen. In der Integrationsgeschichte könnten Fragen nach Österreichs Position in Europa – etwa als "Zentrale" über die Landesgrenzen hinaus oder im "Europa der Regionen" – neue Ansätze, aber auch neue Antworten und Denkmuster vermitteln.

Landesgeschichte wird seit langem an den Universitäten und Archiven sowie auf Vereins- und Kommissionsbasis gepflegt, während die Erforschung der föderalen Strukturen in ihrer politischen und wirtschaftlichen Verquickung deutlich unterentwickelt ist.

Über seriöse historische Biographien wäre eine Vermittlung und Popularisierung der historischen Erkenntnisse möglich. Gerade biographische sowie regionsübergreifende Aspekte fehlen auch im Bereich der Wirtschaftsgeschichte. In der Gesellschaftsgeschichte bestehen Defizite hinsichtlich Migrationsforschung, Legitimitätsproblematik, der Rechtskultur und der Veränderungen seit 1945 sowie der regionalen Entwicklungen.

Erinnerung und Gedächtnis

Die Erinnerungsforschung ist heute eines der bedeutendsten Gebiete historischer Forschung. Wie geht ein Land, ein Volk, eine Nation mit der historischen Erinnerung um? Welche Wendepunkte und identitätsstiftende historische Momente, Ereignisse, Figuren etc. werden gefeiert? Welcher Katastrophen wird gedacht und welche Höhepunkte werden als identitätsstiftend zelebriert? Wie entsteht kollektives Gedächtnis? Welches sind die Prozesse der persönlichen Erinnerungsgenese und welche Rolle spielt das Vergessen und das Unterbewusstsein? Wie verläuft die Interaktion zwischen kollektivem und individuellem Gedächtnis?

Solche Fragen wären an die österreichische Erinnerungskultur zu stellen. Zu untersuchen wäre, welche historischen Großereignisse immer wieder zur Identitätsstiftung bemüht werden. Die Erinnerungskultur zur Ersten Republik ist eine andere als die zur Zweiten Republik, doch erfolgte in beiden Fällen die Selbststilisierung Österreichs und der Österreicher als Opfer. Das kommt u.a. daher, dass das Schicksal des Kleinstaates Österreich immer wieder von außen bestimmt wurde (Friedensschlüsse nach den beiden Kriegen, Völkerbundanleihen und Marshall-Plan, "Anschluss" 1938 und Besatzungszeit). Sozialdemokraten haben die Erinnerung an den Februar 1934 gehegt und gepflegt, um ihren besonderen Opferstatus hervorzukehren, während das christlichsozial-bürgerliche Lager den Widerstand des Ständestaates gegen den Nationalsozialismus betont hat, um seinen eigenen Opferstatus zu untermauern.

Beide Lager haben unisono nach 1945 – aufbauend auf einer staatspolitischen Zielen dienlichen Interpretation der Moskauer Deklaration von 1943 – den "Opfermythos" gepflegt und den "Anschluss" in den Mittelpunkt der Erinnerungskultur gestellt. Die staatlich propagierte Erinnerung von Österreich als "erstem Opfer des Nationalsozialismus" erlaubte es den meisten Menschen, sich ins gesamtösterreichische Opferkollektiv einzugliedern, während die aus rassischen, politischen oder geistigen und physischen Motiven Verfolgten im öffentlichen Leben und in der Betrachtung an die Peripherie verbannt wurden. Erst in jüngster Zeit wurde die "Tätergeschichte" in die Erinnerungskultur einbezogen: jüngste Ansätze zur justitiellen Aufarbeitung der österreichischen Nachkriegsvolksgerichtsbarkeit trugen zum tieferen Verständnis bei. Wichtig wäre aber eine Erinnerung, die der realen Erfahrung – ohne Polarisierung in "Täter" und "Opfer", unter Berücksichtigung der vielfältigen Anpassungs- und Überlebensstrategien – ohne Schuldzuweisungen Rechnung trägt. Zeitzeugenbefragungen lassen die Komplexität der österreichischen Erinnerungsstruktur erkennen; sie sind zu forcieren.

Die österreichische Erinnerungskultur arbeitet heute auf vielen Gebieten; die Analyse der heimischen Denkmalkultur ist in den letzten Jahren besonders fruchtbar gewesen. Die Debatten um das Hrdlicka-Mahnmal in Wien und die jüngsten Diskussionen über das geplante Denkmal am Wiener Judenplatz waren Anstoß zur Erweiterung der österreichischen Erinnerung. Der Umgang prominenter Österreicher mit ihrer Rolle im Zweiten Weltkrieg wurde gelegentlich heftig analysiert und erfasste Angehörige aller Lager. Der Bogen reicht vom "Fall Waldheim" über die NS-Vergangenheit einiger Minister im Kabinett Kreiskys sowie des einstigen FPÖ-Chefs Friedrich Peter bis zu den Bemerkungen Jörg Haiders über die "ordentliche Beschäftigungspolitik" im "Dritten Reich" und seiner Rede vor ehemaligen SS-Angehörigen in Krumpendorf. Gerade die erwähnten Beispiele wurden für pauschale, mediale Schuldzuweisungen instrumentalisiert. Nur ein breiter Forschungsansatz und eine breite Analyse, die auch die Rezeption der Themen in der österreichischen Gesellschaft einschließen muss, kann eine historisch abgesicherte Basis für die Zweite österreichische Republik erbringen.

Der Vergleich mit anderen europäischen Ländern, die ähnliche Erinnerungs- und Verdrängungsrhythmen wie Österreich zeigen, wäre besonders wichtig. Dabei geht es nicht nur um den Umgang mit den Verbrechen des Zweiten Weltkrieges und des "Dritten Reiches", sondern um die Gesamtheit des 20. Jahrhunderts.

Es wäre auch zu fragen, warum gerade die Erinnerung an "Anschluss" und Staatsvertrag in der Zweiten Republik so im Mittelpunkt stand, nicht aber die Erinnerung an bedeutende Beiträge zum wirtschaftlichen Wiederaufbau wie etwa den Marshall-Plan? Warum zelebrieren westeuropäische Staaten den amerikanischen Beitrag zur Rekonstruktion ihrer Wirtschaft in Staatsakten und wissenschaftlichen Konferenzen, nicht aber Österreich? Hier und in ähnlichen Fragen (Stichwort NATO-Beitritt) zeigt sich ein (teils unterbewusster) Anti-Amerikanismus, der bis heute eine selektive Erinnerung propagiert und den amerikanischen Beitrag zu Österreichs Wohlstand und Unabhängigkeit ignoriert. Dieses Phänomen müsste gerade im Hinblick auf die österreichische Identität untersucht werden.

Österreichs nationale Identität

Die nationale Identität Österreichs ist durch mehrere Brüche gekennzeichnet. Die aus der Donaumonarchie abgeleitete österreichische Identität war in erster Linie übernational, mehr an der Dynastie als an einer Nationalität orientiert. Sie wurde in mehreren Etappen überlagert von einem neuen, stark mit "Neutralität" und Sonderrolle im Kalten Krieg verbundenen Österreichbegriff. Die Tabuisierung der in der Zwischenkriegszeit betonten deutschen Identität Österreichs nach 1945 spielte ebenfalls eine Rolle.

Dazu kam eine "Umorientierung": jahrhundertelang richteten sich die "Österreicher" (besser: die Deutsch[sprachig]en in der Monarchie) stärker nach Norden (zum "großen Bruder") und Süden (Toskana, Venetien, Friaul) sowie ostwärts aus (von Polen bis Bosnien-Herzegowina, Albanien und weiter) als nach dem Westen. Dies änderte sich mit dem "Anschluss" 1938, dann mit der alliierten Besatzungszeit 1945-55 bzw. als Reaktion auf den "Eisernen Vorhang". Die politische und militärische, aber auch die kulturelle Westorientierung setzten neue Akzente; dennoch blieb Österreichs Identität mit den Mythen von "Sonderfall" und "Neutralität" einer gewissen Ambivalenz und (oft unbewusster) Reserve und Distanz verhaftet. Wer nach der Rolle der Historiker in der Bewusstmachung dieser internationalen und regionalen Bedingungen und Optionen fragt, muss allerdings ein klares Defizit der historischen Wissenschaften als Orientierungshilfe konstatieren.

In der Mitteleuropa-Diskussion der achtziger Jahre wie in der Europapolitik der neunziger Jahre wurden Österreichs vielschichtige historische Identitäten mehrfach bemüht. In der Rückschau oft idealisiert, sah man in der Vielfalt kultureller, sprachlicher und nationaler Identitäten, die sich im "Haus Österreich" über Jahrhunderte zusammengefunden hatten, nicht mehr den "Völkerkerker", sondern eine Alternative zum Gegensatz der Blöcke im Kalten Krieg, dann – nach der "Wende" von 1989 – auch zu den neuerwachten Gegensätzen zwischen den Nationalitäten in Südost- und Mitteleuropa. So sehr diese Tradition Österreich befähigen sollte, aktiv am Aufbau des gesamteuropäischen Staatensystems mitzuwirken, so gefährlich wäre eine idealisierende bzw. nostalgische Sicht. Immerhin wäre auf die theoretischen Grundlagen zu verweisen, die vor 1914 in der "Experimentierkammer der Weltgeschichte" (Adler, 1922-29) entstanden, auf die Prinzipien der Gleichberechtigung der "Volksstämme", ihrer Sprachen und Kulturen, sowie auf die vielfältigen Modelle der Dezentralisierung, der Selbstverwaltung und die Kombination von territorialer und personaler Autonomie in national durchmischten Gebieten. In gewisser Weise könnte man darin Vorläufer der aktuellen Gedanken für ein "Europa der Regionen" erblicken, die jedoch damals aufgrund eindimensionaler Freiheitsvorstellungen und nationalstaatlicher Interessen nicht in die Praxis umgesetzt werden konnten.

Ebenfalls unter Rückgriff auf die "gute alte Zeit" vor 1914 – wohl auch im Gleichklang mit den Erfordernissen des Fremdenverkehrs – entstand ein weiterer österreichischer Identitätsstrang, der in erster Linie kulturelle Aspekte betont(e), von "Sound of Music" bis zur hoch entwickelten Kunst des Nörgelns. In einem viel beachteten Essay (*Land ohne Eigenschaften*) mutmaßte Robert Menasse (1995), die "österreichische Wirklichkeit" sei eine contradictio in adjecto: "Die Realität in diesem Land zeigt sich auf eine Weise zusammengesetzt, dass alles ununterbrochen in seinem Gegenteil aufgehoben wird und im gesamten nur virtuell als das existiert, was man gerade sehen will." Österreich habe sich, so Menasse, von der Geschichte abgeschottet und versuche dennoch, von seiner Musealität zu leben.

Die nach 1945 neuentwickelte Identität Österreichs war – oft mit dieser "alten" verbunden – am Prinzip: "Nie wieder Krieg!" und einer daraus abgeleiteten aktiven Friedenspolitik im internationalen Kontext orientiert. In der Öffentlichkeit wurde dieser "österreichische Weg" oft mit dem Schlagwort der "Neutralität" verbunden. Zusammen mit der weithin akzeptierten "Opferrolle" Österreichs und dem "Sonderfall"-Mythos entstand so eine Selbstsicht vieler Österreicher, die es heute erschwert, sich den Herausforderungen der neunziger Jahre – jenen der europäischen Integration und des Erstarkens einer europäischen Identität – zu stellen.

Gerade hier zeigt sich die Diskrepanz zwischen – durchaus parallel empfundener – neutraler "Sonderfall"-Doktrin und westlich demokratischer Identität Österreichs. Dabei ist die demokratiepolitische Entwicklung seit 1945 (z.B. parlamentarische Reform, Verstärkung der Elemente direkter Demokratie, Verfassungsreform in den Ländern) in erster Linie westlichen demokratischen Modellen verpflichtet. Eine moderne österreichische Geschichtswissenschaft müsste gerade diesem Paradigmawechsel in der langen österreichischen Geschichte stärker und bewusster Rechnung tragen. Vergleichende Untersuchungen sollten vornehmlich die Entwicklungen in den für Österreich prägenden Staaten – insbesondere den USA, Großbritannien, der Schweiz und den skandinavischen Ländern – sowie deren Einflüsse auf Österreich studieren. Der Vergleich mit Deutschland müsste über die aus der Lage von 1945 entstandene Tendenz zur Distanzierung hinausgehen, um tatsächliche Parallelen und Unterschiede zu verstehen. Dies erscheint um so wichtiger, als Österreich zwar international Ansehen genießt und wirtschaftlich und sozial gefestigt ist, die demokratiepolitische Entwicklung hingegen nachhinkt und damit potentiell instabil wirken kann. Die "versteinerte" Parteienstruktur und Sozialpartnerschaft, die unterentwickelte demokratische Partizipation bzw. der dominante Einfluss von Kammern und Bürokratie in der "Volksvertretung", die mangelhafte bzw. sterile Demokratieerziehung ("Staatsbürgerkunde") sowie die oft kontraproduktive mediale Focussierung (Forderungen nach "Anlassgesetzgebung" und damit de facto nach "mehr Staat") sind potentielle Gefahren für die Demokratie in Österreich.

Zwischen Zentralismus und Föderalismus

Die Bundesländer respektierten in den fünfziger Jahren noch stark die Autorität Wiens in bestimmten Bereichen (Verhandlungen zum Staatsvertrag, wirtschaftlicher Wiederaufbau im Rahmen einer gesamtösterreichischen Industrialisierungspolitik). Seit den sechziger Jahren kam es zum "Aufstand gegen Wien". Die Ereignisse in Fussach (1964) und im Kärntner "Ortstafelstreit" wirkten stark ins Bewusstsein der "Provinz" gegenüber Wien – bis hin zu aktuellen Beispielen wie der Diskussion über den Semmering-Basistunnel. Damit eng verbunden ist das wirtschaftliche "Ost-Westgefälle" in Österreich, das bis heute Auswirkungen der Besatzungszeit erkennen lässt: 80 % der Mittel des Marshall-Plans gingen aus geopolitischen Gründen in den Westen und führten zu einer wirtschaftlichen Prosperität, die die peripheren Zonen am "Eisernen Vorhang" bis heute nicht aufholen konnten. Andererseits war Österreich das einzige Land, in dem auch die kommunistisch besetzte Zone am Marshall-Plan teilnahm, letztlich ein entscheidender Faktor, die Teilung des Landes zu verhindern.

Biographie und Zeitgeschichte

Im anglo-amerikanischen Kulturkreis erfährt ein breites Publikum Geschichte vor allem über den biographischen Ansatz und wird davon fasziniert. Einerseits versteht die größere Öffentlichkeit Geschichte primär über die Leistungen großer Persönlichkeiten und ihres Beitrages zur Gestaltung einer Zeitepoche, andererseits eignen sich gerade Biographien gut zum "Aufhängen" historischer Fakten und spielen somit eine wichtige Rolle für die Vermittlung wissenschaftlicher Erkenntnis. Demgegenüber finden Debatten über Themen wie Struktur-, Sozial-, Frauen- oder Minderheitengeschichte und Postmodernismus außerhalb des Fachpublikums nur wenig Interesse. Das gebildete, an Geschichte interessierte Publikum liest in erster Linie Biographien und Politikgeschichte. Sie alle wären neben Hobsbawms (1994) strukturgeschichtliche Erklärung des *Age of Extremes,* des langsamen Todes des liberalen Zeitalters im 20. Jahrhundert, zu stellen.

Demgegenüber ist es um die wissenschaftlich-seriöse Biographie- und Politikgeschichte der Zeit nach dem Ersten Weltkrieg in Österreich eher dürftig bestellt. Von Klemperers (1976) Seipel-Biographie entstand vor Jahrzehnten – so wie auch Gulicks (1948) bzw. Benedikts (1979) Politikgeschichte. Entscheidende Forschungsimpulse kamen oft aus dem Ausland oder von Außenseitern. Die jüngere heimische Forschung orientiert sich vor allem an gesellschafts- und sozialgeschichtlichen Ansätzen (Hanisch, 1994). Desiderata einer österreichischen Biographiegeschichtsschreibung sind Arbeiten über die führenden Staatsmänner beider Republiken (von Otto Bauer, Engelbert Dollfuß, Kurt Schuschnigg, bis zu den "Gründervätern" nach 1945). Über Karl Gruber als dem Wegbereiter der Westorientierung wird bereits gearbeitet, doch stehen seriöse Schilderungen von Persönlichkeiten wie Julius Raab und Leopold Figl, aber auch von Bruno Kreisky weiter aus. Erfasst sind alle Parteien und Richtungen, vom fehlgeschlagenen Versuch einer Privatisierung und einer Liberalisierung der österreichischen Volkswirtschaft und des Finanzsektors im "Raab-Kamitz-Kurs", über Adolf Schärf und Karl Renner als dem Archetypus des pragmatischen österreichischen Staatsgründers und politischen Überlebenskünstlers durch die dramatischen Zeitbrüche des 20. Jahrhunderts, bis hin zu Kreisky als dem österreichischen Außenpolitiker par excellence, der das Zeitalter der Détente im Kalten Krieg mit beeinflusste. Darüber hinaus aber wäre es an der Zeit für einen ersten Anlauf zu biographischen Versuchen über Franz Vranitzky und Alois Mock, die Österreich nicht nur ungeschoren über die Zeitenwende 1989-91 brachten, sondern auch den langen Weg der schrittweisen europäischen Integration des Landes erfolgreich durchführten. Gerade auf dem Felde der Außenpolitik sind auch hinsichtlich der Biographien Defizite zu verzeichnen – über den Ballhausplatz gibt es nicht einmal ansatzweise Studien, die sich mit den klassischen *Diplomats* messen können. Bezeichnenderweise stammt die einzige derartige Untersuchung über das k.u.k. Ministerium des Äußern nicht von einem Österreicher, sondern von einem amerikanischen Dissertanten.

Österreich und Ostmittel- sowie Südosteuropa

Die Umwälzungen der Jahre 1989-91 waren für Österreich eine historische Zäsur: es rückte vom östlichen Rand der westlichen Welt in die Mitte Europas zurück. Gerade für das Verhältnis zu "Zwischeneuropa", wie es mit dem Zerfall der Donaumonarchie und des Zarenreiches entstanden war, wäre eine historische Perspektive (abseits nostalgischer Verklärung) wichtig. Zu erwähnen ist in diesem Zusammenhang auch die Enttäuschung in vielen ost-/mitteleuropäischen Staaten über die negative österreichische Haltung zur EU-Erweiterung. Ähnlich wie in der Haltung zur NATO sind hier enorme Wissenslücken festzustellen, die die Entstehung von Klischées und Vorurteilen fördern.

Wissenslücken betreffen auch die österreichische Geschichte. Hatte sich die Erforschung besonders der österreichischen Nachkriegsgeschichte (Besatzungszeit) bis dahin vorwiegend auf westliche Quellen gestützt, so eröffnete sich nach 1989 gleichsam über Nacht die Chance, den erleichterten Zugang zu Quellen und Archiven in Ost- und Südosteuropa zu nützen. Eine kritische Bilanz des seither vergangenen knappen Jahrzehnts zeigt jedoch, dass die österreichische Zeitgeschichtsforschung diese Chance – abgesehen von wenigen Einzelinitiativen – bisher kaum genutzt hat.

An Themen mangelt es nicht, um nur einige Beispiele zu nennen:

- Wandel und Kontinuität der Mitteleuropa-Idee (vom Zusammenbruch der Habsburger-Monarchie bis zur gegenwärtigen Habsburg-Reflexion in den Staaten Osteuropas), Ausbau bestehender Mitteleuropa-Projekte zu regionaler Schwerpunkt-Forschung;
- Die bilateralen Beziehungen Österreichs zu den einzelnen Ländern des ehemaligen Ostblocks von der Ex-Sowjetunion bis zu den Nachbarn, von den unmittelbaren Nachkriegs-Wirren (z.B. Vertreibung der Sudetendeutschen, Grenzfragen zu Jugoslawien) über die sowjetische Besatzungspolitik (Parallelen zwischen Österreich und den Ostblock-Staaten) bis zur Österreich-Politik der Supermacht Sowjetunion (anhand von Moskauer Archivalien).
- Die Aufarbeitung gewichtiger Einzelaspekte aus der Ära der Konfrontation – auch, um sie politisch und bilateral außer Streit zu stellen (etwa nach dem Beispiel der Studien zur deutschsprachigen Minderheit in Slowenien) – beginnend mit den Geschehnissen entlang des Eisernen Vorhangs über die wechselvolle Kooperation des neutralen Österreich mit dem Ostblock bis hin zu den "neuen Gemeinsamkeiten", den Beziehungen Österreichs zu Ost- und Südosteuropa unter den geänderten politischen und zeithistorischen Bedingungen nach 1989. Ein besonderer Punkt wäre dabei die österreichische Balkanpolitik seit 1990.

Um diese Fülle an Themen zu bewältigen, ist einiges erforderlich:

- Die erwähnten "windows of opportunity" in Ost- und Südosteuropa sind rasch zu nützen, vor allem die Archivquellen, solange ein Zugang (noch) möglich ist (siehe das Tauziehen um russische Beutekunst und Beuteakten).
- Im nationalen Interesse muss danach getrachtet werden, die Österreich betreffenden Bestände in diesen Ländern, sofern sie nicht in österreichische Verwaltung übertragen werden können, zumindest mit modernen Archivierungs- und Kopiermethoden zu sichern.
- Bilaterale Arbeitsgruppen sollen versuchen, Themen von wechselseitigem Interesse aufzuarbeiten und außer Streit zu stellen (z.B. gemeinsame tschechisch-österreichische Aufarbeitung des "Prager Frühlings" bzw. der Ära der Konfrontation Prag-Wien davor und danach). Eine Erneuerung des Konzepts der "bilateralen Geschichtsbücher" (z.B. Österreich-Deutschland und Österreich-Italien) scheint sinnvoll.

Die Zeit drängt: Es ist schon viel Zeit verlorengegangen, Datenbestände in Nachbarstaaten für zeithistorische Aufarbeitung zu sichern. Aber dort, wo Zugang zu Quellen (noch) möglich ist, muss die Chance genützt werden.

Österreich zwischen Ost und West

Seit Ende des Kalten Krieges ("Zeitenwende" 1989-91) hat die internationale Zeitgeschichtsforschung erstmals die Chance, den Ost-West-Gegensatz als historische Epoche zu begreifen und in den größeren Rahmen des "Zeitalters der Ideologien" (Bracher, 1982) einzubetten.

Das Auf und Ab der Ost-West-Auseinandersetzungen zwischen Spannung und Entspannung berührte Österreich wie kaum ein anderes Land, da es – allenfalls Finnland vergleichbar – an der geostrategischen Peripherie der Machtblöcke lag. Während der Besatzungszeit ging der "Eiserne Vorhang" durch Österreich, das in den frühen fünfziger Jahren als das potentielle "Korea Europas" galt. Doch auch nach 1955 berührten die Krisenherde an Österreichs Grenzen (Ungarn 1956, CSSR 1968, Gefahr eines sowjetischen Eingreifens in Jugoslawien/"Polarka") Österreich: zum Problem der Versorgung von Flüchtlingen trat die Gefahr einer Eskalation der sowjetischen Interventionen innerhalb des Warschauer Paktes zu einer Auseinandersetzung zwischen den Blöcken bis zum nuklearen Holocaust, der auch Österreich nicht verschont hätte. Auch entfernter liegende Konflikte (Libanon 1958) wirkten bis nach Österreich.

Julius Raab steuerte als Kanzler einen Kurs der Äquidistanz zwischen den Blöcken, der letztlich in die Staatsvertragsverhandlungen mündete und zum Ende der Besatzungszeit führte. Bruno Kreisky setzte als Außenminister und Bundeskanzler diese Linie fort: Österreichs Außenpolitik war dabei gleichermaßen der Zugehörigkeit zum Westen wie freundschaftlichen Beziehungen zum Osten verpflichtet und fand eine besondere Aufgabe in der Mitarbeit auf der internationalen Bühne. Einige wichtige Erfolge auf diesem Weg waren:

- Einrichtung des Sitzes der Atomenergieorganisation (IAEO) in Wien (1956/57)
- Übernahme des Vorsitzes im UN-Ausschuß für Weltraumfragen (1959)
- Das Wiener Gipfeltreffen zwischen Nikita Chruschtschow und John F. Kennedy (1961)
- Österreichische Mitwirkung am Zustandekommen des Helsinki-Abkommens (1975)

- Während des "Zweiten Kalten Krieges" der achtziger Jahre fanden die ständigen konventionellen Abrüstungsverhandlungen (KSE) in Wien statt.

Mental gesehen führte diese oft missverstandene "Neutralitätspolitik" während des Kalten Krieges zu einer gefährlichen Außenseiterposition ("Insel der Seligen"-Syndrom). Österreich war - anteilsmäßig - Hauptempfänger von Mitteln aus dem Marshall-Plan und profitierte von den Verteidigungsanstrengungen des Westens, ohne die Kosten mitzutragen. Dies kam dem Ausbau des großzügigen heimischen Sozialstaats zugute und brachte Österreich größeren Wohlstand als in so manchen NATO-Staaten, führte aber gleichzeitig zur Vernachlässigung der Verteidigung des eigenen Landes. Hier bestehen im Bereich der politischen, vor allem aber der Militärgeschichte (Verhältnis Österreich-NATO, Österreich-Warschauer Pakt bzw. operative Planungen der beiden Militärbündnisse) noch erhebliche Defizite. Ähnliches gilt für die Tätigkeit der verschiedenen Geheimdienste in Österreich; diesbezügliche Forschungen sind in der Schweiz und in Deutschland weiter gediehen als in Österreich.

Diese Haltung Österreichs ist für das Ausland meist nicht verständlich und wird als "Trittbrettfahrerei" und "Abseits-Stehen" (etwa im Golfkrieg 1991 oder in Somalia 1992-94) interpretiert. Die "Insel der Seligen"-Identität bestimmt(e) auch Österreichs Position etwa hinsichtlich der Errichtung von Atomkraftwerken in den Nachbarstaaten oder bezüglich der – teils zu Recht als vorbildlich empfundenen – Bestimmungen über Umwelt- und Konsumentenschutz, was gelegentlich die Beziehungen zu unseren Nachbarstaaten belastet und die Integration in Europa erschwert und bremst.

Im Kulturellen blieb auch Österreich nicht von der "Amerikanisierung" verschont. Mittlerweile erlebten mehrere Generationen ihre Prägung durch amerikanische Populärkultur (z.B. Jazz und Rock) und vielfältige Einflüsse von Jeans über McDonalds bis zum Internet. Die hiesige Zeitgeschichtsforschung zeigt bei der Aufarbeitung dieser Themen noch gewaltige Lücken. Dies gilt vor allem für größere sicherheitspolitische Themen der Ost-West Auseinandersetzungen (z.B. Militarisierung, Geheimdienste, Nuklearstrategie) – selbst die Neutralitätspolitik überließ die Geschichtsforschung weitgehend den Völkerrechtlern und Politologen! Einige Arbeiten zu Wiederbewaffnung, Marshall-Plan und Kaltem Krieg sind in Österreich überdies bis in die Gegenwart von "vorsintflutlichen" marxistischen Ansätzen beherrscht, die – anderswo längst überwunden – letztlich auf die amerikanischen Revisionisten der sechziger Jahre zurückgehen.

Wirtschaftsgeschichte

Ein großer Teil der Bevölkerung erfährt den Zugang zur Geschichte nicht so sehr über (kaum direkt erlebte) politische Ereignisse, sondern vielmehr – meist unbewusst! – über die Wirtschaft und ihre Entwicklung: Autos, Flugzeuge, Betriebe (Arbeitswelt); Technologie, Küche, etc. Die Geschichte der Wirtschaft hat daher eine breite gesellschaftliche Akzeptanz und ist vielfach identitätsstiftend. Dies gilt für einen Ort – und seinen Betrieb – wie für den Unternehmer in einer Gesellschaft, bis hin zur Präsenz österreichischer Technik und Produkte in der Welt (LD-Stahlverfahren, Palmers, Swarowski, Fischer, Atomic, Plasser & Theuer, etc.).

Die Wirtschaftsgeschichte der österreichischen Nachkriegszeit weist allerdings eklatante Defizite auf. So fehlen breite und neuere Untersuchungen zur Wirtschaft der Zweiten Republik im Überblick, insbesondere über den Außenhandel. Weitere Defizite betreffen den etappenweisen Übergang von der Plan- zur Marktwirtschaft nach 1945, zur Entwicklung der Sozialpartnerschaft, zu den Folgen des Marshall-Plans, zur Problematik der verstaatlichten Industrie sowie zur Umstrukturierung der Industrie seit 1945. Über die "Highlights" der österreichischen Wirtschaftserfolge, über die parteipolitischen Einflüsse und Verflechtungen in Industrie und Bankwesen, über Wesen und Unwesen des "Kammerstaates", über das "deutsche Eigentum" in Österreich und die schrittweise Westorientierung der Wirtschaft gibt es kaum Untersuchungen, die über Detailstudien hinausgehen. Ebenso fehlen Arbeiten über den österreichischen Unternehmer und zur Geschichte wirtschaftlicher Eliten, aber auch zur Frage der Rohstoffe (Wasser, Erdöl, Holz, Eisen). Der politischen Geschichte der sowjetischen Zone 1945-55 wäre beispielsweise unbedingt eine Wirtschaftsgeschichte an die Seite zu stellen: wirtschaftliche, politische und soziale Entwicklungen waren stets miteinander verknüpft.

Die Lücken der Forschung sind eng verbunden mit Defiziten bei den Quellen und in der Ausbildung, die im Bereich der Wirtschaftsgeschichte besonders krass sind. Eine Erschließung von Quellen zur österreichischen Wirtschaftsgeschichte muss auf zwei Schienen erfolgen: zum einen sind durch die Öffnung ausländischer – vor allem alliierter – Archive zusätzliche Quellen zugänglich, deren Erfassung und Auswertung als Teil einer nationalen Kraftanstrengung dringend geboten ist. Zugleich müssten die inländischen Quellen gesichert werden: so sollte eine konzertierte Aktion initiiert werden, um die Nachlässe und Handakten bedeutender österreichischer Wirtschaftsführer vor der Vernichtung zu bewahren. Durch Bewusstseinsbildung sollte die dringend erforderliche Sicherung von Firmenakten gefördert werden.

Wünschenswert ist die Bildung von Schwerpunkten hinsichtlich der Ausrichtung der Institute für Wirtschaftsgeschichte an den österreichischen Universitäten (z.B.: Unternehmensgeschichte, verbunden mit der Ausbildung von Wirtschaftsarchivaren, in Wien und Linz; Unternehmergeschichte in Graz und Innsbruck; Handelspolitik in Salzburg, etc.). Dazu gehört auch die Ausbildung und Förderung von Wirtschaftsarchivaren modernen Typs für Firmenarchive – dies wäre auch als Beitrag zur Corporat Identity der Firmen bzw. zur Unternehmenskultur von Bedeutung.

Hinsichtlich der regionalen Wirtschaftsgeschichte wäre den Außenbeziehungen mehr Augenmerk zu schenken: etwa den Kontakten zwischen Steiermark, Kärnten, Oberitalien und Slowenien, oder jenen zwischen Tirol und Vorarlberg mit Süddeutschland, Italien und der Schweiz. Ähnliche Kontakte bestehen zwischen Salzburg, Oberösterreich und Bayern, sowie zwischen Niederösterreich, dem Burgenland, Ungarn und Tschechien sowie der Slowakei. Grundsätzlich wäre eine Ausgewogenheit zwischen derartigen (volkswirtschaftlichen) Makro- sowie (detailorientierten) Mikrothemen wünschenswert, ebenso eine Verstärkung der interdisziplinären Kooperation.

Gesellschaftsgeschichte

Unter dem Gesichtspunkt einer modernen, interdisziplinär ausgerichteten Gesellschaftsgeschichte ist folgendes zu berücksichtigen:

- Die Frage der Periodisierung: politische Zäsuren nach herkömmlichen politischen Gesichtspunkten "korrespondieren" nicht immer mit gesellschaftlichen Strukturen und Mentalitäten ("Trends"). In den offiziellen Geschichtsbildern blieben diese Fragen bisher weitgehend ausgespart und wären verstärkt zu berücksichtigen (Stichwort "Waldheim-Debatte").

- Gesellschaftliche Trends und erkennbare Linien nach 1945: Bis Anfang der sechziger Jahre ist für Österreich ein Dualismus zwischen den aus der Kontinuität des NS-Staates überlieferten und latent (nach)wirkenden "Normen" und den von der ersten Nachkriegsgeneration auf Basis einer neuen Identitätsfindung "produzierten" Erkenntnissen zu konstatieren. Die zunehmende Modernisierung im Einklang mit der immer rascher einsetzenden Massenkultur (Schlagworte: Wirtschaftswunder und Amerikanisierung) zeitigte Verschiebungen in einzelnen Segmenten der österreichischen Bevölkerung. Seit den späten sechziger Jahren wird die Transformation des österreichischen Sozialstaates (Blüte der Sozialpartnerschaft) und des gesellschaftlichen Systems beschleunigt. Seit den achtziger Jahren zeigen sich die ökonomischen Grenzen dieses "Modells Österreich" bzw. des Wohlfahrtsstaates. Hand in Hand damit gehen die sich überlappenden Demokratisierungswellen von "unten" (Bürgerinitiativen, Ökobewegungen, Frauenbewegungen, etc.) seit den siebziger Jahren und die weitere Ausdifferenzierung und Pluralisierung des gesellschaftlichen wie politischen Lebens (Mehrparteiensystem ersetzt das "Zweieinhalbparteiensystem").
- Mit der "Wende" 1989, der Öffnung Osteuropas, dem Beitritt zur EU und der weltweiten Vernetzung ("Globalisierung") in den neunziger Jahren erfährt das gesellschaftliche Bild fundamentale Veränderungen. Im Rahmen einer sich methodisch und theoretisch erweiternden Gesellschaftsgeschichte sollen diese historischen Perioden bzw. Übergänge konkretisiert und transparent gemacht und Charakteristika herausgarbeitet werden.

Forschungsleitende Fragestellungen und Themenbereiche sind dabei:

- Die demographische Entwicklung nach dem Ende des Zweiten Weltkrieges in Österreich. Gab es nachweisbare Auswirkungen der "verzögerten Modernisierungsschübe"?
- Die Problematik der politischen wie wirtschaftlichen Migrationen nach dem Zweiten Weltkrieg: Volksdeutsche aus Ost- und Südosteuropa (1945ff), Flüchtlinge des Ungarnaufstandes 1956 und nach dem "Prager Frühling" 1968 sowie aus dem zerfallenden Jugoslawien ab 1991. Unterschiedliche Motive (wirtschaftlich, politisch) und Lösungskonzepte bzw. -ansätze (Gastarbeiterproblematik in den siebziger Jahren, Entwicklung von Aufenthalts-, Asyl- und Arbeitsrecht in den Neunzigern). Veränderungen im Umgang mit den(m) "Fremden", damit verbunden die Frage nach der Integration von Roma und Sinti, sowie zur Stellung der Minderheiten.
- Wie definieren sich Legitimitätsprobleme des herkömmlichen politischen wie gesellschaftlichen Systems unter Berücksichtigung von globalen Entwicklungen; in welchem Ausmaß findet eine öffentliche Rezeption statt?
- Die Frage nach Auswirkungen von konjunkturellen und strukturellen Brüchen – als moderne Zäsuren gesellschaftlichen Wandels (Arbeitsplatzsituation, Wirtschaftswunder und -krisen) – auf das Gesamtbild der österreichischen Gesellschaft.
- Und schließlich: inwieweit werden regionale Eigenheiten und Entwicklungen in den österreichischen Bundesländern durch die Geschichtsforschung bezüglich der Gesellschaftsgeschichte berücksichtigt und wahrgenommen?
- Ein wesentlicher Bereich wurde bislang fast völlig vernachlässigt: Rechtskultur und Rechtsbewusstsein stellen die Grundlage der demokratisch-rechtsstaatlichen politischen Kultur dar. Der Bogen reicht von der Entwicklung der Bürger- und

Menschenrechte über den Rechtsschutz der Bürger und Bürgerinnen bis zur Gleichberechtigung und Gleichbehandlung der Frauen: Themen, die bis in die Gegenwart relevant und aktuell sind, dabei gleichzeitig über Österreich hinausreichen und eine eminent europäische Dimension haben. Zu diesem Problemkreis gehört auch der Missbrauch dieser Rechte – bis hin zur "Instrumentalisierung" der Verfassung durch die jeweiligen Inhaber einer verfassungsändernden Mehrheit im Parlament, wie dies etwa in den USA undenkbar wäre.

Integrationsgeschichte

Die heimische Geschichtsforschung ist stark auf Österreich ausgerichtet. Damit sieht sich die historische Forschung vor ähnliche Herausforderungen gestellt wie Politik und Verwaltung auf allen Feldern: über den eigenen "Rosengarten" bzw. Tellerrand zu blicken. Angesichts der neuen Herausforderungen innerhalb der Europäischen Union ist besonders wichtig: Geschichte schafft Bewusstsein und Verständnis.

- *Österreich in Europa*: Abgesehen von Einzelinitiativen ist Österreichs Rolle in der europäischen Einigung – trotz der führenden Rolle, die Persönlichkeiten wie der "Universal-Österreicher" Richard von Coudenhove-Kalergi etwa in der "Paneuropa-Bewegung" gespielt haben – kaum erforscht und im öffentlichen Bewusstsein wenig verankert. Dazu trug auch die Tradition der nicht wahrgenommenen Chance einer politischen Neuorientierung nach 1918 (stärkere Orientierung an internationalen Ansätzen – Völkerbund – und westlichen Demokratiemodellen) bei. In der Zweiten Republik erwuchs zaghaft – nicht immer freiwillig – eine neue Identität, die stärker international (UNO) und (west-) europäisch geprägt ist. Das Fehlen von Grundlagenarbeit und Information fördert aber die Mythenbildung – wie sich anlässlich der jüngsten Diskussion um die schon im Ansatz falsche Frage "Neutralität oder NATO?" zeigte. Über wissenschaftliche Fachfragen hinaus gewinnt die Forschung hier politische Aktualität.
- *Zentralen und Netzwerke*: Ein besonderes Anliegen sollte die Erforschung der Rolle Österreichs als "Zentrale" in Europa, aber auch darüber hinaus sein – sei es im Rahmen des "Demokratieexports" in den Osten schon vor, besonders aber nach 1989; sei es hinsichtlich der jüngsten Initiativen zur mitteleuropäischen Zusammenarbeit bei Friedenseinsätzen der UNO, um nur zwei Beispiele zu nennen. Die Rolle Österreichs als Akteur und Katalysator im internationalen Geschehen ist bislang kaum gewürdigt worden und daher auch in der Öffentlichkeit wenig bekannt.
- *"Europa der Regionen"*: Erste Ansätze zur regionalen Zusammenarbeit über die Grenzen der Nationalstaaten hinweg reichen noch in die Zeit des Kalten Krieges zurück. 1972 entstand die "ARGE ALP", 1978 die "ARGE Alpen-Adria" und dann die "ARGE Rhône-Alpes". Ein ähnliches Konzept, freilich auf zwischenstaatlicher Ebene, verfolgte die Zentraleuropäische Initiative (CEI; zuerst "Pentagonale", 1990). Neben Länderregierungen und Landtagen spielten Universitäten, Wirtschaftskammern, Schulen, Gemeinden usw. eine wichtige Rolle. Im Rahmen der Europäischen Union fanden diese Ansätze ihre besondere Ausformung im Konzept des "Europa der Regionen". Hier sind zwei gegenläufige Entwicklungen zu verzeichnen: auf der einen Seite "bremsen" die zentralistischen Staaten (Frankreich, Italien) diese Regionalisierungstendenzen; auch der "Ausschuss der Regionen" der EU spielt bisher eine höchst bescheidene Rolle. Andererseits aber tendieren die Länder

- vertreten durch ihre eigenen "Botschaften" – durchaus zur "Umgehung der Zentralen". Letztlich wird sich die Bedeutung der Nationalstaaten durch die Abgabe von Kompetenzen nach "oben" (EU/EG) wie nach "unten" (Länder, Regionen) relativieren und sich das künftige Europa mehrschichtiger darstellen als bisher ("Die post-nationalstaatliche Ära wird die Ära der Regionen sein", vgl. Umberto Ecos (1995) Konzept eines kommenden neuen Mittelalters). Da die Region "bürgernäher" ist, sollte ihr ein gewisser Handlungsvorrang gegenüber der staatlichen und europäischen Ebene zukommen. Der Trend sollte zum teilweisen Souveränitätsverzicht der Staaten zugunsten der regionalen Einheiten gehen, Länder und Gemeinden verstärkt in Eigenverantwortung ihre Aufgaben wahrnehmen. Für Österreich bedeutet dies in den kommenden Jahren die verstärkte Forderung nach mehr Flexibilität und regionaler Kooperation über die Grenzen hinweg, inner- und außerhalb der Europäischen Union.

Quellensicherung: "Rettet die Quellen!":
eine nationale Aktion zur Sicherung unserer Geschichte

Voraussetzung für Geschichtsforschung und -schreibung sind Sicherung und Zugänglichmachung der Quellen. Derzeit bestehen große Lücken, die möglichst rasch zu schließen sind: es droht eine Entwicklung, dass durch den Verlust der heimischen Quellen unsere Geschichte nur noch anhand der "Außensicht" (etwa in amerikanischen Akten) geschrieben werden kann!

Während die Politik der Forschung allenfalls Anregungen geben und Wünsche anmelden kann, sieht sie sich hinsichtlich der Quellensicherung direkt gefordert. Amtliche wie nichtamtliche Quellen müssen gesichert und vor der Vernichtung bewahrt werden. Dem soll ein – längst überfälliges – Archivgesetz dienen, um eine geordnete Überleitung von Akten aus der Verwaltung in die Archive zu regeln. Dem Bundes-Archivgesetz hätten entsprechende Regelungen auf Landesebene zu folgen.

