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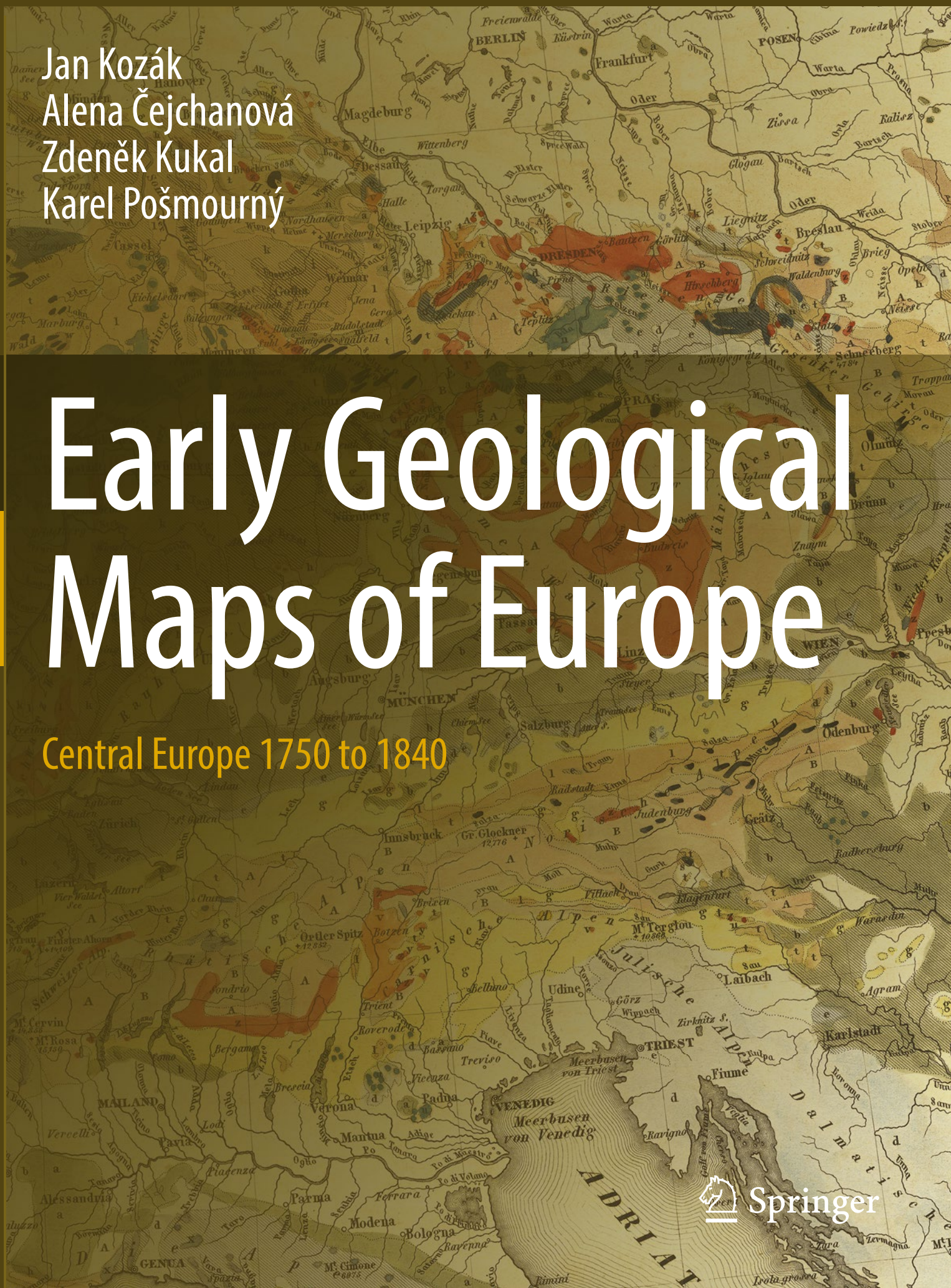
Early Geological Maps of Europe

Central Europe 1750 to 1840



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Dedicated to the memory

Apl. Prof. Dr. Bernhard Fritcher
RNDr. Igor Túnyi, DrSc.
Professor David Oldroyd

Foreword

The beauty and practicality of geological maps are widely recognized today. But the nature and interpretive power of their vivid colors and complex visual clues have undergone a striking evolution since the early eighteenth century. This *ATLAS* will introduce seminal maps, their authors, and key concepts in the critical period of 1726–1845. The names of some of the map authors – Boué, Guettard, Murchison, Sedgwick, von Buch – will be familiar to a wide audience, but others may be new. Not only does the impressive work of little-known naturalists come to our attention in this volume, but the richness of the maps, both visually and as informative documents, may be surprising. Further, the significance of work being done in Central Europe may call for deepened appreciation of advances being made beyond Britain and the countries of Western Europe. Such reactions are a function of one primary aim of this book—to document the important work being done in Central Europe as medieval mining traditions merged with resource needs of the Industrial Revolution and as Enlightenment thought became integrated with new scientific studies of the Earth.

The catalyst for the *Atlas* was a meeting of INHIGEO (the International Commission on the History of Geological Sciences) held in Vilnius, Lithuania, in the summer of 2006. In 2009–2010, representatives of four Central European countries that had united in an alliance (the Visegrad Group) of the Czech Republic, Slovakia, Hungary, and Poland worked together on collecting and evaluating early geological maps of the region. Other political entities of Central Europe, namely, Austria and the German states of Bavaria and Saxony, soon joined the group. The report of those efforts was completed in 2010. It became evident that Central Europe had contributed a rich output of early geological maps, with descriptive texts largely in Germanic languages. Many of those maps are presented in this *Atlas*, and they serve as an important supplement to the productions of Anglophone and Francophone naturalists and mapmakers.

Turning the pages of this book will offer a visual feast, as colors, patterns, and clues from the legends evolve from simple designations of where specific rock and mineral types occurred to incorporation of stratigraphic information and hints of tectonic interpretation. The dynamic maturing of what is being shown on the maps coincides with the increasing sophistication of theories being brought forth by contributors to the young geosciences. In the following pages, current Central European authors provide valuable insights, in English, into the methods and aspirations of the original mapmakers. It is possible to see that changes in map presentation reflect new modes of analysis and new interests. Old descriptive phrases, such as "here be coal," are replaced by the recognition that coal fits into a stratigraphic architecture, has major economic impact, and may in fact be telling us something about the history of the Earth. The relevance of education is also evident, as the maps embody visions from medieval mining lore to efforts of the Wernerian School of Freiberg to share theoretical knowledge among European naturalists. Most of the maps illustrated here predate wide awareness of the late eighteenth century fieldwork of William Smith, or the fossil-based and historically oriented work of Georges Cuvier and Alexandre Brongniart, as they decoded the geology of the Paris Basin in the early years of the nineteenth century. Part of the impact of this collection may be a new appreciation for the productivity of little-known people working in regions not well known to Western Europeans. But Pfaundler, Pusch, and Preininger, Reuss and Raumer, Staszic and

Sennovitz, and others, were building a framework that would yield new methods, new information, and new insights for the expanding geosciences.

Along with introducing us to the early authors and their maps, the contemporary producers of this *Atlas* provide illuminating backgrounds on such topics as the 'definition' of Central Europe, the area's mineral resources and general geology, and the complex political situations prevailing from 1750 to 1820. Also helpful are discussions about how ore deposits, energy resources, and hydrogeology were treated in early maps, and how stratigraphy and tectonics were introduced, over decades, thereby creating a new dimension for understanding geological maps. Each map in the *Atlas* has a companion text that gives background information concerning titles, map scales, nature of the legends, latitude and longitude, extent of the area covered, and the size of each map. Also discussed are modern depositories for each map, supplementary details about map construction, and modern interpretations of the significance of the maps and their meaning.

The oldest of the featured maps, by Luigi Marsigli (1726), focused on the Danube Basin, from Austria to Hungary and Bulgaria. A fascinating parade of maps follows, taking us to 1845. One power of this compilation is that it provides a stunning visual documentation of the evolution of concerns being considered by the scientists and of the art being practiced by the mapmakers. As cartographic techniques improved, new geological theories were incorporated into what may initially have seemed like static displays. A very few examples will have to suffice here. Marsigli's map of 1726 was "proto-geological," in the sense that it only showed selected ores and noteworthy minerals. Von Flur's map (1792) is considered the first 'geological' map of Bavaria, and it incorporates a chronological arrangement based on the Wernerian system. Politico-economic trends can be perceived by map projects such as Hacquet's 1796 work in the Tatra Mountains, signalling interest in the resources of Slovakia. Similarly, Werner's student Leopold von Buch was charged with developing a map (1802) of Silesia, with an eye to developing coal resources. By 1815 von Schindler portrayed tectonic lineaments and called attention to their role in the distribution of ore bodies. Also in 1815, the detailed map by Staszic, concentrating on the Carpathian area, is considered to be a milestone in decoding the geology of Central Europe. Ami Boué's map of 1834 provided insight into the geological resources of Transylvania, combining lithologic and stratigraphic aspects of Tertiary and Cretaceous units. The latest example featured in this *Atlas* is Naumann's 1845 map, reflecting the teachings of the Mining Academy in Freiberg. It is a product now judged to be a remarkably modern geological map, displaying the state-of-the-art knowledge of the era.

We hope that the maps and text discussions will provide visual and intellectual experiences that are both aesthetic and informative.