Während in den westlichen Demokratien wissenschaftliche Aktenpublikationen inzwischen ein selbstverständliches Instrument der politischen Verantwortung gegenüber dem Bürger sind (selbst die CIA veröffentlicht ihre Akten!), fehlen solche in Österreich für die Zeit nach 1945 fast völlig. Diese sind aber für das historische Bewußtsein wesentlich: Österreichische Geschichte soll nicht nur anhand ausländischer Akten geschrieben werden – wir haben ein Recht auf unsere Geschichte!

Eng damit verbunden ist die Einrichtung entsprechender historischer Forschungsstellen im Außen- und Verteidigungsministerium. Diese sollen über die Koordinierung der Akteneditionen hinaus auch ein institutionalisiertes Gedächtnis gewährleisten, das im operativen Bereich (angesichts der aktualitätsorientierten Arbeit und der häufigen Personalrotationen) weitgehend fehlt.

Begleitende Maßnahmen sollten der Erfassung von nicht-amtlichem Schriftgut, Nachlässen, sowie den Archiven von Vereinen, Handels- und Wirtschaftsbetrieben dienen. Besonderes Augenmerk gilt den immer wichtiger werdenden elektronischen Quellen, Tonträgern sowie Bildquellen verschiedener Art. Hier gelten nicht nur besondere konservatorische Grundsätze, sondern es muss auch die Bewahrung der erforderlichen technischen Infrastruktur ("Hardware") gewährleistet sein.

Schriftgut der öffentlichen Verwaltung

Eine moderne Demokratie hat eine offene Geschichtsschreibung: Zugang zu den Quellen ist Recht des Bürgers, kein Gnadenakt. Archive sind Servicestellen der Demokratie, zugleich aber Stätten wissenschaftlicher Forschung. Beide Aspekte sind in Österreich teils wenig entwickelt. In Österreich arbeiten die Archive derzeit ohne gesetzliche Grundlage. Ein Archivgesetz (seit Jahrzehnten diskutiert) soll – abgestimmt mit Daten- und Personenschutzgesetz – den Zugang gewährleisten: Internationaler Standard sind derzeit gleitende Sperrfristen von 30 Jahren. Ausnahmen gelten nur für konkret identifizierbare Dokumente im nationalen Interesse (Sicherheit, Außenpolitik), für die längere Sperrfristen verfügt werden können, während in besonderen Fällen auch eine Verkürzung dieser Fristen möglich ist. Für Aktenskartierung und Fristsetzungen sind entsprechend Abläufe vorzusehen.

Die rechtliche Grundlage für das Archivgesetz bietet die Bundesverfassung, die ausdrücklich die Bundeskompetenz für das wissenschaftliche Archivwesen festschreibt (Art. 10, Abs. 12). Neben der Zugangsregelung muss dieses Archivgesetz den Übergang von Akten der Legislative, der politischen Exekutive und der Verwaltung (einschließlich nachgeordneter Dienststellen) in das Österreichische Staatsarchiv regeln, einschließlich klarer Bestimmungen zur Übertragung der Verfügungsgewalt. Auf Länderebene wären entsprechende Regelungen zu erlassen.

Möglichst einfache und benützerfreundliche Regelungen sollten hinsichtlich der Verantwortlichkeit für personenbezogene Informationen gelten: grundsätzlich ist der Historiker verantwortlich, wie er mit den Daten umgeht, nicht das Archiv, das die Akten zugänglich macht (Reduzierung des administrativen Aufwandes vor der Benützung). In manchem könnten die Archivbestimmungen der UNO als Anhalt dienen.

Im internationalen Vergleich ist die Zugänglichkeit der Archive ein Indiz für den Grad an demokratischer Reife eines Staates bzw. einer Gesellschaft. Ein wesentlicher Aspekt sind koordinierte Akteneditionen, auch in Form von CD-ROM-Editionen bzw. Datenbanken: diese sollen den Quellenzugang erleichtern und so dazu beitragen, historisches Bewußtsein zu schaffen. Österreichische Geschichte soll nicht nur anhand ausländischer Quellen geschrieben werden – wir haben ein Recht auf unsere Geschichte!

Für die Zweite Republik existieren erst Ansätze für Akteneditionen. Diese sollen anhand eines langfristigen Programmes (zur Vermeidung von Parallelaktionen) über eine Nationalstiftung eingeleitet werden; professionelles Management soll hohe Effizienz gewährleisten.

Außen- und Sicherheitspolitik

Besondere Sorgfalt muß der Aktensicherung in den Schlüsselbereichen der staatlichen Verwaltung gelten. Hier wären begleitende institutionelle Maßnahmen vorzusehen, um den Bedürfnissen der jeweiligen Ressorts, aber auch dem Interesse der Öffentlichkeit Rechnung zu tragen. In den westlichen Demokratien sind derartige Forschungsstellen in den Außen- und Verteidigungsressorts auch für Aktenpublikationen verantwortlich, die in einer Bürgergesellschaft selbstverständlich sein sollten, in Österreich aber weitgehend fehlen: die Veröffentlichung von Akten ist wesentliches Element der Transparenz der Verwaltung und der demokratischen Legitimation der Außenpolitik. Dadurch würde auch die Reaktionsfähigkeit auf aktuelle Vorwürfe bzw. Krisen verbessert.

Eine bessere Erschließung der Außenpolitik ist aus Sicht von Forschung und Diplomatie erforderlich. Anders als in den meisten westlichen Staaten fehlt im Bundesministerium für auswärtige Angelegenheiten eine Stelle für quellenbezogene Grundlagenforschung jenseits des aktuellen Betriebs. Dies wäre aber aus zwei Gründen dringend unablässig:

- zum einen könnte ein derartiger historischer Dienst (wie er in den meisten westlichen Außenministerien selbstverständlich existiert) eine solide Basis für die aktuelle Arbeit liefern und so dem alltäglichen "Neu-Erfinden des Rades" entgegenwirken;
- zum anderen sollte diese Stelle die Verfügbarkeit und Aufschließung der Quellen für spätere historische Forschungen sicherstellen.

Ähnliches gilt für die Landesverteidigung. Abgesehen vom kurzlebigen Experiment des "Militärhistorischen Dienstes" (1989-92) fehlt auch im Bundesministerium für Landesverteidigung eine historische Stelle zur Sicherung und Aufbereitung von Quellen, sowie zur aktiven Sammlung von Unterlagen und Interviews. Dies wäre eine grundlegende Voraussetzung für die Erfassung und Erschließung bisheriger Erfahrungen. Derartige militärhistorische Dienste bestehen z.B. in den USA, Israel, Großbritannien, Frankreich oder in Deutschland im "Militärgeschichtlichen Forschungsamt". Die Kosten sind gering im Vergleich zum Gewinn an Information, Transparenz und Bürgernähe.

Nachlässe und nicht-amtliche Quellen/Oral History

Angesichts der Praxis in der politischen Entscheidungsfindung wie der Verwaltung nach 1945 kommt "ergänzenden" Quellen (Nachlässen und Interviews von Zeitzeugen) besondere Bedeutung zu. Diese sollten gezielt und aktiv gesammelt und erschlossen werden. Dies gilt aber nicht nur auf der "Makroebene" der staatlichen Verwaltung, sondern in allen Bereichen. Neben die Sammlung muss eine Vernetzung der Informationen treten, um der Forschung die Möglichkeit zur möglichst umfassenden Ausschöpfung der Quellen zu bieten. Neben den Archiven der Gebietskörperschaften wären auch die Archive anderer Institutionen sowie z.B. von historischen Vereinen zu erfassen. Durch einen möglichst breiten Ansatz soll parallel das Bewusstsein für die Bedeutung von Quellen auf allen Ebenen gehoben werden.

Elektronische Quellen, Bildquellen – Fotos und Film – und andere "dingliche" Quellen

Hier gilt es, jenseits traditioneller "Papierquellen" Informationen zu bewahren, die z.B. nur in Form gespeicherter Datensätze existieren. Für ihre Aufbewahrung und Erschließung gelten Bedingungen, derer wir uns erst langsam bewußt werden. Wenn hier nicht geeignete Maßnahmen getroffen werden, "verschwinden" mit diesen Daten einige Jahrzehnte aus unserem Bewusstsein. So gilt es beispielsweise, durch Konservierung der notwendigen materiellen Infrastruktur ("Hardware") sicherzustellen, dass Daten überhaupt gelesen werden können.

Diese Forderung gilt sinngemäß für Bildquellen. Diesen kommt in unserem "Informa-tionszeitalter" erhöhte Bedeutung zu – gerade sie aber sind besonders gefährdet ("Verfallszeiten" aufgrund des Materialzerfalls etwa bei Filmen). Vor allem hinsichtlich elektronischer und Film-/Bildquellen sind unterschiedliche "de facto"-Archive jenseits der amtlichen Aktendepots anzusprechen. Die Bestände des ORF (der aufgrund seiner öffentlich-rechtlichen Stellung ohnedies eine besondere Verpflichtung haben müßte, seine Bestände zugänglich zu machen) und anderer Medien, auch kommerzielle Bildarchive, sind Teil unseres nationalen Kulturerbes! Vielfach handelt es sich um "private Quellen", deren Erhaltung und Zugänglichkeit jedoch im öffentlichen Interesse liegt. So droht im Zuge der Umstellung auf digitale Bildquellen der Verlust tausender Fotos aus Zeitungsarchiven: eine "nationale Rettungsaktion" für dieses wichtige Element unseres historischen Selbstverständnisses ist notwendig.

Ähnliches gilt für Archive von Handels- und Wirtschaftsbetrieben einschließlich Banken und Kammern. Gesetzliche Maßnahmen, vor allem aber nicht-gesetzliche Anreize und Maßnahmen zur Bewusstseinsbildung sollen die Erhaltung, Sammlung und Erschließung dieser Quellen gewährleisten. Die Landesarchive sind aufgerufen, die Anlage und Erschließung von Firmenarchiven zu unterstützen bzw. die für die aktuelle Gebarung nicht mehr benötigten Bestände als Depots zu übernehmen. Die Bedeutung von Archiven für Selbstbewusstsein und "Corporate Identity" von Betrieben wurde anderswo schon früh erkannt.

Diese Maßnahmen betreffen vorerst die Quellen in Österreich selbst, müssen jedoch hinsichtlich der Erfassung und Erschließung der Österreich betreffenden Quellen im Ausland ergänzt werden. Einerseits durch die Förderung von Forschungen vor Ort, andererseits durch die Verfilmung besonders relevanter Akten zwecks leichterer Benützbarkeit in Österreich soll die Quellenbasis erweitert und somit die Erforschung unserer jüngeren Geschichte auf eine möglichst breite Basis gestellt werden. Erst durch die Verschränkung von Eigen- und Fremdsicht ist es möglich, ein umfassendes Bild zu gewinnen und damit der österreichischen Identität Substanz jenseits der Klischées zu verleihen.

Service: ein "Haus der Zeitgeschichte" als historisches und gesellschaftliches Kommunikationszentrum

Die globale Informationsrevolution stellt auch die Zeitgeschichtsforschung vor enorme Herausforderungen. Ein "virtuelles Zeitgeschichte-Netzwerk" soll daher

* alle historisch tätigen Institute, Archive und Vereine vernetzen,
* alle quellensichernden Archive einbinden, sowie
* die Anbindung der österreichischen an die internationale Forschung sichern.

Dadurch entstehen Synergieeffekte und werden Doppelgleisigkeiten vermieden.

Zentrales Element dieses Netzwerks ist ein "Haus der Zeitgeschichte", das Bürgern, Behörden und Medien Anlaufstelle und Plattform für rasche Informationsbeschaffung ist, darüber hinaus durch eigene Aktivitäten Impulse setzt. Dabei geht es um eine ständige Diskussionsplattform als Begegnungsstätte mit breitgefächertem Angebot, weiters um dauernde und Sonder-Ausstellungen zur jüngsten Geschichte. Der Erfolg diesbezüglicher Ausstellungen der letzten Jahre ("Europa schrankenlos" in St. Pölten 1995) zeigt den Bedarf.

Eine weitere Aufgabe ist die praxisnahe Ausbildung junger Historiker und Archivare in "zeithistorischer Archiv- und Editionstechnik". Grundsätzlich soll das "Haus der Zeitgeschichte" nicht bestehende Einrichtungen duplizieren, sondern "subsidiär" tätig werden. Außerdem hilft das "Haus der Zeitgeschichte", bestehende Kommunikations- und Präsentationsprobleme der Wissenschaft durch Hilfestellung bei der mediengerechten Umsetzung historischer Forschung zu überwinden (letztlich ein Beitrag zur Rechenschaftspflicht staatlich geförderter Forschung gegenüber dem Steuerzahler!). Entsprechende Ausbildungsangebote ("Fachjournalismus") wirken zusätzlich befruchtend.

Die Nutzung technischer Möglichkeiten und neuer Medien im Unterricht ist zu fördern. Neue Medienkoffer und bilaterale Geschichtsbücher sind weitere Schritte, historisches Wissen und Bewusstsein im Unterricht zu vermitteln. In Kooperation mit ausländischen Schülern bietet sich die Möglichkeit, den – teils negativ besetzten – Begriff "Heimat" neu zu definieren, im Sinne einer positiven, über nationalistische Egoismen hinausgehenden innovativen Tradition. Gerade das "supranationale" österreichische Nationsverständnis könnte dazu neue Wege zeigen.

Virtuelles Netzwerk: Vernetzung der Forschung

Die globale Informationsrevolution stellt auch die Zeitgeschichtsforschung vor enorme Herausforderungen: die Forschung ist in rasantem Tempo international geworden. Der Austausch von Forschungsergebnissen mittels internationaler Vernetzung wird zum Standard jeder modernen Wissenschaft. Die Nutzung des Internet für vernetzte Forschung steht erst am Anfang, die Chancen und Optionen sind noch längst nicht ausgeschöpft. In Österreich wurde mit der Vernetzung der österreichischen Bibliotheken, unter Einschluss der Universitätsbibliotheken, ein erster Schritt zu vernetzter Forschung gesetzt. Doch dies kann nur der Anfang einer Entwicklung sein, deren rasanter technischer Fortschritt – siehe Internet – ungeahnte Chancen wissenschaftlicher Nutzung erahnen läßt.

Das Schlagwort jeder vorwärtsgewandten, langfristig planenden Zeitgeschichtsforschung kann nur lauten: "virtuelles Zeitgeschichte-Netzwerk", das folgendes anbieten soll:

- Vernetzung aller in Österreich historisch arbeitenden Institute, Archive und Vereine;
- Einbindung aller quellensichernden Archivstätten Österreichs (auf Bundes-, Länder- und kommunaler Ebene) in ein solches Zeitgeschichte-Netzwerk und
- Anbindung der österreichischen an die internationale Zeitgeschichtsforschung.
- Dieses "virtuelle Zeitgeschichte-Netzwerk" bietet Ausblicke für zentrale und gemeinsame Nutzung der österreichischen Zeitgeschichtsforschung:
- Einerseits als Chance, bisherige Kommunikationsprobleme, Doppelgleisigkeiten und Koordinierungsmängel der österreichischen Forschung zu beenden,
- zugleich als Herausforderung, mit vergleichsweise einfachen Mitteln elektronischer Vernetzung die österreichische Geschichtsforschung zusammenzuführen.

Darüber hinaus ist auf die dringende Notwendigkeit der Modernisierung und Adaptierung zeithistorischer Quellen- und Archiv-Sicherung hinzuweisen (Motto: "Vom Papier-Archiv zum Digital-Archiv"). Hand in Hand damit muss eine Neudefinition und Ausdehnung des Begriffs "zeitgeschichtliche Quelle" gehen. Über die Oral History hinaus wären darunter sämtliche Schrift-, Ton- und Bildträger (Audio, Foto, Video, digitalisiert) zu verstehen. Der adäquaten Lagerung und Konservierung, aber auch der entsprechenden Ausbildung der Archivare und Historiker, wäre entsprechendes Augenmerk zu widmen. Zudem eignet sich das "virtuelle Zeitgeschichte-Netzwerk":

- als Plattform für rasche Informationsbeschaffung (für Regierung, Behörden, Medien bis zu privater Abfrage) sowie

- als ständig abrufbare Grundlage für moderne zeithistorische Informationspräsentation im Rahmen des "Hauses der Zeitgeschichte".

Virtuelles Netzwerk: Ständige Diskussionsplattform Zeitgeschichte

Wie kaum ein anderer Wissenschaftszweig ist gerade die Zeitgeschichte geeignet, durch öffentliche Diskussion und Öffentlichkeitsarbeit einen Beitrag zur Aufarbeitung wichtiger Themen der unmittelbaren politischen Vergangenheit zu erbringen. Dazu muß sie sich in Zukunft mehr als bisher der öffentlichen Debatte stellen bzw. sie initiieren und so ihren Stellenwert in der Öffentlichkeit stärken. Damit die Wissenschaft als "Klient der Gesellschaft" eine adäquate Gegenleistung erbringen kann, ist eine geeignete ständige Plattform für eine kontinuierliche zeitgeschichtliche Präsentation unumgänglich – eine solche ist aber in Österreich, im Gegensatz zu anderen Staaten, derzeit nicht vorhanden. Das "Haus der Zeitgeschichte" könnte, entsprechend den Erfahrungen mit ähnlichen Instituten etwa in Deutschland (Bonn, Berlin), oder den USA (Holocaust-Museum) eine echte Lücke füllen.

Virtuelles Netzwerk: Ausbildung in zeitgeschichtlicher Archiv- und Dokumentationstechnik

Eine weitere Aufgabe des "Hauses der Zeitgeschichte" wäre – in Ergänzung zu Forschung und Service – das Angebot einer einschlägigen Zusatzausbildung in "zeithistorischer Archiv- und Editionstechnik" (einschließlich Multi-Media). Eine derartige Ausbildung wird derzeit weder im universitären Bereich noch außerhalb von Hochschulen angeboten, wäre aber als Zusatzqualifikation für Historiker, Archivare und Museumskuratoren in einschlägigen Positionen (ähnlich dem amerikanischen Masters-Programm in "historical editing") dringend erforderlich. Grundsätzlich sollen keineswegs bestehende Institutionen dupliziert werden; vielmehr soll die Wissenschaft dadurch neue Impulse erhalten.

Durch diese Vermittlung eines praktisch orientieren Programms zur Ergänzung der eher theoretischen, traditionellen wissenschaftlichen Ausbildung könnten auch für Geisteswissenschaftler die Einstiegschancen in den Beruf verbessert werden. Dadurch kommt diesem Vorschlag eine eminent gesellschaftspolitische Bedeutung zu.

Mediale Umsetzung, Interaktion zwischen Forschung und Öffentlichkeit

Meist mangelt es nicht an präsentablen Forschungsergebnissen, sondern an ihrer adäquaten Aufbereitung für die Medien. Um dieser Aufgabe gerecht zu werden und zugleich das Interesse der Medien zu wecken und zu verstärken, ist eine Ausbildung der Wissenschaft zu medialer Artikulationsfähigkeit unumgänglich – Stichwort mediengerechte Sprache: ein Lehrgang in moderner Öffentlichkeitsarbeit ist daher für eine Modernisierung österreichischer Forschung im Zeitalter der Informationsgesellschaft und in Zeiten wachsender Informations- und Reizüberflutung dringend anzuraten, weil geboten. Wir verweisen hier auf das Beispiel des Studiengangs "Fachjournalismus Geschichte" an der Universität Gießen (Deutschland) und dessen erfolgreiche Absolventen.

Eine kritische Betrachtung der Wechselwirkung zwischen zeitgeschichtlicher Forschung und öffentlicher Debatte in Österreich zeigt gravierende Kommunikations- und Präsentations-Probleme auf, sei es, dass Wissenschaftler im "Elfenbeinturm" (häufig vergeblich) passiv auf ein "Wachküssen" durch die Öffentlichkeit warten, sei es, dass sich die öffentliche Diskussion zu wenig um den aktuellen Forschungsstand kümmert.

Zeitgemäße, moderne Präsentation von Forschungsergebnissen muss daher auf mediengerechte öffentliche Umsetzung Rücksicht nehmen und Wert legen: nach dem Gesichtspunkt der Rechenschaftspflicht staatlicher Forschung gegenüber der Gesellschaft. Auch die Zeitgeschichts-Forschung hat – wie jede andere staatlich geförderte Forschung auch – eine Bringschuld an Öffentlichkeitsarbeit.

Nutzung technischer Möglichkeiten und neuer Medien im Unterricht

Das Fach Geschichte ist in allen Schultypen als selbständiges Fach zu führen. Es muß sich im Streit mit verwandten und ergänzenden Fächern bewähren. Lehrstoff- bzw. Wissensvermittlung bleibt dennoch ein wesentliches Ziel. Projektunterricht bietet sich an lokalen Beispielen an, die den gesamten Bereich der Zeitgeschichte umfassen können, bis zu aktuellen und aktuellsten Fragestellungen, wie etwa beispielhaft "Österreichidentität - Europaidentität?" Abgesehen davon wäre es wünschenswert, im Rahmen des Geschichtsstudiums eine Minimalausbildung in Wirtschaftsgeschichte verbindlich vorzusehen.

Wie die meisten geisteswissenschaftlichen Unterrichtsgegenstände bietet auch das Fach Geschichte im multimedialen Zeitalter eine Fülle an Möglichkeiten, neue Wege in der Wissensvermittlung zu gehen, die weit über eine bloße Lehrstoffaufbereitung hinausreichen. Die mittlerweile fast flächendeckende Ausstattung mit Personalcomputern, zumindest an den höheren Schulen, erlaubte es, Lehrinhalte in breiterer und sogar interaktiver Form zu vermitteln. Das gilt sowohl inhaltlich (CD-ROM, DVD) als auch hinsichtlich des Adressantenkreises: mit der Implementierung des Internets liegen Rahmenbedingungen vor, die eine internationale Kooperation und Vernetzung schon in der Schule ermöglicht. Damit einhergehend könnten nicht nur EDV-Kenntnisse praktisch umgesetzt und Fremdsprachen konkret eingesetzt werden, sondern der Nachbar kann im Rahmen des Geschichteunterrichts gleichsam in das Klassenzimmer integriert werden, ohne dass größere Folgekosten daraus entstehen. Für solche Internetpartnerschaften wäre die Geschichtswissenschaft – nicht nur wegen ihres methodischen Instrumentariums des Vergleichs – geradezu prädestiniert.

Lehrbücher, Lehrmittel und didaktische Hilfsmittel

Ein neuer Medienkoffer:

In der zweiten Hälfte der 70er Jahre wurde für den Schulunterricht ein damals auf neuesten wissenschaftlichen und historischen Erkenntnissen aufbauender Medienkoffer "Zeitgeschichte" erarbeitet und für den Schulunterricht zur Verfügung gestellt. Die Entwicklung des Faches Zeitgeschichte mit seinen nicht nur positiven Trends weg von der reinen Fakten- und politischen Geschichte hin zu einer breiteren Wirtschafts-, Sozial- und Gesellschaftsgeschichte erfordert eine Überarbeitung des Medienkoffers "Zeitgeschichte" hin zu einem Medienkoffer des 20. Jahrhunderts. Dieser könnte zum Inhalt haben:

- Politische, Wirtschafts-, Sozial- und Gesellschaftsgeschichte
- Österreich in Europa; Integration/Desintegration – Globalisierung
- Rolle Österreichs an der Bruchlinie zwischen Ost und West seit 1989
- Moderne und aktuelle Biographien

• Österreich und seine Nachbarn.
Bilaterale Geschichtslehrbücher:
Als eine wesentliche Aufgabe der Geschichtswissenschaft muss unbedingt die Erarbeitung bilateraler Geschichtsbücher für den Schulunterricht gefordert werden. In Ansätzen existieren solche Versuche bereits für den Alpen-Adria-Raum. Hier liegt ein unermessliches Potential für die Schaffung eines neuen, integrativen Geschichtsbewußtseins im Sinne der Konzeption des Europas der Regionen. Gemeinsame Geschichtsbücher wie Österreich-Ungarn, Kärnten-Slowenien, Österreich-Tschechien-Slowakei, Österreich-Deutschland, aber auch Österreich-Russland/Sowjetunion oder Österreich-Alliierte sind als Beispiele zu verstehen.

Heimat als Chance für eine neue Identität

Im Lichte des Europäischen Einigungs- und Integrationsprozesses, des Fallens der Grenzen, der Diskussion um die Osterweiterung, und der Debatte um ein gesamteuropäisches Sicherheitssystem gewinnt ein Begriff an Bedeutung, dessen historische Dimension durchaus negative Konnotationen beinhaltet: Heimat. Ein moderner Projektunterricht könnte sich z.B. das Ziel setzen, gerade in Kooperation mit Schülern fremder Länder, einen neuen, innovativen Heimatbegriff zu definieren, der eine moderne Identitätsbildung eröffnet. Die Idee vom "gemeinsamen Haus Europa" könnte eine identitätsprägende Stärke erlangen, die nationale Konflikte im Haus wenigstens eindämmt. Andererseits ermöglicht der Begriff Heimat eine unmittelbarere Wahrnehmung von Veränderungen, wie des historischen und sozialen Wandels der Gesellschaft, des Entstehens neuer sozialer Gruppen oder des nahezu unbemerkten Verschwindens alter sozialer Gruppierungen wie des Bauernstandes. Österreichs Beitrag für ein solches Europa muß nicht als etwas Neues betrachtet werden, es entspricht seiner historischen Tradition. Österreich hatte seit jeher ein supranationales Nationsverständnis und verfügt in dieser Hinsicht über einen reichen Erfahrungsschatz.

Ausstellungen – ein Museum der Zeitgeschichte

Österreich kann mit Recht auf seine Sammlungen von Weltruf stolz sein. Dennoch verfügen wir über kein Museum österreichischer Geschichte. Seit 1945 gab es mehrere Ansätze zur Errichtung eines solchen, die alle scheiterten. Hingegen besteht zweifellos Bedarf an einem modern ausgestatteten, publikumsfreundlichen "Haus der Zeitgeschichte", dessen Ausstellungstätigkeit vor allem der jüngsten Vergangenheit (im gesamteuropäischen Kontext) zu widmen wäre. Gedacht ist an eine permanente Informations- sowie wechselnde aktuelle Spezialausstellung(en). Dieses "Haus der Zeitgeschichte" soll auch im musealen bzw. auf dem Ausstellungssektor als "Clearingstelle" für einschlägige Aktivitäten dienen. Letztlich geht es darum, historisches Bewusstsein – in welcher Form auch immer – zu vermitteln. Wie publikumswirksam dies geschehen kann, beweist ein Blick in den angelsächsischen Kulturraum – aber auch einige österreichische Museen verstehen es mittlerweile, Interesse in allen Schichten der Bevölkerung zu finden. Dies müsste – denkt man etwa an die "National Achives" der USA – auch im Archivwesen möglich sein, das zunehmende Interesse an Familien- und Ahnenforschung etwa könnte als Ansatzpunkt dienen. Der Erfolg gutgemachter einschlägiger Ausstellungen (wie etwa der Schau "Europa schrankenlos" in St. Pölten

1995) beweist den "Markt" für ein derartiges Museum. Dabei ist von einem interdisziplinären, möglichst weiten Ansatz – "Gesellschaftsgeschichte" – auszugehen. Zweckmäßig sollte dieses "Haus der Zeitgeschichte" zuerst Themen der jüngsten Vergangenheit aufgreifen (1989 und das Ende des Kalten Krieges, Österreich in Europa) und erst später frühere Themen der österreichischen Zeitgeschichte darstellen. Gemäß international üblichen Konzepten wäre dieses Museum als Begegnungsstätte mit einem breitgefächerten Angebot (Ausstellungen, Kino, Vorträge, usw.) zu gestalten.

Die hier vorgelegten Ideen sollen auch die Historiker des Berg- und der Hüttenwesens, die Wirtschafts- und Sozialhistoriker sowie darüber hinaus einen breiten internationalen Leserkreis mit der Problematik vertraut machen und zu weiteren Überlegungen anregen.

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The archival documents of the State Central Mining Archives in Banská Štiavnica related to different kinds of museum collections at home and abroad

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The State Central Mining Archives in Banská Štiavnica (SCMA) supervise about 6 km of archival documents relating to different fields of human activity as well as individual people, phenomena and subjects. Some of these documents may serve for identification or more exact description of different museum objects both in Slovakia and in the world.

Contents

Samples of minerals and rocks

It is logical that in the special mining archives there are many documents concerning different collections of minerals and rocks. Most materials are in the collection of the Academy of Banská Štiavnica. [The Academy was established by the decision of the ruler Maria Theresia from December the 10th, 1762 and it existed in Banská Štiavnica till 1918. Then it was moved to Hungary (Sopron and Miskolc) where it exists until now.] Its first professor, Nicolaus Joseph von Jacquin [botanist, chemist; Leyden (Holland), 16.2.1727 – Vienna (Austria), 26.10.1817; his father was a Frenchman by origin, who owned a textile manufacture in Leyden], was put in charge of establishing the mineralogical collection, even before the beginning of the teaching. At the expense of the Court Chamber for Mining and Minting in Vienna (CCh), he was charged to collect samples of the domestic and foreign minerals and rocks needed for the illustrative teaching of future students.

In the fund of the Main Chamber Earl's Office in Banská Štiavnica (MChEO), the inventory of Tadeáš Peitner's private collection of *c.* 2000 minerals, which he sold as a

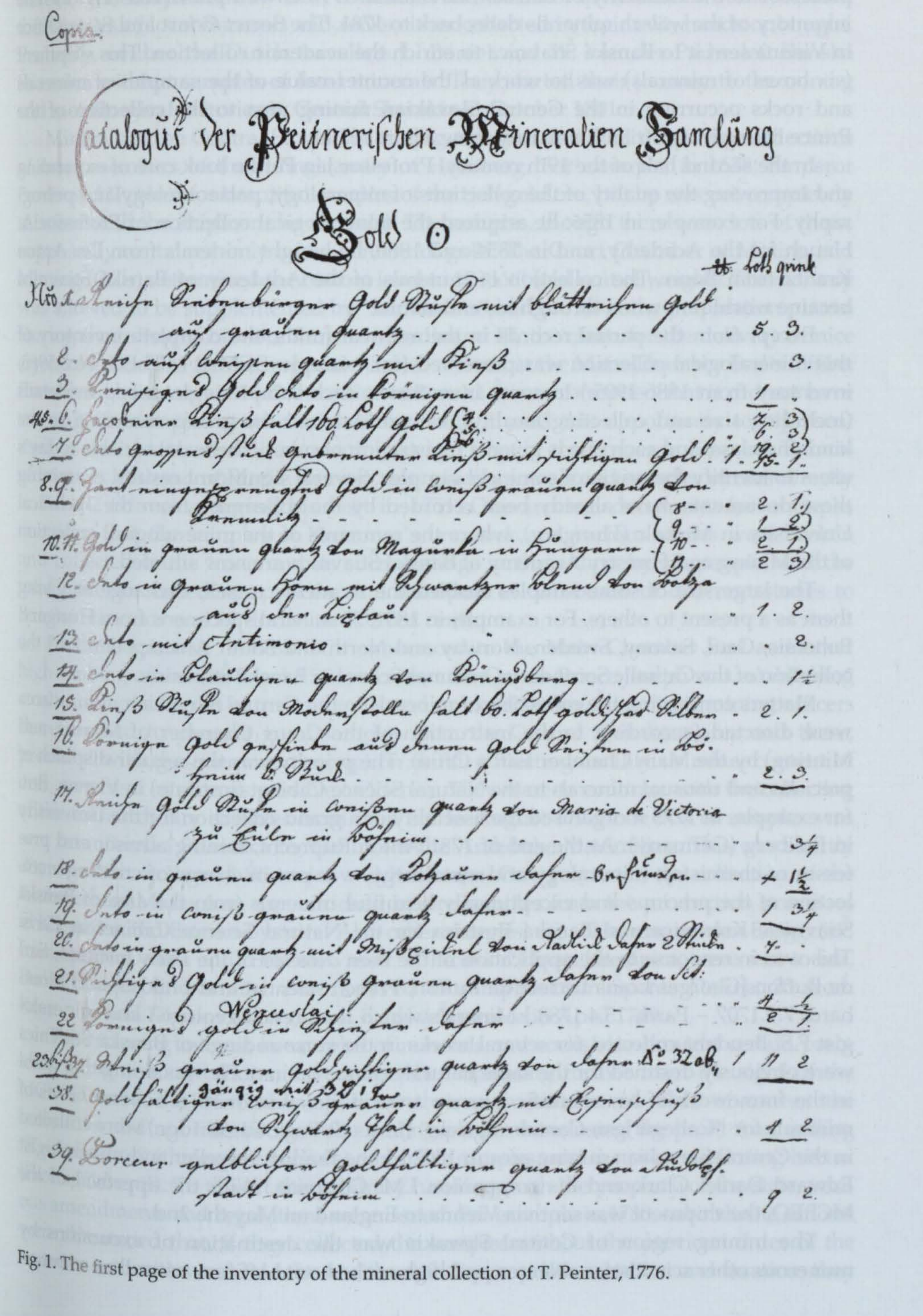

Fig. 1. The first page of the inventory of the mineral collection of T. Peinter, 1776.

professor to the Academy of Banská Štiavnica in 1774 is well preserved (Fig. 1). The inventory of the wälsch minerals dates back to 1781. The Secret Court and State Office in Vienna sent it to Banská Štiavnica to enrich the academic collection. This shipment (six boxes of minerals) was to work as the counter-value of the samples of minerals and rocks occurring in the Central Slovakian mining area to the collection of the Prince ruling in Austrian Lombardy, now a part of Italy.

In the second half of the 19th century, Professor Ján Pettko took care of expanding and improving the quality of the collections of mineralogy, palaeontology and petrography. For example, in 1856, he acquired the mineralogical collection of Professor A. Hauch for the Academy, and in 1854 and 1860, he bought minerals from Dr. Anton Krantz from Bonn. The collection of minerals of the Academy of Banská Štiavnica became world renowned through his endeavour.

Except from the partial records in the archival funds, the complete inventory of this mineralogical collection was preserved (for example: SCMA, MChEO, No. 5963, inventory from 1886-1905.) In some inventories, each sample is described in details (including size and collecting locality), categorised into the group according to the kind and class, and each one is given a registration number. These data enable today's users to identify the origin of some old samples. Several significant results, examining these documents, have already been recorded by the colleagues from the Technical University in Miskolc (Hungary), where the remnants of the mineralogical collection of the Mining and Forestry Academy of Banská Štiavnica are now situated.

The large size of some samples enabled the Academy to sell, exchange or giving them as a present to others. For example, in 1851, 50 mineral specimens from Hungary, Bohemia, Gaul, Saxony, Sweden, Norway and North and South America enriched the collection of the Catholic Secondary Grammar School in Banská Štiavnica.

Matters concerning the collecting of minerals in the Central Slovakian mining area were directed (according to the instruction of the Court Chamber of Mining and Minting) by the Main Chamber Earl´s Office. The priority was the regular dispatch of precious and unusual minerals to the Natural Science Cabinet (institute) in Vienna. But, for example, in 1775 it organised the assembly of a grand collection for the University in Freiberg (Germany). At the end of 1781 Anton Ruprecht, mining advisor and professor of chemistry, mineralogy and metallurgy, was put in charge of creating a collection of the precious and exceptionally beautiful minerals from the area of Banská Štiavnica, Kremnica and Banská Bystrica for the Natural Science Cabinet in Paris. This was in response to the application of the then director of the Paris Institute, Earl de Buffon [Georges Louis Leclerc de Buffon, French scientist and philosopher; Montbard, 7.9.1707 – Paris, 15.4.1788.] Minerals which the French geologist and mineralogist F.S. Beudant collected for several weeks in the surroundings of Banská Štiavnica were obviously destined for the same natural science cabinet. He was doing this within the framework of his scientific journey around Slovakia in 1818. Several boxes of minerals for "Collegii Jesu Cantabridgiesis" (Jesus College Cambridge) were collected in the Central Slovakian mining area in 1802 by the English traveller and mineralogist Edward Daniel Clark and his companion I.M. Crippson. With the approval of the MChEO, the shipment was sent via Vienna to England on May the 2nd.

The mining region of Central Slovakia was the destination of excursions by numerous other scientists, noblemen and high ranked state officers, as well as common collectors. Perhaps none of them continued further on or arrived back home without the samples of local minerals and rocks either collected in their own hands or bought. Probably, neither the Dutch travellers L. Boréel and W. van der Pauw left Banská Štiavnica without samples of local minerals. They started their journey to the mining and metallurgical factories in Central Slovakia in October 1801.

Minerals of the Central Slovakian mining area also enriched the private collections of more members of the ruling family of Habsburg. For example, in 1628, Emperor Ferdinand II asked for beautiful samples of the rich gold ore, but he was not completely satisfied with the shipment he received. The samples, though there were lots of them, supposedly contained only a low content of gold. The Court Chamber of Mining and Minting (CCh) determined the bottom level to 12 "lót" (old unit of weight). The delivery was allowed to be supplemented by "handsteins" and ore from the preparation plants. During the ruling of his son, Emperor Ferdinand III, the claim for the delivery of nice crystal ore samples for the imperial "Grote" arrived at the Main Chamber Earl's Office. Even though in August 1642 the office of Banská Štiavnica replied that it did not have any suitable samples at its disposal, obviously it used this opportunity to represent itself as well as its subordinate mining area in front of the Emperor. Emperor Francis of Loraine, husband of Maria Theresia, was given minerals and samples of ores directly in Banská Štiavnica during his visit in 1751. One archival document, for example, mentions that the samples of Kremnica's ore, rock and various stones were broken and collected in the town and its surroundings in three days by six people, and the total price for collecting, packing and transport of two boxes of different stones to Banská Štiavnica was 10 florins and 52 red cents.

At the beginning of 1763 CCh announced to the Main Chamber Earl and other high-ranking officers in Banská Štiavnica that the Crown Prince Joseph was establishing a collection of samples of ore, minerals and unusual stones. Štiavnica's mining officers therefore had to prepare good samples from the Central Slovakian area and these, provided with the adequate description (kind, collecting locality or mine, content of ore), were sent as soon as possible to Vienna. They were to continue with the collecting of the extraordinary samples from then on. In August 1777, one box of samples was sent from Banská Štiavnica to Vienna for the Archduke Maximilian. This was shortly after his visit to Banská Štiavnica and Kremnica. One year later, the collection of the Archduchess Marie Ann was enriched by ore samples from the production processes in Kremnica and Banská Bystrica. Also other samples, e.g., "Herrengrunden Berggrün" from Špania Dolina and "Scheidewasser" ("lúčavka") from Kremnica, were sent to her. Duke Charles of Lorraine also received 19 samples from Špania Dolina, 35 from Kremnica and 77 from the region of Banská Štiavnica in April 1769.

The enduring interest in samples of minerals and rocks also brought certain problems. Some mining officers, especially when operating further from the sight of the MChEO, used the mineral samples for their own enrichment. This, of course, the authorities did not like, because the mining plants were losing the profit from selling "Kristalldruse" (throngs of crystals) and other samples, and the ruler was losing his tax (Frohn, Zehend). To thwart this arbitrary handling with the property of the state, various amendments and regulations were issued. For example in 1780, subordinate officers were threatened that, if they collected the samples without the previous order of the superior authorities and sold them without the appropriate valuation and taxation, they would be strictly punished, even losing their job. Not to thwart the access to the mining areas, mining works, production buildings and interesting samples of minerals and rocks to the real admirers of mining and nature, they should apply for a special permission of the CCh. Official mineral dealers should also receive a licence to collect or buy minerals in the mining areas. Thus, in 1804, a dealer from Vienna, N. Moravek, gained permission to travel around the mining factories of Hungary and Transilvania (part of Romania). One year later, according to his good reputation and keeping to the terms of payment, the CCh renewed his permission.

The possibility of selling beautiful samples drove even some miners to illegal acts. As an example, consider the case of three contract miners from Kremnica in 1766. For stealing the ore samples from their underground workplace in the Leopold shaft, one of them was punished with 40 strokes by stick, his mining leather apron ('ošliador') was confiscated and he was deprived of the possibility to work at any state owned mining factory. The second got 30 strokes by stick and was prohibited to work at any state owned factory. The third was put in jail for 8 days.

It would be possible to continue in introducing various examples of actions related to collecting, describing and placing as well as selling of samples of minerals and rocks. However, I only wanted to point out the possibilities of using the archival documents for the clarification of different aspects of this problem.

Models of mines and technical machinery

Models of period objects displayed at museums arouse interest of the lay as well as professional public. The creation of models relating to the Central Slovakian mining region had several reasons. They were created to serve as illustrative aids for understanding already existing objects, but also as a certain vision (e.g., the plan of a new construction solution). The following examples from archival documents will tell us something more about their creators and users (Fig. 2).

The mention of the model of a wind smelting furnace dates back to 1653. Daniel David Mossmann was paid 12 Reichstalers for it. Three models of Štiavnica's mines cost 1039 florins and

Fig. 2. Mining worker by the water column machine in the shaft. Detail from the mining map dating back to the 2nd half of the 18th century.

35 red cents in 1739. They were created by the assistant (adjunkt) of a mining inspector, František Gall. Models of Štiavnica's mines with water pumping machines of J.K. Hell were also created by the mining surveyor J.T. Brinn. He was approved a reward of more than 400 florins by the Court Chamber. On different occasions there were created several models of Hell's water column pumps. In 1745, its inventor Jozef Karol Hell [inventor and construtor; Banská Štiavnica, 16.5.1713 – ibidem, 11.3.1789; he significantly contributed to the development of mining in Banská Štiavnica] received 200 florins as a refund for his expenses connected to the construction of this model. Another model of this machine was constructed by Hell on the occasion of the visit of the Emperor Francis of Lorraine in Banská Štiavnica in 1751. This time he only asked for the repayment of material and metal workers' pay, which was 83 florins. This model was placed in a meeting room of the MChEO where the principle of how this revolutionary invention works was demonstrated to the Emperor. In the same year, 111 florins and 45 red cents were paid for another model of Hell's machine. It was built by Adam Vietor at the suggestion of the Chamber Earl Mayer [Karol Theobald von Mayer, the Main Chamber Earl in Banská Štiavnica in 1747-1749.] The reward represented the sum of purchase expenses for iron and several weeks' pay of the constructor (3 florins per week).