Department of Geosciences, Denison University Granville OH, 43023, USA
4 March 2015

Kennard B. Bork

Preface

The present atlas, featuring "Early Geological Maps of Europe: Central Europe 1750 to 1840," carries on the half-year Small Visegrad Project, which ended in 2010. The project brought together an international team of geologists, historians, librarians, and collectors from the Czech Republic, Slovakia, Poland, and Hungary (Visegrad countries), which was later joined by experts from Austria, Bavaria, and Saxony. The outcome of their research was presented in a final report printed in only a few copies. Therefore, the Czech members of the Visegrad group decided to display their unique collection of maps by creating a new printed publication, this Atlas.

The aim of the Atlas is first and foremost to publish a unique collection of old map series that were created in Central Europe since the mid-eighteenth century. The territory of Central Europe is here defined morphologically as the Bohemian Massif and adjacent Northern foreland (up to Góry Świętokrzyskie–St. Cross Mountains, in mid-Poland), the Western Carpathian Mts., Eastern Alps, Hungarian Basin, and incorporated areas. Geopolitically, the region of Central Europe covers the territory of the present Czech Republic, Southern Poland, Slovakia, Hungary, Upper Austria, Bavaria, Saxony, and Lusatia.

As was the case with the Visegrad project, this publication pays special attention to the presentation of maps that were created before 1820. Included also are interesting "map milestones" from the years 1821 to 1840, which were essential for geological mapping in the nineteenth century. This publication presents 47 old map documents. The oldest map of the Atlas is the 1726 map by Luigi Ferdinando Marsigli, and the most recent is a set of maps produced by geologist Carl Friedrich Naumann in 1845. Most of these maps have been known and studied in many works, and some of them are quite familiar to geological circles in Europe. However, the uniqueness of this publication lies especially in the fact that the maps have never been presented together in such a form and with accompanying narratives concerning map details and interpretations. Publication of this collection provides an insight into the inner connections and relationships of these old documents. But the Atlas also presents maps that are not well known, and in three cases the modern authors of this Atlas have found maps that were absolutely new to them (e.g., those by A. Kaluža, C.F. Naumann, and J.G. Sommer).

The Atlas succeeded in assembling a unique set of heterogeneous documents, which were created in a period of 120 years in various parts of Central Europe. The content and character of the incorporated maps differed in numerous ways. Many of them provide an insight into the time and conditions under which these maps were created. The background and origin of several of the maps, such as the work of A. Preininger, remain shrouded in mystery. Furthermore, in some cases the information that was found, not only about the maps but also about their authors, was minimal.

Because they held a geoscience thematic view for the Atlas, the authors of this publication preferred processing of geological (geognostical) maps or maps of a topographic character with mineralogical, petrographical, and economic information. The authors intentionally omitted mining maps, because of their character and because the category is so vast that a compilation of all mining maps would be far beyond the scope of this work.

The maps were systematised in a standard description, but with consideration given to the degree of local geological knowledge. Brief biographical information for the authors of the

maps is provided, including their portraits, if available. Descriptions of the separate maps are accompanied by new chapters on geopolitical and historical developments leading to consequent changes in Central Europe in the considered time interval. Also discussed, where relevant, are stratigraphic points of view and tectonic information that began to appear in the later maps. Also included in the Atlas is a concise outline of the advancement of geological cartography in Central Europe.

A unique event, the creation of a multinational group of authors, all of whom began to cooperate during the VISEGRAD project, was followed by an effort on the part of the Czech authors to generate this Atlas. The result is knowledge of the national history of geology, not only within individual countries, but also for the whole of Central Europe. Without the support and help of this group of collaborators, the current Atlas could not have been realized.

We hope that this first Atlas of the oldest geological maps of Central Europe will be welcomed as a small stone in the newly constructed edifice of the European Union.

Prague
March 2015

Jan Kozák
Alena Čejchanová
Zdeněk Kukal
Karel Pošmourný

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We also thank all members of the INHIGEO, among them especially former INHIGEO general secretaries David Oldroyd (University of NSW, Sydney, Australia) and Kennard Bork (Denison University, Granville, OH, USA), who markedly contributed to the final completion and publishing of the Atlas.

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1.1 Central Europe: Concept and Approach

The definition of Central Europe is still subject to debate. Central Europe can be defined either geographically or from historical, political, sociological, and cultural aspects.

One of the numerous definitions says "the concept of Central Europe is based on similarities emanating from historical, social and cultural viewpoints." According to the prevailing view, the definition is based on the shared history of nations, which contrasts with that of the surrounding regions.

The term "Middle Europe" was sometimes used, as well but this is outdated now.

As referred to in prestigious encyclopaedias, we find numerous definitions which are differently justified.

One of the interesting definitions is worth mention: "Central Europe," from an historical point of view, embraces Germanic nations together with the Austrian Empire.

According to physical geography, Central Europe is delimited by natural borders: the Baltic Sea, the Southern Alps, and the Danube line on the Balkan Peninsula. The borders with western and eastern countries are less well defined.

The authors of this book took into consideration all the aforementioned aspects and some additional ones. The source of primary inspiration was to be found in the Visegrad countries: Poland, Slovakia, Hungary, and the Czech Republic. In fact, during a key historic event, which took place in 1335, the roots of a policy of cooperation between Visegrad countries can be seen. At that time a royal summit of the kings of Hungary, Bohemia, and Poland was organized in the Hungarian castle Visegrad. The monarchs agreed to cooperate in politics and commerce.

In recent times, the description and evaluation of early geological maps called for the extension of a working group that included adjoining nations: Austria, in particular, because a great part of Central Europe represented part of the Austrian Empire in past historic periods. During this map project, the working group needed to have cooperation from the free states of the Federal Republic of Germany, that is, Bavaria, Saxony, and Thuringia.

Geologically and geographically speaking, maps considered or listed in this book depict the area spreading from the Alpine foreland, through the Eastern Alps and the Pannonia Basin in the south, and up to the Harz Mts. and Holy Cross Mts. in the north. The eastern and western borders are less well defined.

1.2 Historical and Economic Development of Central Europe (Second Half of the Eighteenth Century and First Half of the Nineteenth Century)

The advancement of Central Europe since the second half of the eighteenth century up to the dawn of the nineteenth century may be seen as a period of fundamental changes in this region at political, social, economic, and even cultural levels. In this time span, the population of Central Europe appeared on the brink of social and economic modernization; despite numerous efforts to enforce new power-political reforms to this region. At the end of the period in question, its geopolitical face appeared to be well stabilized for the upcoming centuries. Simultaneously, besides new social classes (newly emerging class of workers) and political tendencies (liberalism, socialism), also the phenomenon of modern nationalism was born, which, since the beginning of the nineteenth century up to the end of the twentieth century, (de)formed fatally the Central European cultural and political destination.

Seen from the point of view of international relations and transforms and power-political standpoints, the concerned period, similarly to the previous era, can be treated as a series of attempts of France to govern, in a decisive way, the conditions eastward of its borders, that is, of the borders that were laid out in their natural shape and location by the expansive policy of the French King of the Sun, Louis XIV (1643–1715). In spite of the fact that it was confirmed at the end of the

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long rule of Louis XIV that France alone cannot dictate its political will to all of Europe, France nevertheless in the subsequent half-century tried to keep its position of continental Europe superpower No. 1, and continued to promote its own intentions concerning the political arrangement of the European room.

This French effort was also reflected in the admirable advancement of French science, concerning both animate and inanimate nature. Let us mention, for example, the giant, voluminous French work known under the abbreviated title *Encyclopaedia*…… [Diderot, Voltaire, Montesquieu, Rousseau, Jaucourt, et al., *Encyclopédie ou Dictionnaire raisonné des sciences, der arts et des métiers* (1751–1772)], giving the reader a complex knowledge in all activities of human society of that time. The French "Encyclopaedia," together with its English twin (*Encyclopaedia Britannica* 1768–1771), became a model work for other European states and nations. We may consider the age of encyclopaedia in Europe—which is sometimes called the Age of Enlightenment—as the beginning of modern science based on rational thinking.

As for the advancement of geosciences in this period, it is no wonder that the French scientific invasion into Central Europe left traces also in geological mapping. Several names of French naturalists who devoted their lives to geological investigation and geological cartography are given in our Atlas, in the section in which the description of geological maps of the second half of the eighteenth century and the first decades of the nineteenth century is discussed. The effort of France to restore its hegemonic positions in the continent forced the country into numerous military engagements and economically exhausting conflicts, in which assorted military–political coalitions were experienced. Nevertheless, in contrast to French extraordinary advancement in the field of science and technology, in no one of these hegemonic attempts did France succeed to retrieve its earlier top position of the sole European superpower. In this context we may recall numerous wars led with the aim to acquire or to control new territories in Europe and to expand and widen French colonies in the world; the wars initiated by France or the wars opened with French attendance in the years 1703–1713 (war for Spanish heritage), in 1741–1748 (war with Prussia), and in 1756–1763 (Seven-Year War), as well as the war conflicts in colonial America, illustrate convincingly these French geopolotical interests.

Towards the end of the eighteenth century, France had to face the fundamental inner "coup d'état," also called the Great French Revolution (1789), followed by the Napoleon period, characterized by the revival of traditional French ambitions to rule the entire continent. Instead of French domination, however, with Napoleon's fatal debacle of his Russian campaign (1812) followed by the lost Battle of Waterloo on June 18th, 1815, the French dreams of superdominancy in the continent vanished. According to the peace treaty signed at the Vienna Congress in 1814–1815, France was asked to return into its original pre-war borders; also, the majority of ruling dynasties formerly pushed out of their thrones returned.