In April 1766, the Rector of a College in Wartberg applied to the MChEO to construct functional models of pump machines; fire machine, air machine and water column machine. He gave as a reason that his office had a duty to enable students to become familiar with solving problems of mechanical and hydraulic machines not only theoretically, but mainly practically, and thus preparing them to be able to perform higher working positions as best as they could.

Several interns arriving in Banská Štiavnica from all parts of Austian-Hungarian Monarchy to improve themselves in mining used to construct or have constructed different models. Some of them constructed for the reason to be able to recall the individual machines after the arrival to mother or other enterprises, the others used them as designs for improving existing machines. For example, in 1745, the intern J.A. von Steinberg from Idrija (a town in Slovenia with important mercury mines) constructed two models of his own design of the machinery used for economical 24 hours performance of ore crushing ('stupa', 'Puchwerck'). The Earl Ferdinand Ludwig von Harsch, a former advisor in the Bohemian Kingdom who arrived to Banská Štiavnica in 1762 as an intern, had constructed for himself the whole collection of models (e.g., water column machine, air machine and fire machine, "stangenkunst" (water pump), ore treatment devices "stupa", ore washing devices, as well as models of the machinery from the mint in Kremnica, and other mechanisms.) Models had to serve him for providing a thorough knowledge and understanding of how this machinery worked. All models were created at his own expense. Before his departure to Vienna he left some of them in Banská Štiavnica, but he wanted to take others with him. Several problems arose in connection with this, because even after the reduction of their number there were still many. Although they were taken to pieces and thus transported, 14 boxes were necessary to pack them all, and a special cargo carrying horse drawn cart had to be used. As they had to be taken to pieces before the transportation, they were accompanied by a person who was able to reassemble them. Everything turned out well. The shipment for the Earl Harsch left Banská Štiavnica in April 1764 with the regular

"Silberfuhr" and was accompanied by two people; chief engine keeper (Oberkunststeiger) Z. Neuschl and a skilled carpenter. In 1780, another Czech intern, Augustín Wüst, arrived with the design of a new machine for plaiting mining ropes. The Chief Engine Master, J.K. Hell, could not judge from the presented plan and detailed description the working efficiency of this machine. He suggested construction of a model. The keeper of the water pumps of the MChEO, Pototschka, was put in charge for this duty. The professor of mechanics at the Academy in Banská Štiavnica, Ján Selecký, expressed his view concerning Wüst's design. He praised the diligence and inventiveness of the intern, but he confirmed that the machine was very cumbersome and demanded a lot of human work, which is why he improved Wüst's design by his own ideas. These were later incorporated into Pototschky's model according to which a new machine was to be constructed Professor Selecký also designed the improvements of the rolling machine for the Kremnica's mint. The model, according to Selecký's design, was created by the carpentry master Wallner, from Banská Bystrica. This improved machine, after testing the model, was also proposed for construction. His design that continued was the improvement of the device for vertical transport of ore and water (Gappl). Professors of mechanics were expected to contribute to the improvement of existing technical machinery in different production plants. These professors, as well as those in other branches of study, had to do their best to offer students as much information in their given field as possible. Teaching through the functional models was a very intelligible and effective way.

Not only students of mining and metallurgical branches were in contact with models of buildings and machinery, as shown by the example of the Forestry Institute (Mining and Forestry Academy of Banská Štiavnica). This Institute had its own cabinet of models. It is said that it was lacking mainly the models of different water works. That is why, at the end of 1838, MChEO asked the Office of Saltworks in the Marmaroš region (Ukraine-Romania) for models of water dammed reservoirs for wood transportation (Klause), river retaining devices serving for catching of the floated wood (Rechen), and other devices on river flows. When the office was not able to deliver the required models in one year, professor Feistmantel [Rudolf Feistmantel, Vienna-Ottakring, 22.7.1805 – Vienna, 7.2.1871; 1835-1847 head of the Forestry Institute and Professor of Forestry at the Mining Academy in Banská Štiavnica] suggested that they apply for help from the Mining Management of the region of Banská Bystrica. Some more "Klause" were found at that time in the upper flow of the River Hron. A dismantled model of one such dam construction was created by J. Kartner, master of buildings and '"rakes" ('Rechen'; river retaining devices serving to catch the floated wood) in Banská Bystrica, with the help of one joiner. This model, together with the description and notes, was delivered to Professor Feistmantel in April 1840. Fifty florins and 7 1/2 red cents were charged for the material and work.

Construction of models in the Central Slovakian region was the most common, but not the only, way of gaining them for the cabinet of models of the MChEO or for the Academy. Except from the already mentioned efforts to gain models of various water works for the Forestry Institute from Marmaroš, there are more examples. In 1782, CCh sent a detailed description and models of two processing machines to Banská Štiavnica that were sent there for an expert opinion by their creator, A. Schilling, from Kitzbühl in Tyrol (Austria). As they were not usable for practical purposes at that time, they were placed in the cabinet of models of the MChEO or, possibly, used for teaching at the Forestry Institute. Contrary, the model of a new piston padding which was introduced and successfully used in Příbram (Czech Republic) was sent from Vienna to Banská Štiavnica for the practical use.

Who knows which of these and other models mentioned in archival documents still exist today, and if they do, whether they are correctly specified? In case they are not preserved and there is an interest to construct a model of a certain object from the period of 18th-19th century, you can find help in archives. Besides documents, many historical plans and books are placed there, and a functional model of an old machine can be constructed even today with their help. This is the way the Slovak Mining Museum in Banská Štiavnica enriched its collection of models.

Pictures, statues and other artistic monuments

Banská Štiavnica used to be one of the free royal mining towns. The Main Chamber Earl's Office was the chief office for managing mining enterprises and matters in the Central Slovakian area. The task of the State mining management was to take care of churches, schools and other needs of its employees as well as common miners. Thanks to this, the documents relating to different monuments of art are placed in the mining archives. For example, in the summer of 1744 the picture of John the Baptist was acquired by Štiavnica's office for the church in Kolpachy [Kolpachy, Banský Studenec at present, is a village at 5 km from Banská Štiavnica; it belonged under the Management of the Šášov Chamber Estate.] It was planned for it to be arranged the same way as in the church in Jalná [a village belonging in the 18th century under the Management of the Šášov Chamber Estate.]

The duty of mining offices was to organise processions of miners on the occasion of certain religious holidays. Several problems arose with a local painter Kitsch at the turn of the 1760s-1770s in connection with the preparation of the procession in honour of the Corpus Christi Holiday in Banská Bystrica. He suggested that he would create two altars of his own design for the chamber of Banská Bystrica. As he requested 130 florins for this work, the mining manager Marzani from Banská Bystrica appealed to the painter A. Schmidt to present his own design. Schmidt designed an altar that would look like a gallery. Mining management liked it, but for some reason the plan was not carried out. The painter Kitsch responded again. When he did not get the order even after the repeated offer, he requested his drawings and a financial refund to the amount of 5-6 florins for his drawings of altars and for painting them and travelling costs to Vienna. The decision of the State Management was as follows; to return the drawings to him, but the financial requirement was rejected. The file states as a reason that he could have used the bought colour for another order, for example, for the work at a castle church in Banská Bystrica done in 1772. More written documents and picture from the sphere of church buildings and religious themes can be found in the archives. Plans of churches, altars, altar pictures, bells, statues, plague columns, etc., especially from the Central Slovakian area, but also elsewhere, are preserved (Fig. 3) [for example: the Calvary and the Plague column in Banská Štiavnica, the Holy Trinity column in Kremnica, the altar in Nagymaros (Hungary).]

Portraits of chamber earls belong to another category. They are placed at the

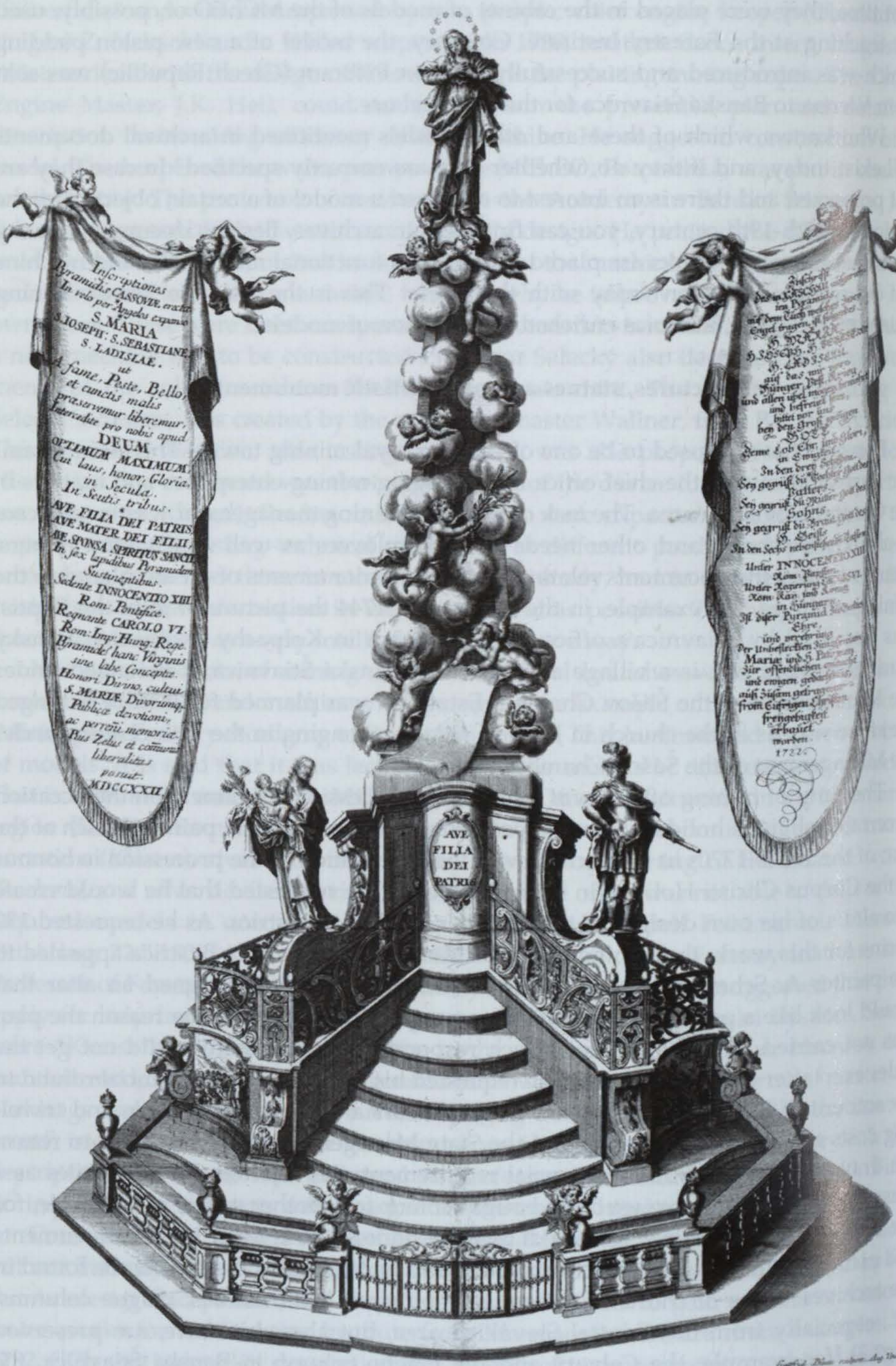

Fig. 3. Plan of the sculpture of Immaculaty built in Košice in 1722. (Gottfried Pfautz)

Slovak Mining Museum in Banská Štiavnica. (This collection has already been presented in a framework of the Heritage Symposium by the author; for example in Leoben in 1995.) Not only documents concerning the life and work activity of pictured chamber earls are placed in SCMA, but also the supporting documents to pictures themselves can be found there as well. For example, a document from 1775 says that after the death of the MChEO director J.A. Adámy, "charming portraits of Lower-Hungarian Main Chamber Earls" were bought from his heirs. They were to be installed at a meeting room of the MChEO and in June the Main Treasury paid 66 florins and 46 red cents to Adámy's heirs.

Grand spaces of the MChEO were decorated with portraits of rulers as well. For example, before the arrival of Francis of Lorraine to Banská Štiavnica in 1751, pictures of Maria Theresia and her husband Francis of Lorraine were displayed at the meeting room of the MChEO. They were painted by J.J. Dollenstein from Vienna. He was paid 213 florins and 20 red cents for them by the Main Treasury in Banská Štiavnica. A portrait of the new Emperor Francis II was delivered from Vienna to Banská Štiavnica on December the 30th. It was determined for the meeting room as well. Its price including the frame and package was 75 florins and 5 red cents. A small piece of paper enclosed with the document (maybe from the author of the picture) says that the portrait had to be placed in a warm room for 14 days until it was completely dry and then egg white was to be applied on it. Rulers are reminded as well by descriptions of arches of triumph built on the occasion of their visits; by shooting targets installed on these occasions for the fun of them, members of their suite or chosen local representatives; by memorial tablets on town buildings and mining workshops, etc.; and by coins and memorial medals with their portraits.

Coins, medals and other similar objects

The archival documentation of common coins, as well as to memorial coins and medals, is very rich (numerous) and diverse in SCMA. It is connected with the hundred-year old activity of the Kremnica mint [the mint in Kremnica was first documented in 1238, and is still operating.] Documents concern the mint devices, preparation of raw materials, engravers of minting devices and other employees, types and resemblance of coins themselves, and their amount, distribution, etc.

On the occasion of the visit of the Emperor Stephan of Lorraine in Banská Štiavnica and Kremnica in 1751, large, medium and small size gold and silver memorial coins were minted which, according to the exact specification determined by CCh, were distributed among the regional and local dignitaries as well as to the mining officers. Different kinds of small coins were determined for workers. Certain problems arose with the minting of the VII-red coin with the portrait of the Emperor. According to the reference of the Main Chamber Earl, it is said that there was no resemblance between the portrait and the emperor, especially the nose was shapeless and very big. Thus the Chamber Earl ordered the smelting of all of the minted coins and in case the engraver of minting devices Sebastián Donner from Kremnica was not be able to repair it, the original was ordered to be destroyed and made again. Six pieces of the VII-red coins were delivered to Banská Štiavnica and were to be placed in the office safe. (Who knows where these unique pieces ended up? Maybe at a museum?)

In 1854, memorial coins were minted on the occasion of the wedding of the Emperor Francis Josef I and Bavarian Princess Elizabeth. Unlike in the past, when jettons were distributed on such occasions, it was agreed that memorial coins would be made (thalers and florins). In February, the Main Coin Office in Vienna asked Kremnica mint for 3000 "hrivna" of pure silver for their production [1 hrivna (marka) = 0.28068 kg; hrivna (marka) – old unit of weight and coin.] Coins were distributed to mining officers according to the size of their income. Memorial coins were minted to commemorate other events as well. For example, in 1766, on the occasion of successful finishing of the hereditary gallery of Emperor Francis.

During the reconstruction of the church in Žarnovica in 1772 [Žarnovica is a village at 19 km from Banská Štiavnica. The Management of the Revište Chamber Estate seated there in the 18th century. An important silver smelting works and a chamber brewery were situated there.] a treasure was found. One hundred and seventy five pieces of old ducats, it is said from the times of the reign of King Zigmund of Hungary [Zigmund of Luxemburg was King of Hungary from 1387 to 1437], were buried not so deep in the ground under the main altar; MChEO offerred to buy these ducats from the church at a current price of a foreign currency, that is 4 florins and 18 red coins per piece, which were to be sent for study purposes to Vienna. On the document of the MChEO sent to the CCh should have been the prints of ducats there. On a draft of this document that remained in the archives of the MChEO, only the places of the prints are marked (where the print of the front side and the back side of the ducat was on original).

On the other hand, a document from 1798 provides information about the usage of money without their own value. It mentions an introduction of wooden money tokens used for paying the workers in some mining factories in Spiš [Spiš, a historical area in the north-east part of Slovakia.] These imitations of real (valid) money could only be used in certain shops usually owned by the employer. It is valuable that with this document the whole series of these tokens was preserved.

Work tokens, in its true meaning of the word, were introduced by the Chamber estate in Liptovský Hrádok in 1812. For registering the completed and prescribed work by villeins with a team of horses, it ordered 100 pieces of brass tokens for 4 red coins per piece; to register one-day work with half a team of horses, it ordered 200 pieces of yellow tokens for 3 red coins per piece; and in exchange for one-day work of a villein without a team of horses (manual work), it ordered 700 tokens from tin-plated (white) iron plate for one and half red coins per piece.

Even the fakes of real (valid) money are mentioned in the documents. For example, the skilful smith Juraj Kowatschik from the woodcutter´s settlement of Dobroč (now a part of the settlement of Čierny Balog) made in 1817 85 pieces of 20-red coins, also known as money with a head, a portrait of the Emperor. He also successfully exchanged these coins for gold coins of Vienna, but was caught and put in jail.

In May 1745, 1000 pieces of copper plates were made for the Dutch Mint Office (SCMA, MChEO, doc. no. 153/II/1745) in Kremnica mint and in July of the same year, the Mint Office in Kremnica received small and large Dutch melting-pots for the preparation of the mint alloy ("Hollendischen Nürnberger Tägln"). Many documents illustrate the buying of Dutch, English and other foreign coins to gain raw materials for minting Kremnica ducats. In 1802, the buying of Dutch ducats took place to gain gold and silver for minting a significant amount of money needed for the state lottery.

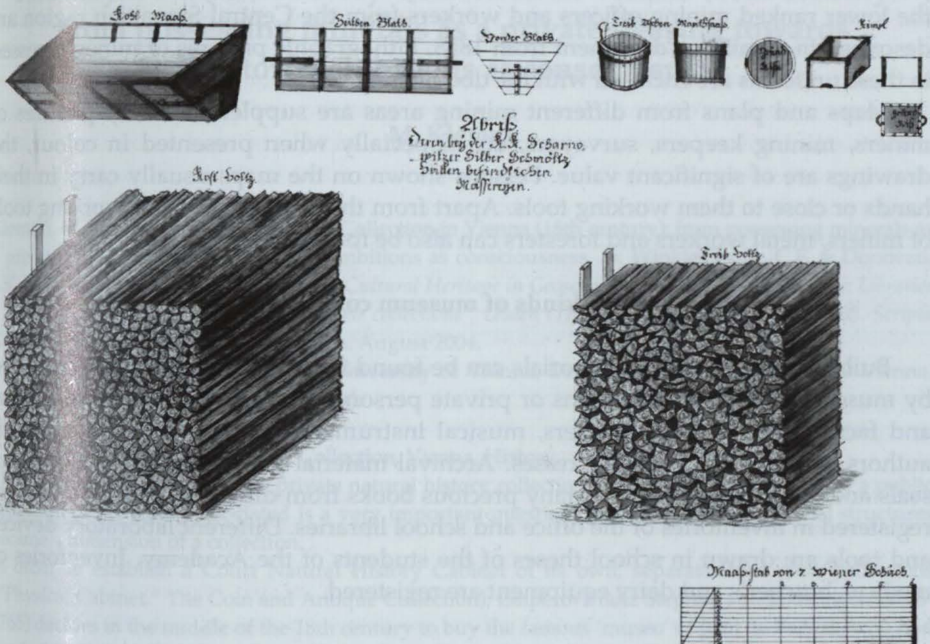

Fig. 4. Measures used at smelting works in Žarnovica (Slovakia). 1775.

Mining measures, units of weight, and other measuring devices

Special measures and units of weight were used in the mining and metallurgical branches, different ones in individual mining areas. For example, in metallurgy it helped to keep the production processes a secret, but on the other hand it complicated the comparison of the production costs, orientation in the field, mainly the determining of the distances based on mining maps and plans.

To become familiar with the period measures, maps and plans are very helpful. Old units of length can be studied on the basis of illustrated measures and measures marked by words. Units of capacity can be also found in a written and picture form. The document of the MChEO from 1775, about the convertion of measures used in the MChEO district into the Vienna measures was a contribution to this field of study together with the tables and drawings of Professor Tierenberger. Period measuring devices and other surveyor aids are pictured on several separat plans and drawings added to the mining maps. From the documents we can also recognise producers, measure controllers, kinds and amounts of aids used in certain working places, etc. (Fig. 4).

Working and ceremonial clothing, and working tools of miners and metal workers

When becoming acquainted with objects from a certain period and field, filed and pictorial materials serve the best. In the files, clothing of miners and mining officers is mentioned on the occasion of preparing for the visits of important guests, occasional processions, official determination of the uniform, etc. For example, the uniforms of the lower ranked mining officers and workers from the Central Slovakian region are described in detail in a document from 1858. Lithographic pictures of miners dressed in these uniforms are enclosed with the document.

Maps and plans from different mining areas are supplemented by pictures of miners, mining keepers, surveyors, etc. Especially when presented in colour, the drawings are of significant value. Persons shown on the maps usually carry in their hands or close to them working tools. Apart from that, special plans of working tools of miners, metal workers and foresters can also be found.

Other kinds of museum collections

Building and technical memorials can be found in SCMA which are administered by museums, other organizations or private persons. Also, documents on municipal and factory clocks, clock masters, musical instruments, pieces of music and their authors, weapons and war fortresses. Archival material preserves different kinds of seals and old postage stamps. Many precious books from different fields of study are registered in inventories of the office and school libraries. Different laboratory devices and tools are drawn in school theses of the students of the Academy. Inventories of medical, butcher's and dairy equipment are registered.

The Royal Natural History Collection in Vienna (18th century): from possessing minerals as a private treasure towards territorial ambitions as consciousness

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Key words: Royal Natural History Collection, Vienna, History.

This paper deals with a famous private natural history collection of the court, transformed to a public collection of the state. Associated is a very important question: how cultural and political structures became a dimension of a collection.

In order to establish a Court Natural History Cabinet of its own, separate from other collections ("Physical Cabinet," The Coin and Antique Collection), Emperor Franz Stephan von Lothringen (1708-1765) decides in the middle of the 18th century to buy the famous 'museo' of Jean de Baillou, who had worked as a director of gardens and mines in Tuscany. The Collection of de Baillou consisted mainly of minerals, which were collected in Italy (some came from famous places all over the world), and fossils, particularly mussels, snails and crustaceans. It was one of the most famous and richest European collections of its type. It represented the Emperor's passion for science, modern 'know-how' and his self-confidence at being a personal centre, not for politics, but for special taste. The Emperor spent a lot of money on the collection. Furthermore, he sent naturalists to collect specimens and thus increase the collection. The Collection was the emperors private treasure and was placed near the Library of the Viennese court. De Baillou became managing director for life and after his death was succeeded by his son. In the first decades no catalogue was made.

After twenty years, following the death of Franz Stephan von Lothringen, Maria Theresia wanted to have a survey about the collections of the court. Ignaz von Born, who had already made a name for himself at the Prague mint was appointed to write a first catalogue of the collection. He pointed out the low standard of the natural history collection and the scientific necessity of a rich mineral collection. It was also a time in which the government started to work against particularism in administration. The government also tried to get more evidence of minerals of all countries governed by the Habsburg Monarchy. The mining administration at Vienna ordered the mine inspectors in the periphery to send up documentation of minerals and rocks, which were found there. Thus, the transfer represents a new concept of scientific interest in a political dimension. Treasure no longer had priority.

Contents

Introduction

The history of collecting is becoming one of the focuses of cultural studies. The flood of works produced in this field can be categorised as follows:

1. Historians are interested in the meaning of an object as "semiophore" (the bearer or representative of a certain meaning), i.e., the medium that mediates between the known (that which can be seen) and the unknown (that which cannot be seen) (Pomian, 1987).
2. The focus is on the interpretation of the act of collecting, i.e., the reality of collecting (Klemun, 2000a) as a practice.
3. Researchers concentrate on the functions of collections, which explain both the act of collecting as well as the collections themselves (Heesen & Spary, 2002).

My paper focuses on the last category and will try to answer the question of what function does an imperial collection fulfils that, within less than half a century, was transformed from an extremely valuable private imperial treasure to a similarly valuable public state institution. The uniform cosmos of the 'Wunderkammern' (Findlen, 1994; Daston & Park, 1998) broke open in the course of the 18th century and diffused into various special collections. In the metropolis of the Habsburg countries this process began in the middle of the century. Emperor Franz Stephan von Lothringen (1708-1765), Maria Theresia's husband, made the first step by replacing the old 'Schatz- und Wunderkammer' by a treasury containing insignia and devotional objects, and by a coin collection, a physical collection and a natural history collection.

The collection of de Baillou and its function for the Emperor

In order to furnish the latter, Franz Stephan bought the world-renowned collection of Jean de Baillou (1684 or 1668-1758). De Baillou was the General Director of the Medici gallery in Florence, and General Director of all fortresses, gardens and mines in Tuscany, before he accompanied the relocation of *c.* 30,000 objects from Florence to Vienna, where he stayed as Director after 1750 (Zedinger, 2000). The right to look after his collection that was now located in the Residence of Vienna was conferred by heredity upon his son.

So what did this valuable collection include, of which we can identify only very few objects that are kept in the Museum of Natural History in Vienna, the successor institution of the imperial collection? It contained a large number of selected crystals, minerals (in a modern sense), Colombian emeralds and fossils (notably ammonites), but also shells, corals and crustaceans. It was famous in all of Europe for its rarities and its richness. Franz Stephan spent a lot of money on it from his private funds. Apart from fulfilling the purpose of representation, the collection also served his private interests and passions, since he even did himself experiments with diamonds. Moreover, it should be noted, that the collection was housed close to the baroque court library built by Emperor Karl VI, the father of Maria Theresia. Thus, there was a connection to the traditional centre of learning. At that time the court library served as a stage for the reformer Gerard van Swieten (1700-1772), who Maria Theresia has called from Leiden, The Netherlands, the leading place of medical studies. Apart from being her personal physician, he was concerned with the reformation of the university, especially the medical faculty. The old guild-university was to be transformed into a modern place of teaching. In order to do this new rooms for teaching, a dissecting room, classrooms for the practical teaching of anatomy and the first botanical garden were needed, all of which were erected due to van Swieten´s initiative (Klemun, 2000b).

However, van Swieten did not hold his progressively structured lectures in the old university building, but in the Court Library, in order to offer new ways of access to the world of medicine outside an obsolete institution like the university. In consequence, the Court Library temporarily obtained a new politico-cultural and sciento-political meaning. This was also where the Emperor met the directors of the collections and van Swieten, the leading figure in the renewal in the field of natural sciences. Moreover, it is here that counselling and the demonstration of knowledge in connection with collection pieces took place.

Just as in cabinet politics, in which the fates of the Habsburg countries were negotiated at the round table, the Emperor wanted to be informed on the latest scientific knowledge when he met with these knowledgeable men. The collection became a place for exercising the Emperor´s personal passion for modern 'know-how'. A historical portrait (by Franz Messmer, Ludwig Kohl and Martin von Meytens), painted only after Franz Stephan´s death, documents this reflective gesture. The painting itself cannot be interpreted as a realistic representation according to art experts, since paintings of emperors usually bear a propagandistic and prospective message. On the left behind the Emperor is Van Swieten in a rather dominant position, holding a book, while the three directors of the collection are pushed into the background. The meeting is taking place in the room with the natural history collection. It seemed to be the centre for the Emperor, who tried to secure and solidify his personal role in natural sciences, which he acquired via his collection, towards other monarchs. It must also be noted that the painting has been retouched in the course of time (Ranacher, 2000) and that the piece of crystal on the right side of the picture has been completed.

The Habsburg Monarchy had no colonies of its own and also did not have an academy, both routes by which other countries extended their collections (Allen, 1994). The new institutions like the menagerie, the botanical garden, the exotic garden in Schönbrunn and the natural history collection had to be furnished richly and impressively by other means, by expeditions initiated by Franz Stephan. A young doctor of medicine, Nicolaus Jacquin (1727-1817) from Leiden, travelled all over Central America for the Emperor for over three years in order to acquire minerals and fossils for the natural history collection (Hühnel, 1992). Further, Franz Stephan tried to enrich his collection also by pieces from within the Habsburg territories. The Court Mathematician Josef Anton Nagel (Schönburg-Hartenstein, 1987), for example, was sent to the Carpathian mountains in Slovakia in order to acquire minerals.

The historical sources on the individual pieces of the natural history collection are, unfortunately, rather meagre. There are hardly any written documents and up to 1800 there was no catalogue. Also, there is no book of receipts, i.e., no register of newly acquired items. The only facts we have are from some documents relating to a handful of dedications of members of the higher nobility, who knew about the Emperor´s passion and made presentations to the collection.

De Baillou was responsible for the collection, but was not persuaded to publish on it. He was the only person who knew all the details about the collection. (Only a visitor, Saint Laurent, published something about it in Florence in 1746, which was not really to de Baillou´s liking.) After Franz Stephan's death in 1765, the Emperor's collections were no longer in the private ownership of the imperial family, but became state property. His widow, Maria Theresia, ordered that an inventory of the collections be made, since it was now the actual volume of the inheritance of her husband that was of importance and the authorities wanted to know what he had left behind. De Baillou's son, Ludwig Balthasar, however, lacked the necessary competence and knowledge for taking inventory of such a large collection. This was done much later by Ignaz von Born (see below).

The mineral collection as function of the state

After Franz Stephan's demice, the collection was transferred from the Court Library to the corridor behind the Augustiner Church. It was the time of enlightenment, during which tendencies of centralisation occurred on many levels, in which the particularist forces were abolished, and in which the administrations and the laws of the various Habsburg countries were unified. Thus, the interest in cataloguing the collection pieces was not an isolated phenomenon, but was part of the 'red tape' that started running through many other areas of public life.

There is a long tradition of the close connection between mineral collections and mining, and thus mines have always been preferred places for acquiring minerals (Wilson, 1994). After 1770, however, there was a new trend in German-speaking countries: collectors and mineralogists started being interested in series of materials from inside a mining area in order to examine and study strata. While twenty years before it was the rarity of a valuable piece, the individual mineral, a gem, or a sparkling crystal that aroused the interest of collectors, at this time rocks and grounds from a certain area or with certain geographical qualities became increasingly interesting (Rudwick, 1996). Even the most renowned collectors in the German-speaking territories, such as the aristocrat Adolf Traugott Gersdorf from Görlitz (Lemper, 1974), the poet Johann Wolfgang von Goethe and Abraham Gottlob Werner from the Montanistic Academy in Freiberg, acted according to this maxim. Due to this change of emphasis, the natural history collection that originated in Florence and was transferred to Vienna did not comply with the latest standards. According to Graf Kolowrat, the head of the "Münz- und Bergwesen" (Department of Mining), a reform was needed. He emphasised the absolute necessity of a catalogue and the importance of mineralogy for mining. The catalogue, according to Kolowrat, would not only serve as an essential reference for a well-organised administration and an official documentation of the richness of the collection, but it would also show the way for future collection strategies. Only if there were a catalogue one would be able to decide what was still missing in the natural history collection (HHStA, OKäA, 1781). That mineralogy constituted an important sector of mining is proven by the foundation of the Montanistic Academy in Schemnitz (Bianska Stiavnica, now Slovakia), and the initiation of the first professorship for mineralogy and mining sciences at the University of Prague. Further, since 1766 the state council was also concerned with the improvement of ferrous metallurgy in the inner-Austrian countries, a measure that really became successful once the limitations on iron production was abolished in the 1770s.

In order to finally have a written documentation of the collection Graf Orsini-Rosenberg, the Court-Chamberlain, advised the Empress to charge a renowned expert of mining, Ignaz von Born, with cataloguing the imperial collection. Ignaz von Born was from Transylvania, had studied at the Montanistic Academy of Schemnitz and was a councillor for mining before retreating to his estate in Altzedlitsch (Hamann, 1989). There he published a book on his own collection, which however, he had to sell to England for financial reasons. He was, what today would be called a scientific manager (Teich, 1976) and was extremely active in founding a private science society in Prague. Since the mineralogy part of the natural history collection in Vienna was still missing a reference, that is a connection to the Habsburg territories, Born concentrated on furnishing the collection with pieces characteristic for the Habsburg countries. For this reason he started by cataloguing the shells, the part of the collection that seemed to be complete and which represented the richness of the imperial collection.

As far as mineralogy was concerned, Born really followed new paths, the paths of bureaucracy. All local mining authorities in the Habsburg countries were ordered by the mining authority in Vienna to send in samples of all 'newly-found ores' (HKA, Münz- und Bergwesen). Due to this new strategy the collection was transformed into a documentation site, in which series of minerals from many different areas of the Habsburg Monarchy were kept. While it used to be the Emperor, whose joy it was to own precious stones and items, who was the centre of the collection, it was now the natural history collection which, as far as minerals are concerned, was becoming a medium of the consciousness of the montanistic richness of the various Habsburg countries.

In 1780 the collection, now filling two rooms in the Augustinersaal of the Hofburg Court, was completely new organised. New cupboards and pedestals that cost more than 3000 florin, the annual salary for a higher court functionary, lent a completely new face to the collection. According to a report by the Görlitz aristocrat Gersdorf, who visited Vienna in 1781, the minerals were now exposed on blue velvet in glass cases or in drawers (Gersdorf, manuscript). Gersdorf described the following new order for the exposition of exhibits; first the visitor saw the gold from Transylvania, next silver and copper from Banat, iron from Carinthia, Elsass and Bohemia, tin and salt. Only then followed emeralds, opals and a large number of cut stones. The large variety of calc-spars and sands forms the transition to the crustaceans. A short published note made at that time (Kurzböck, 1779) revealed that the formation of rocks was to be demonstrated according to their degrees of hardness starting with a corn of sand and ending with diamonds. This shows that the collection was also to be instructive and not only visually impressive by featuring sparkling gems or rarities. For this reason it became accessible for the public once a week.

The world-renowned carved pictures that had been ordered by Franz Stephan in Florence were kept separately from the minerals, on a third room together with other valuable objects. The technique of cutting gems was developed in the 16th century at the Court of the Medici in Florence as a typical result of the Italian mannerism, and was revived again in the middle of the 18th century by the co-operation of Guiseppe Zocchi and Louis Sierès as "Opificio delle pietre dure." Tables made of lapis lazuli or of the opalescent "Muschelmarmor" (shell marble), found in the lead mine in Bleiberg (Carinthia) and described by Franz Xaver Wulfen (Klemun, 1984), were also kept separately from the mineral collection.

Apart from the emphasis on collecting items from the countries of the Habsburg Monarchy, Born also started a programme of enlarging and enriching the collection by instructive studies. Therefore, he contacted academies and scholars in all of Europe. He kept in a close contact with Simon Pallas in St Petersburg and bought the collection of the Hamburg merchant La Potererie, which mainly included ferrous rocks from Iceland. In 1783 Georges de Buffon, curator of the cabinet of the French King Louis XVI, conveyed the King´s interest in exchanging minerals between Paris and Vienna (HHStA, OKäA). The French King had married a daughter of Maria Theresia and thus the two Courts became close. More than seven boxes of pieces were sent to the collection in Paris. However, Vienna prefered to let institutions within the Habsburg Monarchy have specimens, which is proven by the fact that the Lyceum in Lemberg receives more than thirty boxes, including parts of the collection from France.

In line with the Josephinism, a certain style of politics practised by Maria Theresia's son Joseph II, a large number of monasteries were dissolved in the Habsburg territories around 1780 and their collections were also transferred to the natural history collection. According to a report by Born they especially contained Saxon minerals. Emperor Joseph II supported all those activities. However, when it came to Born's extensive programme of publications on the collection, he did not give his consent and stopped the programme. Thus, the publications were never realised.

Conclusion

I have tried to show how a collection was transformed from a private treasure of an Emperor to a state institution within 40 years, a state which was in the process of modernisation at that time. The possession of minerals established the connection to a large cultural and political area that included much more than scientific research.

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Towards modern petrological collections

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Key words — geology, petrology, collections, selection, de-selection, de-accessioning.
Petrological collections result from sampling for academic research, for aesthetic or commercial reasons, and to document natural diversity. Selection criteria for reducing and enhancing collections include adequate documentation, potential for future use, information density, time and money invested in specimens, and spatial and financial constraints. Application of these criteria to the voluminous (*c*. 300,000 samples) rock collections of the University of Amsterdam, led to partial acquisition by the Nationaal Natuurhistorisch Museum in Leiden (Naturalis) late in 2002. Selected items included: (i) historical collections; (ii) material from former overseas domains; (iii) material from poorly accessible areas; (iv) material useful for research at the museum itself; (v) non-voluminous items with high information density (thin sections) or subjected to laboratory treatment (rock powders, mineral separates); and (vi) all samples quoted in academic dissertations.
Promotion and advertising of the newly acquired collections is expected to lead to a second life for these important academic specimens. Application of similar criteria to other museum collections will lead to partial de-accessioning, thus creating space for future acquisitions in the framework where Naturalis is increasingly regarded as the Dutch national repository of geological collections. Researchers from partner institutions will be stimulated to (de-)select their collections at the end of a project, to avoid the much higher costs of later selection by museum staff.

Contents

Introduction

Recent years have seen several alarming messages from various countries including the USA, concerning valuable natural history collections that have become increasingly threatened because of closure of museums, disposal of university collections, or extreme reduction of the number of staff members. In many cases the number of curators and technicians has dropped below the adequate level for proper collection maintenance.

At the same time, despite international efforts (e.g., Sanz & Bergan, 2002), universities are becoming less interested in maintaining large natural history collections, focussing on what they regard as their core business, i.e., teaching, requiring a small basic collection, and research, needing mainly temporary work collections. Whereas this may be cost-effective on the short term, it is likely to threaten the international knowledge base on natural diversity and natural processes, with potentially negative spin-off in many fields of human endeavour, including agriculture and ecosystem research.

In The Netherlands, awareness of the importance of natural history is still at a high level (e.g., Ministry of Health, Welfare and Cultural Affairs, 1992), but several factors have contributed to a situation that is not ideal. Firstly, the Ministry of Education, Culture and Sciences (OC&W) has a structure in which Culture, including academic heritage, is separated from Education and Sciences. This leads to a situation where universities (Education and Sciences) are not, or no longer, funded for maintaining large natural history collections, whereas museums (Culture) are not, or only insignificantly, funded for doing research. Secondly, a large restructuring has occurred in the Earth sciences in the late 1970s to early 1980s, leading to closure of Earth science departments at the universities of Leiden (UvL) and Amsterdam (UvA), and strong reduction in capacity in Groningen, Delft and Wageningen. As a result, many collections were kept at the lowest level of maintenance and were unavailable to the scientific community (see de Clercq, 2004, for more details). Collections of UvL became part of the Nationaal Natuurhistorisch Museum Naturalis in Leiden, which started as a merger between the geological and zoological museums in this city (van der Land, 2001).

Naturalis is increasingly considered as the national repository for natural history collections in The Netherlands. In view of this national role, Naturalis was asked to acquire a large selection of the UvA material, mainly palaeontological and petrological specimens. In this paper, I discuss our petrological collection philosophy, starting with a general outline about sampling, selection and de-selection. Although I realize that some potentially valuable material may have been lost in the process, I am confident that the transparent procedure has led to increased quality of the collections, which are now more fit to be re-used by future generations of Earth scientists. The criteria listed may also be applicable to petrological collections in other natural history museums. Modernizing our geology collections may be an important step in increasing the awareness of the unique natural history of our planet, a history largely stored in museum collections.

Why and how do petrologists collect?

In this paper, I loosely consider petrology in the broad sense as the field of science concerned with consolidated rocks. Geological specializations falling under this definition include metamorphic and magmatic petrology, volcanology, structural geology, and to a lesser extent sedimentology, where involved with lithified sedimentary rocks, i.e., 'hard' rocks with relatively low porosity. Excluded are palaeontology and 'soft' rock sedimentology, mineralogy and gemmology.

Petrological specimens *sensu lato* are generally collected within the framework of fieldwork in a specific research area or by means of drilling. Some of the main reasons for collecting are (see also Sola, 1999):

1. for academic research, distinguishing the following phases:
   - preparatory research (pilot studies)
   - main research phase, often leading to Ph.D. theses
   - complementary sampling, rounding off the research project;
2. to document diversity:
   - special phenomena (e.g., meteorites, rare mineral associations)
   - geological overview of an (excursion) area or country
   - for educational purposes;
3. for aesthetic or commercial reasons:
   - exhibition specimens
   - dimension stone, ornamental stone
   - ores, including industrial minerals.

Which material deserves to be kept ... and for how long?

Material that obviously must be kept for future generations includes rare items such as holotypes and figured specimens; objects providing evidence for maps, dissertations, etc.; material from sites of dramatically reduced accessibility; objects, including instruments, highlighting the history of scientific thinking; and valuable exhibition or commercial material such as gems, meteorites, etc. (see contributions in Nudds & Pettitt, 1997). It is also important to consider the usefulness of material in the case of future theoretical or analytical advances. The three types of collections mentioned in the previous section are discussed below, particularly regarding their future potential in academic or other collections.

Academic collections — Material collected for research obviously must be kept in an integral way during the main stage of active research, i.e., temporarily. During research it is commonly hard or impossible to predict whether a sample will ever be used again, because research questions, themes and methods may change with time. Material from pilot studies is often of a lower quality, because it is common practice during reconnaissance fieldwork to collect as much material as possible from as many places as possible to obtain a first overview. During the main research stage, a major part of this material commonly turns out to be uninteresting. Although keeping in mind that research questions may change, it is recommendable to de-select and dispose of some of this material already during the active research phase, if it does not come from unique localities.

It is equally common that additional sampling is carried out during the waning stages of a project, e.g., during the last field season. Such samples may have been collected with very clear research objectives in mind, but there may be little time left to investigate them properly, especially in the case of high researcher mobility. Hence, keeping them may only be useful if there is good reason to expect further research in the near future.

One process that ought to be applied to all types of research material is partial de-selection at the end of the active project, employing clear, defendable and controllable criteria (see below). Only after significant reduction and when accompanied by sufficient documentation is it useful to store material for future researchers.

The potential to do modern research on old collections may be illustrated by a brief summary of some new theories in the Earth sciences: modern plate tectonics since the late 1960s (e.g., LePichon, 1968); pressure-temperature paths since the early 1960s (Schuiling, 1963); discovery of ultra-high temperature metamorphism in continental crustal rocks (e.g., East Antarctica, India) since the late 1960s (Dallwitz, 1968); discovery of ultra-high pressure metamorphism in continental crustal rocks (e.g., Alps, Norwegian Caledonides, Tien Shan) since the 1980s (Chopin, 1984); and theories involving extensional collapse after collision, mantle lithosphere delamination, etc. (e.g., Betic Cordillera / Alborán, Aegean), also since the 1980s (Bird & Baumgardner, 1981). In addition, technical advances allow analysis of major and trace elements as well as radiogenic and stable isotopes on increasingly smaller samples, down to the micron-scale (e.g., ion microprobe, Laser Ablation ICP-MS), requiring much smaller fragments for relevant scientific output. Examples are research on presolar particles in meteorites (e.g., Clayton, 1974), and U-Pb ion microprobe geochronology on zircon and monazite microdomains (e.g., Froude *et al.*, 1983). Such new theories and techniques can be applied to properly maintained rock collections.

Material documenting diversity — This material may be selected on the basis of historical aspects, uniqueness (inherent or because of poor accessibility and deteriorating outcrop conditions), representativity (reference material), exhibition value and future research potential. Collections frequently used for student education, commonly systematic collections, should be stored at the universities, rather than at national depots such as Naturalis. However, if certain fields of expertise are being discontinued at a department, a common event in times of budget cuts, it would be natural to transfer related educational collections to a national museum. Large museums such as Naturalis commonly have an educational sector devoted to the non-specialized public, and staff members regularly teach in other institutions.

Excursion collections, a special class of educational collections, may remain of interest if natural history excursions to related areas are being organized regularly and if providing background information is a key element of such excursions. So-called country collections can be valuable under the same conditions as excursion collections, but also in the case of countries or areas that are poorly accessible for geographical (e.g., Greenland, Tibet) or political (e.g., Afghanistan, Iraq) reasons. Another example of inaccessibility is when outcrop conditions have deteriorated considerably several years after sampling of a road section, inhibiting future sampling along the same section. Similarly, tunnels, abandoned mines and wells can rarely ever be resampled. Meteorites are also rare enough to keep under all cicumstances, even when considering the large number of them found in hot and cold deserts in recent years.

Aesthetic and commercial material — Material collected for aesthetic reasons will generally be useful for exhibitions or possible sale, but generally has a relatively small total volume. Bulk material from ore exploration and mines is commonly of poor aesthetic value and can largely be removed. A small part can be kept for its educational aspect, documenting how raw materials can be detected. Well-developed minerals are, of course, always highly appreciated.

Discussion — The Ministry of Health, Welfare and Cultural Affairs (WVC, now merged in OC&W) mentioned in its Rescue Plan for Cultural Heritage (Ministry of Health, Welfare and Cultural Affairs, 1990) that material collected (bought) by a previous director (i.e., curator) may be kept for historical reasons, but this does not seem very useful in petrological collections. The motives behind collecting in geology/petrology are generally less personal and less culture and time dependent. Quality demands, however, are among the few aspects that have changed over the years. For example, the old Indonesian collections, collected by the Dutch before Wold War II, contain a large number of river boulders, whereas present-day collecting has a strong emphasis on *in situ* sampling, preferably even oriented.

Another difference with the world of art is that untreated samples may have high scientific value. For example, material collected during expeditions to poorly accessible areas may not have been investigated by the collectors, but could potentially represent the only specimens for future research into those areas.

The potential loss of diversity for future generations plays a much smaller role than in zoology. Although some unique exposures have been lost, such as by concrete covering or by uncontrolled collecting, new exposures are constantly being produced, e.g., new road cuts in mountainous areas or badlands in semi-arid zones. There may also be a limit to what we should regard as 'irreplaceable' and it seems important to guide our thinking not by personal scientific preference, but by objective (or at least inter-subjective) criteria.

From collecting to keeping: selection criteria

There are many ways to selectively shrink collections and simultaneously enhance their quality. Below I will systematically discuss a number of selection criteria, first in general, then applied to rock collections recently acquired by Naturalis. Some of these criteria are based on boundary constraints that are non-scientific, but have major influence on the implementation of the preferred strategy, such as spatial and financial constraints.

Selection criteria

I. Quality demands — The following is a list of minimum quality demands that ought to be met for petrological material (see also contributions in Nudds & Pettitt, 1997):

1. Good documentation (e.g., Doughty, 1992) of all objects with the exception of unique specimens with inherent value:
   - collector (name, institute, year, project),
   - sample map of the project area and sample list, preferably with coordinates,
   - clear sample numbers and/or labels.
2. Considerable variation, little doubling (e.g., not 10 samples of a homogeneous granite).
3. Dissertation or other publications.

The third demand can be loosened if unpublished, yet high-quality documentation exists, e.g., when a dissertation has not been completed. One may also ponder the issue of what kind of publication is deemed good enough; is an excursion guide or a paper in a low-ranking, local journal sufficient, or does it have to be a journal mentioned in the Citation Index or GeoRef?

II. Spatial constraints — Most museums have space problems and Naturalis is no exception. We have a large collection tower and an additional depot (Raamsteeg) in the centre of Leiden, but the recent acquisition of collections from various universities (Technical University of Delft = TUD, UvA, University of Utrecht) has almost completely filled any prior empty space in the two buildings. Spatial problems will always remain, unless we have the courage to adopt a new collection philosophy and implement new methods for selecting and de-selecting. Using additional buildings, e.g., building a second tower at Naturalis, could provide temporary relief, but if the collection philosophy is not changed drastically, it will only be a matter of years before the voids are filled again (see, e.g., Sola, 1999), in the very same manner that new highways do not lead to less traffic jams on the long run. It also seems unfair to future scientists if criteria for keeping objects from their collections are more severe than those for old collections.

Early in 2001, when the practical part of the Geological Heritage project started (see de Clercq, 2004), the rock collections at Naturalis were located in *c.* 275 racks distributed over four main compartments in the collection tower. At 32 carton boxes per rack, this means 8800 boxes, containing *c.* 220,000 rock samples. The rooms were fully occupied by standing racks and there was no space for additional acquisitions. The Raamsteeg depot held *c.* 480 boxes (*c.* 12,000 samples), mainly sediments, and had space for another 2000 boxes, although not stored in an ideal way. Space at the Raamsteeg was soon to be filled by major acquistions from the TUD later that year.

In view of the size of the anticipated acquisitions, it was decided that more space could be created by purchasing movable containers for the collection tower, similar to when the Jongmans collection was acquired in 1996-1997 (see van Waveren, 2004). Doing so would increase the storage capacity by *c.* 65 racks (*c.* 2000 boxes) and thus enhance the efficiency of the building. Movable containers were not considered useful for the Raamsteeg depot, because it is an expensive investment and the future destination of the historical building remains uncertain.

III. Representative rock samples — By contrast to, for example, art objects and zoological and palaeontological material, petrological material shows a certain degree of homogeneity due to the operation of physico-chemical processes. This homogeneity is, however, dependent of the scale of observation. For example, granites may be heterogeneous at mm- to cm-scale, but homogeneous at dm- to m-scale. The scale of homogeneity strongly depends on grain size; slates and schists (fine-grained) may be homogeneous at cm-scale, whereas granulites (coarse-grained) are commonly homogeneous at dm-scale or larger. Hence, every rock type has a corresponding representative rock sample. The same applies to bulk (geo)chemical analyses; only an analysis of a representative sample is useful, unless small-scale processes are being investigated. Sediments and tectonites (rocks displaying deformational phenomena) may locally require more material, when important structures (cross-bedding, folds) occur at dm-scale.

For fine-grained rocks (volcanites, schists) a small block ('chip') of 5 × 3 × 1 cm from which thin sections could be cut may be sufficient, especially in the case of purely scientific material of low uniqueness that is unsuitable for exhibitions. Hence, wherever such rock chips and thin sections are available, the remaining material can, in principle, be removed, creating significant reductions in the space occupied. Coarse-grained rocks require more material, but one could store a slice rather than an original bulky sample. For exposable material the opposite is often true; large blocks of several hundred kilogrammes (e.g., graphite from Sri Lanka, banded iron formation from Greenland, meteorite from Canyon Diablo) make a much larger impact on the general public than tiny specimens.

IV. Financial constraints — Storage of petrological collections in the Naturalis collection tower costs *c.* € 200 per m^2 per year, corresponding to *c.* € 150 per rack (60 × 120 cm floor dimensions), i.e., *c.* € 5 per box per year, excluding personnel costs (total costs may be as high as € 500 per m^2 per year). To this one has to add the costs of moving, digital registration and incidental conservation measures. As many collections result from projects that have either been terminated or are in their final stages (see next section), one can anticipate a fairly low average level of usage in the coming years, allowing the question to be raised whether the high cost for storage is warranted, and whether constant accessibility is required (cf. collection accessibility at the Smithsonian in Washington). Reducing accessibility, i.e., increasing the time needed to make specimens available on request, could lower the storage costs.

V. Potential for future use — Graphs of the cumulative number of publications over a period of 40 years (Fig. 1) by Dutch Earth scientists in three project areas (Betic Cordillera, southern Spain; Galicia, northwestern Spain; Bergslagen, central Sweden)

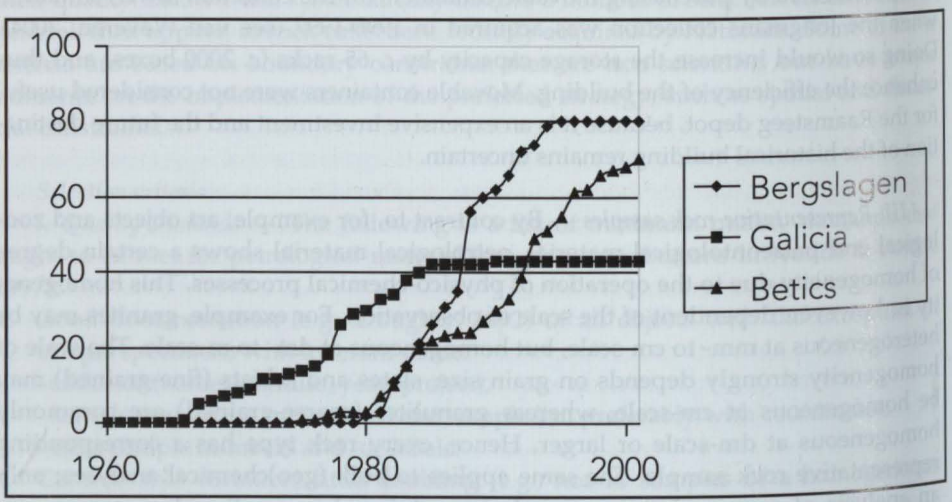

Fig. 1. Cumulative number of publications produced by Dutch Earth scientists in the course of three major, regional research projects in Europe. All three examples show an initial phase of pilot studies and low production, followed by a main phase, and are terminated by occasional papers after the active project period has expired. Note that the Betic Cordillera project keeps being productive and may settle at similar output as the Bergslagen project. Source: GeoRef (SilverPlatter WinSPIRS®, v. 4.01).

give some interesting results. All graphs show an S-shape that fits the three phases of research (see above): (i) slow start with sporadic publications; (ii) main phase with steep increase in the number publications; and (iii) slow finish, again with sporadic publications. It is also clear that the Bergslagen and Galicia projects have been terminated completely, whereas the Betic project still leads to a few publications per year, although it seems to have reached the last phase. The Bergslagen project has led to roughly twice the amount of publications as the Galicia project. The final number of publications on the Betic Cordillera may settle at a comparable level as that of the Bergslagen project. This does not necessarily reflect quality, because some projects may put more emphasis on producing monographs and geological maps.

Discussion — No hard predictions for potential future use of the collections can be derived from the graphs in Fig. 1, because research themes and methods can differ fundamentally in the future. For example, the discovery of majoritic garnet in garnet peridotites from the central Alps (Alpe Arami) has triggered renewed interest in the Alpe Arami collection of Naturalis, which is now on loan to Utrecht University. Importantly, funding associations are rarely willing to fund long-lasting projects, unless a fundamentally new scientific question is being formulated, and there is increasing pressure to address thematic rather than regional issues. We can therefore assume that only a small part of these collections will be re-used in near-future research, but we cannot with any degree of certainty predict which part. This futurological dilemma has led to the cautionary (or 'no regret') principle in museum collections (e.g., Krikken, 1997), stipulating that objects should not be removed permanently when their future use cannot be excluded.

In view of the uncertainty to predict exactly which rock sample will later turn out to be important for research, we need to develop other criteria for (de-)selection and storage of scientific material, based on uniqueness, representativity, connections to existing publications, etc. Possibly one of the most important issues is the ability to check past research, to verify or reject past conclusions, and to do some additional research, including analyses, that directly builds on the old material. Rendering the material accessible is crucial to provide potential users a quick overview of past research and to check the evidence. In my view, this is possible with a reduced number of rock samples, that are representative at the regional and thematic levels, and have a representative size.

Based on this discussion, we adopted a collection philosophy for petrological collections at Naturalis, which strongly emphasizes the following aspects: information density (e.g., thin sections, rock chips); energy and money invested in objects (e.g., thin sections: *c.* € 35 each; mineral separates: up to € 100 per sample); estimated scientific re-usability; quality of documentation; accessibility of source areas (e.g., mountains, drill-cores, tunnels); and spectacular specimens for exhibitions. This philosophy was first applied to the rock collections from the UvA, that were about to be redistributed in 2002 (see below). As for the above mentioned five criteria, the priority used was: II > I > III + V. This order is quite logical, because available storage space (II; and, to a minor extent, finances) determines how many (and what size) samples can be acquired (III); and the quality of documentation (I) determines whether specimens can be re-used or not (V).

UvA collections: analysis of selection methods and criteria

The Department of Geology at the (City) University of Amsterdam (formerly GUA, now UvA) was closed in the eighties and a number of staff members continued their careers at the Free University of Amsterdam (VU; see de Clercq, 2004). For many years, the rock and thin section collections (*c*. 13,200 boxes, divided over > 500 subcollections) remained largely at the original UvA depot at Roeterseiland. An important part of the collections (*c*. 2600 boxes, notably collections from Timor, mainly fossils) were on permanent loan to the Geological Museum of Artis, the Amsterdam Zoo, and still remain there (see below). When it was discovered that the depot at Roeterseiland showed severe contamination by asbestos, the boxes were cleaned and transferred to a temporary depot in the nothern outskirts of Amsterdam, which had to be evacuated by the end of 2002. As a result, the UvA collections formed the largest part of the so-called threatened Earth science collections in The Netherlands (see de Clercq, 2004).

Since it was neither physically possible nor useful to try and acquire all subcollections, we adopted three (de-)selection methods at Naturalis (see below), each with its own criteria, to ensure that a significant fraction of the academic geological heritage (see, e.g., Timberlake, 1997) would remain available and accessible for later generations of Earth scientists. Each method is based on assumptions that will be clarified and discussed in the following subsections. In addition, each method has specific consequences for storage facilities, finances and future accessibility of the material.

Selection on the basis of researcher status — This method is based on the premise that material collected within the framework of a Ph.D. dissertation has a higher quality than objects collected by students during their mapping or M.Sc. research projects. Staff collections, collected by university professors and lecturers, were also anticipated to meet relatively high standards, although the related documention later turned out to be disappointing. The order of selection could then be (if relevant documentation exists): 'historical' collections (mainly Indonesian material collected prior to WW II); dissertation collections; staff collections; excursion and country collections; and student collections.

The historical collections of the UvA, including areas relevant to the Dutch territorial history (Indonesia, Surinam, the Caribbean), comprised *c*. 1750 boxes. The Geological Museum at Artis housed about 950 of them (mainly the so-called Timor collection), so *c*. 800 remained. The dissertation collections (beside the historical collections, which included some pre-World War II dissertations) consisted of *c*. 3700 boxes, and the reasonably well documented staff, excursion and country collections amounted to *c*. 2200. Therefore, the total reached *c*. 6700 boxes, with an estimated 170,000 objects, requiring *c*. 220 storage racks. About 70% of them consisted of rocks (sedimentary and petrological material) and *c*. 30% of fossil-bearing samples, where each fossil-bearing sample may easily contain tens to hundreds of fossils, and even thousands in the case of micro-fossils. The total amount was thus well beyond the upper capacity limit of Naturalis (see above). If the final acquisition were narrowed down to historical collections and dissertation collections, there would still be 4500 boxes (*c*. 150 racks) left. Dissertation collections from the Betic Cordillera project (southern Spain) alone already amounted to 2400 boxes (*c*. 80 racks).

In view of space limitations, at least all excursion collections, country collections, student collections and most staff collections would have to be rejected, possibly with the exception of a few that would fit well into current and anticipated research programmes at the museum. From a practical point of view, this would have been an easy solution, where selection could have taken place entirely at the UvA depot, before moving the chosen ones to Naturalis. Storage costs would be *c.* € 22,500 per year, excluding personnel costs. This option was considered possible in the case of sufficient state funding, but the complete rejection of some important collections (e.g., Tanzania, Andes) was seen as a major drawback.

Selection on the basis of publications — This method is based on the notion that it is useful to keep material as testimonies of past publications, allowing future researchers the possibility to view and check old pieces of evidence. This is important, because theories and research methods may change with time, which sometimes calls for renewed testing of past researchers' conclusions using their own collections. It may be useful in this context to distinguish between dissertations (commonly monographs) and publications in scientific journals. Dissertations generally provide a more complete picture, with more documentation, of the results obtained on the basis of research in a specific area or on a specific theme.

The order of selection could then be (if relevant documentation exists): historical collections; dissertation collections; staff collections that have led to publications; and student collections that have led to publications. Excursion and country collections have rarely led to (serious) publications, except for local excursion guides. The major distinction with the previous section is that less weight is attached to (apparent) research status and more to publication output.

Similar to above, the integral acquisition of historical and dissertation collections would already amount to *c.* 4500 boxes. We investigated key publications coupled to staff and student collections via GeoRef (SilverPlatter WinSPIRS®, v. 4.01) and estimated the aditional subcollections required at *c.* 2000 boxes. The total reached, *c.* 6500 boxes, is similar as in the previous section, requiring similar storage space and similar annual storage costs.

Selection on the basis of information density – The basis for this method is to maximize the information density per unit space, thus either saving space and storage costs or maximizing the total amount of information that can be stored in the existing storage facilities. In this option there is no attempt to gather all existing objects and information of a given rock collection, nor to keep all information related to publications (e.g., Ph.D. dissertations). Instead, the starting point is a collection of key information carriers, i.e., objects and documentation that give an efficient overview of a certain area or theme. The emphasis for reuse of the collections thus lies on their potential for pilot studies, e.g., in the early phases of future research projects, rather than on a full record of the past. It may thus be seen as a more foreward-looking approach. Future scientists are given the opportunity to study existing material before designing plans for subsequent sampling in relation to their specific research themes. This approach seems far more cost-efficient than the other selection methods.

It has been remarked above that a representative rock sample for fine-grained petrological material may be a 'chip' of 5 × 3 × 1 cm. Extrapolating this line of thought leads to the following strategy:

1. Keep all thin sections and other treated material (powders, analyses) for each publication (incl. dissertations, M.Sc. theses, excursion guides, etc.).
2. If available, also keep all rock chips.
3. Keep all documentation (theses, publications, field books, maps, etc.).
4. Select those samples that have been mentioned in the publications.
5. Add representative, oriented and/or aesthetic/historical specimens (categories A and B: Krikken, 1997).

This approach emphasizes material which has been treated in various ways (sawing and thin sectioning, crushing, mineral separation), i.e., the specimens in which most energy and money has been invested. This leads to a strongly reduced number of petrological samples, simplifying access of the material for future use and reducing storage space and costs.

Final choices and implementation — The final choices made by Naturalis were based on a combination of the following criteria:

1. Category A collections (historical and/or rare: Krikken, 1997) were to be acquired on an integral basis.
2. Emphasis should be on high information density (thin sections, rock powders, etc.).
3. All samples quoted in Ph.D. dissertations were considered as evidence and thus geological heritage. The potential for future research was also considered highest for Ph.D. material.
4. Student collections were only considered if they fitted into Naturalis research programmes.
5. Many staff and excursion collections were rejected because of the poor level of documentation.
6. Poor accessibility of collection sites mainly applied to closed mines in the Bergslagen district, but they were considered appropriately covered by collections in Sweden.
7. Special phenomena and samples valuable for exhibitions would have been selected, but were hardly present.

The following steps were proposed to, and approved and funded by, the Mondriaan Foundation:

1. Replacement of old racks by movable containers in 50% of one large storage room to increase storage capacity.
2. Selection and repacking of most rock samples in Amsterdam, prior to disinfecting and moving to Leiden.
3. Final selection of some collections (Himalayas, Andes, Tanzania) in Naturalis at a later stage.
4. Digital registration at Naturalis, followed by active advertisement of collection presence and promotion of their re-use.

For practical purposes, three selection codes were employed for the communication with those doing the physical separation. Code A meant that all material was to be transferred to Naturalis, preferably after repacking. Some selection would possibly still be required later. This mainly applied to collections from Indonesia, Surinam, the Caribbean, the Himalayas, the Andes and Tanzania. Code B indicated all thin sections with rock chips and documentation; and all samples mentioned in Ph.D. dissertations (monographs) or related publications, for which lists were made by Naturalis technicians. Special samples, if present, could be added. Code C meant only thin sections with rock chips and documentation. No rock samples were selected in this case, which mainly applied to staff and student collections.

Fig. 2. Collection mobility formalized: signing the transfer of geological collections. The secretary of the University of Amsterdam (Mr. Bleijerveld, centre) is flanked by representatives of Naturalis (Mr. Van der Weiden), Natuurhistorisch Museum Maastricht (Mrs. Dingemans), Geological Research and Development Centre in Bandung, Indonesië (Mr. Dwiyanto) and Natuurmuseum Nijmegen (Mr. Styns).

Formalizing collection mobility — On 28th April 2003, the Dutch Academic Heritage Foundation (SAE) organized a symposium on the theme "Keeping to be used", in collaboration with Naturalis, the Library of UvL and the Scaliger Institute, also part of UvL. After the symposium, those rock collections of the University of Amsterdam that had been selected were formally transferred to their new owners/keepers (Fig. 2). This sealed some 20 years of academic history, during which the UvA geological collections had remained orphaned in poorly accessible depots, and paved the way for a second life of these collections, nicely fitting the theme of the symposium.

Naturalis highlights before and after the UvA acquisition

Besides extensive zoological collections, Naturalis currently houses > 1,100,000 fossil samples, > 400,000 rock samples, > 40,000 mineral specimens, *c.* 180,000 thin sections, and related documentation such as dissertations, research papers, reports, field note books, maps, photos and analytical data. Most of these numbers represent minimum estimates, as many individual samples (registration units) may contain tens or hundreds of fossils or crystals.

Some collection highlights at Naturalis are: the Staring collection, material related to the first geological map of the Netherlands; the Von Siebold collection, related to the first geological research in Japan (VOC); the Dubois collection, comprising *Homo erectus* and related material (part of the World Palaeontological Collections: Cleevely, 1983); the Schürmann collection, mainly Precambrian rocks of North Africa (Zwaan, 1994); the Jongmans collection, amongst others fossil plants from abandoned Dutch coal mines (van Waveren, 2004); the Zandstra reference collection of erratic boulders; and the King William I gem collection, invaluable as a reference set of natural gems. For an overview of the history of the geological collections, see Winkler Prins (2004).

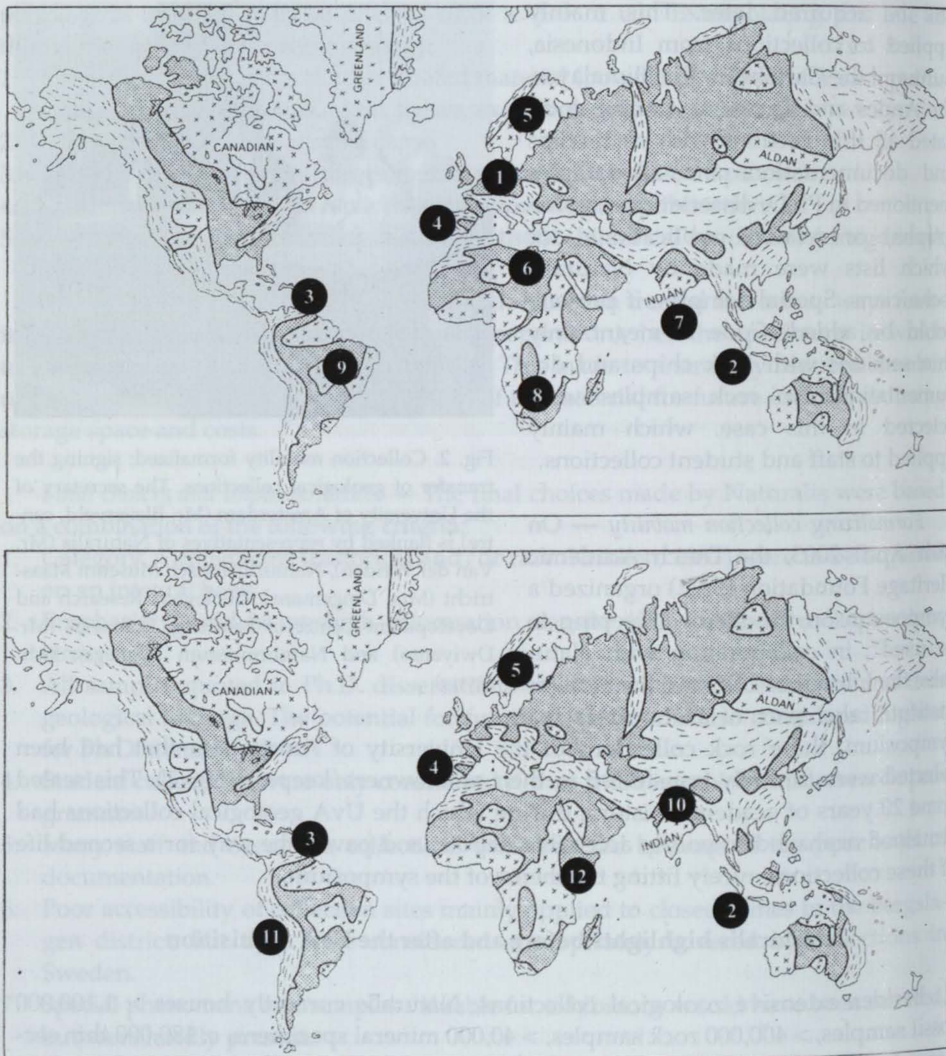

Fig. 3. Regional 'hotspots' of the Naturalis rock collections. (A) Situation before 2002, with highlights including The Netherlands (1) and its former overseas domains Indonesia (2) and Surinam + part of the Antilles (3); typical long-lasting projects areas in Spain (4) and Scandinavia (5), the Schürmann collection from North Africa (6), and classical gem provinces in Sri Lanka (7), southern Africa (8) and Brazil (9). (B) The new acquisitions from the University of Amsterdam (UvA) enhance the pre-existing regional strengths, with additional highlights from climbing expeditions in the Himalayas (10) and Andes (11), and major mapping projects in Tanzania (12).

The regional 'hotspots' of the Naturalis rock collections are shown in Fig. 3a. The main regions underline the history of geological research in the Netherlands, starting from the country itself and its former overseas domains, and the long-lasting project areas in Spain and Scandinavia, that became an increasing focus of attention after loss of the colonies. The Von Siebold collection is mainly of historical importance, but cannot be regarded as representative for the rich geological variety of Japan and neighbouring countries.

Collection highlights from the UvA include the Permian fossils of Timor, presently housed at the Geological Museum of Artis in Amsterdam; material from expeditions to the former Dutch East Indies; Caribbean collections (fossils & volcanics); collections related to *c.* 80 Ph.D. dissertations; and material from climbing expeditions to the Himalayas and Andes in the 1950s. It is clear that the new acquisitions from the University of Amsterdam (Fig. 3b), amounting to *c.* 49,000 rock samples, *c.* 16,000 fossil specimens and *c.* 100,000 thin sections, enhance the pre-existing regional strengths (Fig. 3a), with additional highlights from climbing expeditions and major mapping projects in Tanzania.

From acquisition to second life

Promoting a second life — Acquisition is merely one step in the process leading towards future use of rock collections (see, e.g., Shelton, 1991; McGinley, 1992). Additional action points include digital registration of all samples of the most important collections; digital photographing of key samples (e.g., meteorites); publishing a catalogue at sub-collection level, possibly on the homepage; advertizing the presence and contents of (inter)national academic heritage to the Earth science community and the community at large; and stimulating international funding for museum visits, e.g., via recent EU funded programmes such as SYNTHESYS and Transnational Access. We intend to post a short description of all rock collections on the Naturalis homepage (www.naturalis.nl) in 2005, because only increased visibility is likely to generate collection re-use.

Examples of a second life — The new acquisitions as well as older collections (see below) can be used in pilot studies carried out either before submitting research proposals or at an early stage of projects. Researchers will be invited to study theses, maps and thin sections; to reinvestigate and analyse old material, using more advanced techniques or new insights not available at the time it was collected; to build on existing collections and then to define what kind of additional specimens are still required for a specific research theme. This may be a more cost-efficient way of running projects than to start again from scratch, collecting samples in the field. To give some examples, fossil material from the Caribbean and crustal xenoliths from southern Spain are currently being studied by Naturalis staff members, in collaboration with foreign researchers and integrated into larger scale projects.

Old collections can also be re-used for teaching purposes, notably thin sections, mineral specimens and fossils. The thin section collections host a large variety of igneous and metamorphic phenomena from many tectonic settings and countries. A reference collection for such phenomena could be lent to universities for teaching purposes. Material from type localities and reference material (holotypes) must be identified and preferably be stored separately.

Modernizing old collections — The rock collection philosophy adopted also has a bearing on existing academic collections at Naturalis, most of which have been inherited from the Geology Department of Leiden University. These collections have generally been left intact, without any selection, and thus include poor quality student collections, excess excursion collections (many years to the same region), etc. They are not of a higher standard than the UvA collections and therefore ought to be treated the same way. De-selecting and de-accessioning parts of these collections is recommended as a forward looking strategy (see, e.g., Cannon-Brookes, 1992; Ainslie, 1999), aimed at providing space for possible future acquisitions, either from The Netherlands (e.g., University of Utrecht, oil companies?) or abroad.

Discussion — As mentioned by de Clercq (2004), the procedure adopted here to select and de-select academic collections, and to promote collection mobility, is expensive and probably only possible under special circumstances. A lot of money and energy can be saved when researchers themselves make a selection of the material they have collected, allocating the material to various levels of uniqueness and future research potential, and removing poor quality material before they leave a research institution. It is rather common practice that active researchers take the best material with them to the next assignment, leaving behind the poor quality material. Whether they can keep the best material or not is a matter of agreement between them and their former host institution. In the absence of proper collection management, it may be the best option. Leaving behind the left-overs should not be promoted.

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Collection fund of the Slovak Mining Museum

Jozef Labuda

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Key words — Museum, collections, exhibitions: natural, technical, historical and gallery.

The Slovak Mining Museum in Banská Štiavnica belongs to museums of Slovak field activity and includes several exhibition departments:

Natural history - collection of minerals and fossils in Berggericht building with 37,500 pieces.

Historical - collections and exhibitions linked to specific community developments of miners in the region: archeology, history, numismatics, ethnography, development of architecture, lapidary. Exhibitions in the Old and New Castles of 17,628 pieces.

Gallery - a collection of art-historical character from the region, modern fine art; for example sacral art, portraits of chamber earls, artists of the 20th century - the Gallery of Jozef Kollár of 3650 pieces.

Technical - a unique Slovak collection with majority of objects from Banská Štiavnica region - mining tools, lamps, models of mines, etc. 9651 pieces altogether.

Open-air mining museum - situated in the original place of Ondrej's shaft, the exhibition of ore extraction established 2 km far from the town in Bartolomej's shaft of 1600 m length; a presentation of technical buildings, a coal exhibition and presently not exhibited houses of miners from other regions.

The collections of the Slovak Mining Museum are of an unusual character. The majority of our collections originate from regional products, in no other museum you can find such a collection. The history of Banská Štiavnica has always been connected with mining. The town was not transformed into a business-market place because it was not situated on trade routes, nor was it essential for the town because rich sources of ore were sufficient. Invention and implementation of technical innovations for increasing production of ore or its more effective processing, brought improvements in production. Various artists and architects, who created monumental pieces, sculptures of The Holy Trinity church and technical innovations of mining devices, were invited to work and left excellent examples of their work for everyday use, such as the interior of the Kammerhof building with frescos and ceramic tile stoves, goldsmith products for churches and parishes, documents of book culture from the 16th to 18th centuries. The collection includes many of these items.

Contents

Beginning of collections

In 1900 the Town Museum was established in Banská Štiavnica in the Old Castle during the Mining and Forestry congress. Some new obtained items from specific families, churches, town hall or older collections of the Mining Academy were included in the museum collections. At the beginning of 1901 Banská Štiavnica exhibits were returned from the world exhibition in Paris. Silver goblets from the 16th century, an illustrated book of town atribution from the 16th century, gold-plated town insignias of hammer and gopher from 1536, a gilded Turkish dagger with bony handgrip, a flag with the town coat of arms from 1751, etc. belonged to the most precious collection items. Unfortunately, immediately after the break-up of the monarchy in 1918 a part of the collections was moved to the National Museum in Budapest. The Town Museum in the Old Castle was given a new goal under V. Baker, the collection curator (Fig. 1). Thanks to him the museum was transformed into the District Museum, and in 1935 14 rooms with 29,640 exhibits were opened to the public.

After the establishment of the Czechoslovak Republic several attempts to create a mining museum in Banská Štiavnica were made. Finally, the proposal was accepted that the museum should gather everything connected with mining – collections of minerals and ores, mining-technical, cultural and literature documents. Basis of the museum was to be the rich and scientifically precious collection of the state mining management with more that 20,000 samples of minerals and ores from all over Slovakia. On 22nd May 1927 the museum was officially opened in the Berggericht building in the Holy Trinity square at the 100th anniversary of Dionýz Štúr's birth. During the leadership of Dr. Fiala already existing collection became a part of the inventory and it

Fig. 1. Banská Štiavnica – The Old Castle, a view to the exhibition of the 1930s.

was further completed by collecting and purchasing. Curator Fiala worked out the conception of the open-air museum, although it was implemented only several decades later.

During World War II both museums faced difficult times. After the end of the war the museums were several times reorganized. New impulse into the progress of Štiavnica's museums came in 1964 when by unification of two museums the new special one was founded – the Mining Museum. On the 3rd of January it was renamed into the Slovak Mining Museum to highlight its main purpose (Herčko, 1993).

Character and structure of recent collections

Presently the Slovak Mining Museum owns more than 80 thousand collection items, which are divided into six exhibition departments. Since the 1960s the exhibitions have been situated in the places according their historical development (for example anti-Turkish renaissance fortress from the second half of the 16th century by the Italian architect Francesco Ferrabosca served from 1971 onwards for exhibitions of military clashes of Turkish and Habsburg armies). Nowadays, the exhibits are logically situated into particular objects in the town, so any visitor can obtain a complex view on the precious metal sources, technical methods of mining, visitors are familiarized with the oldest beginnings of regional settlements and further historical development, variety of craft, professional art and folk art or visitors of open-air mining museum can enter almost 2 km long shaft. Our exhibitions form a "model book" on mining history which is widely used by schools all over the region (Labuda, 1994).

Mineralogical exhibition in the Berggericht building

Despite above mentioned basis of our collections from the State Mining Management (mining geologist Ľ. Cseh), other material was gathered from collections of professor J. Pettko and Dr. Fiala (by purchasing Botháry's collection). After the arrival of I. Herčko in 1966 the museum gained various exhibits from all parts of the world, they were completed with exhibits from Slovak sources. Since 1968 the permanent exhibition exists of an arrangement of minerals and rocks corresponding to student books of primary and secondary schools. The collection includes 37,500 pieces. An inevitable part of the exhibition is a 60 m long shaft with used spaces of cellars. In May 2003 the information center of geo-park was opened to the public in the Berggericht building in the Holy Trinity Square using its strategic position in the historical town center to inform tourists about the newly established Geo-park of the Štiavnica Mountains. On the ground floor of the museum visitors can find a souvenir shop focusing on minerals.

Technical exhibition "Mining in Slovakia" in the Kammerhof building

The purpose of the exhibition is to present a collection which might help to form an image on result of ore processing so that it becomes a coin or a jewel. Visitors can see collections of ore processing, testing and metallurgy, everything is supported by the use of models. The exhibition contains a rich collection of mining lamps, mensurasion, surveyorship, transport. In the entrance lounge visitors can see samples of

Fig. 2. Banská Štiavnica – The Kammerhof, a part of the building with exhibitions.

minerals and rocks mined in Slovakia or those ones which used to be mined in our territory. An archeological part of the exhibitions follows, where you can see findings from the Kammerhof research with a unique collection of technical ceramics for ore testing as well as a number of gothic figural tiles. The Kammerhof (Fig. 2) used to be a seat of main mine trustee, chancellors of the Mining Academy and because of this we show also furniture of interiors with fresco of the Emperor's family. That is why we placed the portraits of main chamber earls, mining overcoats of Maria Theresia's family members, mining insignias, etc.; we also display works of miners like models of mines in bottles, mine models, sculptures of miners, collection of mining uniforms, flags, etc. Subsequently, a technical part of the exhibition follows.

Two independent exhibition parts are promoted in the Kammerhof – Mining Education and the Exhibition of Book Culture. The first exhibition represents mining education since the beginning of the 17th century focusing on the Mining Academy (1762-1918), another one includes production of Štiavnica's book printers from the 18th to the 20th centuries. You can see rare prints of classical authors (Caesar, Cicero, Herodotus etc.) from the 16th century, French encyclopedia by Diderot, as well as works by Voltaire, Rousseau from the 18th century.

Open-air mining museum

About 2 km from Banská Štiavnica you can visit the most attractive exhibition part of the Slovak Mining Museum – in the authentic surroundings of the Ondrej shaft from the 17th century (Fig. 3). Original technical sights from mining regions from all over Slovakia (extraction towers, mining devices, gauging room, smith's forge and

Fig. 3. The entrance to Bartolomej's shaft with visitors.

almost 2 km of an underground exhibition in the Bartolomej shaft) were places in the open-air museum in the 1960s. The underground part offers displays of ore extraction development from the 17th to the 20th centuries. Since 1999 the exhibition of coal mining has become an inevitable part of the open-air museum. In the near future, we are planning to open houses of mining architecture to the public in order to offer a complete picture of miners' lives and work (Kladivík & Ladziansky, 1988).

Fig. 4. A view to the exhibition of shooting targets and weapons from the 18th and 19th centuries.

The Old Castle, The New Castle – historical exhibitions

The first museum exhibitions were established in the Old Castle. Nowadays, there are situated 7 independent exhibition parts named Miners arrive ... , Later Gothic Altar by Master M.S. from 1506, The Art of Smiths, Lapidary in the courtyard, Baroque sculptures, Shooting

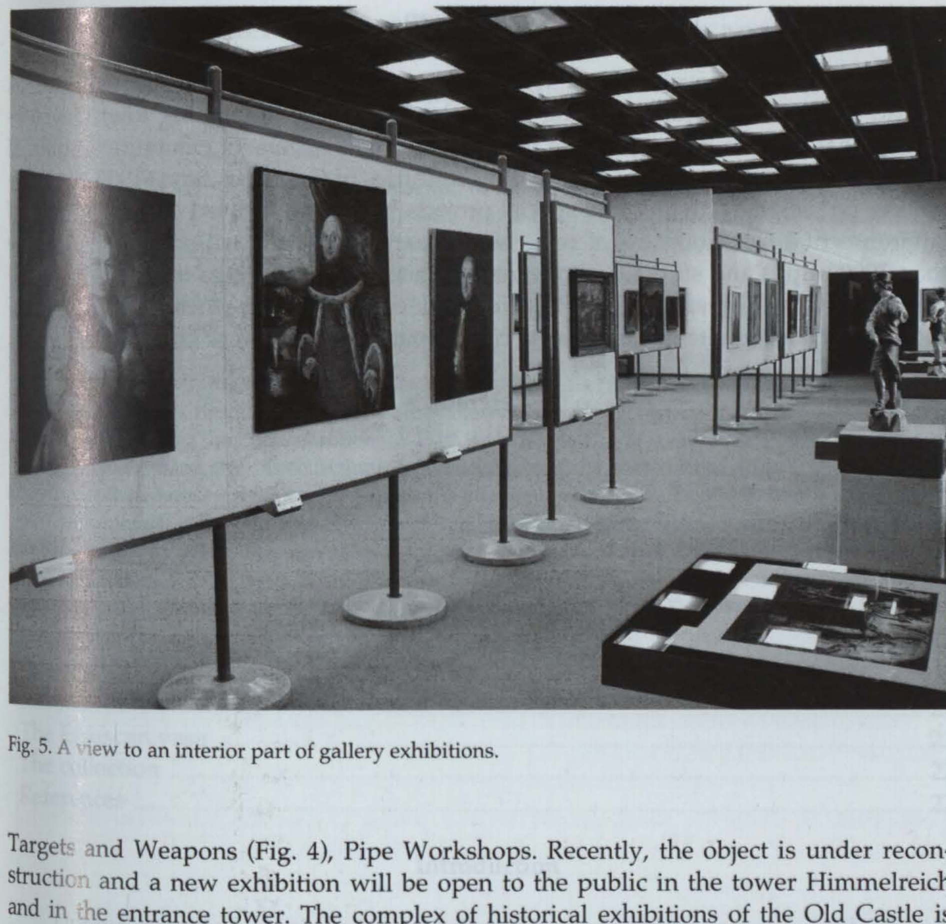

Fig. 5. A view to an interior part of gallery exhibitions.

Targets and Weapons (Fig. 4), Pipe Workshops. Recently, the object is under reconstruction and a new exhibition will be open to the public in the tower Himmelreich and in the entrance tower. The complex of historical exhibitions of the Old Castle is completed with historical part in the renaissance fortress of the New Castle from the 16th century. There are displayed items linked to military fights of the Habsburgs and Turkish armies. The fourth floor of the castle provides tourists with a beautiful view on historical center of the town and its wide surroundings (Labuda, 2001).