Another important change, which to some degree goes along with the post-war restoration of the situation, consisted in replacing the former Holy Roman Empire of the German Nation (1762–1806) by the so-called German Association. In 1749, the Hapsburg Monarchy, the territory of which was amalgamated by earlier military and political acts, was fused with the Czech lands into one political and regional unit. This construct lasted for a little less than 200 years, until the end of the First Great War. During this time, the Austrian Emperor Franz II proclaimed the establishment of the Austria Empire in 1804. In the second half of the eighteenth century and the first half of the nineteenth century, numerous reforms were carried out in the Austrian Monarchy by the enlightened liberal emperors Mary Therese (1717–1780), Joseph II (1741–1790), and Leopold II (1747–1792).

The strong impact of these reforms could have been observed on sciences including natural sciences. The ruling class, including landlords, took an elevated interest in its natural resources, both animate and inanimate. The beginning of the Industrial Revolution required both types of resources, and thus to create their professional registration (recently, "database") was inevitable. Scientific societies and also individuals followed in this effort with might and main and, curiously enough, the church took part to evaluate its property. Various sorts of maps, geological maps among them, became graphical illustrations of such resources and property.

Agricultural reforms were also introduced, mainly, the cultivation of potatoes and breeding and feeding of domestic animals. Thanks to the progress in medicine and healthcare, mortality decreased drastically, and the population in Central Europe increased by at least one third. New industrial enterprises, and newly constructed and modernized transport systems, all required a new type of energy, so coal was forced through and the "coal age" started. This development can be observed on geological maps, where coal seams in the whole of Central Europe were carefully recorded.

The same concerns hold for metals, the reserves of which were distributed throughout Central Europe with extremely irregularity. Reserves of so-necessary building materials were adequate. The City of Vienna, capital of the Austrian empire (only from 1867 the Austrian-Hungarian Empire), and partly also some smaller Austrian towns, could be called "melting pot of nations." Increased migration of population on the one hand and their segregation on the other hand ended in the crystallization of modern nationalism. In Central

Europe, this idea was promoted mainly by the Germans and Hungarians. Smaller Central European ethnic groups spared no effort to achieve limited political and cultural autonomy as a part of the Austrian Monarchy within the bounds of possibility. The national revival of small Central European nations also referred to glorious parts of their history. Such efforts, however, should be promoted by compulsory full-time schooling in the mother tongue under law from the lowest levels of education.

When such a situation is seen by a present reader in a retrospective look, the multi-ethnic region of Central Europe in the post-Napoleon nineteenth-century period appears as a relatively consolidated and prosperous territory. Unfortunately, in the following twentieth century the hopeful advancement of this region was devastated by two world wars and by other antagonistic and even brutal events. This unfortunate development scarred the face of Central Europe for a long time: it was not until the turn of the twentieth century that the spirit of unity and fellowship returned to Central Europe, this time in the framework and support of the European Union.

During the first decades of the nineteenth century, the "Industrial Revolution" brought important economic and social changes. Nationalism and national self-determination led to a series of uprisings and reforms. In these times, "national awakening" also took part and called for national unification. It is interesting that the frontiers which were established in 1815 remained in effect in a great part of Central Europe for another hundred years.

1.3 Geological Maps as a Portrait of the Earth

In general, a map should show where different things are on the Earth's surface.

A geological map shows the distribution of geological features.

Those geological features, such as different rock types, mineral resources, groundwaters with springs, mines, and quarries, are illustrated graphically in colours or symbols.

Each geological map should contain a key table explaining the colours and symbols: such a map attachment is called the legend.

Later, the geological cross sections began to represent an integral part of geological maps. By drawing cross sections in different directions across the area, we can see what the subsurface geology looks like.

This book is focused on the history of geological mapping in the second half of the eighteenth century and the first decades of the nineteenth century.

The term "geological map" appeared for the first time during the very beginning of the nineteenth century. Many maps that were called "mineralogical, petrographic, geognostic, orographical" were in fact "geological" in the strict modern sense of the word.

The so-called Turin papyrus, dated from 1150 A.D., should, at least according to some historians, represent the oldest geological map. It mapped the location of some building stones and gold deposits in Egypt.

The oldest geological map in our Atlas, from 1726, was constructed to show the location of some mineral deposits on a topographic map. A later map, constructed by J.E. Guettard in 1764, already shows the spatial distribution of four rock types (in the original French version called "bande sableuse, bande marneuse, bande saline, bande schisteuse ou métalique"); that is, "belt of sands, belt of marls, belt of salt, and belt of schists and metals."

In the period of our mutual interest, numerous so-called mine maps or mining maps appeared that depicted technical workings and occurrences of individual resources in a single mine or mine field. Such maps are not "geological" in the true sense and thus are not part of this volume.

1.4 The Geology of Central Europe: A Brief Outline

This chapter contains only an outline of the geology of Central Europe. It is focused on the Earth's surface, which was of main interest for early geologists, but relevant information on geological development is also included.

We know that geological evolution was responsible for the Earth's very diverse geological features and to a great extent also for the relief of the surface.

Several orogenies (mountain building stages) were responsible for the highly diversified geological images of Central European countries. On the whole, Europe geologists described about nine orogenic periods, which gave rise to high mountains. As described next, two of these orogenies were of exceptional importance: the Variscan (Late Palaeozoic) and the Alpine (Late Cretaceous up to the present).

Palaeozoic Central Europe consists of a series of tectonostratigraphic units, or "terranes," located between the remnants of two major paleocontinents, Gondwana and Baltica. Such terranes have often been referred to as typical microcontinents. The impacts of Precambrian and Early Palaeozoic orogenic phases are only partly preserved; they are mostly overworked by Variscan processes.

The Variscan orogeny, which culminated during the Carboniferous, had a substantial role in the formation of the Central European lithosphere and its current relief. Some parts were later affected by the Alpine orogeny and mountain building.

For these reasons, Central Europe is sometimes called "the crossroad of orogenic systems."

A detailed description of Central European geology from the Proterozoic up to the Mesozoic can be found in the book by T. McCann (2008): *The Geology of Central Europe*, vols. 1 and 2. *An Outline of European Geology* was published by D.V. Ager (1980).

1.4.1 The Bohemian Massif: The Nucleus of Variscan Central Europe

One of the most important geological units in Central Europe is the Bohemian Massif, which covers the greater part of the Czech Republic, adjoining Austria, Bavaria, Saxony, and Lusatia, as well as southernmost Poland.

It is firmly believed that the Bohemian Massif was formed by accretion of terranes and was consolidated during the Variscan orogeny, from the Late Devonian to Early Permian. The former Rheic Ocean disappeared when the two supercontinents, southern Gondwana and northern Laurassia, collided.

During the Variscan orogeny a number of microcontinents became united in a supercontinent called Pangaea. The Bohemian Massif functioned as a fundamental segment of the supercontinent. First, post-orogenic Permo-Carboniferous basins originated, followed by deposition of Triassic, Jurassic, and Cretaceous platform sediments. The Bohemian Massif is generally subdivided into four structural and tectonic zones, which extend through Western and Central Europe:

1. The Rheno-Hercynian Zone, with the Rhine Slate Mts. and Harz Mts.
2. The Saxo-Thuringian Zone, which forms the northern part of the Bohemian Massif. The northernmost part represents the Mid-German Crystalline Highland.
3. The Moldanubian Zone, which forms the central part of the Bohemian Massif and consists of higher-grade metamorphosed rocks and magmatites, includes the Teplá-Barrandian unit, composed of slightly metamorphosed rocks and an unmetamorphosed sequence of Early Palaeozoic deposits with some volcanics.
4. The Moravo-Silesian Zone, situated in its southeastern part. This geologically diverse zone includes autochthonous blocks composed of metamorphosed rocks and sediments, as well as allochthonous blocks thrust over them.

Post-orogenic and post-Variscan deposits filled Permo-Carboniferous basins of the Bohemian Massif with Early Carboniferous marine deposits overlain by terrestrial and partly coaliferous paralic sequences.

The platform stage of the Bohemian Massif started in the Jurassic and culminated with deposition of Late Cretaceous marine sediments.

In the Early Tertiary, terrestrial basins developed, yielding a thick sequence of lacustrine and fluvial deposits with thick lignite seams.

1.4.2 Germany and Its Complex Geological Pattern

The Federal Republic of Germany, mainly its southwestern and northwestern Free States of Bavaria, Saxony, and Thuringia, forms an integral part of Central Europe.

As formulated by experts in the geological mapping of Germany, "looking at the geological map of Germany one sees a striking and colourful pattern, reflecting the structure, composition and age of the rock units. It is the result of hundreds of millions of years of plate movement, magmatism and mountain building, erosion and sedimentation, metamorphism and glaciation."

The oldest rocks belong to the Precambrian basement and occur in the southwestern and central eastern parts of Germany. (Such rocks can be found along the margins of the Bohemian Massif, in the Saxonian Granulite Mts., the Lusatia, and elsewhere.)

The volcano-sedimentary massif of the so-called Cadomian basement of Neoproterozoic and Early Cambrian ages can be correlated with blocks to the east.