The Gallery of Jozef Kollár – gallery exhibits

The museums owns unique displays of art-historical character from the 13th to the 20th centuries. These displays are exhibited in three original burgher houses and today they are considered to be evidence of the building development of the town in the gothic and renaissance era (Fig. 5). The gallery exhibits also works of the most significant painters of the 20th century – Jozef Kollár (the gallery is named after him) and Edmund Gwerk. Particularly we can mention polychromatic sculptures of miners' patrons Saint Barbara and Saint Catharine by the Master M.S. from 1506, gothic board paintings, altar pictures, a baroque painting of Maria Theresia, Franz Joseph von Lothringen and several paintings of chamber earls.

Discussion

Nowadays, the Slovak Mining Museum displays its collections at home as well as abroad in a structural form offering a complete picture of the mining town development. What is more, every year the museum arranges dozens of exhibitions, some of them are also exhibited in the neighboring countries of Germany. Since 1999 our exhibitions, publishing activities and special projects have been focused on the increase of environmental consciousness of our visitors, particularly at local schools with more than 3000 pupils and students altogether. Authentic surroundings of medieval architecture provides also space for various forms of entertainment – theatre, concerts, festivals. The collection items have also become a part of education or entertainment.

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The Alexander the First collection of the Lausanne Museum

Elena L. Minina

Minina, E.L. The Alexander the First collection of the Lausanne Museum. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, 4: 223-228, 4 figs.; Leiden, August 2004.

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Key words — Mineralogical collection, Alexander the First, La Harpe, Etruscan vase.

Study of written sources in archives sometimes allows to restore the history of collections. A good example is the Alexander the First collection. In 1819, de la Harpe had sent an Etruscan vase to Alexander I as a gift, and had received a collection of Russian minerals in return. Alexander's collection, totaling 1031 samplesaccording to the catalogue of 1874, consists of five sections: salts, stones, metals, combustible minerals, and rocks. The collection of Russian minerals presented by Alexander the First in 1820 to La Harpe is completely preserved to the present day and is exhibited at the Lausanne Natural History Museum.

Contents

Introduction

Unique samples and mineralogical collections presented by members of the Russian imperial family are stored in many of the oldest mineralogical museums of Russia and Europe. For example, the collection of the sister of Alexander the First, Alexandra Pavlovna (1783-1801), is stored in the Budapest Natural History Museum (Papp, 1991).

The study of written sources in archives sometimes allows to restore the history of collections. A good example is a rather significant collection of minerals received as a gift from the Emperor Alexander the First (Fig.1) in 1819 exhibited at the Lausanne Natural History Museum. Alexander the First had presented this mineral collection to his old friend Frederick de la Harpe, who was his tutor and instructor in childhood.

Invited to Russia by the Empress Katherine the Great in 1783 as a tutor and instructor of the grand dukes, de la Harpe (Fig. 2) managed to become not only the teacher, but also a close friend of Alexander. Remaining the tutor of the successor until 1795, de La Harpe strongly influenced Alexander. Leaving Russia, de la Harpe, at the request of Alexander, made "Guidelines", in which he stated the sights and principles of state government.

Having returned home, de la Harpe was engaged in natural sciences, particularly in chemistry and mineralogy. He closely cooperated with prominent scientists, including René Haüy. He was concerned with the state of affairs in the Swiss Academy of

Fig. 1. Grand Duke Alexander Pavlovich, about 1790, unknown painter (Anonymus, 2002).

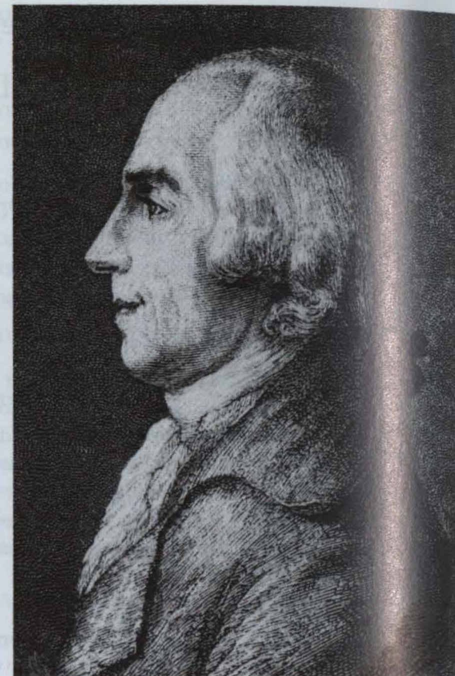

Fig. 2. The portrait of La Harpe (Troiat, 2003).

Sciences and in a letter to Alexander I (1805) he wrote "... The Academy does not have neither stock, nor collections related to the natural history; Russia is so rich in minerals that it would be praiseworthy to share with us a small part of the redundant, we shall be very grateful, and in turn, we would collect that is in our mountains. I recognize that my desire will not seem to you as of the category of which cannot be executed" (Meisser, 1998). This was his first request to Alexander I regarding the transfer of a collection of Russian minerals. Fourteen years passed, but de la Harpe had not lost hope to receive a collection of Russian minerals and in 1819 he had sent a gift to Alexander I, an Etruscan vase, notifying the Emperor by a letter. The description of this vase and a drawing made by the Minister of Finance, Count Guriev, is kept in the Russian State Historical Archive (RSHA, Fund 519, Inventory 1, File 893, list 25; Fig. 3).

Rome, April 10, 1819.

The vase, which I had the honor to speak to you about, was sent by the sea: here is its description.

I dare to address to Your Imperial Majesty with the letter to forward this parcel, being careful. The post seal is put on the packing. I hope that it will come in a good condition. The captain has put it in the cabin. I am pleased to think that this Italian souvenir will decorate your study. Sincerely and devotedly yours. On the 14th we plan to visit de la Harpe.

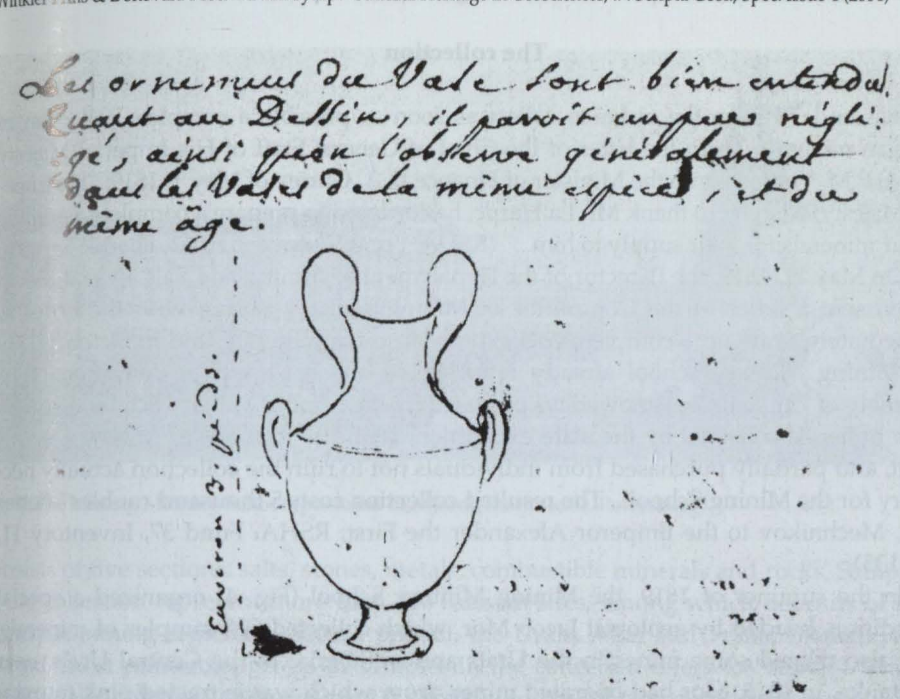

Fig. 3. The description of Etruscan vase. (RSHA, Fund 519, Inventory 1, File 893, list 25).

The Etruscan vase

It had been found near Naples. It was broken, but by the diligence of a competent archaeologist, who supervised the excavation, it was restored by pasting together separate antique fragments; the basis of the vase was made anew. Its height is about 1 m and the form is graceful.

By the proportions, dimensions and place of find, it is attributed to the type of Etruscan vase, found in big valleys. In its top part, on the front side, Apollo with lyre is represented; nearby a person is extending a wreath to him as a victory symbol. As he does not have wings, he cannot be considered as a deity. He may be one of those who were present at the dispute between Apollo and Marcius, and should participate in the decision of dispute. Bearded Marcius, completely demolished, is placed below.

The winged deity playing with a fallow deer at a small altar is on the vase neck. Probably, the artist wanted to eulogize Phoebus, the winner, patron of arts and god of hunting. On the other side, the artist has represented another plot, that of naked Orestus, who lost his clothes. Above at the left, is a deity with a torch. Near Orestus is suffering Piladus. The vase is decorated with a little bit negligent ornament, which is usual for vases of this type and age."

It was not possible to establish its current whereabouts.

The collection

Alexander I gave the order to collect as soon as possible a complete collection of Russian minerals. From the letter of the Chief of General Staff of His Imperial Majesty Prince P.M. Volkonsky to the Minister of Finance D.A. Guriev of May 1, 1819; "his Imperial Majesty, wishing to thank Mr. La Harpe, has ordered to prepare a complete assembly of our minerals for their supply to him..." (RSHA, Fund 37, Inventory 11, File 135).

On May 12, 1819, the Director of the Department of Mining and Salt, Evgraf Mechnikov, sent a letter to the Committee of Mining Military School with the order to immediately draw up a complete collection of Russian minerals, and in October 1819 the Mining Military School already reported on the readiness of collection. "The assembly of 791 samples is nowadays prepared by the Mining Military School, partially from minerals collected by the state expedition, sent due to funds of Mining Department, and partially purchased from individuals not to ruin the collection actually necessary for the Mining School... The resulted collection costs 5 thousand roubles" (letter of E. Mechnikov to the Emperor Alexander the First; RSHA. Fund 37, Inventory 11, File 135).

In the summer of 1819, the Mining Military School (Fig. 4) organized a special expedition, headed by geologist Jacob Mor, which collected 600 samples of minerals. Mor also owned some mines in the Urals and in Siberia. In the Central Urals, near Shaitanka, in 1815, Mor had operated mines, from which was extracted pink tourmaline, greenish quartz and vorobyevite.

Future Academician, lecturer of the Mining Military School, Dmitry Ivanovich Sokolov (1788-1852) was engaged in drawing up the collection catalogue. From the letter of the Commander of the Mining Military School Peter Meder to the Department of Mining and Salt of January 26, 1820: "the Committee of Mining Military School forwards herewith the description in French of that collection of Russian minerals, made by the Chief Inspector of Corps Cabinet Ober-Gitterverwalter of the 8th class Sokolov, and closed by him in 5 boxes under letters L and H, having the honor herewith to inform, that this collection includes: salts – 68 pieces, stones – 354, metals – 411, combustibles – 13, and rocks – 175. Total of 1021, including two complete collections, from those delivered by Mor, each of 300 to 600 pieces … from the assembly of the Mining Military School and 421 pieces bought from individuals. All the above collection has cost 5000 roubles" (RSHA, Fund 37, Inventory 11, File 135). The expenditure of the Mining Department was compensated by Alexander I.

Shipping of the collection to Switzerland was commissioned to a relative of de la Harpe, merchant Nikolay Betling, who lived in Petersburg, on the English Quay. De la Harpe received the collection of minerals in the summer of 1820. On September 3, 1820, de la Harpe sent to Alexander I a letter of thanks: "Sovereign, I have just received minerals from Russia, which your Imperial Majesty kindly presented to me. My gratitude is still higher, as now I have a possibility to organize the national education on my native land, having placed this collection in our Museum of Natural History, where it will serve for lessons in mineralogy. Such perfect collection should be evaluated as it deserves and I also hope, Sovereign, that you would approve how I shall dispose of it" (Meisser, 1998).

Alexander's collection, totaling 1031 samples according to the catalogue of 1874,

Fig. 4. The Mining Military School (postcard of Mining Institute St. Petersburg).

consists of five sections: salts, stones, metals, combustible minerals and rocks. Samples of the collection represent more than 100 Russian sites, among which deposits of the principal mining regions of Russia prevail, the Urals, Altai and Transbaikalian. The second most numerous group of samples in the collection refers to "stones". These are basically coloured and ornamental stones, and rock-forming minerals, varieties of quartz, nephrite, garnet, beryl, topaz, tourmaline, lazurite, vesuviane, staurolite, feldspar, amphibole, pyroxene, and mica.

Quartz varieties are represented by 90 specimens, including amethysts from Olonets and Murzinka (the Urals), rock crystal from Lipovka pegmatites and smoky quartz from the Urals, and some amethyst specimens as aggregates of crystals and geodes from the well-known Volk Island. The collection rather completely represents jaspers from the Urals and Altai; landscape jasper from Orsk, green-black ones from Kundrava and Kalkan, jaspers from Korgon and Revnevaya, lazurite and nephrite from the Baikal area, and gems from the Urals.

A large section of the collection is devoted to ores. It includes ores of iron, copper, silver, lead, zinc, chromium, minerals of titanium, native gold, silver and copper from the major mining regions of that time. Most of the ore collection represents ores from the Urals, among which iron minerals are important; magnetite, hematite, limonite from Neiva, Kushva and Miass mines. Specimens of native copper and copper ores from the Urals (Polevsky, Gumeshevsky, Tur'indky mines) are numerous; native gold from Berezovsk is present. The well-known silver-lead and gold-ore deposits of Altai are widely represented in the collection: Zmeinogorsk (gold, silver, galena), Nikolaev mine (galena, silver, opal), Ridder (silver) and Salair (silver).

One section in the collection is devoted to combustible mineral and organic compounds, covering specimens of coal, combustible slate, peat, and graphite from northwest of Russia. The collection also contains the basic types of rocks from the Urals, Karelia and Baikal regions.

The collection of Russian minerals presented in 1820 to de la Harpe is completely preserved to the present day and is exhibited at the Lausanne Natural History Museum, being the material testimony of connections between Russia and Switzerland.

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Historical mineral collections in the silver mining town of Kongsberg, Norway

F.S. Nordrum & B.I. Berg

F.S. Nordrum & Berg, B.I. Historical mineral collections in the silver mining town of Kongsberg, Norway. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, 4: 229-235, 4 figs.; Leiden, August 2004.
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Key words — old geological collections, silver mines, mining officers, mining academy, Kongsberg.
The discovery of native silver deposits at Kongsberg, Norway, in 1623 created interest for silver specimens and mineral collecting, also among mining officers. Large collections were donated by J. Hiort, M.T. Brünnich and J. Esmark to the Mining Academy at Kongsberg. The Academy's collections were in 1814 transferred to the University of Oslo. From 1841 The Kongsberg Silver Mines built up their own collections.

Contents

Introduction

The Kongsberg Silver Mines were established in 1623 and the Kongsberg mining town was founded in 1624 by the Danish-Norwegian king Christian IV. The ore, dominated by native silver, was a sensation at the time. Specimens of native silver became popular collecting items. Most fine specimens, however, went to members of the royalty in Copenhagen. From the Silver Mines' annual sales lists (Berg & Nordrum, 2003a,b, 2004) it appears that officers at the Mines and the Mint also bought some, sometimes many, specimens. It might be suspected that some officers had rather large collections, but further information is unavailable, until the year 1729.

In 1727 inspectors noticed that some copper was missing from the storage room in the Royal Norwegian Mint, which was a part of the Kongsberg Silver Mines. Investigations showed that coins had been struck with insufficient silver, substituted by copper, and mint master Henrick Christoffer Meyer had retained the silver. Meyer was sentenced "to loss of honour, life and property", but the King showed him mercy by withdrawing the death penalty. Instead, he was sentenced to be whipped, branded and assigned prison work for life. The first part of the penalty was executed in public at the market place in Kongsberg at 2.00 p.m. on February 16th, 1729. He received 27 whip lashes and a thief mark was burned into his forehead, so that forever he would be shut out from normal society. Two months later he died in the darkness of his cell

(Rønning, 1986; Bancroft *et al.*, 2001). His property and belongings were auctioned later that year, and in the auction list we find a mineral collection, estimated to a value of 100 riksdaler (Danish dollars). It was sold for 135 riksdaler and 24 skilling to Johann J. Lonnicer. In the collection there were silver specimens from Kongsberg, but also specimens from other occurrences and countries.

In his diary the Swedish mining official Daniel Tilas noted from his visit in Kongsberg in 1750 the beautiful collections of bergjunker Fr. Schindel and the untidy mineral collection of Oberbergamtsforvalter "Hellson" (Wichman, 1966, pp. 238-239). This was a reference to Michael Heltzen, who later became Oberberghauptmann and director of the Silver Mines (1756-1770). From the Silver Mines' annual sales lists we know that Heltzen bought 95 specimens in 1761, and 18 silver specimens and five gold specimens in 1762 (Berg & Nordrum, 2003a). He probably had a large private collection. Even Mrs Heltzen and Miss Heltzen are listed as buyers of specimens.

Early mineral collections at Kongsberg

The Royal Norwegian Mining Academy (Bergseminarium) was established in Kongsberg in 1757. At the Mining Academy, geological specimens were needed for educational purposes. In the beginning, no money for the purchase of specimens was granted by the Finance Ministry in Copenhagen. The lecturers had to use their own collections or acquire the necessary specimens themselves, even after the first grant in 1770 of one thousand Danish dollars for the acquisition of specimens, with purchases spread over eight years. A fire destroyed Professor Peter Thorstensen's collection of about 3000 numbers in 1777 (Blom, 1957).

Revitalisation of the Mining Academy in the 1780s resulted in new enthusiasm for the institution. In 1786 Oberberghauptmann Jørgen Hiort donated his comprehensive collection to the Mining Academy. Later, the large collections of Oberberghauptmann M.Th. Brünnich and lecturer at the Academy and Oberbergamtsassessor Jens Esmark were also acquired.

Jørgen Hiort (1737-1804; Fig. 1) was Oberberghauptmann (director) of the Kongsberg Silver Mines from 1775 to 1791. Hiort's collection was diligently registered in two leather-bound manuscript catalogues, written in Danish and Latin. It contained more than 3550

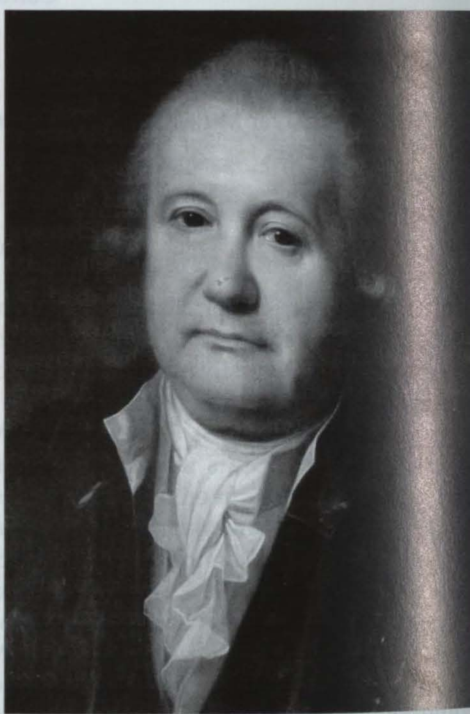

Fig. 1. Oberberghauptmann Jørgen Hiort (1737-1804); from painting in the Geological Museum, Natural History Museum and Botanical Garden, University of Oslo.

numbers; about 2870 specimens in the main collection and *c.* 680 samples from Norwegian mines (505 from 75 different silver mines and prospects in Kongsberg). The main collection contained 189 specimens from Kongsberg, including 65 with native silver, 49 with other silver minerals and 14 with gold. The sample collection contained 59 samples with native silver, 26 with other silver minerals and seven with gold from Kongsberg. Hiort donated his collection as a gift to the Mining Academy, given "as a proof of his zeal for his native country, his devotion to the King and his love for the mining profession."

Morten Thrane Brünnich (1737-1827; Fig. 2) was appointed professor at the University in Copenhagen in natural history and economy in 1769, and thus also manager of the university's natural history museum and its collections. His private collections were on display when the new museum exhibition was opened in 1772 (Garboe, 1959). By a royal resolution of June 27th, 1782, his collections were purchased for 1500 riksdaler, and an annual payment of 200 riksdaler to him and his wife for the rest of their lives. His collections consisted of both geological and biological objects. For the biological collections, 800 riksdaler, and annually 100 riksdaler, were paid by the King (Den kongelige kasse), and the collections apparently went to the University's Natural History Museum (Universitetets Natural Theatre). The Mining Directorate (Bergverksdirektoriet) paid 700 riksdaler, and annually 100 riksdaler, and got the geological part, which was estimated at 6000 pieces. Etatsråd Holt was charged with making a record of those minerals and rocks in Brünnich's collection that were of interest for the Mining Directorate. Holt assured the Directorate that the collection was well worth the money.

Fig. 2. Oberberghauptmann Morten Thrane Brünnich (1737-1827); from painting in the Geological Museum, Natural History Museum and Botanical Garden, University of Oslo.

By a royal resolution of December 23rd, 1789, it was decided to send a record of the Mining Directorate's mineral collection to the Mining Academy in Kongsberg, so that the Academy could select all the specimens they needed for educational purpose. Around 1790 Professor Peter Thorstensen selected 1050 of the 1452 entries (some entries covering more than a dozen specimens) in the paperback catalogue (written in Latin) for the Academy, including 730 ore mineral specimens and ore samples and more than 100 polished slabs (Kjerulf, 1861).

Brünnich became Mining Commissioner at Kongsberg in 1789 and was Oberberghauptmann (director) of the Kongsberg Silver Mines during 1791 to 1814. Brünnich was the author of

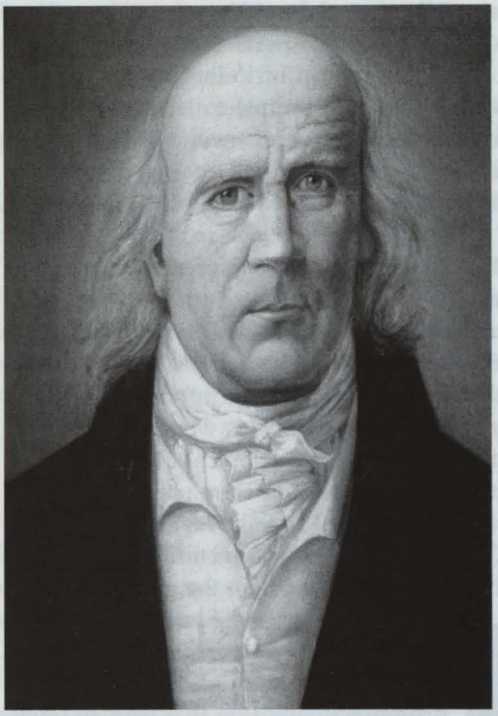

Fig. 3. Professor Jens Esmark (1762-1839); from painting in Geological Museum, Natural History Museum and Botanical Garden, University of Oslo.

Forsøg til Mineralogie for Norge (1777) ("Attempt at a Mineralogy of Norway"), and also of other books on natural history and mining history.

Jens Esmark (1762-1839; Fig. 3) was Oberbergamtsassessor from 1797, and also lecturer and collection manager at the Mining Academy. In 1814 he became the first professor of geoscience at the University of Christiania (Oslo). His personal mineral collection of 1658 specimens was registered in a five-volume catalogue with metal screws, written by himself. The collection was registered after Werner's system of mineral classification; 1st Class, Earthy fossils (that is minerals), 1064 numbers; 2nd Class, Salty fossils, 18 numbers; 3rd Class, Inflammable fossils, 46 numbers; and 4th Class, Metallic fossils, 530 numbers.

These three donations and also the information that Professor Thorstensen lost his large collection in a fire in 1777, as well as the indications about Schindel and Heltzen, show that high-ranking mining officers in Kongsberg often owned large collections of geological specimens from many countries and a large number of occurrences. How did they acquire the specimens from abroad? During the 18th century, knowledgeable young men who were chosen to become mining officers were given travel scholarships to visit leading mines and mining schools around Europe. Usually they spent some years abroad. These postgraduate students or experienced miners had a great opportunity to collect and acquire geological specimens during these years of travel.

Hiort, Brünnich and Esmark had all received travel scholarships, as did Schindel and Heltzen, and their collections reflect their travel routes in Europe, besides the mines and occurrences they had worked at or surveyed at home. Only a limited number of specimens originate from other localities and countries, and were probably obtained through contact with other colleagues.

Hiort's grand tour lasted more than three years, from July 1763 to September 1766. He visited a number of mines and schools in Denmark, Saxony, Czechia, Slovakia, Rumania, Hungary, and Austria, although in some instances the names of the countries at that time differed from the present ones. Brünnich was on his grand tour from July 1765 to October 1769, 4 years and 3 months, visiting The Netherlands, England, France, Italy, Slovenia, Austria, Hungary, Czechia, Slovakia, Rumania, Saxony and Harz. Esmark was on his journey from 1791 to 1797, about 6 years, visiting Saxony,

Fig. 4. The main building of the Mining Academy in Kongsberg, built 1786 (photograph P.H. Sælebakke).

Czechia, Slovakia, Austria, Hungary, Rumania, Poland and Silesia (Esmark, 2003). He had long stays in Freiberg, as he was a great admirer of Abraham Gottlob Werner. All the three men wrote travel reports.

In September 1811 it was decided to establish Norway's first university at Kongsberg because the Mining Academy was already situated there (Fig. 4). This was overruled in January 1812 and the university was located at Christiania (Oslo). The Mining Academy was abandoned in 1814, and the collections and catalogues transferred to the university. The Academy's mineral collections became the nucleus of the present-day collections in the Geological Museum at the University of Oslo.

The Kongsberg Silver Mines' mineral collection (1841-1958)

After the Mining Academy collections were removed from the town, the mining officers at Kongsberg felt the need for geological specimens and scientific literature. Discoveries of very rich silver ores around 1830 improved the economic situation. The board of directors approached the Finance Ministry requesting the establishment of collections of minerals and books. This was approved by a royal resolution of March 15th, 1841.

The man behind the demand was probably director Karl Friedrich Böbert (1804-1869). Böbert was born in Hettstedt near Mansfeld, Germany, and was director of the Kongsberg Silver Mines 1840-1869. After they were established, the Kongsberg Silver Mines' Collections were gradually increased by gifts, exchange, purchases and collecting. The Silver Mines participated in many exhibitions, showing their fabulous silver specimens, such as most of the "world fairs" during the 19th century, including the first in Crystal Palace in London in 1851. The collections were open to the public in the silver smeltery building at regular intervals from about 1880.

The period 1912-1914 saw new collecting activity as preparations were made for the large national fair in Christiania (Oslo) in 1914, celebrating the first hundred years of the Norwegian constitution. On February 28th, 1938, a decision to build a larger "Silver Mines' Museum" was made, initiating another search for exhibit items. New exhibitions opened in 1945.

The Kongsberg Silver Mines' mineral collection was, when mining was abandoned in 1958, a pure Kongsberg collection. Although specimens of other ore and vein minerals are present, the collection is focused on one mineral (native silver), crystallized by one geological process under the same environmental conditions and deposited in one restricted area. The specimens had been chosen and the collection kept by non-professionals (in the curatorial and mineralogical sense). Impressive silver specimens from major pocket finds after 1840 are present, as are also silver specimens of a great morphological variety of wires, crystals, plate crystals and arborescent forms. Vein minerals have obviously been of minor interest to the custodians, as most high quality specimens of these minerals disappeared to other museums and private collections. Some top silvers were also taken out of the collection over the years. They were sold or given away as gifts, e.g., to high-ranking mining officers when they retired.

The collection today contains about 1000 silver specimens, of which 330 pieces are on display in the "silver mineral chamber." The collection is valued as a national silver treasure. Together with the collections of objects, tools and products it is still exhibited in the old silver smeltery, and is a part of the entire national mining heritage monument at Kongsberg. The collections are in the custody of the Norwegian Mining Museum.

Acknowledgements

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The mineral collection of the Royal Ajuda Museum, Lisbon, Portugal

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The origin, development and vicissitudes of the mineral collection of the Museu Real da Ajuda (Royal Ajuda Museum) in Lisbon are described, as well as its relationships with the collection of gems and jewellery that belonged to the Portuguese crown, deposited in the royal Ajuda Palace. The Museum was created around 1775 for the instruction of the royal prince Dom José. Domingos Vandelli, an Italian naturalist and professor at the University of Coimbra, was in charge of its creation and development (Carvalho, 1987). Specimens of rocks and minerals were received mostly from the Portuguese colonies (mainly from Brazil), the most beautiful gems and gold nuggets being intended for the crown collection. A precious inventory was made in 1794 by Alexander R. Ferreira.

Vicissitudes in the 18th and 19th centuries affecting the Museum collections (Godinho, 1991; Almaça, 1996) included those derived from the invasions of Portugal by the Napoleonic armies (Ferreira, 1911), resulting in the transfer to France of many specimens; the removal of many sets to other Portuguese collections for scientific purposes, viz. to the Lisbon Academy of Sciences and to the Lisbon Polytechnics (Canêlhas, 1983); and, very recently, the robbery in Holland of some rich specimens from the crown collection that were in a public exhibition.

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

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Key words — 19th century, Bohemia, museum, collections, research, mineralogy.
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.

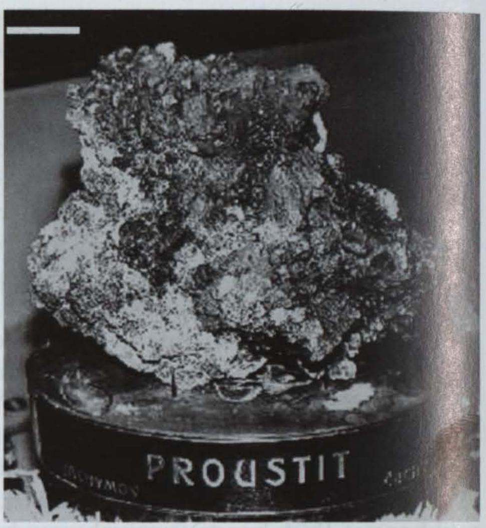

Fig. 2. Proustite from Joachimsthal (gift from Franz I, 1824). Scale bar represents 2 cm.

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.

Acknowledgements

I express sincere thanks to Professor O. Fejfar for contributing the photographs of the minerals by permission of the Bohemian National Museum in Prague. I also thank Dr. J. Kourimsky from the Bohemian National Museum for helpful discussions on the history of the mineral collection. This project has been supported by the Austrian Science Fund (FWF) (Project Nr. P-14773-G01).

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Trautschold's collections in the Vernadsky State Geological Museum of the Russian Academy of Science (Moscow, Russia)

Iraida A. Starodubtseva

Starodubtseva, I.A. Trautschold's collections in the Vernadsky State Geological Museum of the Russian Academy of Science (Moscow, Russia). *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue,* 4: 249-252, 3 figs.; Leiden, August 2004.

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Key words — G.A. Trautschold, Carboniferous, Jurassic, Cretaceous, central Russia, palaeontology.

Hermann (German) Trautschold (1817-1902) is an outstanding researcher of the Carboniferous, Jurassic and Cretaceous geology of central Russia. Three decades (1857-1888) he lived in Moscow and moved from tutor and lecturer of the German language to Professor of Geology of Peter's Agricultural University. All these years Trautschold was unceasing in palaeontological and stratigraphical researches.

Contents

Biographical notes

Hermann Trautschold was born in Berlin in 1817. After graduation from a grammar school, he studied pharmacy for six years. He matriculated to the University of Berlin to study natural sciences. In Berlin he was the assistant of Link, a well-known botanist of that time. Moving to Hessen, he was engaged in chemistry, physics, mineralogy and crystallography. For about two years he was assistant in the laboratory of the well-known chemist Liebich. In 1846 he became Doctor of Philosophy of Hessen University.

He came to Russia for the first time in 1846 with the family of the rich Kostroma landowner Luginin, but in 1848 he returned to Germany, where he worked in a private higher educational institution till 1857. In 1857, Trautschold returned to Russia as tutor in the family of Akhlestyshev. He made annual excursions along the rivers Volga, Oka and Unzha in central Russia, paying paricular attention to the geology and palaeontology. From 1863 to 1868 he taught the German language in the physical-mathematical and medical faculties of Moscow University. In 1868, Trautschold was invited to join the faculty of mineralogy and geognosy of the Peter Agricultural and Forest Academy. From 1871 he was the professor of the Faculty of Geology of this Academy. In 1888, Trautschold retired and left Russia. First he moved to Breslau (nowadays Wroclaw, Poland), then to Freiberg and Karlsruhe (Germany). For biographical notes see Mitta & Starodubtseva (2002) and Starodubtseva & Mitta (2002).

Geological achievements

Hermann (German) Adol'fovich Trautschold (1817-1902) (Fig. 1) was a well-known naturalist of the second half of the 19th century, an expert on the Carboniferous and, especially, Jurassic and Cretaceous deposits of central Russia, particularly those in the vicinity of Moscow. He described many taxa, including sponges, corals, bryozoans, ammonites, crinoids, brachiopods and fishes; his descriptions are still used by modern researchers. Trautschold was the author of more than 160 scientific publications, which formed the base for further development of palaeontology and geology in Russia.

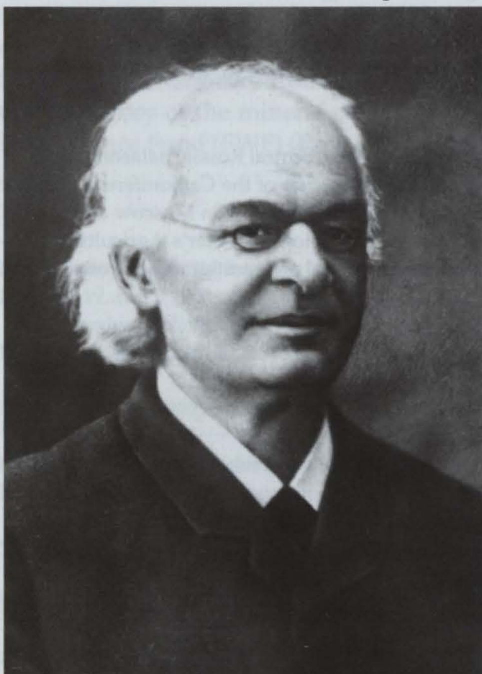

Fig. 1. Photograph of Hermann (German) Adol'fovich Trautschold (1817-1902) made in Moscow.

In articles devoted to fossils from Carboniferous deposits of Moscow vicinity, G.A. Trautschold has discovered (among others) new species of sea lilies; *Hydriocrinus pusillus, Cromyocrinus geminatus* [= *Moorecrinus geminatus*], *Cromyocrinus simplex, Poteriocrinus multiplex* [= *Moscovicrinus multiplex*], etc. He also described for the first time a gastropod mollusc parasitizing on sea lilies *Capulucus parasiticus* [= *Platiceras parasiticum*].

Trautschold's works devoted to the description of fossils from Jurassic and Lower Cretaceous deposits of Central Russia have doubtless merits. He has described about 250 species of fossils from these deposits. Some species of ammonites discovered by him, *Ringsteadia cuneata, Kachpurites fulgens, Craspedites subditus, Speetoniceras versicolor,* have become zonal indices for the Oxfordian, Volgian and Hauterivian stages. He has first described and figured the endocochlian cephalopod of the suborder Teuthoidea from Russia, whose imprints he had found in the neighborhoods of Simbirsk in Upper Jurassic shales and determined as *Coccoteuthis hastiformis* Rüppen [= *Trachiteuthis zhuravlevi* Hecker & Hecker] (Fig. 2).

In 1862, he has published the first coloured palaeogeographic maps of Russia under the title "Probable distribution of land and seas in Jurassic time for the European Russia, presented on the basis of geognostic maps by R. Murchison". The palaeogeographic map for the Late Jurassic in the "Atlas of lithological-palaeogeographical maps of the Russian platform and its geosynclinal frame" (Vinogradov, 1961) shows outlines of continents and seas similar to the maps published by Trautschold.

The Vernadsky State Geological Museum of the Russian Academy of Science (RAS) stores the collections of fossils described and drawn by Trautschold in his works (1861, 1866, 1871, 1874, 1876, 1879, 1877, 1879a, 1879b, 1886). The complete list of the

Fig. 2. *Coccoteuthis hastiformis* Rüppen [= *Trachyteuthis zhyravlevi* E. Hecker & R. Hecker]. Location: Russia, Ulyanovsk region, bank of Volga near Gorodische and Polivna (Jurassic, Volzhsky layer). Sample to paper by Trautschold (1866). Vernadsky State Geological Museum of RAS.

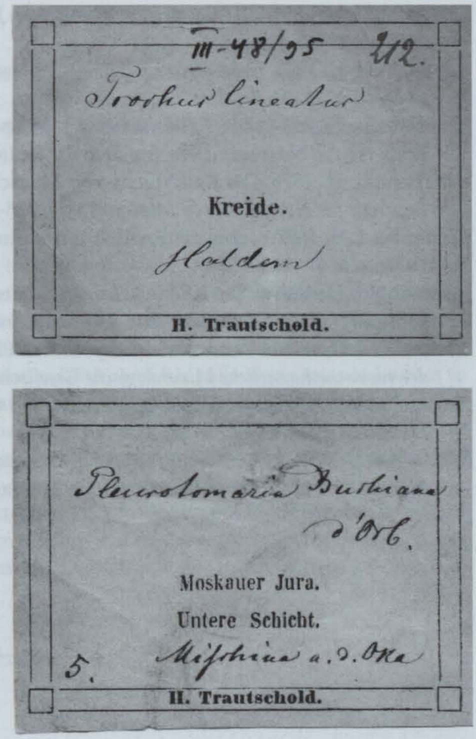

Fig. 3. Labels by G.A. Trautschold to the samples stored in the Vernadsky State Geological Museum of RAS.

specimens is published in a paper by Mitta & Starodubtseva (2002). The museum also has diverse specimens collected by Trautschold from the Carboniferous and Jurassic deposits located nearby Moscow and Mesozoic invertebrates from Europe (Fig. 3).

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The Kinker diatom collection: discovery – exploration – exploitation

Frithjof A.S. Sterrenburg & Hein de Wolf

Sterrenburg, F.A.S. & Wolf, H. de. The Kinker diatom collection: discovery – exploration – exploitation. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, 4: 253-260, 5 figs., 1 pl.; Leiden, August 2004.

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Key words — diatoms, typification.

Johannes Kinker (1823-1900) was a typical representative of the Victorian 'amateur-savant'. As a well-to-do stockbroker he was able to invest considerable time and money into studies of nature, first entomology and subsequently diatoms. The latter subject flourished in the late 19th century and, among his international contemporaries, Kinker was regarded as "the only Dutch diatomist of renown". There is a marked discrepancy between this reputation in his own time and his complete obscurity since, for which there are two reasons; Kinker did not publish, and his collection was not known to exist. Our discovery of the virtually intact Kinker diatom collection after it had vanished for a century can be regarded as a cultural heritage conservation paradigm; the collection is scientifically significant and can be developed into a rich source of information for micropalaeontological, biostratigraphic and biodiversity studies. The conservation project now under way illustrates the importance of a synergy between materials and archives, because Kinker's extensive correspondence and notebooks have been preserved and are essential to the conservation, documentation and future exploitation of these valuable materials. Although Kinker cannot be regarded as a productive scientist, his importance as an 'information node' is now evident.

Contents

Introduction

For a century, the position of the late-Victorian Dutch diatomist Johannes Kinker in the history of diatom research has been enigmatic (de Wolf & Sterrenburg, 1993). The sum total of the available data was limited to the obituary written by the renowned Flemish diatomist Henri van Heurck (1900). Minimal as the information may have been, van Heurck's assessment of Kinker's status amounts to a veritable eulogy, as the following quotations translated from the French may show: "Holland had only one diatomist of renown", "Kinker left a collection .... that can be regarded as masterpieces", "Kinker notably contributed to the study of diatoms ... he was in contact with virtually all eminent diatomists of his day."

The discrepancy between Kinker's obscurity now and his eminence in his own time is best illustrated by comparing two facts; Kinker never published a single paper, yet nine renowned diatomists of his time named no less than 28 different species after him, an exceptional distinction. It had never been possible to form an objective idea of Kinker's true relevance because, apart from a very small number of slides with Kinker's labels that have come to light in a few herbaria, as a result of our International Survey of Diatom Collections (de Wolf & Sterrenburg, update 2003) nothing of the reputedly valuable Kinker collection was known to exist. That situation has now changed fundamentally.

Historical background

In the second half of the 19th century the then new field of diatom research flourished. This was inextricably linked to the simultaneous rapid development of the optics of the microscope. Frison (1954) gave a fascinating panorama of this synergy, and pointed out that the quest for visualization of the minute and beautiful structure of diatoms (Fig. 1), and the consequent demand for improved optics, created an excellent market for microscope designers. In less than 40 years, microscope performance was raised from 'mediocre' to the limits allowed by physics.

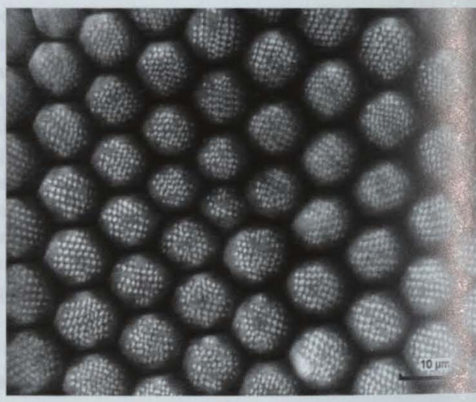

Fig. 1. The fine structure of diatoms requires perfect optics. The hexagonal chambers of a *Triceratium favus* Ehrenberg valve are closed by membranes with nano-scale perforations. Polarized light, objective NA 1.3.

There is a marked parallel with the second heyday of diatom research, ushered in a century later by the introduction of the electron microscope, but with one marked difference. Whereas in modern times diatom research is overwhelmingly practiced by professionals, the professional scientist was still largely an emerging phenomenon in Victorian times, notably in diatom research. Ludwig Rabenhorst was an apothecary, William Smith a reverend, Henri van Heurck an industrialist and Johannes Kinker a stockbroker.