Devonian through Permo-Carboniferous rocks in large parts of Germany are a result of the collision of Gondwana and Laurasia along the suture called the Mid-German Crystalline Zone, and along Saxon-Thuringian and Moldanubian zones. Palaeozoic sediments occur in the Rhine Slate Mts. Central Massif and Harz Mts.

In the Late Carboniferous, the molasse sediments of the Variscan Orogen were deposited. Shallow seas deposited limestones, dolomites, and even salts. Terrigenous Triassic sediments cover great parts of eastern Germany and are overlain by Jurassic marine limestones, often containing fossils. Marine sedimentation continued into the Cretaceous.

A small northernmost part of the Alps is located on German territory (for the Alps, see following). To the north of it, in the Alpine Foreland, the vast area up to the Danube River is covered by Tertiary molasse sediments.

Traces of Tertiary volcanic activity can be seen along an east–west belt striking across central Germany.

Several world-famous geological curiosities can be mentioned, such as the Ries impact crater in Bavaria, called the Nördlingen Ries, Solnhofen plate limestone of Malm age (Jura) with unbelievable fossil riches, including *Archaeopteryx*, and "castellated sandstone rocks" in the Elbe Sandstone Mts. (Saxony).

1.4.3 Poland: The Geological Crossroad

The Polish landscape has been often described as a flat, lowland country, mostly covered with glacial deposits. However, geologically diversified rough relief can be found there as well.

Poland is situated at the crossroad of three great geological European provinces: (1) the northwestern part belongs to the Precambrian East European Platform, (2) the central and western part belongs to the Palaeozoic and Mesozoic platform of Central and Western Europe, and (3) the southern part belongs to the Outer Carpathians of the Carpathian-Alpine orogenic system, with its foreland.

The territory of Poland can be geologically subdivided into several major zones stretching from the northwest towards the southeast. The northeastern part belongs to Baltica. Its Archean and Proterozoic basement rocks are covered by thick Quaternary deposits. The southern zone belongs to the Outer Carpathians, as a part of the Alpine European zone: it consists of Mesozoic and Tertiary sediments. In between, the Caledonian zone contains Palaeozoic and Mesozoic sediments. The Bohemian Massif extends far northwards and is rimmed by the Variscan front zone with Permo-Carboniferous coal-bearing sedimentary sequences.

The Polish territory crosses the Teisseyre–Tornquist Line, which farther to the west is called the Trans-European Suture Zone, one of the most prominent sutures in Europe. In Poland it represents the boundary between the continents of Gondwana and Baltica.

The Variscan orogen of southwestern Poland embraces the Western and Eastern Sudetes and the Fore-Sudeten Block. To the east from the second block extends the so-called Silesia-Cracow Depression with coaliferous Carboniferous sediments.

The Holy Cross Mts. in central Poland, situated between the Lysogory and Malopolska geological units, are a part of the Variscan Trans-European belt. Their sedimentary sequence consists of Cambrian to Devonian rocks, and fossil-bearing strata can be correlated with other Early Palaeozoic occurrences throughout the world. The margins of this complicated tectonic structure are formed of Mesozoic deposits.

In southern Poland, the Alpine structure of the Carpathians dominates. The Carpathians are conveniently divided into Inner and Outer. The Inner Carpathians consist of the Tatra Massif, with a crystalline core, and the Podhale Flysch Basin, with Paleogene and Neogene deposits. The outer part is formed by the Pieniny Klippen Belt and the Flysch Carpathians. The whole Carpathian block was thrust northwards onto the Palaeozoic Platform, and the Carpathian Foredeep was filled in by Miocene sediments.

1.4.4 The Carpathians in Slovakia

The Carpathian Mountains are a geologically young arcuate chain extending from the Vienna Basin up to structural depressions in Serbia and Montenegro. The Carpathians are surrounded by some basic European geological units, such as the old Bohemian Massif and East European Platform. Within the Carpathian arc the depressed Pannonia Basin occurs, along with the hill zone of Transdanubia.

The Alpine orogeny was responsible for building the Carpathian mountain range less than 60 Ma ago.

In the north and east of Slovakia, the Outer Flysch belt occurs, consisting of flysch-like Mesozoic and Paleogene formations. Three groups of nappes extend along the Slovak–Czech border and cover the southeastern part of the Czech Republic.

The so-called Klippen belt separates the Outer Carpathians from the Inner Carpathians. It is a tectonically deformed zone, mainly composed of Jurassic and Cretaceous sediments. The Inner Carpathian Core Mountains are classified into several units according to their ages and tectonic deformation. The units bear local names (Tatricum, Veporicum, Hronicum, Gemericum, and other units). Crystalline cores were metamorphosed during the Variscan orogeny and are enveloped by Palaeozoic and Mesozoic sediments.

Basins and grabens were formed and filled with sediments during Paleogene and Neogene times. Rising mountain ranges supplied vast amounts of detrital material. Marine sedimentation passed into terrestrial deposits. Sediment thickness in the East Slovakia basins, Danube basin, and Southern Slovakia basins reaches several thousand metres.

Neogene volcanic rocks occur in central, southern, and eastern Slovakia, as well as in northern Hungary. They are part of an extensive volcanic region of the Carpathian arc and Pannonia Basin.

1.4.5 Hungary: The Puszta and Thermal Waters

Although most of Hungary's surface is lowland, parts of the country are geologically variable. The geologically important Zágráb–Hernád line divides Hungarian territory into two geologically different units. Even though both occur on the edge of the Tethys Ocean, the northern unit belongs to the Eurasian plate and the southern one to the African plate.

Basement rocks in the Hungarian plain consist of Carboniferous granite, Triassic limestones, and dolomites of the Jurassic age.

Huge masses of andesitic rocks erupted during Tertiary time along the margin of two different blocks. Because of the

young volcanic activity, the Hungarian crust of the Earth is comparatively thin and has the highest geothermal gradient in Central Europe, higher than in all the European mainland countries except for Italy.

The Pannonia Basin is a large basin in the central territory of Hungary. It extends southwards to the Balkans and northwards to western and eastern Slovakia. The basin was born by rifting during Miocene time and was filled by great thickness of Neogene and Quaternary sediments.

1.4.6 Austria: Between the Alps and the Bohemian Massif

Austria can be geologically subdivided into four main units:

1. The Alps, mainly the Eastern Alps
2. A Molasse Zone in the Alpine Foreland
3. Tertiary basins in the eastern part of the country
4. Southern parts of the Bohemian Massif

The Alps represent a young orogen composed of nappes, thrusts, and other tectonic phenomena. The structures were created by the collision of the African and Eurasian plates. This process started 150 Ma ago, during the Upper Jurassic, and is still in action.

The Austrian Eastern Alps were created by overthrusting and northward movements of nappes. They consist of Mesozoic limestones and dolomites and are subdivided into the Northern Calcareous Alps and Southern Calcareous Alps. Erosional processes have caused so-called geological windows to appear on the surface, exposing rocks of the Alpine basement.

The Calcareous Alps are underlain by Lower Palaeozoic greywackes, phyllites, and limestones, which, again, lie on the metamorphic rocks.

The Pennine Nappes consist of Precambrian and Cambrian gneisses with granite intrusions. Younger sediments are of Palaeozoic age, with youngest Cretaceous and Lower Tertiary ages. During the Tertiary, as a response to mountain uplift, a thick flysch sequence was deposited.

After the Austroalpine nappes had been thrust over the Flysch Zone, the foreland basin in the north was filled with sand and gravel, material that was produced by post-tectonic massive erosion of mountains. This area is called the Molasse Zone.

A vast marine belt that spread through north Austria (from the German Black Forest up to the Black Sea) was called Paratethys. In Lower Austria, sediments of Badenian age were deposited, still in a marine environment. Younger deposits of Sarmatian age were deposited in brackish waters, whereas Pannonian sediments are already of freshwater origin.

In Austria the Eastern Alps were formed by a northward movement of overthrusts and nappes. The so-called Calcareous Alps are composed mostly of Mesozoic limestones and dolomites. Erosional processes "opened" so-called geological windows and uncovered the basement with its metamorphic rocks and older sediments.

Thrusting of nappes over the Flysch Zone was accompanied by filling of foreland basins with sand and gravel. This sequence is called the Molasse Zone.

The Eastern Alps are subdivided into old Precambrian and younger Cambrian gneisses. Also in the area are Palaeozoic metamorphic rocks, younger Variscian granites, and Triassic and Jurassic sedimentary rocks, with some ophiolites.

Several zones stretch through the Austrian territory, roughly from west to east. The Helvetic zone crops out as a narrow nappe thrust over molasse in the Alpine Foreland. A Greywacke zone with Palaeozoic metamorphosed sediments forms another band through the Austrian Alps. The Pennine zone is formed by nappes comprising metamorphic rocks and flysch. The Calcareous Alps cover great parts of the Austrian territory. The so-called Gosau Group is a lithostratigraphic member of the Northern Calcareous Alps.

The Bohemian Massif, which reaches to the Danube River, consists of a diverse complex of metamorphic rocks and magmatites.

Early and Modern Portraits of the Earth

This chapter offers descriptions of the geology of countries belonging to Central Europe. One sees how diverse this geology is. Geological maps constructed by advanced methods, to different scales and for different purposes, were worked out by responsible persons or the geologic teams of Central European countries.

So, we can now easily monitor the knowledge of early naturalists and geologists and observe the gradual progress of geological cartography and geology as a whole.

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Descriptions of Individual Maps with Their Reproduction

2

J. Kozák et al., *Early Geological Maps of Europe*, DOI 10.1007/978-3-319-22488-6_2

Map 01 Mappam Mineralographicam in qua negleta accurata locorum diftantia. (Source: Private collection, I. Tunyi)

2.1 Descriptions of Individual Maps with Their Reproduction

Mappam Mineralographicam in qua neglecta accurata locorum diftantia. Hungarie Superioris Fodinae magis diftinete exhibentur.
1726
Luigi Ferdinando Marsigli

Title in English A mineralogical map in which exact distances are neglected. The area of Upper Hungary is depicted.

Scale The scale is not given on the map: it is approximately 1:1,635,000.

Supplement to the Book The map is enclosed as a graphical supplement to the book by Luigi Ferdinando Marsigli entitled *Description du Danube, depuis la montagne de Kalenberg en Autriche, jusqu'au confluent de la rivère Jantra dans la Bulgarie*, Tome I. et III. /Traduite du Latin/. Haga. (*Description of the Danube, from the Kahlenberg Mountain in Austria to its confluence with the Jantra River in Bulgaria, Vols. I. and III*. Translated from Latin. The Hague.)

Legend The map is without its own separate legend. Only one note with a description on the map is added concerning the occurrence of gold. The occurrence of some other metals is depicted by symbols but is not explained on the map. Some straight lines can be recognized on the map, probably showing the strike of ore veins.

Coordinates The map contains outdated counterclockwise radial divisions of longitude with a center to the northeast of *Lučenec* Town (present Slovakia). Coordinates are derived from the map and correspond to 43°40′–49°20′ N, 17°40′–25°30′ E (in Greenwich).

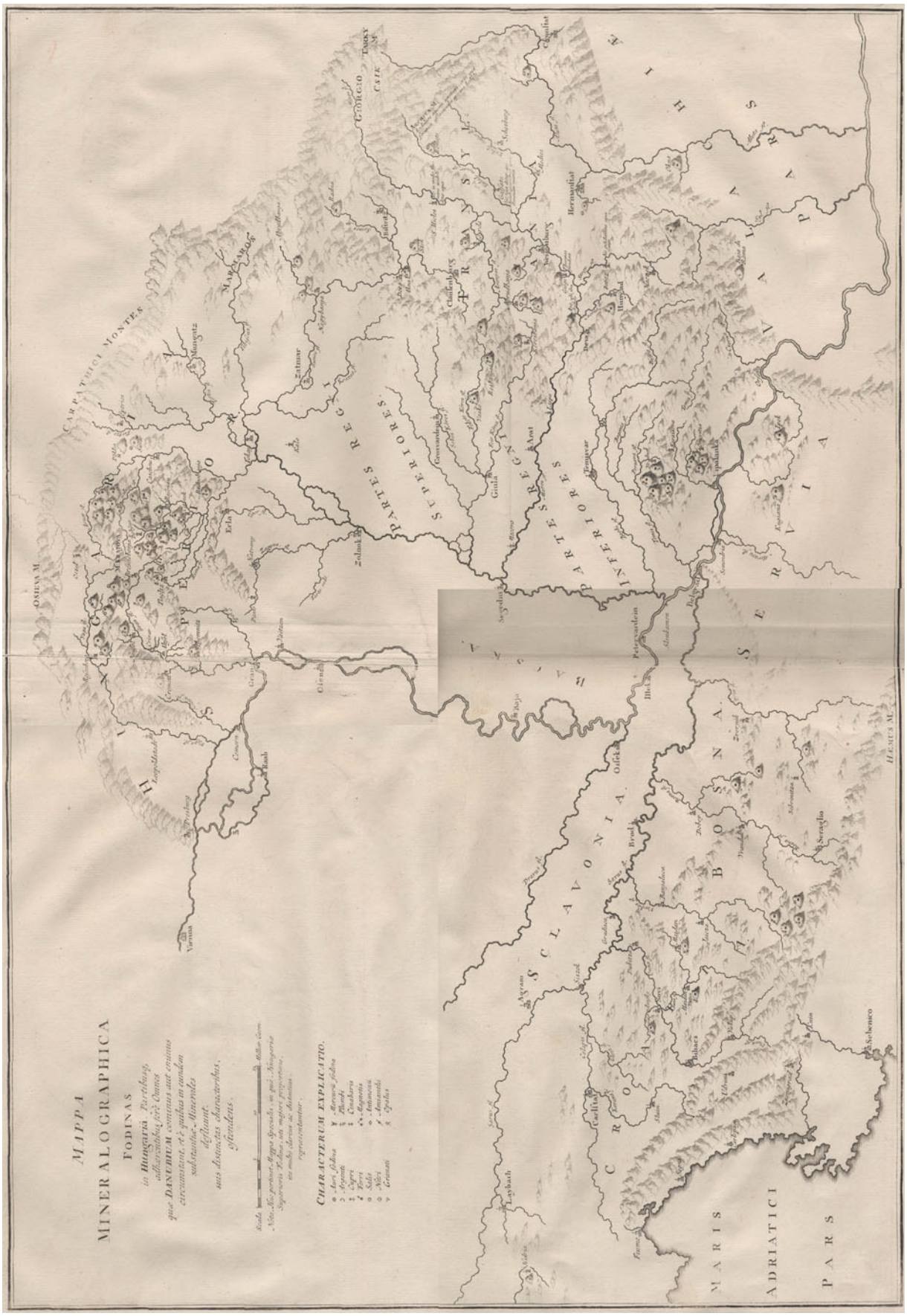
Mapped Area About 100,000 km^2.

Mapping Area Former Austrian Empire, present Slovakia, Hungary, Slovenia, Croatia, Rumania, Bulgaria.

Size of the Document At this moment, the original of this map is not available.

Deposition Information Geological and Geophysical Institute of Hungary, Dept. of Geo-informatics.

Supplementary Information
This map, dated to year 1726, is meant as a topographic map with brief information about minerals including ores and their short descriptions.



Map 02 MAPPA MINERALOGRAPHICA FODINAS in Hungariâ. (Source: Geological and Geophysical Institute of Hungary)

MAPPA MINERALOGRAPHICA FODINAS in Hungariâ. Paribusq adherentibus ferè Omnes quæ DANUBIUM cominus aut eminus circumstant, et è quibus in eundem substantiæ Minerales defluunt, suis discintas characteribus ostendens.
1741
Louis Ferdinand Marsigli

Title in English Abbreviated: Mineralographic map of mine and mineral occurrences in Hungary.

Year of Publication The year 1741; although this date is not on the map, it is generally known.

1744, third edition

Scale The scale is given on the map in old miles: it is approximately 1:1,550,000.

Supplement to the Book The map is an attachment (Table IV) to the book *La Hongrie et le Danube*, par M. le comte de Marsigli, en XXXI partes très-fidèlement gravées d'après les dessins originaux et les plans levés sur les lieux par l'auteur même. Mr. Bruzen de la Martinière, à la Haye (Den Haag).

Legend Legend includes symbols only for following 14 items: gold, silver, copper, iron, salt, nitrate, garnet, quicksilver, lead, cinnabar, magnetite, antimonite, "amiante," opal.

Coordinates No coordinates are given on the map: they are deduced approximately 44°00′–49°30′ N, 13°00′–28°30′ E (in Greenwich).

Mapped Area Approximately 600,000 km^2.

Mapping Area Northern and Eastern Hungary, Transylvania, Croatia, Slovenia, Bosnia (present Slovakia, Hungary, Croatia, Slovenia, Serbia, Bosnia, and Herzegovina, Romania).

Size of the Document 455 × 660 mm.

Deposition Information Original is deposited in Geological and Geophysical Institute of Hungary, Dept. of Geoinformatics. Registered signature: Inventory number 607.

Supplementary Information
This map is really a mineralogical map, so it can be called a proto-geological map, showing occurrences of important ores and some interesting minerals. The importance of this mineralogical map of by L.F. Marsigli from the year 1741 is in the registration and mapping of occurrences of important ores and some interesting minerals in a large area (Hungary, Transylvania, Croatia, Slovenia, Bosnia). It is evident that this map could be used for strategic and economic purposes.

Map 03 Carte Minéralogique des Pologne. (Source: Private collection, P. Krzywiec)

Carte Minéralogique de Pologne
1764
Jean-Étienne Guettard

Title in English Mineralogical map of Poland.

Scale The scale is given on the map in *German* and *French miles*: it is approximately 1:4,400,000.

Supplement to the Book The map is enclosed as a graphical supplement to a paper by Jean-Étienne Guettard: "Memoire sur la Nature du terrain de la Pologne et des Mineraux qu'il renferme," p. 2, published in *Mémoires de l'Académie Royale des Sciences*. Année MDCCLXII. (*Memoir concerning the nature of terrain of Poland and the minerals it contains, p. 2. In Memoirs of the Royal Academy of Sciences. Year MDCCLXII).* De l'Imprimerie Royale, Paris. First edition.

Legend The map has no legend, but it contains four basic subdivisions ("belts," or bandes): the first and third are shown on the map as "belt of sand" (*bande sableuse*), and "belt of salt" (*bande saline*). Only the main relief features are shown as mounds (as topographic highs and lows). The map also shows cities and rivers.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*[1]; they are approximately 48°00′–57°40′N, 14°40′–32°00′E (in Greenwich).