It has been fashionable to picture these Victorian investigators as quaint Daddy Longlegs irrelevantly chasing after obscure creatures, but that image is false. Laying the foundations of a science is never irrelevant, and the current classification of diatoms and practical scientific applications of diatom studies were given a sound basis by the work of these earlier investigators. Kinker need not have been modest because he was "only an amateur." So were most of his contemporaries, and the position of "amateur-savant" was a respectable and even distinguished one in his time. In fact, if modern trends in financing of Science continue, we may well see a return to that situation in our lifetime.

Relevance of diatom research

Diatoms (Classis Bacillariophyceae) are unicellular algae and rank among the most diverse groups of organisms. Some 30,000 taxa have been described and estimates of the total number of species range from 100,000 to a million, a spread of one order of magnitude, indicating the uncertainty prevailing. Any figure within this range is sufficient, however, to show that 'species diversity' certainly applies here (Fig. 2).

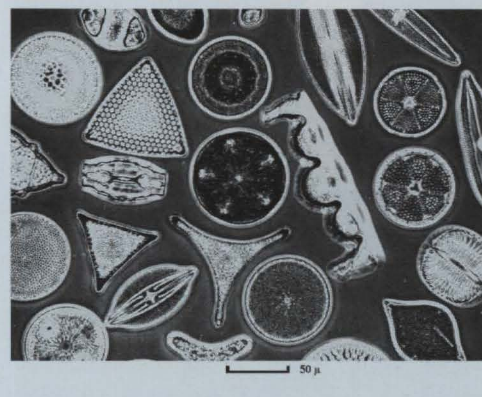

Fig. 2. An impression of the morphological variety of diatoms – a portion of an 'arranged slide' containing 100 diatoms.

In nature, diatoms are among the principal aquatic primary producers. They are the source of much of the oxygen in the atmosphere and a major component at the base of the entire aquatic food chain. The majority of species are predominantly, or exclusively, linked to a clearly defined environment, from marine to freshwater, from nutrient-poor to nutrient-rich.

Because the unique silicate exoskeleton of diatoms easily fossilizes after the organism dies and its morphology is species-specific, the nature of, and changes in, the environment can be reconstructed from sediments and sedimentary rocks that contain diatoms over long periods, up to millions of years. Valuable results have been obtained in the reconstruction of ancient coast lines, of acidification and pollution of the environment and of climate change, for example.

For such studies to make any sense at all, good taxonomy is an indispensable requirement and, despite financial constraints, diatom taxonomy has flourished in the past 25 years, just as it did in the second half of the 19th century. It is now universally accepted that taxonomy must be based on the investigation of the original materials from which species were originally described, by the process called typification, as in the course of time misidentifications have accumulated, leading to an erroneous shift in the species paradigm. Hence the crucial importance of collections of original materials.

The collection

By a fortunate course of events we were able to trace the Kinker collection after it had vanished for almost a century. A preliminary investigation (Sterrenburg & de Wolf, 1993) immediately revealed that this is the most valuable diatom collection to be discovered in The Netherlands. It consists of approximately 1300 slides (Figs. 3-4), over 700 'cleaned' samples, hundreds of unprocessed materials still in their original wrappings of a century ago, 600 large-format glass negatives of diatom photomicro-

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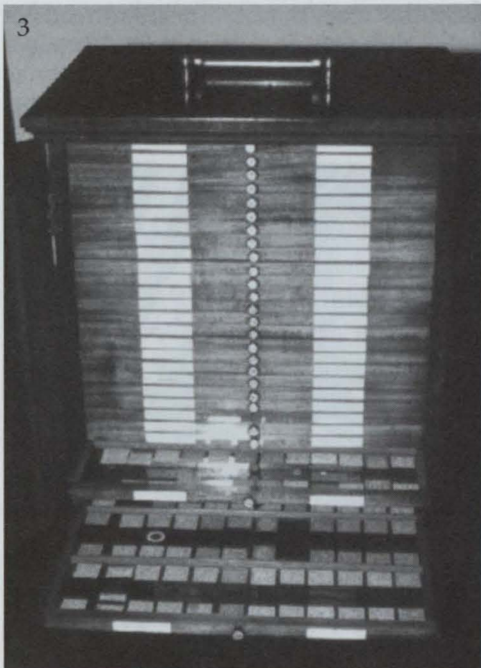

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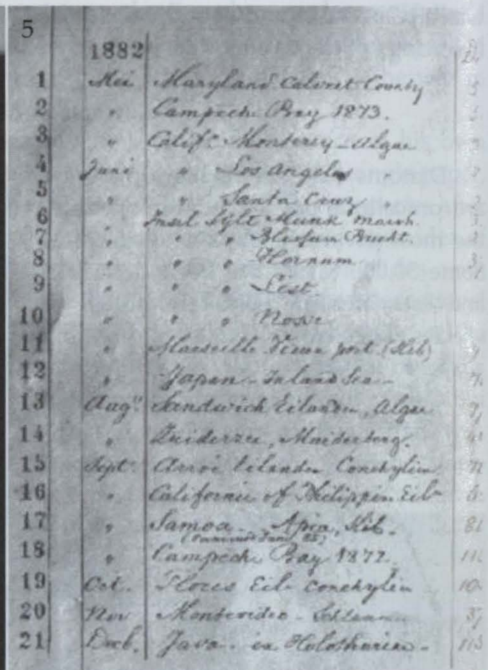
1882
1 Mei Maryland Calvert County
2 " Campeche Bay 1873.
3 " Calif. Monterey - Algae
4 Juni " Los Angeles
5 " " Santa Cruz
6 Insel Sylt Munk marsh.
7 " " [illegible] Bucht.
8 " " Hornum
9 " " List
10 " " [illegible]
11 " Marseille Vieux port (Lit)
12 " Japan - Inland Sea
13 Aug. Sandwich Eilanden, Algae
14 " Zuiderzee, Muiderberg
15 Sept. Azori Eilanden Conchylien
16 " California of Philippijn Eil.
17 " Samoa - Apia, Lit.
18 " Campeche Bay 1877.
19 Oct. Flores Eil. Conchylien
20 Nov. Montevideo - Eilanden
21 Dec. Java - ex Holothurien -

4

Fig. 3. Cabinet with slides in the Kinker collection
Fig. 4. Close-up of a drawer with slides.
Fig. 5. A page from one of Kinker's notebooks.

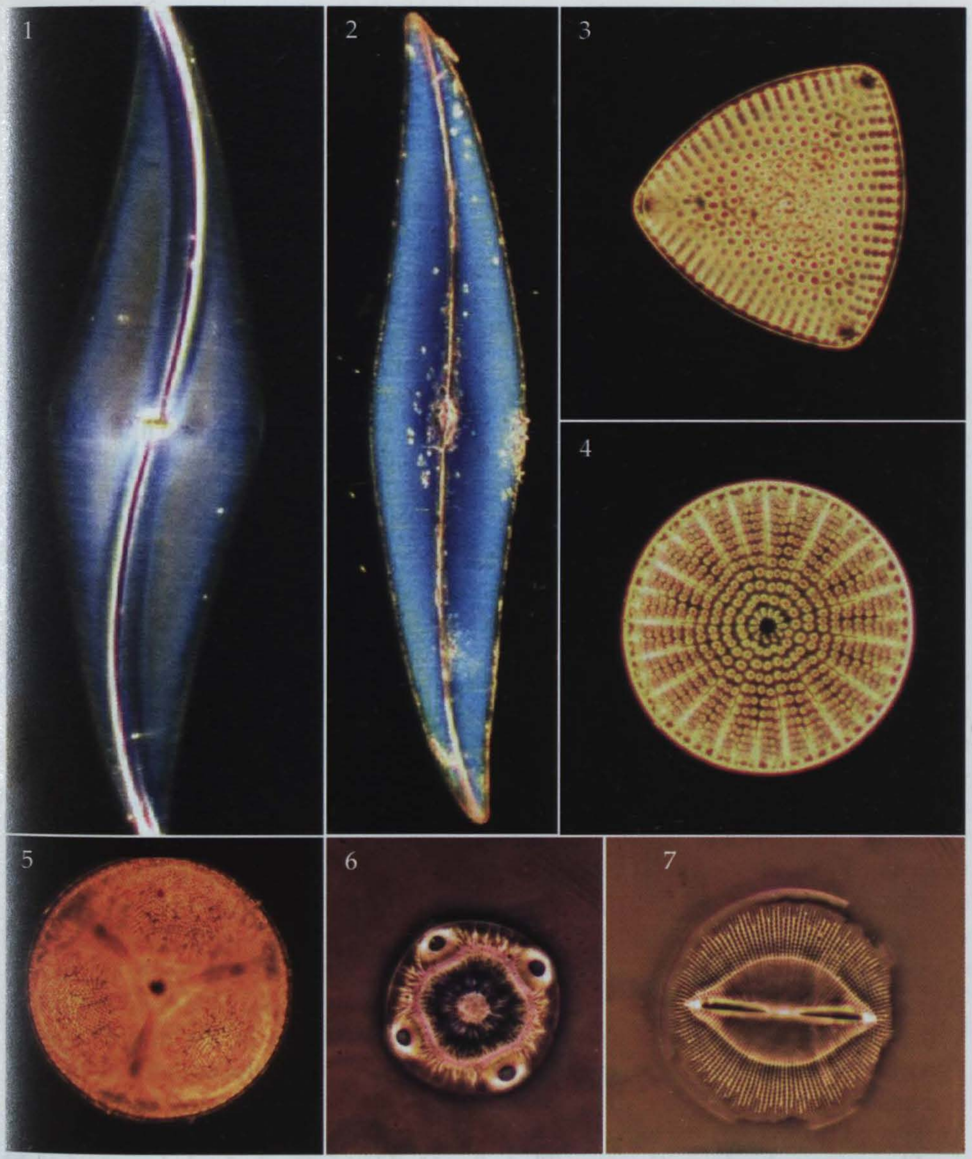

Plate 1

Fig. 1. *Pleurosigma rhombeum*, a (sub)tropical species. Darkfield, objective NA 0.55.

Fig. 2. *Pleurosigma angulatum*, a species from temperate waters. Darkfield, objective NA 0.55.

Fig. 3. *Stictodiscus kinkerianus*, from the deposits at Jeremie, Haiti. Darkfield, objective NA 0.55.

Fig. 4. *Arachnoidiscus barbadensis*, from the classic Barbados deposits. Darkfield, objective NA 0.55.

Fig. 5. *Aulacodiscus tchestnovii*, from the Kuznetsk, Russia deposits. Darkfield, objective NA 0.55.

Fig. 6. *Glyphodiscus stellatus*, from a deposit in Montana, USA. Phase contrast, objective N.A. 0.65.

Fig. 7. *Rhaphidodiscus marylandicus*, from the original Maryland, USA, deposits. Phase contrast, objective N.A. 0.65.

graphs and, very importantly, Kinker's notebooks (Fig. 5) plus a collection of hundreds of letters. These confirmed that Kinker was indeed in contact with the "eminent diatomists of his day" as van Heurck (1900) wrote, including Möller, Thum, Witt, Pantocsek, Peragallo and others. Copies of the letters written by Kinker himself are also present so that the record of this correspondence may be largely reconstructed.

Conservation

The Kinker collection appears to be just manageable enough to permit its conservation in the form of a finite, instead of open-ended, project. The first phase involves the examination, numbering and, where necessary, restoration of the slides and their documentation in the form of a database. Most slides were made by Kinker himself, from documented materials donated by his correspondents. Also, the cleaned samples are being documented and safeguarded. The link between archival data and materials supplied by the notebooks and letters is of outstanding importance in this respect. The samples will be entered in a database and this work is now in progress.

The second phase will address the tantalising intact packets. Tantilising because we have no idea as yet how many there may actually be. When we examined one packet, which was in danger of falling apart, it was found to contain 20 smaller packets, which, fearing a Matrushka effect, we then wisely left alone until a later moment. These packets need to be conserved, taking extreme precautions to avoid mutual contamination, and entered in a database. Finally, the notebooks and correspondence must be copied; the originals have now been stored under appropriate conditions.

Exploitation

The first phase of renewed research on the Kinker collection is already yielding new data. Our preliminary investigation (Sterrenburg & de Wolf, 1993) had shown that most of the slides contain specimens selected from the original materials which Kinker had received from his correspondents. Thus, we will be able to typify and for the first time photographically document a large number of species of several important authors. Designation of types so far covers only a fraction of the diatom species described; the illustrations accompanying the protologues of the authors mentioned consisted of line drawings of unknown accuracy. Here are some examples of interesting species that have come to light in Kinker's slides:

- *Pleurosigma rhombeum* Grunow (Pl. 1, fig. 1): this is a typical inhabitant of (sub)tropical waters. In the literature, it has been confused with *P. angulatum* (Quekett) W. Smith (Pl. 1, fig. 2), leading to a distorted biogeographical range because the latter species inhabits the temperate marine littoral.
- *Stictodiscus kinkerianus* Truan & Witt (Pl. 1, fig. 3): one of the 28 species named after Kinker awaiting typification. Only known from Miocene deposits.
- *Arachnoidiscus barbadensis* A. Schmidt (Pl. 1, fig. 4): some 60 taxa have been described in this genus, all very difficult to separate, and a taxonomic revision is necessary.
- *Aulacodiscus tchestnovii* Pantocsek (Pl. 1, fig. 5): one of the Pantocsek species from Miocene deposits that can now be typified.

- *Glyphodiscus stellatus* Greville (Pl. 1, fig. 6): a species originally described from Miocene deposits, which turned out to be still extant some 120 years later (Stidolph, 1985).
- *Raphidodiscus marylandicus* Christian (Pl. 1, fig. 7). This is such a curious organism that Christian's contemporaries in the late 19th century were reluctant to accept it as "real".

The samples include many 'classic' fossil deposits collected in the 19th century, from which several authors described new species. Such well-documented materials are of outstanding value as they may permit the first scanning-electron microscopy investigation of many species.

Examination of the correspondence will yield a wealth of information that has been lost otherwise. For example, about 80 % of Pantocsek's collection in Budapest, Hungary, was destroyed during the Second World War, and from the Kinker collection at least a partial reconstruction of Pantocsek's scientific legacy will be possible.

Once we have made the data available, other researchers will be able to further use the Kinker collection for their specialist investigations into taxonomy or micropalaeontology, for instance. Several colleagues have already asked for information and loans.

Epilogue

So what was Kinker's relevance for diatom research? It remains a mystery why he never published. He wrote easily and had a good command of French, German and English. From an objective point of view, his scientific relevance in his own time was, therefore, minor. But a century later, the perspective is different. In the pre-Internet era, Kinker's isolated position as the only seriously interested diatomist in Holland gave him no alternative but to contact renowned investigators abroad by letter. Apparently his questions and views were good enough to be taken seriously by these authorities in the field, and a lively exchange of materials and rich correspondence resulted. Thus, Kinker indeed became 'eminent' as the obituary suggests, but in the sense of an 'éminence grise'. Now, a later generation of investigators, blessed with superior equipment and a more profound understanding of taxonomic issues, can study his legacy, exploiting the synergy between his materials and archival data.

Acknowledgements

The museum of Groningen University donated the collection to the Nationaal Natuurhistorisch Museum, Leiden, The Netherlands, thus enabling us to conserve, document and study it.

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Landesmuseum Kärnten – the Collections of Natural Sciences

Rotraud Stumfohl

Stumfohl, R. Landesmuseum Kärnten – the Collections of Natural Sciences. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, 4: 261-266, 3 figs.; Leiden, August 2004.

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Key words — Carinthia, Collections of Natural Scinces, 'Naturwissenschaftlicher Verein für Kärnten', 'Landesmuseum Kärnten'.

Public museums collections had a hard start in Carinthia: only in 1848 did the first Museum of Natural Sciences open, maintained by the 'Naturhistorischer Verein für Kärnten'. For a long time the collections were based on private donations. In 1884, the 'Naturhistorischer Verein' and the 'Geschichtsverein für Kärnten' moved into a new museum building, since 1898 there have been full-time curators. The museum's scientific publication was and still is the periodical *Carinthia*. In 1942, the collections became property of the Government, but since 1998 they have been privatized.

Contents

Introduction

At the time of Enlightment there arose in Carinthia an interest in reappraising natural history and the historical past. Many private collectors tried hard to open their collections to the public. One such collection for example was owned by Archiduchess Maria Anna, daughter of Maria Theresia, who had her residence at Klagenfurt. Her Major domo, Joseph Count Enzenberg, also collected minerals, plants, conchilies and butterflies, and when Maria Anna died he inherited her collection; now he owned about 3000 pieces. Unfortunately, Enzenberg had a lot of debts and was forced to sell the collection for about 6000 florins, a lot of money in those days. We do not know who bought it (Klemun, 1998, p. 24).

Two other collectors, who lived for a short time in Carinthia, were Franz Xaver Wulfen and Sigismund von Hohenwart, who both were interested in scientific materials (von Jabornegg, 1898, p. 4). When Vicar von Hohenwart went to Linz and became bishop, he let his friend Franz Count Egger have his collection. The latter put it at the third floor of the Palais Lindenhain at Klagenfurt, where it was open to the public. Count Egger worked closely with Archiduke Johann of Austria, who persuaded him in 1811 to give the greater part to the newly founded 'Museum Joanneum' at Graz. The remaining part of the collection went to the Lyceum at Klagenfurt in 1815. Teachers at that institution were very interested in natural sciences. For instance Mathias

Achazel started at his private home meteorological observations and had a little botanical garden (Klemun, 1998, p. 41).

Museum of Natural History at Klagenfurt

At the Lyceum there was a lack of place for exhibiting the collections, and so rose the first plans for a Museum of Natural History. In 1846, at a session of the 'Geschichtsverein' (Historical society), the zoologist Meinrad von Gallenstein (Fig. 1), abbot at St. Paul (a Benedictinian monastery in Carinthia), made an application for the establishment of a Museum of Natural Sciences. Within the Agricultural Society a committee was established which invited the population to contribute money or to donate collections. Chairman of the committee was the industrialist Paul von Herbert (von Jabornegg, 1898, p. 4). At first the donations were modest, but in 1848 the industrial Count Gustaf Egger let the committee have his collection of minerals and birds on the conditions that they make it open to the public and never move it out of Carinthia (Anonymous, 1848, p. 25). Baron Paul von Herbert presented his geognostical collection and minerals on the same conditions. When the committee found a suitable house, it engaged the curator Heinrich Freyer from Ljubljana to make the donation ready for transport from St. Georgen am Sandhof to Klagenfurt (von Jabornegg, 1898, p. 7). The committee petitioned the subscribers do make donations for the library, which would form one of the most important parts of the museum. One year later the material was ordered so far that on October 10th, 1848, a first guided tour for the committee was arranged (Heinrich, 1853, p. 9). This date marks the establishment of the 'Naturwissenschaftlicher Verein für Kärnten' (Society for Natural Sciences Carinthia) (Lex, 1928, p. 1). The Society maintained the museum for many years. The stated purpose of the objects in the museum collection was to show the necessary material for the studies of natural sciences, to make natural sciences popular and to fulfill scientific research. From 1849 the museum was open to the public each Sunday from 9 to 13, and for students also on Thursday. On Thursdays there were public lectures on geology, in the morning for students and in the afternoon for "Friends of natural sciences." On Sundays there were public lectures for manual workers (Anonymous, 1849, p. 22). To educate the public, the museum had correspondents all over the country and, from 1854, sent minerals, plants, etc. to schools (von Jabornegg, 1898, p. 15).

Fig. 1. Portrait of Meinrad von Gallenstein (Original: Landesmuseum Kärnten).

The museum was financed by the donations and contributions of the members. The first curator was Friedrich Simony, who was the first to sound the depth of the Wörthersee (Simony, 1850, p. 114). He did not stay long and was succeded by Josef Leodegar Canaval, secretary of the chamber. He edited the publications of the museum and wrote, together with his father-in-law, Franz von Rosthorn, the first scientific mineralogy of Carinthia (Canaval & von Rosthorn, 1853). Franz von Rosthorn, industrialist, worked out the first geognostical profile of Carinthia in 1831 (Canaval, 1851, p. 29). In 1861 the 'Naturwissenschaftlicher Verein' and the 'Geschichtsverein' moved with their collections into the 'Landhaus,' the most important representative building of Carinthia. The collections grew larger: the botanist Kokeil donated his collection, Friedrich Münichsdorfer, the administrator of the mine at Hüttenberg, sent al lot of minerals to the museum, and the pharmacist Alois Traunfellner donated his Herbarium (Simony, 1850, p. 114), as did the botanist David Pacher, who published the unique work about the Flora of Carinthia (Pacher, 1880-1888). The two herbars, together with the collections of Markus Jabornegg-Gamsenegg and Gustav Adolf Zwanziger, form the basis of the 'Kärntner Landesherbar.' At the centre of Klagenfurt the Society obtained an area for setting up a botanical garden under the direction of Leopold von Hueber and von Jabornegg (von Jabornegg, 1898, p. 20). From 1866 it was open to the public three days a week (Lex, 1928, p. 2).

To maintain the collections more efficiently several professional groups were formed. Over the winter professionals gave popular lectures, segregated for males and females. Every week there was an informal meeting of professionals at the so-called "round table."

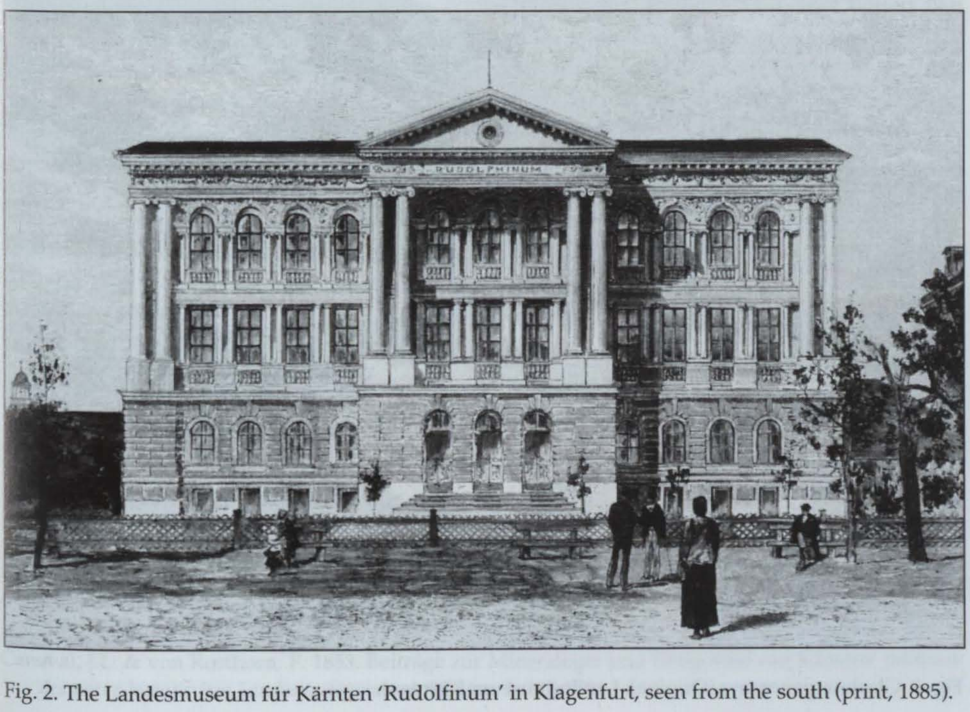

Fig. 2. The Landesmuseum für Kärnten 'Rudolfinum' in Klagenfurt, seen from the south (print, 1885).

In 1872, the independent 'Verein Naturhistorisches Landesmuseum' (Society Museum for Natural History) was established and there was no longer an official connection with the Agricultural Society (von Jabornegg, 1898, p. 24). As the 'Landhaus' was not big enough for the collections, the chairman, Ferdinand Seeland - who looked after the meterological station at Klagenfurt, sounded the Wörthersee and measured the Pasterze at Großglockner – together with the 'Geschichtsverein' and the 'Kärntner Gewerbehalle' planned a new building. In 1879, there was the ceremonial laying of the foundation stone and in 1884, the festive opening of the new museum (Fig. 2), built by Gustav Gugitz and sponsored by the 'Kärntner Sparkasse.' Since 1898 there were full-time curators; Hans Sabidussi for botany, Karl Frauscher for zoology and August Brunlechner for geology. Brunlechner (1884) wrote a new Geological Survey of Carinthia and was President of the Montanistic Society at Klagenfurt and specialist in montanistics (von Jabornegg, 1898, p. 45).

From the beginning, the library of the society was of special importance to the members. A large donation was the library of Count Goess, dedicated in 1850 (Canaval, 1851, p. 30), with about 1000 books, now in the University Library Klagenfurt. Also the 'Geologische Reichsanstalt' (Vienna) sent her yearbook to the museum. In 1872, the part-time curator Gustav Adolf Zwanziger (Klemun, 1993, p. 316) catalogued the books and took an inventory of the stock. His successor was Wenzel Hofbauer (Lex, 1928, p.15). Many periodicals came in exchange for the scientific publications of the members of the Society. The scientific journal first published for the

Fig. 3. Glocknerpanorama (Original: Landesmuseum Kärnten).

'Geschichtsverein' and the 'Naturwissenschaftlicher Verein,' then for the museum, was the *Carinthia* established in 1811 by Carl Mercy, and is the third-oldest scientific magazine in German which has been published without a break. From 1863 the two societies edited the periodical together (von Jabornegg, 1898, p. 21). Since 1891 it is divided into *Carinthia I* (*Geschichtsverein*) and *Carinthia II* (*Naturwissenschaftlicher Verein*). The 'Naturwissenschaftlicher Verein' published from 1852 to 1918 the *Jahrbuch des Naturhistorischen Museums*. Another important series was, and still is, the *Special Magazines* of *Carinthia II*.

In 1923 a new collection came to the museum, that of the Alpine Museum, which no longer had a place for the reliefs of Paul Oberlerecher. His 'Glocknerrelief' (Fig. 3) is one of the most interesting objects in natural sciences that is owned by the Landesmuseum Kärnten (Lex, 1928, p. 3). When in 1925 the Carinthian Museum of Local History was founded, these collections were moved into the museum building.

Landesmuseum Kärnten

In 1942 the collections of all three societies became property of the 'Reichsgau Kärnten' and so the government for the first time had to administer the museum. After the Second World War the collections remained in the ownership of the State of Carinthia; the government rebuilt the destroyed building and employed full-time curators (Anonymous, 1987, p. 10). In 1958, the botanical garden, almost 100 years old, had to move to the Kreuzbergl quarry, managed by Franz Kahler, Erwin Aichinger, Felix Widder and Fritz Turnowsky (Müller, 1971, p. 352). At the tunnel of Kreuzbergl since 1973 there is the Montanistic Museum. In 1974, the 'Geschichtsverein' and the 'Naturwissenschaftler Verein' made a contract with the government and sealed the moving of the collections and libraries into public property (Anonymous, 1987, p. 10). In 1998 the museum was privatized and started a new publication, *Rudolfinum, yearbook of the State Museum of Carinthia*. The two scientific societies, which contributed so much to it, still have their offices in the building, and work closely together with the curators and the library.

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The Dubois collection: a new look at an old collection

John de Vos

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Key words – Dubois, *Pithecanthropus erectus, Homo erectus, Homo sapiens*, Java.

One of the most exciting episodes of palaeoanthropology was the find of the first transitional form, the *Pithecanthropus erectus*, by the Dutchman Eugène Dubois in Java during 1891-1892. The history of Dubois and his finds of the molar, skullcap and femur, forming his transitional form, are described. Besides the human remains, Dubois made a large collection of vertebrate fossils, mostly of mammals, now united in the so-called Dubois Collection. This collection played an important role in unravelling the biostratigraphy and chronostratigraphy of Java. Questions, such as from where were those mammals coming, when did *Homo erectus* arrive in Java, and when did it become extinct, and when did *Homo sapiens* reach Java, are discussed.

Contents

Introduction

The Dubois Collection of vertebrate fossils was made by Eugène Dubois in the former Netherlands East Indies, nowadays Indonesia, at the end of the 19th century. Cleevely (1983) mentioned it as one of the most famous palaeontological collections in the world. Its importance lies mainly in a molar, femur and skullcap that were attributed by Dubois to a transitional form named *Pithecanthropus* (now *Homo*) *erectus*. This was the first hominid ever to be accepted as evidence for human evolution. Therefore, the Dutch physicist Marie Eugène François Thomas Dubois founded, with his *Pithecanthropus*, palaeoanthropology as a science in 1891-1893 (Shipman & Storm, 2002). Associated with the *Pithecanthropus* remains are tens of thousands of bones and teeth of the Pleistocene vertebrate fauna of Indonesia. The vertebrate fossils and the hominid remains were sent during 1895-1900 to what is now the Nationaal Natuurhistorisch Museum, but was then the Rijksmuseum van Natuurlijke Historie at Leiden, The Netherlands.

After the find of *Pithecanthropus erectus* (1891-1893) on Java and a similar hominid (*Sinanthropus pekinensis*) in China in 1926 (Black, 1926), attention was focused on Asia as the cradle of Mankind in the early part of the 20th century. In the 1960s the attention shifted to Africa, caused by the finds of older and more ape-like hominids (the Australopithecinae) in Olduvai and Lake Turkana. In the early 1980s a new interest was focused on the Javanese *Homo erectus* again, as a result of new interpretations of the Dubois collection.

The general consensus nowadays concerning the evolution of Man is that in Africa one of the Australopithecinae gave rise to *Homo ergaster*. About 1.5 Ma ago this species migrated to Eurasia. The descendants of *Homo ergaster* reached Asia as *Homo erectus*.

The purpose of this paper is to give a historical survey of the role of Dubois in palaeoanthropology, and to show how the Dubois Collection served as a basis for the debate on the arrival and extinction of *Homo erectus*, and the arrival of *Homo sapiens*, in Java. These issues are closely related to the bio- and chronostratigraphy of Java, and faunal dispersal in southeast Asia.

Early theories about the evolution of Man

Theunissen & de Vos (1982), Theunissen (1989), Theunissen *et al.* (1990), Leakey & Slikkerveer (1993), Shipman (2001) and de Vos (1985b, 2002) have described the story of Dubois in great detail. For a good understanding of the role of Dubois in palaeoanthropological research, a summary is given here based on de Vos (1985b, 2002).

Although the first finds of fossil hominids started in 1891, ideas about the evolution of Man started earlier. In 1844 Robert Chambers (1802-1871) published *Vestiges of Natural History of Creation*, in which he set out a development theory. Chambers did not stress the point, but his development hypothesis clearly made Man an immediate descendant of the apes. The anatomist Richard Owen (1855) used his expertise to disprove the theory of evolution at its most controversial point, Man's link with the apes, by pointing out that the heavy eyebrows of the great apes were missing in modern Man. According to Owen, as eyebrows are developed independently, and are not influenced by internal or external factors, Man must have had heavy eyebrows, if Man descended from the great apes; this is obviously not the case (Reader, 1981).

However, a skull with heavy eyebrows was found in 1856 in the Neanderthal near Düsseldorf. The fossil came into the hands of Hermann Schaaffhausen, professor of anatomy at the University of Bonn, who was convinced that the remains were very old and hominid. Their strange morphology was caused by deformation, but the doligocephalic form of the skull was, according to Schaaffhausen, not comparable to any modern race, even not to the most 'barbaric'. The heavy eyebrows, characteristic for great apes, were according to Schaaffhausen typical for the Neanderthal. The skull therefore must have belonged to an original wild race of northwestern Europe. Some even considered it as the skull of an idiot, an 'old Dutchman', or a Cossack.

In 1859 Charles Darwin published *On the Origin of Species*, in which he set out a theory of evolution, characterised by a gradual development in which natural selection is the mechanism. Others were drawing the conclusion that there is no separation between Man and apes. In this context the skull of the Neanderthal became a centre of debate. Two ideas developed, which are still debated today; either Neanderthal Man belongs to Recent Man or Neanderthal Man is a species of its own. Huxley (1863) set the tone of the discussion by describing the morphological characteristics of the Neanderthal as primitive, yet definitely human. He also pointed to the large brain capacity as proof of the Neanderthal's human nature (Theunissen *et al.*, 1990). In contrast King (1864), professor of anatomy at Queen's College (Ireland), considered, without giving scientific arguments, that Neanderthal Man was a new species and called it *Homo Neanderthalensis*. Later finds, such as the mandible of La Naulette (1866) and the Spy skeletons (1887) now recognised as Neanderthals, were also usually ascribed to a (primitive) race of modern humans (Erickson, 1976).

Darwin (1871) discussed the position of Man in evolution, but did so on theoretical grounds without using fossils to support his argument. For Ernst Haeckel (around 1887) fossils were not necessary as proof that Man took part in the evolution, because the process could be proven already by anatomy and embryology. He introduced the name *Pithecanthropus* as a theoretical missing link between apes and Man (Theunissen, 1989).

Thus, none of the fossils found before 1887 were considered proof that Man took part in evolution. In that year Eugène Dubois sailed for the Netherlands East Indies in search of the missing link.

The role of Dubois (1858-1940) in palaeoanthropology

Marie Eugène François Thomas Dubois (Fig. 1) was born in 1858, a year before Darwin published his *On the Origin of Species* and two years after the Neanderthal skull had been found. He grew up in a period that witnessed the rapid acceptance and dissemination of the theory of evolution. In the 1860s and '70s the problem of human ancestry was central to many discussions on evolutionary theory. Until far into the '80s opponents and adherents of an evolutionary ancestry for humans agreed that, as yet, no hominid fossils were known that provided proof of human evolution. Dubois was among the first to bring about a change in this climate of opinion (Theunissen, 1989).

Fig. 1. Eugène Dubois at the age of 70.

Born in Eijsden in the south of The Netherlands, near St. Peter's Mountain where the remains of a mosasaur were found in 1780, Dubois had been interested in palaeontology from his early childhood. The German anthropologist Carl Vogt, who in the late 1860s lectured in The Netherlands on evolutionary theory and human descent, probably encouraged his interest in palaeoanthropology. From 1877 to 1884 Dubois studied medicine at the University of Amsterdam, where he became reader in anatomy in 1886. Although he now seemed to be on the brink of a prosperous academic career, his predilection for palaeoanthropology made him decide to change course; more and more he became possessed by the idea of beginning a search for hominid fossils that might prove human evolution. Following this call, he gave up his position at the university and in 1887 left for the Netherlands East Indies to begin his search for the missing link.

But where to look for? Dubois (1889) referred to Darwin, Wallace and Lydekker to explain this choice. In his *Descent of Man* (1871) Darwin had reasoned that our human ancestors must have lived in the tropics, since human beings had lost their fur pelts in the course of their development. He suggested Africa, where chimpanzee and gorilla live, as the most probable region of human origins. Wallace, on the other hand, had stressed the importance of searching for the ancestors of present-day anthropoids in caves and Tertiary deposits in both Africa and southeast Asia. Lydekker (1879) had described a primate fossil, an incomplete jaw with a number of teeth, from the Siwalik Hills in British India, which seemed to throw some light on human descent. According to Lydekker, this primate, whom he named *Palaeopithecus sivalensis*, could be regarded as a predecessor of the chimpanzee (in those days put in the genus *Anthropopithecus*). Yet, he added that the fossil also showed resemblance to both gibbon and human. Dubois concluded from this that "the Gibbon group which in earlier geological periods had developed further" might have played a role in human evolution (1889, pp. 160-161).

For Dubois the East Indies seemed a suitable area, the more so because this colony of The Netherlands lay wide open to him. To provide himself with an income, he joined the Dutch East Indies Army as a medical officer and in December 1887 arrived in Padang on Sumatra. In May 1888 he was seconded to Pajakombo in the Padang Highlands, where he began to scout for caves suited for palaeontological excavations. By August he had gathered proof that fossil mammals occurred the caves of Sumatra. Thereupon, the colonial government not only enabled Dubois to dedicate all his time to this search, but even charged him to carry out palaeontological excavations on Sumatra and, if necessary, on Java. Two members of the army engineering corps were assigned to his party, along with fifty forced labourers to help him with the excavations.

The Sumatran cave fauna soon proved too young to include any human forerunners. Therefore, in 1890, Dubois decided to continue his excavations on Java, where fossils of supposedly Tertiary age had already been found by, among others, Junghuhn (1857) and Radèn Saléh (1867). Moreover, in 1888, the mining engineer B.D. van Rietschoten had found a fossil skull near the village of Wajak on Java which, though fully human, clearly differed from the modern Javanese population (Dubois, 1890). Java thus held promising prospects.

Cave exploration in Java proved unrewarding and Dubois now turned his attention to the open field. Success was almost immediate. In November 1890, near Kedung Lumbu at Kedung Brubus in the Kendeng Hills, he found a fragment of a mandible that he described as follows: "Amidst the remains of typical representatives of the

Fig. 2. Skull-cap of *Homo erectus* (Dubois, 1893).

fauna concerned, and in the same layer ..... a human fossil was found, the right side of the chin of a lower jaw with the sockets of the canine tooth and of the first and second premolar.... [T]his fossil [jaw] forms a different and probably lower type than any previously known" (1891, pp.14-15).

In August 1891, during the second digging season on Java, Dubois began excavations at Trinil, a locality that was to acquire historical significance. An enormous number of vertebrate fossils were unearthed and in September the first remains of a primate, a third molar, emerged from the sediments. At first, Dubois ascribed the fossil to a chimpanzee (*Anthropopithecus*). In one of the reports to his superiors he wrote: "This genus of anthropoids, occurring only in West- and Central-equatorial Africa today, lived in British India in the Pliocene and, as we can see from this discovery, during the later Pleistocene in Java" (1892a, pp. 13-14).

The skullcap (Fig. 2) for which Dubois acquired fame was unearthed in October. In the opinion of Dubois it was clearly distinguishable from that of the orang-utan and the gorilla. It had to belong to the same fossil chimpanzee from which a molar had been found a month earlier. Despite having designated the find as a "chimpanzee", Dubois was well aware that he had made an important discovery. The Javanese cranium was higher and larger than that of the recent chimpanzee and substantially more human-like than any known anthropoid, whether fossil or recent (1892b, pp. 14-15).

In August of the following year a third primate fossil was discovered, this time an almost completely preserved left femur. "This thigh bone", Dubois stated, "lay at the same level in which both the other parts were found, yet following the direction of the earlier stream which deposited the tuff material 15 m upstream. From the circumstances of the find and [my] comparative research it is evident that the three skeletal

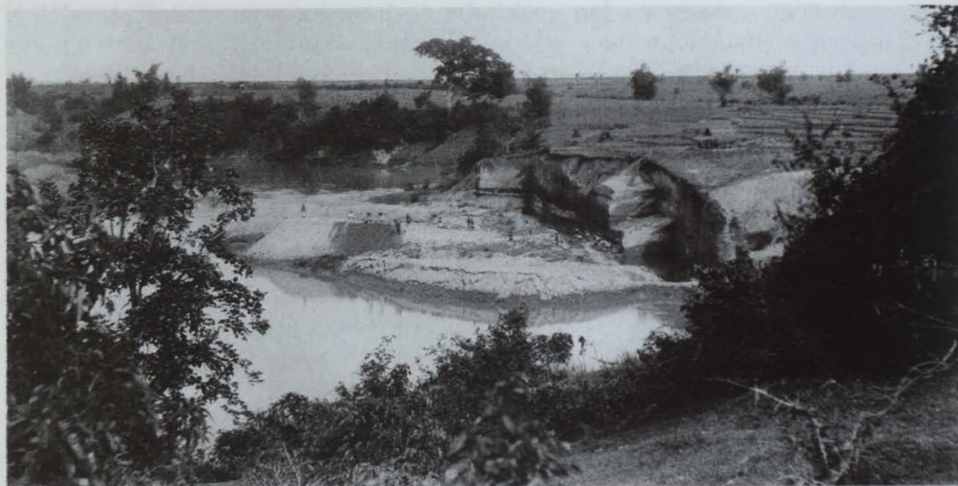

Fig. 3. Excavation at Trinil in 1900.

elements belong to one and the same individual, probably a very aged female" (1893, p. 10). The almost perfectly human characteristics of the femur indicated that the individual must have walked upright and this induced Dubois to christen his "chimpanzee" *Anthropopithecus erectus*. Further, he stated: "In view of all three skeletal elements, especially the femur, *Anthropopithecus erectus* Eug. Dubois approaches modern Man more closely than any of the three great apes, a fact which is in harmony with the thesis of Lamarck, and later of Darwin and others, that the first step in the direction of humanisation of our ancestors was the [acquisition of the] erect position".

Additional investigation of the remains finally convinced Dubois that they represented an intermediary form between humans and apes. He therefore decided that instead of a 'man-ape' or *Anthropopithecus*, it was more appropriate to designate his find an 'ape-man', a *Pithecanthropus* (the name coined by Ernst Haeckel (1868) for the hypothetical link between humans and fossil Apes). In 1894 Dubois published the results of his studies under the title "*Pithecanthropus erectus*, eine menschenaehnliche Uebergangsform aus Java".

One year later he returned to the Netherlands. His assistants continued the systematic excavations until 1900 (Fig. 3). Dubois widely publicised his *Pithecanthropus* finds, and displayed them at several international congresses and scientific meetings. Opinions on his discovery varied, but essentially the critics were divided into two camps. Some gave the *Pithecanthropus* remains the same treatment the Neanderthal fossils had received forty years earlier; they regarded them as primitive, though fully human. Others, however, ascribed the bones to an (upright-walking) ape. Dubois (1896) did not fail to exploit this difference of opinion. He pointed out that for some of his colleagues the fossils were apparently too primitive to be regarded as human, while for others they were too human-like to be assigned to an ape. Consequently, *Pithecanthropus* must have been something in between.

After Dubois had clarified several points and especially during congresses, held from 1894 to 1900, where they had been able to examine the fossils for themselves, a growing number of scientists recognised that they were dealing with a transitional form linking humans with their ape-like ancestors. Thus, they accepted Dubois's belief that a phylogenetic significance could be ascribed to the fossils. Most of them did not agree with Dubois' contention that *Pithecanthropus* stood exactly halfway between human and ape. They relegated him to an extinct side branch of human evolution, for instance, or they thought that he had been much closer to *Homo sapiens* than Dubois was prepared to allow. The crucial factor is, however, that they showed themselves ready to adopt an evolutionist interpretation, meaning that for the first time a group of researchers acknowledged a fossil hominid as a transitional form (Theunissen, 1989).

From that moment on the search for more of such fossils started. First there were discoveries in Africa (Dart, 1925) and China (Black, 1926) before new finds were reported from Java.

Important hominid sites of Java

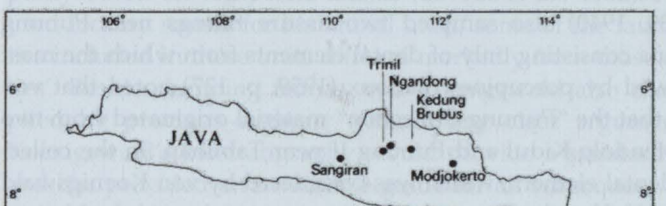

Fig. 4. Map of Java, showing the important hominid sites.

Dubois's excavations at Java showed that *Homo erectus* was present in Trinil, Kedung Brubus in the Kendeng Hills, whereas *Homo sapiens* was found in Wajak (Fig. 4). In 1932, the Dutch geologist W.F.F. Oppenoorth described new hominid finds from the village of Ngandong on the banks of the Solo River. The site, a river terrace some 20 m above sea level, had already been mentioned by Elbert (1907) and turned out to be a rich deposit of fossil vertebrates, including eleven skulls of a new hominid. Oppenoorth (1932) subsequently described this hominid as *Homo soloensis*.

Gustav Heinrich Ralph von Koenigswald (1902-1982), who followed in the footsteps of Dubois, was of tremendous importance for palaeoanthropological and biostratigraphical research in Java. In 1930, via his professor of palaeontology F. Broili, von Koenigswald was offered the post of vertebrate palaeontologist of the Dutch Geological Survey on Java, and he gladly accepted this chance to go to southeast Asia. Already in 1931 he published his first attempt to date the fauna from the 'Trinil beds' (1931), where Dubois had discovered the *Pithecanthropus*. As early as March 1936 von Koenigswald was able to announce the find of 'the child from Mojokerto' (Fig. 5), East Java, which he was sure belonged to *Pithecanthropus*.

Von Koenigswald (1940) collected a lot of hominid fossils in an area called Sangiran. The problem with this area is that there are outcrops of several different formations. As almost all hominid fossils are incidental surface finds, it is not known from which formation they originated.

Fig. 5. Skull of the child from Mojokerto.

Von Koenigswald (1939, 1940) also sampled two fissure fillings near Punung (Java), which yielded a fauna consisting only of dental elements from which the most part of the roots was gnawed by porcupines. Badoux (1959, p. 127) noted that von Koenigswald had told him that the "Punung Collection" material originated from two localities, Punung I near Mendolo Kidul and Punung II near Tabuhan. In the collection there was a hominid dental element, which was considered by von Koenigswald as cf. *Pithecanthropus erectus*. Half of the Punung collection is nowadays in the Nationaal Natuurhistorisch Museum, the other half is in the Senckenberg Museum (Frankfurt, Germany).

The typical preservation of the Punung fauna can also be observed in the material Dubois collected from the Sumatran Caves during 1887-1888. Large numbers of fossils were found here, but, like in Punung, they consist only of dental elements from which the most part of the roots is gnawed by porcupines. The Sumatran collection contains a few dental elements of a hominid, which were attributed to *Homo sapiens* by Hooijer (1948). The close resemblance between the two faunas led to the conclusions that the molars identified as cf. *Pithecanthropus erectus* by von Koenigswald should also be attributed to *Homo sapiens* (de Vos, 1983). So, Trinil, Kedung Brubus, Sangiran, Ngandong and Mojokerto with *Homo erectus*, and Punung and Wajak with *Homo sapiens*, are important sites for the discussion concerning the arrival and extinction of *Homo erectus* and the arrival *Homo sapiens* in Java.

The role of the Dubois Collection in biostratigraphy

Von Koenigswald's official task at the Geological Survey was to provide a division of the terrestrial deposits of Java on the basis of fossil mammals. In 1934 he published his biostratigraphy, but stressed that he would only give a summary of his results and that these had to be regarded as preliminary. Von Koenigswald (1934, 1935) based his biostratigraphy on 'guide fossils' and distinguished, from the hominid-bearing deposits mentioned above, the following faunas from old to young; Jetis (Early Pleistocene), Trinil with *Homo erectus* (Middle Pleistocene) and Ngandong with *Homo soloensis* (Late

Pleistocene). Von Koenigswald was convinced, on the basis of the guide fossils of the Jetis fauna found in the Mojokerto area, that the skull of the child was derived from an older layer than the Trinil finds of Dubois (von Koenigswald, 1936a). Unfortunately, as he stated himself, the skull in question was a surface find. Dubois (1936) contested the age proposed by von Koenigswald (1936a, b). The age of the Mojokerto skull has been in the centre of later discussions, and is as yet still unresolved.

Von Koenigswald considered the fossil assemblage from Punung to be a Trinil fauna, of Middle Pleistocene age, and included it in the faunal list of Trinil. To von Koenigswald it was logical to identify the hominid in the Punung fauna as cf. *Pithecanthropus erectus*, since the species was also found in Trinil. Badoux (1959) gave a full description of the Punung fauna, with the exception of the hominid specimens. He considered the age of the Punung fauna to be younger than the Trinil fauna, but older than the Ngandong fauna. However, he still placed the fauna in the Middle Pleistocene.

The classic Pleistocene vertebrate biostratigraphy of the island Java (Jetis, Trinil and Ngandong) as established by von Koenigswald (1933, 1934, 1935, 1940, 1956) was partly based on composite faunas (de Vos *et al.*, 1982). Although von Koenigswald used locality names for his faunal units, some of the faunal assemblages from localities included in these units differed markedly from those collected at the 'type localities'. Besides lumping faunas, von Koenigswald also changed the faunal lists compiled by previous authors, without any clear argumentation. Nevertheless, von Koenigswald's biostratigraphy would provide a standard for more than forty years, and has provided an invaluable guide for all subsequent research in Java. However, new research revealed its serious deficiencies (de Vos *et al.*, 1982).

Beside the hominid fossils, Dubois had collected more than 20,000 vertebrate fossils, mostly mammals, from different sites, like Trinil and Kedung Brubus, from 1891 until 1900 (Fig. 6). The fossils came to The Netherlands and were stored at several places from 1900 to 1940 (Holthuis, 1995). Scientifically these animal remains were clearly considered inferior to the all-important hominid fossils, and thus received very little attention. Dr. J.J.A. Bernsen catalogued the collection in the '30s (Brongersma, 1941). This gave Dr. D.A. Hooijer, former curator of the Dubois Collection, the opportunity to describe the fauna from the Sumatran caves and the fossils from Java in detail (e.g. Hooijer, 1946a,b, 1947, 1948, 1957, 1958, 1960, 1962). So, from every specimen from a particular site, the taxon became known. Hooijer didn't use the fossils in a biostratigraphic way. However, his taxonomical work made it possible to study the faunal composition of the hominid 'type localities'. It was the starting point for a new look at the old collection.

In the early 80s of the last century a joint Dutch (Utrecht University and the Nationaal Natuurhistorisch Museum, Leiden) and Indonesian (Geological Research and Development Centre) team started to interpret the faunal succession using only faunas from sites of which the stratigraphical context was known. The Dubois Collection yielded the data for the sites at Trinil and Kedung Brubus (de Vos & Sondaar, 1982). The authors concluded that the Trinil Haupt Knochen Schicht (H.K.) fauna, the layer from which the *Pithecanthropus erectus* of Dubois originated, was older than the one from Kedung Brubus. The latter fauna was in their opinion of the same age as the Jetis fauna of von Koenigswald, which had yielded *Pithecanthropus modjokertensis* (= *Homo erectus*). This was a remarkable conclusion, as the child of Mojokerto had always been considered to be older than the *Homo erectus* from Trinil. After comparing the

Fig. 6. The enormous amount of fossils on the veranda of Dubois' house in Pajakombo, Java.

fauna from Punung with the Sumatran caves material de Vos (1983) concluded that those faunas are similar in faunal composition and age, and suggested that the hominid dental elements from Punung belonged to *Homo sapiens*, like the ones from the Sumatran caves. Comparison of both faunas with the Wajak fauna showed that those faunas were intermediate in age in between Ngandong and Wajak.

The new approach led in a series of papers (Sondaar *et al.*, 1983; Sondaar 1984; Sondaar & de Vos, 1984; Leinders, 1985; de Vos, 1985a; Aziz & de Vos, 1989; Aziz & de Vos, 1989; Theunissen *et al.*, 1990), and ultimately to a revision of the fauna succession as proposed by von Koenigswald and to a new biostratigraphy for Java, which runs from old to young for the hominid sites: Trinil H.K., Kedung Brubus, Ngandong, Punung and Wajak. Two earlier faunas were also distinguished, namely an island fauna (Satir) and an impoverished Trinil Fauna (Ci Saat) (Fig. 7).

Dispersal of faunas in southeast Asia

At the same time in the early 1980s a new interest came up about the origin of the faunas of Java. Having established when the various faunas inhabited the island, the question of their origin and reasons for faunal turnovers became part of the research programme. In the past there were already speculations about the origin of the Indonesian fauna. Martin (1884), who described some of Java's first recovered fossils, interpreted the mammal remains as descendants of an ancient Indian stock. Dubois

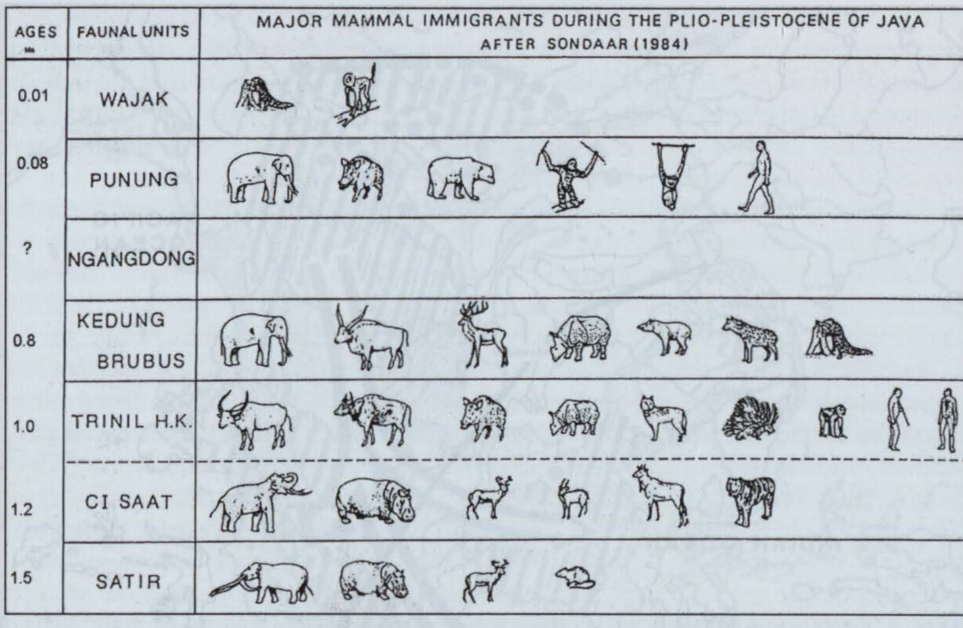

Fig. 7. Biostratigraphy of Java after de Vos (1995). The symbols of animals represent new arrivals.

(1908) recognised the continental and specifically Indian character of extinct mammals of Java. Molengraaff (1922) suggested a dispersal route west, not east, of Sumatra. From Burma, following the Andaman and Nicobar Islands, the islands west of Sumatra could have received faunal elements from Burma. Later, Rensch (1936) proposed that some species could have even reached Java following this route. The islands west of Sumatra as well as the Nicobars and Andamans form the exposed parts of a continuous ridge, mostly submarine, which can be traced from the Arakan Yoma in Burma, along the west coast of Sumatra and Java. More of the ridge could have been exposed in Pliocene and Pleistocene times. The uncertain topography, difficult terrain and heavy overgrowth of the islands present major obstacles for fieldwork and none of the islands has so-far produced remains of an ancient land fauna.

In the 1990s the fauna of the Javanese sites were grouped in clear faunal associations (de Vos, 1996; Sondaar *et al.*, 1996). The hominid sites showed a clear bipartition in the fauna from the localities with *Homo erectus* and those containing *Homo sapiens*. The sites with *Homo erectus* yielded the *Stegodon-Homo erectus* fauna association. The faunas from the hominid sites Trinil, Kedung Brubus and Ngandong are attributed to this faunal association, characterised by archaic faunal elements like the proboscidean *Stegodon* and *Homo erectus*. It clearly shows affinities with the faunal association from the Indian Subcontinent (the Siwaliks) and Burma. Five species and one genus have a direct relation with the fauna of the Siwaliks, viz., *Hexaprotodon sivalensis, Hyaena brevirostris, Caprolagus* cf. *sivalensis, Homotherium ultimum, Nestoritherium* cf. *sivalense*, and the genus *Megantereon*. Three species are closely related to Siwalik species, viz., *Stegodon trigonocephalus* with *Stegodon ganesa, Elephas husudrindicus* with *Elephas hysudricus* and *Duboisia santeng* with the Boselaphini. De Vos (1995, 1996) concluded that the

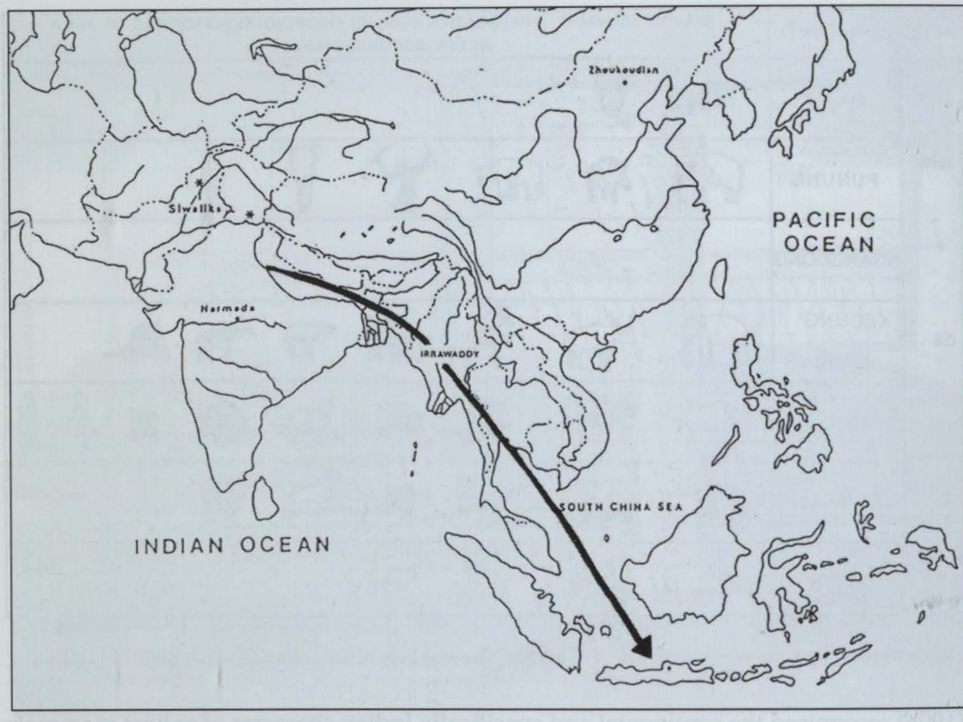

Fig. 8. The migration of mammals during the Early-Middle Pleistocene via the Siva-Malayan route (after de Vos, 1995).

Stegodon-Homo erectus fauna association originated from the Siwaliks (the Indian subcontinent) and reached Java via the so-called Siva-Malayan Route (Fig. 8).

At the end of the Middle Pleistocene the *Stegodon-Homo erectus* fauna association became extinct. A faunal turnover took place and a new fauna migrated into the Indonesian Archipelago; the *Pongo-Homo sapiens* fauna to which the site Punung is attributed, as well as the material from the Sumatran caves. In this fauna we find the Indian elephant (*Elephas maximus*), orang-utan (*Pongo pygmaeus*), the gibbon (*Hylobates syndactylus*), the pig-tailed Macaque (*Macaca nemestrina*) and the Malayan bear (*Ursus malayanus*), all species which are still extant on the continent or in other places of the Indonesian Archipelago, but are no longer found on Java. The large quantity of orang-utan and the presence of other primates indicate a humid tropical rainforest environment. Similar faunas with orang-utan (*Pongo pygmaeus*) are also found in fossil sites of the continent, like Vietnam (Lang Trang Cave), Cambodia (Phnom Loang), and China (de Vos 1984, Vu the Long *et al.*, 1996).

Based on the balanced character of the faunas of Punung and Sumatra, and the fact that we are dealing with a tropical rainforest, which cannot cross a water barrier, we may assume that the connection with the mainland became more continuous. Probably between 126,000 and 81,000 years ago (Storm, 2001) there was such a lowering of the sea level, which connected Sumatra, Java and Kalimantan (the Sunda shelf) to the continent. In that period there was an immigration of a tropical rainforest fauna with *Homo sapiens*

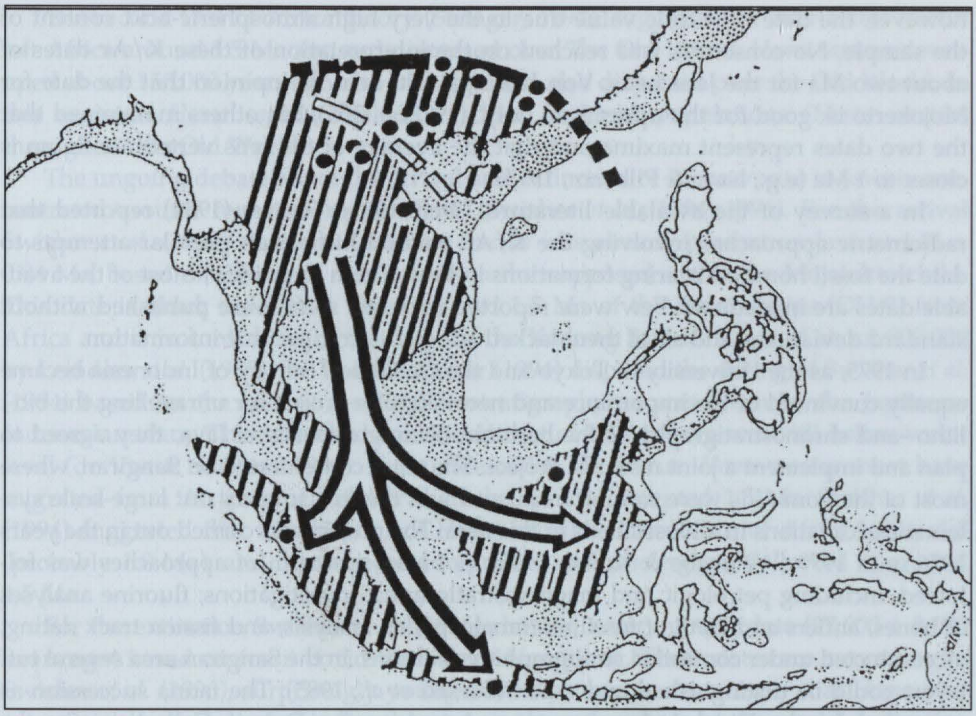

Fig. 9. The migration of mammals during the Late Pleistocene via the Sino-Malayan route (after de Vos, 1995).

from China, via Vietnam, Cambodia, the Malay Peninsula to the Sunda shelf (de Vos & Long, 2001). Based on the presence of orang-utan and other elements of the fauna de Vos (1995), van den Bergh *et al.* (1996,) and de Vos *et al.* (1999) deduced that the fauna from Sumatran Caves, Niah (Kalimantan) and Punung (Java) came from South China during the Late Pleistocene, via the so-called Sino-Malayan route (Fig. 9).

The chronostratigraphy of Java

The faunal succession gives a good idea about the relative age of the faunas, but in order to make correlations with mainland faunas, it is better to have them in a chronostratigraphic framework. From the 1960s this problem has been tackled by methods of absolute dating. Radiometric ages have been reported for various lithologic units and tektites in Java. Many of these dates, however, are contradictory and confusing when applied to the dating of various geologic and palaeontologic events.

Von Koenigswald (1964, 1968) published two potassium/argon (K/Ar) dates. The first was based on a 'typical Trinil' fauna with the age of 495,000 ± 100 to 60,000 yr; the second on a tektite from the Trinil layers at Sangiran, which was 730,000 ± 50,000 yr. Von Koenigswald supposed the first date represented the age of the upper Trinil.

Jacob & Curtis (1971) gave a preliminary K/Ar dating for early humans in Java. A sample from Mojokerto gave a result of 1.9 ± 0.4 Ma. According to Curtis (1981), however, the date is of little value due to the very high atmospheric-acid content of the sample. No consensus was reached on the interpretation of these K/Ar dates of about two Ma for the Jetis beds. Von Koenigswald held the opinion that the date for Mojokerto is 'good for the upper Jetis only' (1975, p. 306), but others maintained that the two dates represent maxima and that the average of the Jetis vertebrate fauna is closer to 1 Ma (e.g., Isaac & Pilbeam, 1975).

In a survey of the available literature, Orchiston & Siesser (1982) reported that radiometric approaches involving the K/Ar method have been popular attempts to date the fossil hominid bearing formations in Java. Yet in their view, most of the available dates are inadequate. Few were reported in detail, some were published without standard deviations, and all of them lacked adequate stratigraphic information.

In 1975, as the University of Tokyo and the Geological Survey of Indonesia became equally convinced of the importance and necessity of a project for unravelling the bio-, litho -and chronostratigraphy of the hominid-bearing deposits of Java, they agreed to plan and implement a joint research project. The team concentrated on Sangiran, where most of the hominids were coming from, and was the first to carry out large-scale systematic excavations in all fossil beds in this area. The project was carried out in the years 1976 until 1979 (Watanabe & Kadar, 1985). A broad spectrum of approaches was followed, including petrologic and magnetostratigraphic investigations; fluorine analyses of bones, antlers and teeth of fossil mammals; pollen analysis; and fission track dating, all conducted under controlled stratigraphic conditions. In the Sangiran area several tuff layers could be distinguished and dated (Suzuki *et al.*, 1985). The fauna succession as suggested by the Dutch-Indonesian team, based on the Dubois Collection, fits the results of the excavations of the Indonesian-Japanese team (Watanabe & Kadar, 1985). Leinders *et al.* (1985) correlated the faunas with the Indonesian-Japanese dates, and also based on Shutler *et al.* (2004) and Storm (2001), the following ages for the hominid sites were obtained (Fig. 4):

The Wajak fauna between 12,930-12,140 years (Shutler *et al.*, 2004).

Wajak Man between 7,670-7,210 years (Shutler *et al.*, 2004).

The Punung fauna must have an age about 81,000-126,000 years (Storm, 2001).

The Ngandong fauna is considered to be younger than the Kedung Brubus fauna (Leinders *et al.*, 1985).

The Kedung Brubus Fauna is considered about 0.8 Ma (Leinders *et al.*, 1985).

The Trinil H.K. and Ci Saat faunas are between 1 and 1.2 Ma (Leinders *et al.*, 1985).

Time of arrival of *Homo erectus* and *Homo sapiens* in Java

Two main theories have been put forth to explain modern human origins, the Multiregional Evolution Model and the Out of Africa theory. The Multiregional Evolution Model (Wolpoff *et al.*, 1984), proposes that *Homo erectus* migrated from Africa to Eurasia about 1.5 Ma ago and gave rise to modern humans in various regions of the Old World over a long period of time. The result is the evolution of a single, widespread species, *Homo sapiens*, which preserves specific regional traits. In this model, in Java, *Homo erectus* gave rise, via Ngandong Man and Wajak Man, to the Recent Australian aboriginals (*Homo sapiens*). Storm (1995) showed, based on the Wajak skull in the Dubois Collection, that this scenario is not valuable for Java.

The second Out of Africa theory (Stringer, 1992), suggests that after *Homo erectus* left Africa around 1.5 Ma ago and dispersed over The Old World, *Homo sapiens* developed about 150,000 years ago also in Africa and also dispersed over the Old World. In this scenario *Homo sapiens* replaced archaic hominid populations (*Homo erectus*) throughout the Old World.

The ungoing debate about the arrival and extinction of *Homo erectus* in Java is concentrated around two radiometric dates (Swisher *et al.*, 1994, 1996). For the arrival Swisher *et al.* (1994) claimed that *Homo erectus* was already present on Java at 1.81 ± 0.04 Ma, based on dating of minerals from the supposed site of the Mojokerto child. This date is much older than the supposed 1.5 Ma of the *Homo erectus* (OH-9) from Africa and is in contrast with the date for the Kedung Brubus fauna of about 800,000 by Leinders *et al.* (1985). De Vos & Sondaar (1994) disputed the dating of Swisher *et al.* (1994) based on the lack of a solid lithostratigraphy as was given by the Japanese-Indonesian team. This team had concluded that at 1.8 Ma Java was still below water level (de Vos & Sondaar 1994). If the date of 1.8 Ma is true, *Homo erectus* must have migrated from Africa much earlier than the general accepted 1.5 Ma. Swisher *et al.* (1994) suggested that the ancestor of *Homo erectus* ventured out of Africa before 1.5 (probably 1.8 Ma), and that a second migration of *Homo ergaster* followed at around 1.5 Ma.

For the extinction Swisher et al. (1996) claimed a very young date (27,000 ± 2,000 years ago) based on fossil bovid teeth from Ngandong. These dates are, according to Swisher *et al.* (1996), surprisingly young and, if proven correct, imply that *Homo erectus* persisted much longer in Southeast Asia than elsewhere in the world, indicating that *Homo erectus* existed beside *Homo sapiens*. In this case the Multiregional Model doesn't stand. According to the Dutch-Indonesian team these dates are indeed too young. The Punung fauna with orang-utan and *Homo sapiens* had an age between 81,000-126,000 years and was younger than Ngandong fauna including Ngandong Man. If the data of Swisher *et al.* (1996) are correct than one would expect a mixed fauna consisting of *Homo erectus*, archaic faunal elements (like the proboscidean *Stegodon*) and Recent faunal elements (like *Pongo*) with *Homo sapiens*. However, this is not the case; there are only archaic faunal elements in Ngandong.

The question is "what is the value of those absolute dates". Anyway, the debate will continue for some years.

Conclusion

The Dubois Collection owns its fame as an important part of cultural heritage to the famous skullcap and femur that gave the first physical proof of a transitional form between apes and Man. The remainder of the fossils initially received little attention and were stored from 1900 till about 1940 at several places. Much progress was made in the study of fossil man on Java as new finds were made in the 1930s. Other vertebrates were considered of minor importance, although von Koenigswald used them for a first biostratigraphical scheme.

The role of the Dubois collection was restricted to the hominid fossils, until Bernsen started cataloguing the other fossil material, after which Hooijer started the task of systematic descriptions. This work set stage for a new role for the collection.

These vertebrate remains provided new and valuable insights in the biostratigraphy of the region. Secondly, they allowed the reconstruction of the ecological changes in southeast Asia. Thus, the Dubois Collection got a new life, and provided the basis for evolutionary scenarios concerning the dispersal of *Homo erectus* and *Homo sapiens*.

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Is the Jongmans collection cultural heritage or a scientific collection?

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Key words – Jongmans, palaeobtoany, 'Geologisch Bureau', Carboniferous Congress.

Wilhelmus Josephus Jongmans (1878-1957) was a Dutch botanist who became involved in palaeobotany at an early stage in his career. He became head of the department of the geological survey for coal winning in Limburg ('Geologisch Bureau voor het Mijngebied'). He accumulated the bulk of the fossil plant collection now kept in the Nationaal Natuurhistorisch Museum. A great deal of this collection consists of Carboniferous material gathered during the period of coal exploitation in the south of the Netherlands, but it also reflects the research interests of its collectors and keepers and consequently is a reflection of the state of the art in palaeobotany since approximately 1920.

In 1996 the Dutch Geological Survey was reorganized and the palaeobotanical collections needed to be kept safely for future generations. Our museum felt that the collection was both a reflection of Dutch history and a valuable scientific collection. Consequently half a floor of the collection tower was made available for the 70,000 plant fossils composing the collection.

Contents

Introduction

In March 1996 the palaeobotanical collection known as the Jongmans collection was transferred from a branch of the Geological Survey in southern Limburg ('Geologisch Bureau voor het Mijngebied') to the Nationaal Natuurhistorisch Museum in Leiden, The Netherlands. This transfer was the subject of several articles in national and regional newspapers. The history of the collection and its collector are outlined herein to illustrate both its scientific and cultural significance. The composition and the organization of the collection are described to illustrate how it was used for prospecting purposes in the mining industry and how it is still being used for fundamental research.

Life of Wilhelmus Josephus Jongmans (1878-1957)

Wilhelmus Josephus Jongmans was born on August 13th, 1878 in Leiden, The Netherlands. He was a good pupil at school and was clearly predestined to go to the university. At first his interest was directed to pharmacy, but after two years he decided to become a botanist. For his dissertation he went to Munich, Germany, in order to work under the supervision of Professor K. Goebel. Jongmans defended his thesis in 1907. Before he finished his dissertation he already was asked to take up the function of second curator at the National Herbarium in Leiden, the first being Dr. J.W.C. Goedhart. Together with Goedhart he had started working on plant distribution maps of the Netherlands (Goedhart & Jongmans, 1904-1907) for which they elaborated a system that is still in use in nearly the same form. The maps were published regularly but their publication stopped after 1907, probably because Jongmans left to southern Limburg.

He started to work on the palaeobotany of the coal layers being exploited in Southern Limburg by what would later become a branch of the Geological Survey (Rijks Geologische Dienst, RGD). He developed an interest in plant fossils and was asked by Dr. Ing. W.A.J.M. van Waterschoot van der Gracht, director of the Rijks-Opsporing van Delfstoffen (later to become the Geological Survey, RGD) to describe the fossil content of the coal layers of southern Limburg (Jongmans, 1928) which resulted in a palaeobotanical contribution to a paper on the deeper geology of The Netherlands by van Waterschoot van der Gracht (1909). He got this position because of his botanical background. Indeed, the director believed that a botanist should describe the plant fossils (van Waterschoot van der Gracht, 1932). When new boreholes were drilled, Jongmans was given the possibility to work both at the Rijks Herbarium and at what had become the RGD. In 1910 he was dispensed from his work at the National Herbarium and started working full time in southern Limburg at the RGD. In 1915, Jongmans published his first palaeobotanical paper on the Carboniferous palaeobotany of southern Limburg and his first correlations with German coal layers.

Jongmans took over the project of the German H. Potonié to assemble all literature on the different palaeobotanical taxa in volumes now known as the *Fossilium Catalogus*. Van Amerom and van den Burgh are still working on this series of volumes. This work could only be achieved by knowing all of the literature on these taxa. Over the years Jongmans assembled *c.* 29,600 papers from which 23,800 are now kept at the library of the Nationaal Natuurhistorisch Museum and which Dr. Johan van der Burgh has recently reorganized.

The most important systematical work that was written by Jongmans was a monograph on *Calamites* that he wrote in cooperation with Dr Kidston in Schotland (Kidston & Jongmans, 1917), who can be considered as his mentor (Wagner & van Amerom, 1995). Later he started working with Gothan, who had written a dissertation on palaeobotany and was working in the German Westphalian just across the border from southern Limburg; they published many important papers together (Jongmans & Gothan, 1925, 1934, 1935, 1952). In 1919 Jongmans commenced running the Geological Bureau in Heerlen and in 1924 he became its director; this sounds more than it was as there were only two geologists working there (Thiadens, 1957)!

During the period of exploitation of the mines the palaeobotanical collection grew steadily as each Saturday morning mining engineers would come to the Geological Bureau and would show new material that had been gathered during the week, which would consequently become part of the collection. This led gradually to the accumulation of one of the largest collections of Westphalian plant fossils at that time associated with very good lithostratigraphic data. This collection formed the base for several monographs (Boersma, 1972, van Amerom, 1975), but much revision remains to be done (Wagner & van Amerom, 1995).

Throughout his career Jongmans pattern of publication changed from writing monographs on genera to describing complete floral assemblages. He made many trips abroad such as to the United States of America when he discovered the resemblance between the floras on each side of the ocean. He sampled in Turkey, in Spain, in East Block countries, the Donets Basin and even in China. He considered the Carboniferous of The Netherlands to represent a temperate zone and looked for the tropical areas in northern Africa. Other assemblages he described were the Jambi flora from Sumatra (Jongmans & Gothan, 1935), for which he organized the expedition, and the palaeoflora from Irian Jaya.

One of the most important achievements of Jongmans is that he managed to develop a general stratigraphic framework for north Western Europe by organizing several congresses for all scientists from the various coal districts. The first "Congrès pour l'Avancement des Études du Carbonifère" was held in Heerlen in 1927 and was a great success (Jongmans, 1928). This first congress was a gathering of two dozens stratigraphers but has led to what today is the International Congress of Carboniferous and Permian Stratigraphy welcoming more than 500 professionals.

Later in his life Jongmans became Professor of Palaeobotany at the University of Groningen, which was a long trip from southern Limburg where he lived (Wagner & van Amerom, 1995). All these activities have led to an impressive list of some 250 publications on a great variety of subjects, such as literature review (*Fossilium catalogus*), taxonomy, stratigraphy, petrography, palynology, palaeogeography, museology, nature protection and even seismology as the exploitation of the mines at the time led to soil instability. Most impressive was the large collection of plant fossils that he left to us, reflecting his taxonomic, stratigraphic and palaeogeographical research interests. Jongmans died in 1957, before the mines in southern Limburg closed, whilst still being very active and leaving much work unfinished. Fortunately, his coworkers finished much of this work later (Fig. 1).

Fig 1. Wilhelmus Josephus Jongmans (1878-1957) in 1957.

Collection composition

The Jongmans fossil plant collection holds *c.* 70,000 palaeobotanical fossils. They are distributed over some 6150 boxes. Each box holds on average 11 samples. This number was established by calculating the mean number of samples in each of 40 randomly chosen boxes in the collection (making sure each collection type was well represented).

The collection is composed of several subcollections, the systematic, representing about half of the collection, the stratigraphic, representing about a quarter to a third, some private donations and the cores, each representing one eighths of the total.

1. The taxonomic collection is mainly composed of samples from the mines, organized according to their genus. This is the main part of the collection and is composed of 2775 boxes: 870 seed ferns, 677 horsetails, 532 club mosses, 506 regular ferns, 51 boxes conifers (*Cordaites*), 88 flowering plants and 51 with divers taxonomy groups like e.g., the Psilophytales and the Cycadales (Fig. 2).
2. The stratigraphic collection is composed of 1464 boxes consists of samples organized according to their age and geographical provenance. Most of this collection is Carboniferous, constituting 60% of this part of the collection. Twelve percent is Tertiary, 7% Permian, 6% Devonian (a.o. Bear Island), and 5% Quaternary. Very little material is from the Triassic (4%), Cretaceous (3%) and Jurassic (2%). Specimens are mostly from Europe, with some material from Eastern Europe (Czechoslovakia, Russia). Other regions represented are Africa (Egypt, Morocco, Algeria and Rhodesia), America, the Middle East (Turkey, Iran) and the Far East: Indonesia, Irian Jaya, China. Most plant fossils are from The Netherlands; these samples are organized according to the mine in which they were found. A card system that came with the collection indicates the depth at which they were found, and what fossils were identified in that particular rock sample. Many plant fossils also come from Spain (Valdinfierno, La Camocha and other localities), and there is a significant number of specimens from Austria (Stangalpe). Other European provenances are Belgium France, Germany, Italy, and Sweden, but surprisingly little material from the United Kingdom (Fig. 3).
3. The cores are kept in *c.* 830 boxes. These were not only taken during the lifetime of Jongmans but also after his demice by the Geological Survey of The Netherlands.
4. The remaining collections represent *c.* 570 boxes. These are smaller collections donated to the Geological Museum in Heerlen, including a mineral collection of Professor Molengraaff.

Collection use

The Jongmans collection, due to its size, was only partly worked on in the past 50 years or more, and consequently much identifications need to be reviewed and compared to modern literature. Moreover, new methods need to be applied to the collection, like cuticular research, which has added much information to macroscopic determinations or the use of *in situ* spores determinations. Other approaches like taphonomic analysis can shed new light on the collection (Jones & Rowe, 1999).

At the end of the Carboniferous new Permian floras replaced the older ones. This fundamental pattern and its climatic and palaeogeographical constraints are still not fully understood and are the object of international research. The Jongmans collection holds several subcollections that reflect these changes, but they haven't been studied in this framework yet. For example the Permian Jambi material from Sumatra and the Stephanian material from the Stangalpe in Austria are relevant to those studies.

The Jongmans collection includes a large collection of fossil plants from the Upper Carboniferous (Pennsylvanian) that is of interest for taxonomic studies. A number of

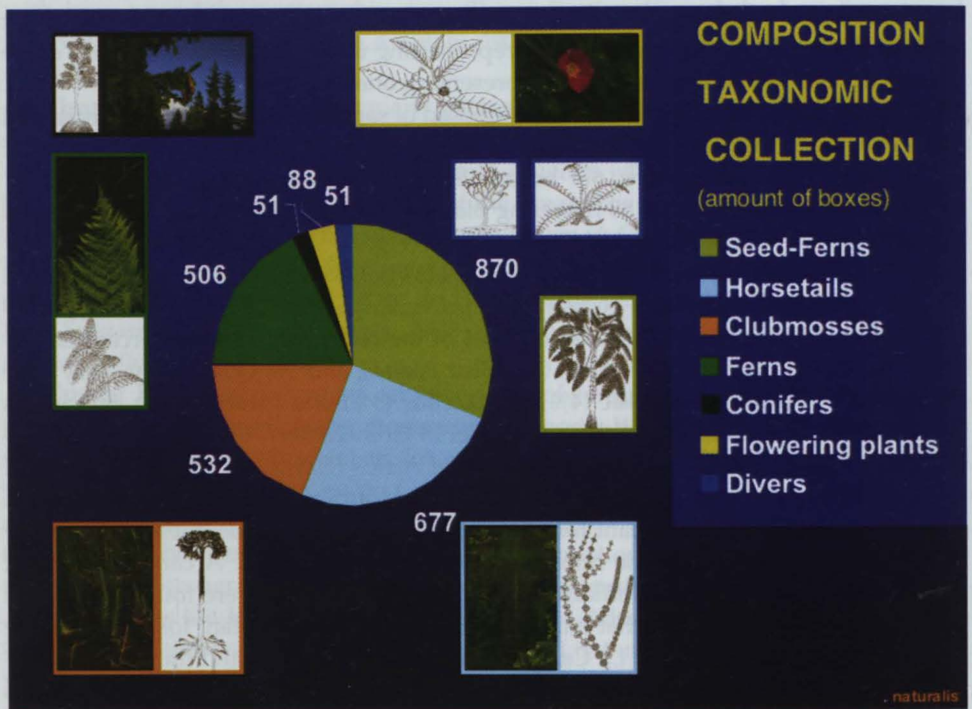

Fig. 2. Affinity of the 2765 boxes from the taxonomic collection, mostly seed ferns.

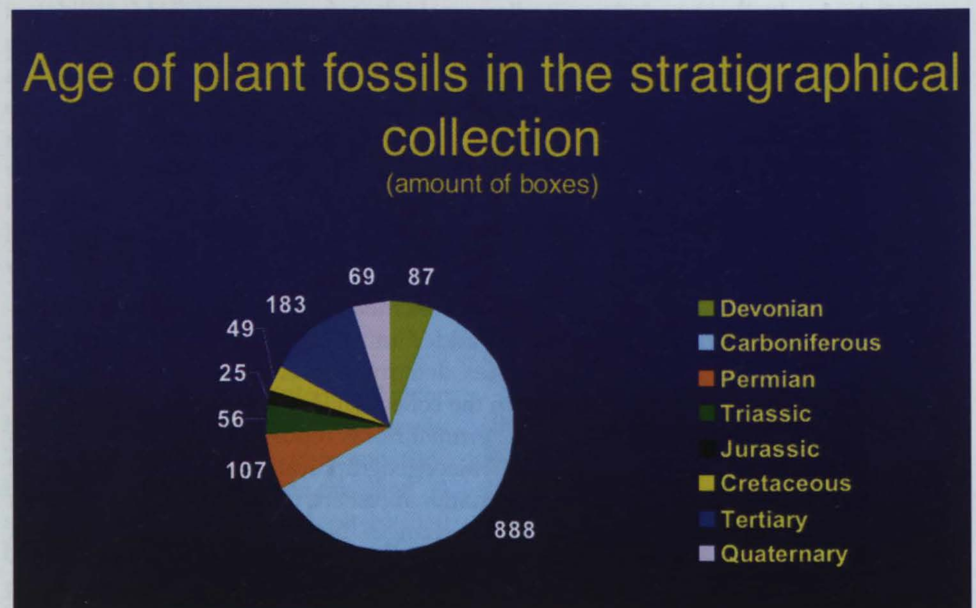

Fig. 3. Geological age of the *c.* 1970 boxes from the stratigraphic collection, mostly Dutch Carboniferous.

genera have in the past been subject to taxonomic revisions (Wagner, 1968; Boersma, 1972). The morphogenus *Sphenopteris* includes material belonging to the seed ferns that has been revised under the name *Eusphenopteris* (van Amerom, 1975), but the botanical affinity of a number of Sphenopterids remains unknown. Several of these species are moderately to highly dissected, and have also been attributed to the genera *Palmatopteris* and *Diplotmema*. The delimitation of these genera still needs to be clarified. Many more genera still need to be reviewed in a similar way.