Mapped Area Approximately 315,000 km^2.

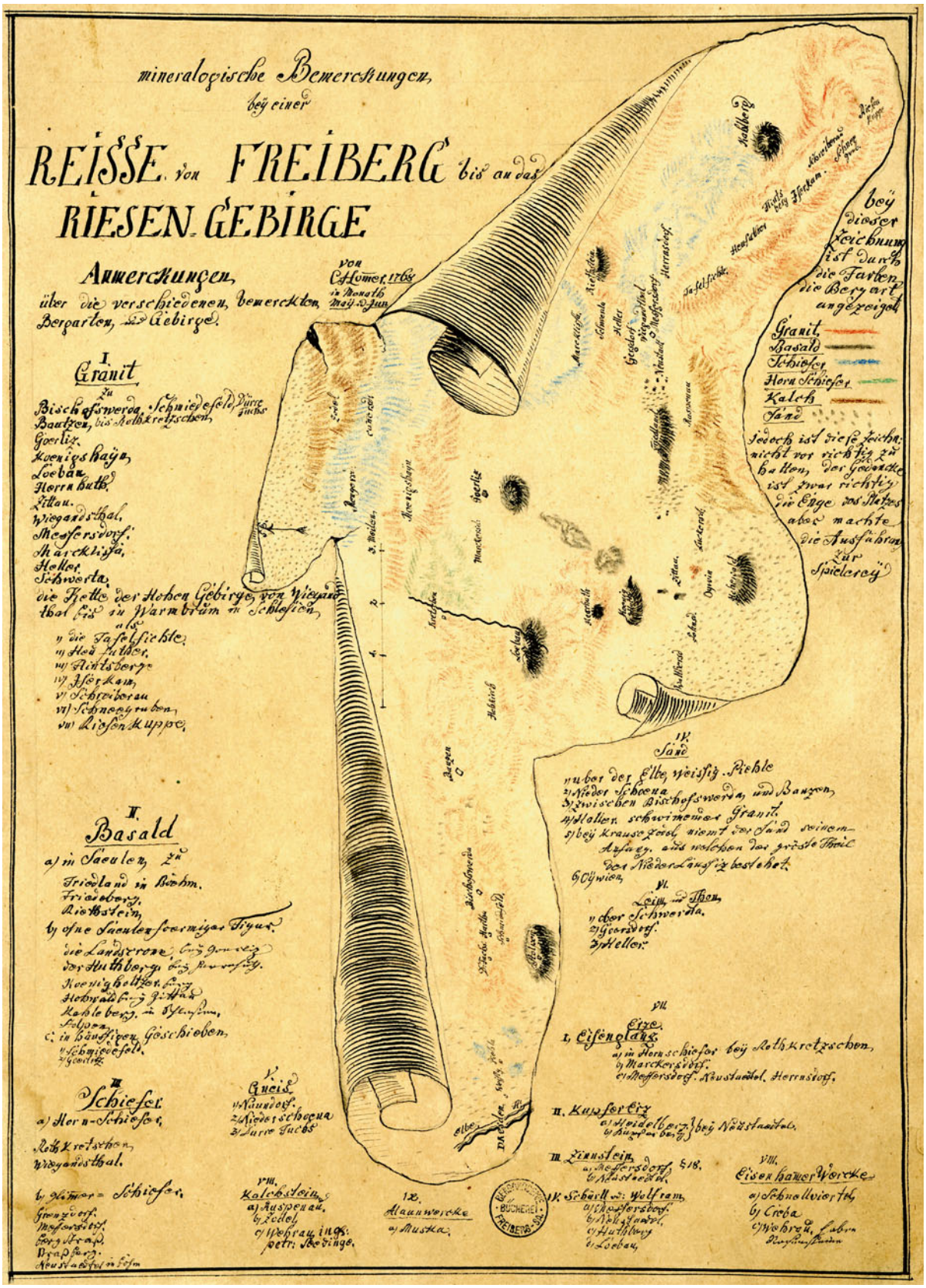
Mapping Area A part of the Carpathian Arc and its foreland: Poland (focused on central and northern Poland), Ukraine, Romania, Belarus, Lithuania, Latvia, and part of Russia.

Size of the Document 250×230 mm.

Deposition Information A copy of this map is from the private collection of P. Krzywiec.

Supplementary Information
The map is meant as a first geological, mineralogical map of Poland and surrounding countries. This early map of by J.E. Guettard covers the huge areas around the Carpathian Arc in the south to the Baltic sea in the north, whereas the western part of the map is limited by the territory along Wisla River and to the east by the mighty Dnieper River. Almost half the upper part of the region is covered by sandy sediments; in the strip from Wieliczka along the Carpathian Arc to the southeast stretches a belt of salt sediments.

[1]The line of longitude running through El Hierro (a part of the Canary Islands) is called Ferro and was known in European history as the prime meridian. It was later found that the actual island of El Hierro itself is in fact 20 degrees west of Paris (in fact 20°23′09′′ west of Paris and 18°08′51′′ west of Greenwich). According to - https://en.wikipedia.org/wiki/Ferro_Meridian.



Map 04 Mineralogische Bemerkungen beÿ einer Reisse von Freiberg bis an das Riesen Gebirge. (Source: Library of Mining Academy of Freiberg)

Mineralogische Bemerkungen beÿ einer Reisse von Freiberg bis an das Riesen Gebirge. Anmerckungen über die verschiedenen bemerckwerten Bergarten und Gebirge von Ch. Lommer.
1768 in Monach May u Jun 1768
Christian Hieronymus Lommer

Title in English Mineralogical notes of a journey from Freiberg to the Giant Mts.–*Krkonoše Mts.*). Comments by C. Lommer on miscellaneous and remarkable types of rocks and mountains. Published 1768 in the months of May and June.

Scale The scale is not given on the map: it is approximately 1:120,000.

Title of the Book Ch. H. Lommer: Mineralogische Bemerkungen bey einer Reise von Freiberg bis an das Riesengebirge. Anmerkungen über die verschiedenen bemerckwerten Bergarten und Gebirge. Freiberg. First edition. (*Mineralogical observations during a trip from Freiberg to the Giant Mts.–Krkonoše Mts. Notes on the various remarkable rocks and mountains*.)

There is an attachment to Lommer's report on the expedition, which studied rocks and mineral resources of the respective areas. The map is a geological map, focused on rock types and mineral deposits.

Legend The map incorporates colours and symbols, but borders between units are not sketched. The legend is drawn out of an unrolled scroll area and contains a description of rocks and localities: I. Granite (red); II. Basalt (black); III. Shale (blue); IV. Mica schist (green); V. Gneiss (brown); VI. Limestone (localities of individual rocks are coloured). Separately, in a part of VII, symbols are given for minerals: sand, loam and clay, chert, and ores (hematite, Cu, Zn, W ores), alum shales, and mine workings. Several occurrences of each item are added. Some tectono-stratigraphic units and morphological units are depicted, such as the Elbsandsteingebirge Mts., Lusatian Granite, and basalt Inselbergs.

Coordinates No coordinates are given on the map: they are deduced approximately 50°45′–51°10′ N, 14°10′–15°30′ E (in Greenwich).

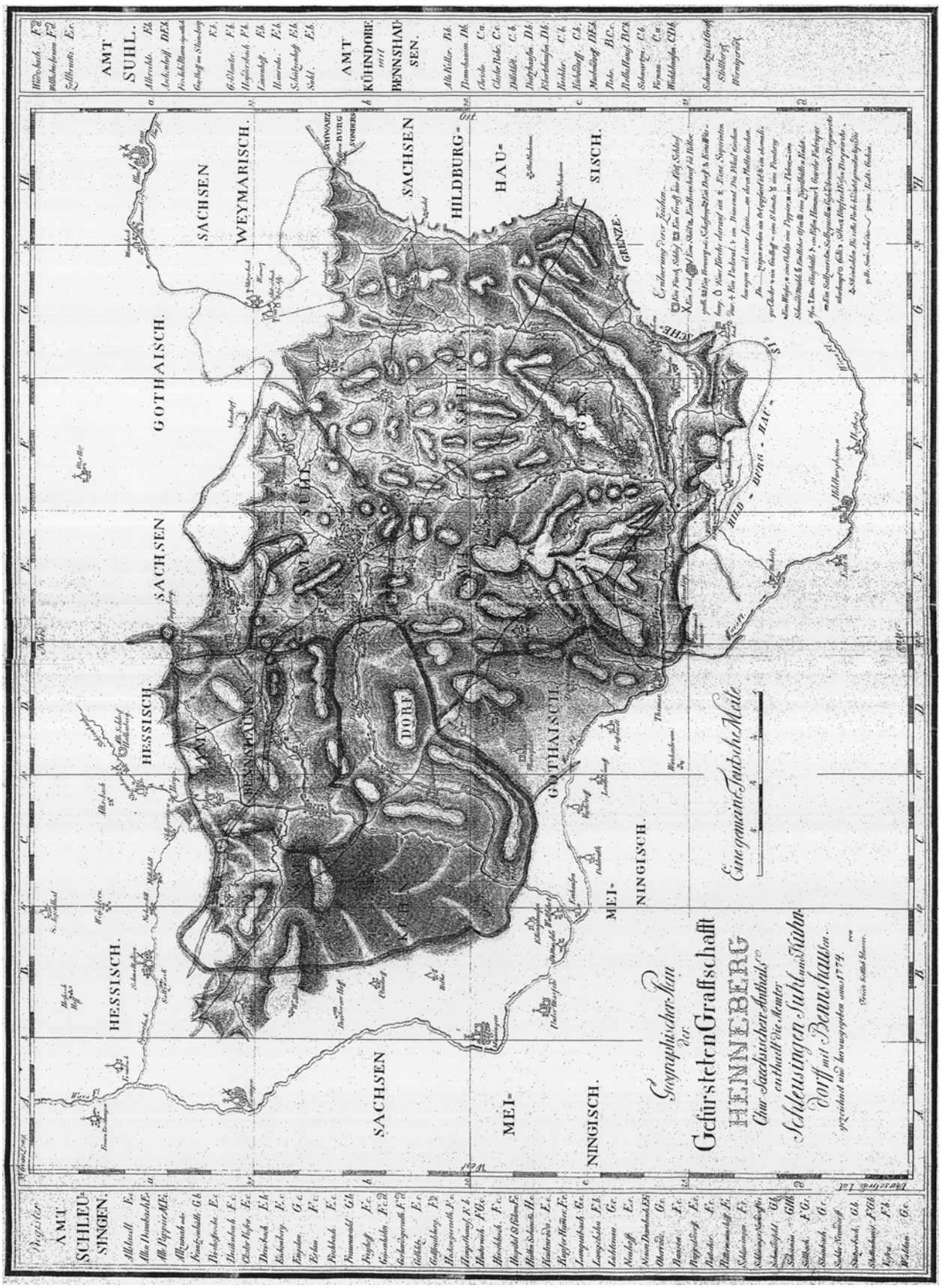
Mapped Area Parts of Saxony, Upper Lusatia, Northern Bohemia (present Germany, Czech Republic, Poland).

Size of the Document 480×290 mm.

Deposition Information Original document is in the Mining Academy of Freiberg. Signature XVII 129.

Supplementary Information
The map by C.H. Lommer has been often called "protogeological" because of the very simple mapping of geological units and archaic style of depiction.

Currently, however, the map is more highly appreciated as the first true coloured geological map of Saxony. The map is drawn in an atypical form of a partly unrolled scroll.



Map 05 Geographischer Plan der Gefürsteten Graffschafft Henneberg. (Source: Private collection, J. Kozák)

Geographischer Plan der Gefürsteten Graffschafft Henneberg. Chur Saechsischen Antheils enthaelt die Aemter Schleusingen Suhl und Kühndorff mit Bennshausen gezeichnet und herausgegeben anno 1774 von Friedr. Gottlob Glaeser
1774
Friedrich Gottlob Glaeser

Title in English Geographic map of the Henneberg County. State of Saxony; contains regions of local authorities of Schleusingen, Suhl and Kühndorf with Bennshausen. Drawn and published in 1774 by Friedr. Gottlob Glaeser.

Scale The scale is given on the map: it is approximately 1:25,000.

Supplement to the Book Friedrich Gottlob Glaeser: Versuch einer mineralogischen Beschreibung der Graffschafft Henneberg. (*Report on the mineralogical description of the Henneberg Earldom*.)

Legend In the right-lower corner of the map (in the colour version) is a colour-coded description of lithologies: red, granite; yellow, sandstone; green, limestone. In this atlas we present a black-and-white copy from the private collection of J. Kozák. Symbols are also provided that indicate settlements with their churches, castles, and estates. It also contains symbols designating mine workings, mineral deposits (Au, Ag, Cu…), and glass- or iron-processing plants.

The map by F.G. Glaeser is a topographic map with hatch marks indicating valleys and elevations. Settlements, rivers, some transport routes, and borders between estates are also shown. An interesting grid pattern divides the map into designated rectangles. Longitude lines, spaced at 5° intervals, create eight north–south columns, each of which is designated with a capital letter (A–H) at the edges of the map. Latitude lines, also in 5° increments, generate four horizontal rows, each designated with lowercase letters (a–d). Intersections of the lines create rectangular areas, such as "Eb," that can then be located on the map. The legends along both sides of the map give the names of the areas in alphabetical order, along with their locator code (capital letter for longitudinal column and lowercase letter for latitudinal row): "Eb" identifies the region of Albrechts, for example.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 50°20′–50°40′ N, 10°10′–10°40′ E (in Greenwich).

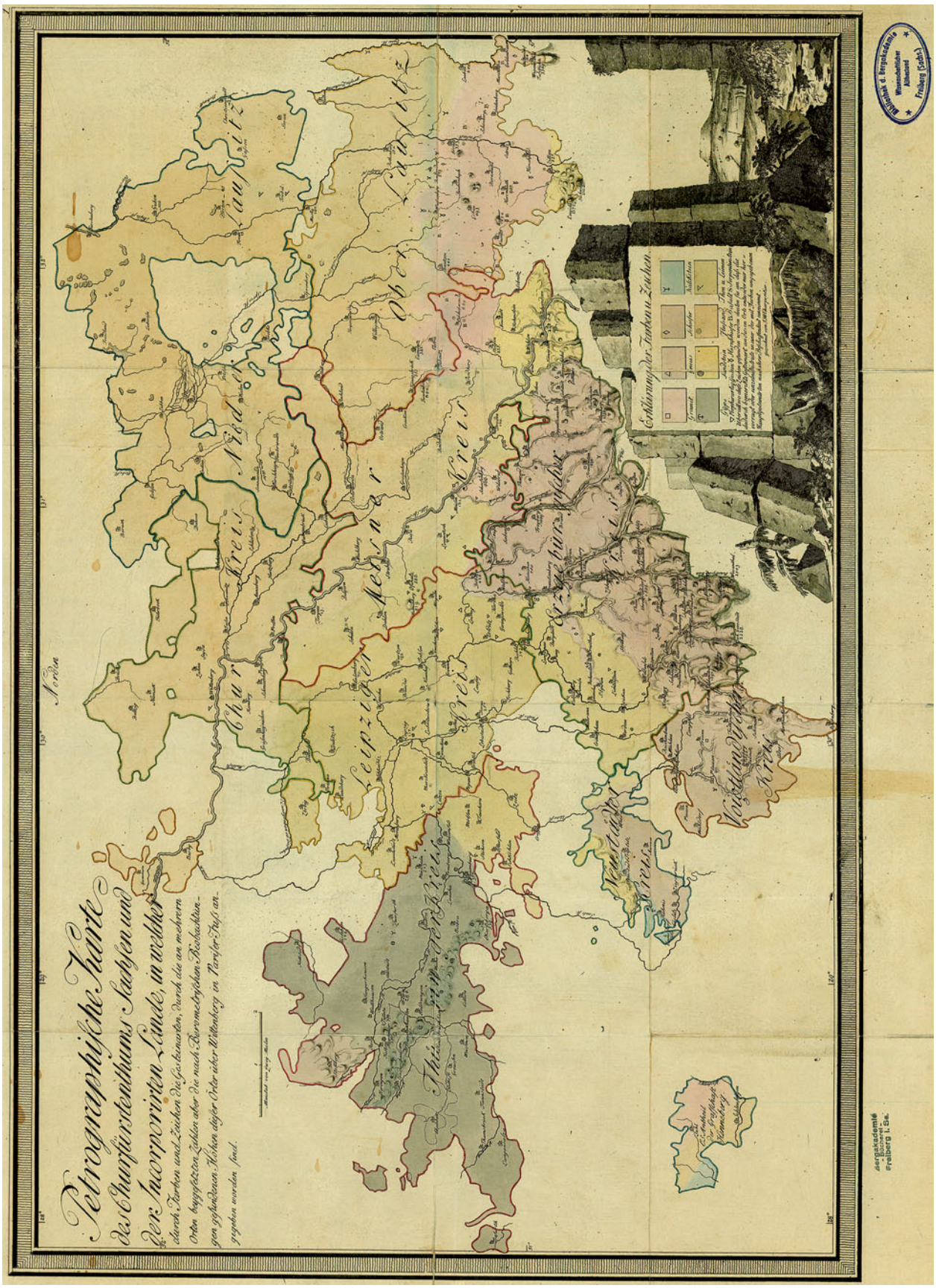
Mapped Area Approximately 1,200 km^2.

Mapping Area Part of Saxony, present Germany.

Size of the Document 600×450 mm.

Depository Information The original is deposited in the Munich Technical University. A black-and-white photocopy, which was used in this Atlas, is from the private collection of J. Kozák.

Supplementary Information
According to historians, the map by Friedrich Gottlob Glaeser represents the first coloured geological (geognostical) map of part of Saxony. It shows certain progress in geological knowledge and also in cartographic depiction of relief and geological data.



Map 06 Petrographische Karte des Churfürstentums Sachsen. (Source: the Library of Mining Academy of Freiberg)

Petrographische Karte des Churfürstentums Sachsen und der Incorporirten Lande, in welcher durch Farben und Zeichen die Gesteinarten, durch die an mehrern Orten beygesetzten Zahlen aber die nach Barometrischen Beobachtungen gefundenen. Höhen dieser Örter über Wittenberg in Pariser Fuß angegeben worden sind
1778
Johann Friedrich Wilhelm von Charpentier

Title in English Petrographical map of the Saxony and adjacent lands, in which colours and symbols depict the rock types, which occur on various places, and also barometric observations with figures and elevations given in Parisian feet.