The macrofossil record of the type area of the Maastrichtian (Upper Cretaceous), south Limburg, The Netherlands, is currently under study. Macroremains of conifer leaves and shoots have been assigned to eight different taxa, and the study of angiosperm leaf remains has just begun. Additionally, there are a number of (mainly silicified) wood remains that still have to be examined. In the past, mainly angiosperm wood remains from the Cretaceous of Limburg have been described, but the conifer wood has never been studied in detail. The conifer families from the Maastrichtian of southern Limburg need to be described and compared with the fossil leaf and pollen record.

The Jongmans collection also holds exhibit material from the Westphalian of the southern Limburg. As a matter of fact it is a very good source of specimens to communicate the history of plant life to the public, both in the Nationaal Natuurhistorisch Museum as in Geon, the regional museum of southern Limburg where the Mining Industry and it products have become part of the cultural heritage and where nostalgia can be illustrated by paraphrasing the title of book by Llewellyn (1939) "How black was my valley!".

In spite of the intensity of these regrets that have manifested themselves in both national and local news papers, the Jongmans collection is, before anything else, a scientific collection of national dimensions and deserves to be kept in a national museum.

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Geological collections of the Nationaal Natuurhistorisch Museum (Leiden, The Netherlands): cultural heritage of the geosciences and mining

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The role played by the geological collections of the Nationaal Natuurhistorisch Museum, the National Museum of Natural History, in documenting the developments in the Earth sciences in The Netherlands and abroad is discussed, as well as the influence exercised by the mining industry and former Dutch colonies. Thus, an overview is given of the variety of the geological collections which were obtained from government institutions, including universities, and private persons.

First the early collections, which are poorly represented, are treated. An example is the Cabinet of the Stadtholder William V. Geological exploration during the 19th century, mainly in Asia, but also in the Americas, left its traces in our museum. Of special interest is the von Siebold collection, a small collection of unattractive minerals and fossils, but the first of its kind from Japan.

Interpreting the geological history of a region or a period is the next phase in geological research. An early example is the Staring collection, brought together by the Commission for the geological map of The Netherlands, of which Dr. Winand Staring was the Secretary. The influence of mining developments is shown amongst others by the Jongmans collection of Carboniferous-Permian plants and stratigraphical samples of the Dutch coal mines, illustrating the rise and fall of the Dutch coal industry.

Contents

Introduction and early collections

The rich geological collections of the Nationaal Natuurhistorisch Museum Naturalis (National Museum of Natural History Naturalis, Leiden, The Netherlands) are examined from a number of perspectives herein. When the Rijksmuseum van Natuurlijke Historie (RMNH, i.e., National Museum of Natural History) was founded in 1820 by Royal Decree (of King William I), it was based on three collections:

1. 's Lands Kabinet van Natuurlijke Historie (National Cabinet of Natural History), founded by King Louis Napoléon of The Netherlands, a younger brother of the French emperor Napoleon.
2. The Natural History collection of Leiden University, including the 'Kabinet des Stadhouders' (Cabinet of the Stadtholder: William V), which had been donated to the university by his son King William I.
3. The collection of its first Director, Coenraad Jacob Temminck, essentially a bird collection (see Holthuis, 1995, p. 10).

The early geological collections are rather insignificant. As might be expected, Medieval times are not documented at all. The first Dutch lapidary was written in the 13th century by Jacob van Maerlant (1193-1280), probably a Belgian, who worked for the Count of Holland and Zeeland. Van Maerlant wrote a natural history encyclopedia *Der naturen bloeme,* a title that should not be translated as 'On the flower of nature', but rather something like 'An overview of nature', because 'bloeme' is used in the sense of selection as in the Dutch word 'bloemlezing' (= anthology). Unfortunately, the lapidary that formed part of it is not preserved, but references to it are known (van Oostrom, 1996). It is unlikely that it was based on a collection (no Medieval collections are preserved). Rather, it was based on earlier lapidaries, such as those of Hildegard von Bingen (1098-1179) and Albertus Magnus (1193-1280), to mention two Saints who wrote on minerals (one a woman at that!). In turn these were based on the lapidaries of 'Arab' scholars, such as Avicenna (Ibn Sina; 980-1037), who was born in Bukhara (Uzbekistan) and should more correctly be considered a Turk. The interest in minerals was largely based on their pharmaceutical value and these lapidaries were mainly written by people practicing medicine. Many famous physicians, such as William Harvey (1578-1657) and Herman Boerhaave (1668-1738), had important mineral collections or wrote on mineralogy.

Fig. 1. Painting of Carolus Linnaeus (Carl von Linné; 1707-1778) in Lap costume, physician and famous naturalist, founder of binary systematics (in posession of the Nationaal Natuurhistorisch Museum, Leiden).

Although the latter was a professor at Leiden University, no minerals from its old natural history collection can be traced to him.

Minerals and fossils also formed part of the curiosity cabinets that were accumulated in the 17th century in The Netherlands (Winkler Prins, 2000). An atypical example is the 'Constcamer' of Rembrandt van Rijn (1606-1669), which was focused on art, but included minerals and fossils, as we know from a detailed inventory of his household which was made because he went bankrupt. This inventory was used to reconstruct his 'artroom' in the Rembrandthuis, a museum in the house where he used to live in Amsterdam (see van den Boogert *et al.*, 1999). Naturalis provided a long-term loan of minerals and fossils that could have been in Rembrandt's possession. His minerals and fossils would not have been spectacular, because he didn't use them for his paintings, drawings or etches, as he did with most of the material from his 'artroom', including sea shells and stuffed birds.

Although we have no geological material that can be referred to Carolus Linnaeus (Carl von Linné, 1707-1778) - we have only a painting of him (Fig. 1) - he should be mentioned since he carried out much of his important research in The Netherlands where he also took his Doctor's degree in Medicine (not in Leiden, but in Harderwijk, which had a much quicker doctoral programme). This research was published in his *Systema Naturae,* which formed the basis for the binominal nomenclature used in biology and palaeontology, and also included mineralogy (Linné, 1766-1768).

The 'Kabinet des Stadhouders' (Cabinet of the Stadtholder, William V) included material taken to Paris as spoils of war, but regained after the defeat of Napoleon at Waterloo by Professor Sebald Justinus Brugmans (Franeker, 24.3.1763 - Leiden, 22.7.1819; see Winkler Prins, 2003, fig. 1). Brugmans was a physician (Major-General of the Netherlands Army Medical Corps) and naturalist (his dissertation was on the Scandinavian origin of Dutch erratics) who was sent to Paris to reclaim the Dutch natural history collections (Brongersma, 1978, p. 43). He succeeded only partly, because Cuvier and Lamarck claimed that they needed some of the specimens for taxonomic descriptions; they were supported by Alexander von Humboldt. Therefore, we only have a plaster cast copy of the famous mosasaur from Maastricht (Fig. 2). The mosasaur came from the underground mines in Maastrichtian limestones (Faujas-Saint-Fond, 1779). It was considered so important that the military was instructed not to bombard the part of Maastricht where the fossil was located and to bring it back to Paris.

The Mineralogical collections were rather unimportant; the curators had no formal geological training and showed little interest in the collections (Holthuis, 1995, p. 27). The fossils formed part of the zoological collections. The curators of Invertebrates showed some interest in fossils, notably Guilielmus de Haan (Amsterdam, 7.2.1801 - Haarlem, 15.4.1855), whose Doctoral thesis (de Haan, 1825) was on ammonites describing several important genera, such as *Goniatites* and *Ceratites* as new, thus being important until this day. However, the main interest of the curators was in zoology (Holthuis, 1995, p. 32). The second director of the Museum even refused to accept a curatorship for palaeontology offered by the government, because there were not separate curators for the different classes of vertebrates. The pharmacist and palaeontologist Joseph Augustin Hubert de Bosquet (Maastricht, 7.2.1814 - Maastricht, 28.6.1881; Kruytzer, 1963) would have been an ideal candidate for this post. As a result we have only a few of de Bosquet's specimens, the majority of which are to be

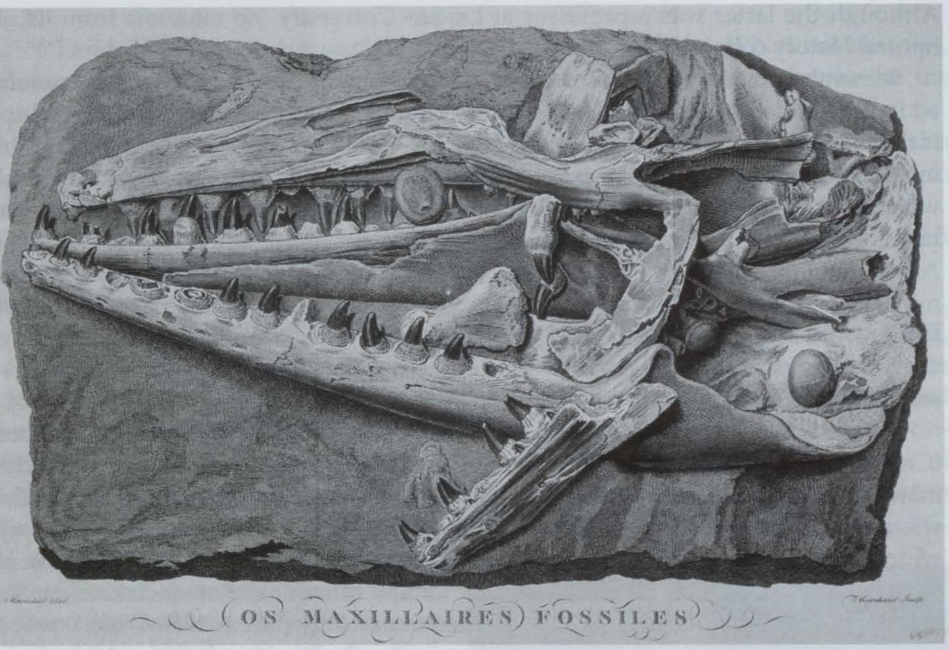

Fig. 2. Replica of mosasaur scull, original in the Muséum National d'Histoire Naturelle at Paris (Faujas-Saint-Fond, 1799, pl. 51).

found at the Musée Royale d'Histoire Naturelle in Brussels. Things changed for the better when, in 1878, the geological collections were entrusted to the newly appointed Professor of Geology, Karl Martin, thus effectively creating the 'Rijksmuseum van Geologie en Mineralogie' (National Museum of Geology and Mineralogy), which was reunited with the National Museum of Natural History after a century.

Exploration phase

The Americas

Some fossils and minerals of the renowned Dutch chemist, physician and geologist Gerard Troost ('s Hertogenbosch, 15.5.1776 - Nashville, Tenessee, 14.8.1850; Fig. 3) form a rather insignificant part of our collections. Troost had emigrated to the USA, where he was a founder and first president of the Academy of Sciences of Philadelphia. His collection is mainly of historical interest (e.g., a specimen donated to him by Governor Clinton of New York; Fig. 4), because it illustrates the early geological exploration of Tennessee (Merrill, 1906).

As far as South America is concerned, we have a collection of Dr. Franz Voltz, a German geologist who was an early investigator of the geology of Suriname (Martin, 1927). He died in Paramaribo in 1855 (Wong *et al.*, 1998). Recent acquisitions from the Dutch universities document the study of the geology of the former Dutch Antilles (ABC islands). For example, from Utrecht we received the collection of Professor Louis Martin Robert Rutten (Maastricht, 4.6.1884 - Utrecht, 11.2.1946; see Kuenen, 1947).

Fig. 3. Portrait of Dr. Gerard Troost (1776-1850), physician, chemist and geologist (Merrill, 1906, pl. 9).

Asia

Of special interest is a small collection of Japanese minerals and fossils of Dr. Philipp Franz Balthasar [von] Siebold (Würzburg, 17.2.1796 - München, 18.10.1866; Fig. 5). Von Siebold worked as a physician for the Dutch Government, especially on Decima where he learnt Japanese in order to be able to communicate with Japanese physicians and other scientists (Kouwenhoven & Forrer, 1993). He was a great collector and naturalist. His collections formed the foundation of the 'Rijksmuseum voor Volkenkunde' (National Ethnographical Museum) in Leiden; his botanical specimens were described in the *Flora Japonica* (de Siebold *et al.*, 1835-1870) and are kept at the Leiden branch of the National Herbarium of The Netherlands; the zoological specimens described in the *Fauna Japonica* (de Siebold *et al.*, 1833-1850) are in our museum. We have also his geological specimens, which are far less important, but still of considerable interest since they form the oldest such collection from Japan. Von Siebold is considered the father of modern (western) science in Japan and is as such greatly honoured (he is as well known there as a Linnaeus or Newton with us). Japanese investigators regularly visit our museum in order to study the von Siebold collections and Leiden formed the obvious place for the Siebold House for Japanese-Dutch cultural relations.

The natural history of the former Dutch East Indies (present day Indonesia) was extensively studied by the 'Natuurkundige Commissie', whose members provided the RMNH with important, mainly zoological, collections. As far as geology is concerned, the most important commissioner was Franz Wilhelm Junghuhn (Mansfeld, 26.10.1809 -

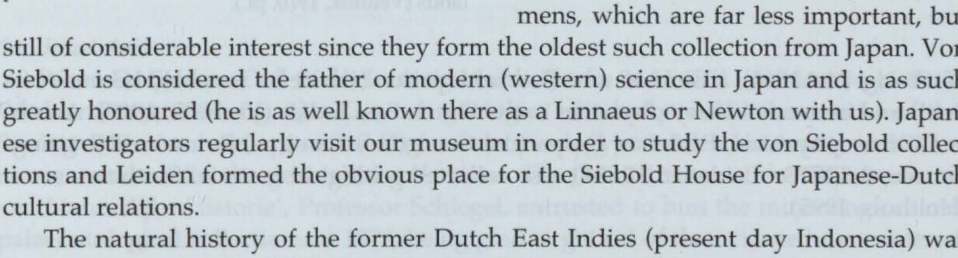

Fig. 4. Label of a specimen donated to Gerard Troost (1776-1850) by Governor Clinton of New York, now in our collections (RGM 216075).

Fig. 5. Japanese painting of Dr. Philipp Franz Balthasar [von] Siebold (1796-1866), first investigator of the geology of Japan.

Fig. 6. Portrait of Dr. Winand Carel Hugo Staring (1808-1877) initiator and secretary of the Commission for the Geological Map of The Netherlands (Veldink, 1970, pl.).

Lembang, 24.4.1864), a German who fled from prison (where he was held because of a duel) and became military physician in the Dutch East Indies (Verbeek, 1909). Another German physician, Professor Caspar(us) Georg(ius) Carol(us) Reinwardt (Lütting-hausen, 3.6.1773 - Leiden, 6.3.1854), also collected geological material for the museum (Holthuis, 1995).

Historical geology

The Netherlands

Of crucial importance for the development of the Dutch geosciences was the geological mapping of The Netherlands by the 'Commissie voor de Geologische Kaart van Nederland' (Commission for the Geological Map of The Netherlands). This is especially true of its secretary, the 'Father of Dutch geology', Dr. Winand Carel Hugo Staring (De Wildenborgh bij Vorden, 5.10.1808 - De Boekhorst bij Laren, 4.6.1877; Fig. 6), whose doctoral thesis dealt with the geology of The Netherlands (Staring, 1833). The map was published by Staring in 1860, after the Commission was dissolved due to internal frictions (van den Bosch, 1979). It was highly innovative in showing a detailed subdivision of the Quaternary and was awarded a gold medal at the 1862 London exhibition, An early geological map of France and the Low Countries from 1817 by Jean Baptiste Julien d'Omalius d'Halloy showed The

Netherlands as practically one colour, for the Quaternary, with the exception of southern Limburg (see de Bruijn, 1974, p. 27). Staring's map was useful for agriculture and 'mining' of raw materials such as clay (for the brick and tile industry).

Clay pits were of crucial importance for the study of the Dutch Quaternary, the basal stage of which is the Tiglian with its type locality at Tegelen. When the clay pits at Tegelen were temporarily accessible in the 1970s, the museum started a major collecting project with colleagues from Dutch universities to recover fossil material (Freudenthal *et al.*, 1976). Although the material in general is not impressive, the bones, seeds and pollen give a good impression of life in The Netherlands 1.5 million years ago, when the climate must have been subtropical (van den Hoek Ostende, 2004, fig. 5).

In contrast, erratics from the Ice Age also formed an important part of the Staring collection. The study of the Dutch Quaternary was continued by Dr. Jan Lorié (Rotterdam, 30.6.1852 - Utrecht, 5.1.1924; van Baren, 1922), who made important contributions and whose collections are in our possession. The study of glacial erratics continues to the present day and we recently acquired the important Zandstra collection.
Amateurs played an important role in providing material for Staring's map (van der Geijn, 1944) and continue to undertake important research to this day. Arie W. Janssen, formerly a curator in the museum, himself came from the amateur ranks. He stimulated the contacts between professionals and amateurs, and became an internationally renowned specialiast on Cainozoic molluscs, starting with Miocene molluscs from The Netherlands - his Miste book is a classic monograph - and adjoining countries. His search for a tool to correlate the Cainozoic deposits of northwest Europe with those of Tethys led to his study of pteropods, small pelagic gastropods with a world-wide distribution, of which he became a renowned expert.

Southeast Asia

When Dr. Johann Carl (Karl) Ludwig Martin (Jever, 24.11.1851 - Leiden, 14.11.1942; Winkler Prins, 2003, fig. 2), a German geologist who had studied the erratics of the Staring collection, was appointed Professor of Geology at Leiden University in 1877, a new era started for the geological collections. The then Director of the 'Rijksmuseum van Natuurlijke Historie', Professor Schlegel, entrusted to him the mineralogical and palaeontological collections in 1878, being glad to get rid of them, since he considered them a source of dust endangering his zoological specimens. Gradually the collections became an independent institution, the 'Rijksmuseum van Geologie en Mineralogie' (RGM, i.e., National Museum of Geology and Mineralogy), with Martin as it first director (Escher, 1931), to be reunited with the National Museum of Natural History one hundred years later.

Opening a box labelled "Petrefacts from the Aachen region" Martin found the Junghuhn collection, considered to be lost, containing Tertiary molluscs from the Dutch East Indies (now Indonesia) (de Groot, 1978, p. 5). Thus started his lifelong interest in these fossils, of which he became the foremost expert, and Leiden became the centre for research on Indonesian Cainozoic molluscs (Gerth, 1944; van Regteren Altena, 1946). He used them to unravel the Cainozoic history of Indonesia using Lyellian statistics, i.e., the percentage of Recent species in a sample was used to estimate its age (Gerth, 1944; see also Rudwick, 1978). He obtained remarkable results, although he was occasionally mistaken when the sample reflected an unusual

Fig. 7. Medal struck on the occasion of the centenary of the discovery of *Homo erectus* (Dubois, 1892) showing the portrait of Professor M. Eugène F.Th. Dubois (1858-1940).

palaeoenvironment, as was shown by Dr. Cornelis Beets (Klatèn (Indonesia), 25.4.1916 - Wassenaar, 28.7.1995), who continued Martin's work. Beets interrupted his research career by working in the oil industry before returning to the RGM as its Director (Winkler Prins, 1996). Our present curator of Cainozoic molluscs, Frank P. Wesselingh, started research in Indonesia using these collections.

The best known palaeontological collection of our museum, and the only one cited in *World Palaeontological Collections* (Cleeveley, 1985), is that of Professor Marie Eugène François Thomas Dubois (Eijsden, 28.1.1858 - De Bedelaer near Halen (Lb.), 16.12.1940; Fig. 7). He was a Dutch physician who, as a child, developed an interest in the Upper Cretaceous fossils found in South Limburg, the area where he grew up. Dubois was greatly impressed by *On the Origin of Species* (Darwin, 1859), published the year after he was born. After his medical studies he went to the Dutch East Indies as a health officer, but with the intention to search for the missing link between men and the apes. He succeeded in finding the *Pithecanthropus erectus* (= *Homo erectus* (Dubois, 1892); see, for example, Leakey & Slikkerveer, 1993; Shipman, 2001; de Vos, 2004). With the help of the military, he collected a large number of Pliocene-Pleistocene vertebrates from excavations on Java and Sumatra, specimens that are now in our collections. Biological and biogeographical aspects illuminated by the Dubois collection remain very important. Study of these faunas has continued until this day, presently by Dr. John de Vos in cooperation with colleagues in Indonesia and elsrwhere. Research continues to elucidate the stratigraphic context and periods of migration to the islands, which are connected with sea-level fluctuations. Upon his return to The Netherlands, Dubois became Professor of Geology at the University of Amsterdam, where he worked on his collections, which were in part studied by others (Brongersma, 1941), but he also studied vertebrate material from the Dutch locality of Tegelen (see van den Hoek Ostende, 2004).

The Mediterranean

The scarcity of exposures of lithified pre-Pleistocene rock in The Netherlands meant that the Dutch universities had to look elsewhere for possibilities to train their students. Attention was focussed on Mediterranean countries such as Spain, Italy and Greece. Curators with degrees from different universities have focused their interest on different aspects of the geology of Spain. Vertebrate palaeontologists from the University of Utrecht, among them Dr. Mathias Freudenthal of our Museum, developed the study of small mammals as a tool for detailed stratigraphic research of the Cainozoic terrestrial deposits. Washing large sediment samples (see van den Hoek Ostende, 2004, fig. 4), enough rodent teeth can be retrieved to get statistically relevant samples, thus enabling the study of evolution and migration of these faunas. A good example is the study of the Aragonian in eastern Spain by a team lead by Freudenthal (1988). Another important project of his was on the Miocene island fauna of Gargano (southeast Italy), showing both gigantism within rodents (e.g., *Deinogalerix*; Freudenthal, 1972) and birds (owls; Ballmann, 1973), as well as nanism within deer (*Hoplitomeryx*; Leinders, 1984). Parts of the Gargano fauna are still being studied by Dutch and Italian students.

The Betic Cordillera (southern Spain) was the subject of research by a group from the University of Amsterdam. Dr. Phillip Hoedemaeker, former curator of our museum, studied the ammonites from a virtually complete section of the Lower Cretaceous in basinal facies along the Río Argos that proved to be ideal for the determination of sequence stratigraphy. This section is now the standard section for the Lower Cretaceous of the Tethys and, as such, also world wide (e.g., Hoedemaeker & Herngreen, 2003).

The Geological Institute of Leiden University mapped large parts of northern Spain from the Pyrenees (mainly crystalline rocks; Zwart, 1979) through the Cantabrian Mountains (mainly Palaeozoic sedimentary rocks (see below); Savage & Boschma, 1980) to Galicia. The collection of crystalline rocks of the latter area is now being revised by Dr. Charles Arps, a former curator of petrology.

Developing mining industry

Coal industry

Recent acquisitions include important collections from the Dutch Geological Survey (now Netherlands Institute of Applied Geoscience, TNO), of which the palaeobotanical collections of Professor Wilhelmus Josephus Jongmans (Leiden, 13.8.1878 - Heerlen, 13.10.1957; Winkler Prins, 2003, fig. 3; van Waveren, 2004) are of special interest. Jongmans was a botanist who became a palaeobotanist to help dating the coal layers in the collieries of southern Limburg. He was the Director of the Heerlen branch of the Geological Survey ('Geologisch Bureau voor het Mijngebied') and became a famous Carboniferous stratigrapher, initiator of the Carboniferous Congresses, the first international congress series to be dedicated to the study of a specific geological period (Wagner, 1997). The history of the collection illustrates the rise and fall of the Dutch coal industry.

Jongmans was also instrumental in the choice of a research area for the Geological Institute of Leiden University. He was given the oportunity to undertake palaeobotanical research in either Morocco or the Cantabrian Mountains in Spain. After a quick glance at the literature, it became clear that more Carboniferous plants were to be found in the Cantabrian Mountains, so he decided to go there with his student R.H.

Wagner; both the Structural Geology and Palaeontology/Stratigraphy Departments of Leiden University followed suit. After the closure of these departments their collections were donated to the museum. I continued research on the Carboniferous stratigraphy of the area and on its marine faunas, particularly brachiopods. Dr. Wagner and I carried out a detailed investigation of the Cantabrian, the basal stage of the Stephanian, filling the gap below the Stephanian A, which was renamed Barruelian with its type section also in the Cantabrian Mountains. In order to obtain detailed information on these stages, the Guardo project was proposed and accepted by IGME, the Spanish geological survey. The official goal was to evaluate the coal reserves of the Guardo coal basin (it was the time of an oil crisis!), but in the meantime detailed stratigraphic sections of the uppermost Westphalian and Lower Stephanian were measured and the fossils collected, allowing a detailed reconstruction of the basin (Wagner & Winkler Prins, 1985).

Oil industry

The biostratigraphy of southeast Asia based on molluscs by Professor K. Martin was too crude and impractical for the developing oil industry, and the Royal Dutch/Shell group stimulated micropalaeontological research. Dr. Isaak Martinus van der Vlerk (Utrecht, 31.1.1892 - Leiden, 29.6.1974; Fig. 8) worked on larger foraminifera and became famous for developing his letter classification of the Indo-

Fig. 8. Professor Isaak Martinus van der Vlerk (1892–1974) at work in Bandung. He is well known for his so-called Letter classification of the Indo-Pacific Tertiary, based on larger foraminifera.

Fig. 9. Portrait of Drhc Ir Heinrich Moritz Emil Schürmann (1891–1979), an oil-geologist (Director of the Royal Dutch/Shell Group, whose extensive collection of Precambrian rocks was donated to our museum.

Pacific Tertiary. He later became Professor of Palaeontology at Leiden University and Director of the Museum (den Tex, 1974). Several people continued his work and now Dr. Willem Renema (curator of micropalaeontology) is working in southeast Asia on larger foraminifera, diving also for extant specimens to collect ecological data for his palaeoecological studies.

Only indirectly connected with the oil industry is a magnificent collection of Precambrian rocks from all over the world, collected mainly before the Second World War by Drhc Heinrich Moritz Emil Schürmann (Dessau (Anhalt), 24.3.1891 - Den Haag, 13.6.1979; Fig. 9), and bequested to the Museum. He was a petroleum geologist, later to become Director of the Royal Dutch/Shell Company, who started his career as a student of Professor J. Wanner in Egypt studying Precambrian rocks, thus developing a life-time fascination for these rocks (Dozy, 1979).

Mineral industry

With the Jongmans' collection came the small, but important, mineral collection of Dr. Gustaaf Adolf Frederik Molengraaff (Nijmegen, 27.2.1860 - Wassenaar, 26.3.1942; Fig. 10), a botanist and geologist, professor at the Technical University of Delft (Brouwer, 1942). The greater part of Molengraaff's collections, consisting mainly of rocks and fossils from our former colonies (e.g., Permian and Triassic fossils from Timor, Indonesia, including type material of Wanner's monographs) were donated to our museum by the Technical University of Delft as part of the endangered geological collections from our universities that form part of our national geological heritage. The Timor collections were originally used for a chronostratigraphic subdivision, but the way they were collected (bought from the local population by the basket load) makes this impossible. However, I just started a project with a colleague from Australia (Professor Neil Archbold) to study the Permain brachiopods for comparison with the faunas from Western Australia for palaeogeographic analysis. There is also interest in other parts of those collections, such as the echinoderms, and catalogues of the type and figured specimens will be prepared.

Also worthy of mention is our collection of minerals of gemstone quality used for reference by the Nederlands Edelsteen Laborarorium (NEL; Netherlands Gemmological Laboratory), which is housed in our museum. The NEL

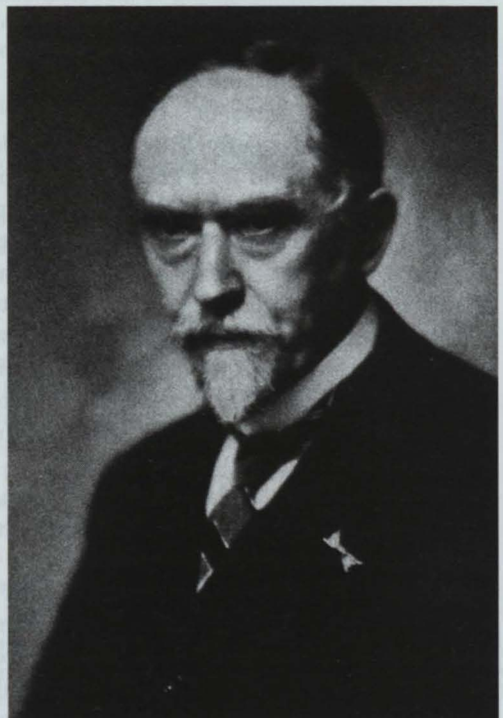

Fig. 10. Portrait of Professor Gustaaf Adolf Frederik Molengraaff (1860-1942).

operates for the gem trade and private individuals who want their gems assessed (but no price estimates are given). Professor Pieter Cornelis Zwaan (Katwijk, 11.8.1928 - Leiden, 7.11.2002; Fig. 11) was an internationally renowned gemmologist, and former director of NEL and of the geological museum. He was succeeded as a mineralogist and gemmologist by his son Johan Zwaan.

The impression that mining in The Netherlands was restricted to the 20th century is far from true. An important prehistoric flint industry existed, tens of thousands of years ago, at Rijckholt (south Limburg), of which some material can be found in our collections.

Fig. 11. Portrait of Professor Pieter C. Zwaan (1928-2002), an internationally renowned gemmologist (Arps & Winkler Prins, 2002).

Conclusions

It is unfortunate that no material can be attributed to the old curiosity cabinets and the collections of 18th century scientists with a Leiden connection, such as Boerhaave and Linnaeus. An in itself rather unimportant early 19th century collection of minerals, rocks and fossils from Japan by von Siebold is of great cultural importance, since it marks the beginning of the geological studies of Japan. Other important (late) 19th century collections are from the former Dutch East Indies (present-day Indonesia) and consist mainly of Cainozoic molluscs studied by Karl Martin and the Dubois collection of fossil vertebrates, including the famous *Homo erectus* type material. The museum remains a centre for the study of the geology of southeast Asia up to this day, and we have, for example, significant 20th century collections of Cainozoic foraminifera (initiated by van der Vlerk) and Permian-Triassic invertebrates from Timor. These collections had formed the basis for important publications in the past and are still the focus of ongoing research.

Our colonial past played also a role in obtaining collections from the Americas, notably from the ABC Islands. Presently, there is a new interest in these 20th century collections.

Obviously, the museum had an interest in the geology of Europe, particularly The Netherlands. In the 19th century European material was mainly bought from merchants or donated. The only outstanding collection was the one brought together by the commission for the preparation of the first geological map of The Netherlands, the Staring collection. In the 20th century students brought back nice fossils and minerals from geological excursions, but scientifically these were of no great importance. From The Netherlands, the Tiglian collection is worth mentioning (van den Hoek Ostende, 2004), but also the Cainozoic molluscs collected and studied by curators of the museum in co-operation with amateurs. After the Second World War, the Dutch universities started research in various parts of Spain, helping to create research centres at various Spanish universities, who have taken over, still cherishing the old Dutch contacts. The collections resulting from the Dutch studies are largely kept in our museum.

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The 2003 Peter Schmidt award presented to Joanne Lerud

Cor F. Winkler Prins

Winkler Prins, C.F. The 2003 Peter Schmidt award presented to Joanne Lerud. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, 4: 308, 1 fig.; Leiden, August 2004.

C.F. Winkler Prins, Nationaal Natuurhistorisch Museum Naturalis, Postbus 9517, 2300 RA Leiden, The Netherlands (winkler@naturalis.nnm.nl).

It was decided 'en petit comité' to present the Peter Schmidt award for 2003 to Joanne Lerud, a dear friend who attended many of the 'Erbe Symposia' and made valuable contributions to them. The award is especially for organising in such an excellent way the Fifth International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums' at the Colorado School of Mines in Golden (Colorado).

The award is not valuable in a material way, but I hope it will be a precious souvenir of the mining history in The Netherlands and of the Nationaal Natuurhistorisch Museum Naturalis in Leiden. It consists of a piece of rock with Carboniferous plant fossils (*Alethopteris decurrens* (Artis) Zeiller and *Lepidophloios laricinus* Sternberg) from a Dutch mine, the National Mine Hendrik of south Limburg, long since closed down. It formed part of the important Jongmans collection, but was collected in 1976, long after the demise of Professor Jongmans. I was allowed to mount it and use it for the award.

It was with great pleasure that I handed over the award to Joanne Lerud (Fig. 1).

Fig. 1. The presentation of the Peter Schmidt award for 2003 to Joanne Lerud by the author.

The 2003 Peter Schmidt award presented to Joanne Lerud

Cor F. Winkler Prins

Winkler Prins, C.F. The 2003 Peter Schmidt award presented to Joanne Lerud. *In*: Winkler Prins, C.F. & Donovan, S.K. (eds.), *VII International Symposium 'Cultural Heritage in Geosciences, Mining and Metallurgy: Libraries - Archives - Museums': "Museums and their collections", Leiden (The Netherlands), 19-23 May 2003. Scripta Geologica Special Issue*, **4**: 308, 1 fig.; Leiden, August 2004.

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The award is not valuable in a material way, but I hope it will be a precious souvenir of the mining history in The Netherlands and of the Nationaal Natuurhistorisch Museum Naturalis in Leiden. It consists of a piece of rock with Carboniferous plant fossils (*Alethopteris decurrens* (Artis) Zeiller and *Lepidophloios laricinus* Sternberg) from a Dutch mine, the National Mine Hendrik of south Limburg, long since closed down. It formed part of the important Jongmans collection, but was collected in 1976, long after the demise of Professor Jongmans. I was allowed to mount it and use it for the award.

It was with great pleasure that I handed over the award to Joanne Lerud (Fig. 1).

Fig. 1. The presentation of the Peter Schmidt award for 2003 to Joanne Lerud by the author.

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Scripta Geologica Special Issue 4

nationaal
natuurhistorisch

national museum
of natural history

Instructions to Authors

General Information

Scripta Geologica publishes original papers and monographs dealing with the various branches of vertebrate and invertebrate palaeontology, palaeobotany / palynology, stratigraphy, petrology and mineralogy, including gemmology. The journal appears twice per calendar year, although it may be supplemented by special (thematic) issues, and each issue has its own serial number.

The principal focus of the journal is systematics, although papers on all aspects of these subjects are welcomed. The majority of publications in *Scripta Geologica* are the result of research projects of the Nationaal Natuurhistorisch Museum, Leiden, or are based mainly or entirely on specimens in the collections of the Museum. Other papers are accepted, very rarely, at the Managing Editor's discretion. Only original papers that have not been submitted or published elsewhere will be considered for publication.

Typescripts should be sent to Dr Stephen K. Donovan, Managing Editor, *Scripta Geologica*, Department of Palaeontology, Nationaal Natuurhistorisch Museum, Postbus 9517, NL-2300 RA Leiden, The Netherlands. If you have questions concerning submission to the journal, please contact the editor at Donovan@naturalis.nnm.nl.

Submission and Style

Typescripts should be submitted in English. Papers in other major languages are accepted only in special cases and solely at the discretion of the Managing Editor. In the first instance, authors should submit three copies of their typescript with good copies of all figures at approximately publication size. Typescripts must be double spaced in a common font such as Times New Roman or Arial, and presented in print no smaller than 11 pt. Note that the Managing Editor will not process any paper unless three copies are received. Authors should also submit the names, addresses and e-mail addresses of three authorities whose expertise makes them particularly suited to review the paper. The format of the paper should follow that of a recent issue of *Scripta Geologica*; those papers submitted in an incorrect format will be returned to the author(s) for revision.

The paper should include an English abstract and no more than five relevant key words, followed by the address(es) of the author(s). Authors are referred to Landes (1951) for a discussion of the structure of an informative abstract. The author(s) should give a suggestion for a running heading (repeated at the top of each page). If the paper is not written in English, an English translation of the title must be provided. Abstracts in other languages are optional, but additional to the abstract in English. The contents include only the first heading level (chapters). Footnotes are not accepted.

Fossil names below family group level should be underlined or in italics (they will be printed in italics). Primary type material of new taxa must be housed in a public collection (usually that of the Nationaal Natuurhistorisch Museum) and their registration numbers must be given. Palaeontological papers must follow the rules of *International Code of Zoological Nomenclature* (International Commission of Zoological Nomenclature, 1999) or *International Code of Botanical Nomenclature* (Greuter *et al.*, 2000), as appropriate.

All papers will be sent to at least two referees for peer review. These reviews will be used by the Managing Editor to determine the acceptability, or otherwise, of the paper.

References

References include exclusively those publications that are cited in the text. That is, all references that appear in the text should appear in the reference list; all references in the reference list must appear at least once in the text (which includes captions to figures and plates, and captions and contents of tables). It is preferred that titles of journals are given in full, not as abbreviations, and are italicised, as are titles of books. Volume numbers of journals are bold. Style of references should conform to the style of the following examples: —

Bridgwater, D., Watson, J. & Windley, B.F. 1977. The Archaean craton of the North Atlantic region. *In*: McCall, G.J.H. (ed.), *The Archaean: Search for the Beginning*: 308-327. Dowden, Hutchinson & Ross, Stroudsburg, Pennsylvania.

Chapman, F. 1898. On Ostracoda from the Cambridge Greensand. *Annals and Magazine of Natural History* (series 7), **2**: 331-346.

Greuter, W., McNeill, J., Barrie, F.R., Burdet, H.M., Demoulin, V., Filgueiras, T.S., Nicolson, D.H., Silva, P.C., Skog, J.E., Trehane, P., Turland, N.J. & Hawskworth, D.L. 2000. *International Code of Botanical Nomenclature (Saint Louis Code)*. Koeltz Scientific Books, Königstein: 474 pp.

International Commission on Zoological Nomenclature 1999. *International Code of Zoological Nomenclature (4th edition)*. International Trust for Zoological Nomenclature, London: xxix+306 pp.

Jung, P. 1971. Fossil mollusks from Carriacou, West Indies. *Bulletins of American Paleontology*, **61** (269): 147-262.

Landes, K.K. 1951. A scrutiny of the abstract. *Bulletin of the American Association of Petroleum Geologists*, **35**: 1660.

Poole, E.G. & Barker, L.H. 1983. *The Geology of Barbados. 1:50,000 sheet*. Directorate of Overseas Surveys and Government of Barbados, St. Michael.

Schäfer, W. 1972. *Ecology and Palaeoecology of Marine Environments*. University of Chicago Press, Chicago: xiii+568 pp.

Speed, R.C. 1988. Geologic history of Barbados: a preliminary synthesis. *In*: Barker, L. (ed.), *Transactions of the 11th Caribbean Geological Conference, Barbados, July 20-26, 1986*: 29:1-29:11. Government Printing Department, Bridgetown, Barbados.

Trechmann, C.T. 1955. *A New Explanation of Mountain Uplift, Based on Lunar Gravitation and Ocean Pressure*. Privately printed, Messrs. B. T. Ord Ltd, West Hartlepool: 64 pp.

Vergoossen, J.M.J. 2003. *Fish Microfossils from the Upper Silurian Öved Sandstone Formation, Skåne, southern Sweden*. Unpublished Ph.D. thesis, Rijksuniversiteit Groningen: 195 pp.

The names of authors in the text of the paper should not be capitalised, but cited as, for example, Chapman (1898) or (Chapman, 1898); publications by two authors should be referred to as, for example, Poole & Barker (1983) or (Poole & Barker, 1983); those publications with more than two authors should be referred to as, for example, Bridgwater *et al.* (1977) or (Bridgewater *et al.*, 1977).

Illustrations

Scripta Geologica publishes both photographic plates, positioned at the end of each paper, and figures (either line drawings or photographs) that are integrated within the body of the text. Maximum illustration size is 128 × 180 mm (including the caption, 200 mm).

Plates: Plates are numbered consecutively. At the review stage, copies of photographic plates or mock-ups of the same should be provided at publication size. Acceptance of a paper will depend upon plates being provided at publication size, with individual figures adequately labelled, as necessary, and magnifications being indicated either in the caption or as scale bars positioned on the plates. It is emphasised here that these tasks are the responsibility of the author, not the editor, typesetter or their assistants. Top copies of all plates at publication size are required following acceptance.

Figures: Figures are numbered consecutively. Copies of line drawings accompanying papers for review should be reproduced at approximate publication size, although originals can be up to twice publication size. Photographic figures are smaller than plate size and should be submitted at publication size. Acceptance of a paper will depend upon figures being adequately prepared, with individual figures labelled, as necessary. Magnifications should be indicated as scale bars positioned on the figures. Again, it is emphasised such tasks are the responsibility of the author, not the editor, typesetter or their assistants. Top copies of all figures are required following acceptance.

If illustrations are to be supplied in a digital form, in addition to the hard copies, they should be submitted preferably as a .JPG without compression, .TIF or .EPS file, although other file formats that can be used with Adobe Photoshop are also accepted. Photographs should have a resolution of 300 dpi, line drawings 600 dpi. Queries concerning electronic submission of figures should be directed to the Managing Editor.

Tables

Tables are numbered consecutively and should have an informative title. Tables are not to be used merely to duplicate data presented elsewhere, e.g., in the text or a line drawing, but should include information additional to that found elsewhere in the paper. Tables should be constructed using the 'Tab' key, to prevent the information loss that may occur when moving between programmes with 'Table' functions.

Acceptance

Following revision in the light of comments by the reviewers and editor, the paper should be resubmitted to the Managing Editor with a letter explaining how the paper has been revised. In particular, authors should justify those aspects of the reviewers' comments that have not contributed to the revised typescript. The revised typescript should be resubmitted in both hard copy and electronically, preferably on a 3 1/2" disc in WordPerfect, Word or Rich Text Format (preferably not very recently released versions). It is not acceptable for the electronic version of the text to be provided as an e-mail attachment or on CD (submission to the typesetter is on disc and the Editor needs to be able to make changes of format that could not be accommodated on CD). Originals of all plates and figures should also be submitted at this time (and electronic versions, if available, acceptable on CD).

Authors will be informed by the Managing Editor once their paper is accepted for publication. Proofs will be sent to the corresponding author, normally within 3-6 months of final acceptance.

Offprints

Following publication, the corresponding author will receive 100 offprints of the paper free of charge, except in the case of particularly long papers, for which only a reduced number may be available. Further offprints can be purchased at cost.

Stephen K. Donovan
Managing Editor, *Scripta Geologica*
19th June, 2003