Supplement to the Book The map was published in the book by Johann Friedrich Wilhelm von Charpentier: *Mineralogische Geographie der Chursächsischer Lande (Mineralogical geography of the Saxonian county lands).* Siegfried Lebrecht Crusius, Leipzig. First edition.

Scale The scale is given on the map: it is approximately 1:720,000.

Legend Located in a rectangle on columnar basalt in the background in the lower right corner of the map, with very simple countryland cartouche without ornamental elements. It contains eight items in coloured rectangles with symbols: granite, gneiss, shale, limestone, gypsum, sandstone, river sand, and clay with loam. Additional symbols and letters indicate locations of basalt, serpentines, and chert. Only two stratigraphy units are distinguished: older rocks and Quaternary sediments.

The map is based entirely on lithology. There is a simple topographic base, without relief, with main settlements, river flows, and elevations (given by "barometric measurements in Parisian feet").

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 50°20′–52°10′ N, 11°30′–14°40′ E (in Greenwich).

Mapped Area Approximately 80,000 km^2.

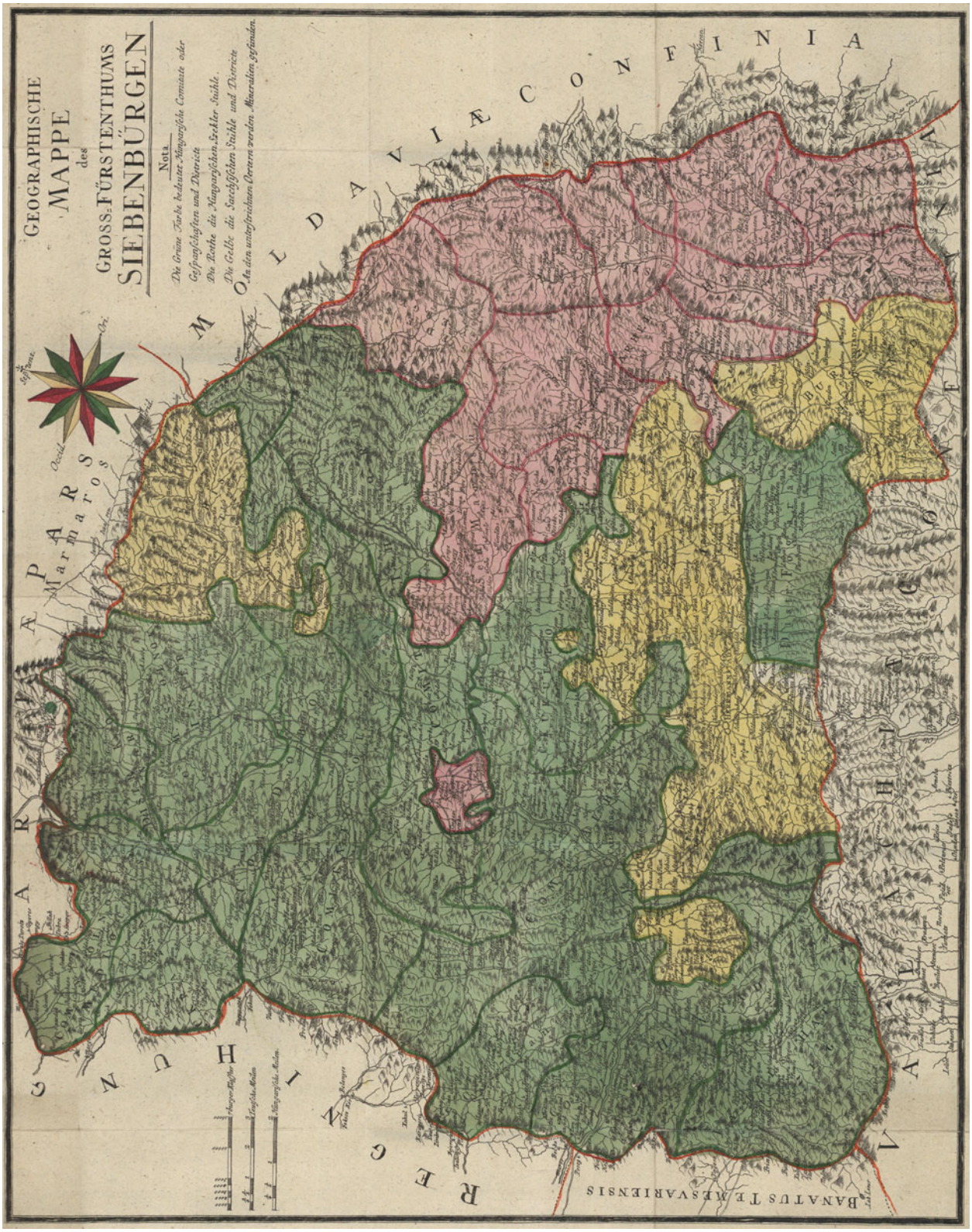
Mapping Area Saxony with the Upper and Lower Lusatia and a small part of Thuringia. Recent Germany with part of Poland.

Size of the Document 600×400 mm.

Deposition Information Original is deposited in the Library of the Mining Academy, Freiberg. Signature XVIII 128b.

Supplementary Information
By some historians, this map is taken for the earliest coloured map of Germany. Some others believe Charpentier's map postdates maps of J.E. Guettard and F.G. Glaeser.

The map indicates a revolutionary development of geology and mining in the Saxony and increased interest in metal mining. The geologically extremely interesting region of the Ore Mountains (Erzgebirge) has been mapped comparatively precisely, with recognition of magmatic and metamorphic rocks and adjacent Cretaceous sandstones.



Map 07 Geographische Mappe des Gross-Fürstenthums Siebenbürgen. (Source: Geological and Geophysical Institute of Hungary)

Geographische Mappe des Gross-Fürstenthums Siebenbürgen
1780
Johann Ehrenreich Fichtel

Title in English Geographic map of the Grand-principality of Transylvania.

Year Year not stated on the map but is generally known from the book's title page.

Scale The scale is given on the map in three ways - in *Habsburg Klasster*, in *German miles*, and in *Hungarian miles*: it is approximately 1:646,000.

Supplement to the Book Beytrag zur Mineralgeschichte von Siebenbürgen. Nachricht von den Versteinerungen des Gross-Fürstenthums Siebenbürgen mit einem Unhange und beygefügter Tabelle über sämmtlichen Mineralien und Foßilien dieses Landes. Erster Theil. (*On the mineral history of the Grand-principality of Transylvania, with attached list of minerals and fossils of this country. First volume*.) A supplementary graphical document: Plan der andeütet, wie der Unterrdische Salz-Stok von der Wallacheÿ angefangen, durch die Walacheÿ Moldau, Siebenbürgen, Hungarn und Pohlen, bis nach *Vieliczka* und *Pochnia* in Polen und bis *Sowar* in Hungarn längst der Karpatischen Gebürge fort streichet (*Extension of the underground salt reserves in the Carpathian range from Valachia, Moldavia, Transylvania, across Hungary and Poland, up to the Polish Wieliczka and Pochnia and the Hungarian Sowar*), I. Theil, Table I**.** Verlag der Raspische Buchhandlung, Nürnberg.

Legend J.H. Fichtel's map is in fact an administrative map, where districts and borders are drawn, and settlements with mining districts and occurrences of different raw materials are depicted, such as salt mines and salt springs.

A standard legend is missing, but underneath the map title there are four notes, with only the last one concerning geology, as follows: "An den unterstrichnen Oertern werden Mineralien gefunden" (*Around underlying settlements mineral deposits were found*).

Coordinates No coordinates are given on the map: they are deduced approximately 45°30′–48°05′ N, 21°30′–26°00′ (in Greenwich) E. The map has a rotation of 345°.

Mapped Area Approximately 60,000 km^2.

Mapping Area In the geographical map there are districts of Transylvania and a small part of Hungary (recent Romania and Hungary).

Size of the Document 456×436 mm.

Deposition Information Geological Institute of Hungary, Dept. of Geo-informatics. Inventory number 224.

Supplementary Information
J.E. Fichtel's map is not a geological map in the true sense of the word, but it contains some interesting geological data. According to F. Síkhegyi (Čejchanová et al. 2010) the aforementioned attachment to the book contains a list of mineral deposits and individual minerals, as well as of fossils. As expected, neither stratigraphy nor tectonics are mentioned at all. A depiction of salt mines and other salt occurrences is of special interest because of the date of this map.

Map 08 Petrographische Landkarte des Hochstifts Fuld. (Source: Library of Mining Academy of Freiberg)

Petrographische Landkarte des Hochstifts Fuld. Gezeichnet von J.C.W. Voigt 1782
1782
J.C.W. Voigt

Title in English Petrographical regional map of Fulda County. Sketched by J.C.W. Voigt 1782.
Publisher: Frankfurt am Mayn, J.C. Bernát

Scale The scale is given on the map in *old German miles*: it is approximately 1:160,000.

Legend The legend is very simple. It is situated in the lower right corner, framed by a drawing of castellated sandstones and dykes. It represents four trapezoids, where four types of rocks are distinguished in different colours: Vulcanische Berge (volcanic elevations, violet), Hornschiefer (silicites, yellow), Kalkstein (limestone, blue), Sandstein und sandiger Thon (sandstone and sandy shale, white). The units are not stratigraphically differentiated.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 50°10′–50°48′ N, 09°10′–10°10′ E (in Greenwich).

Mapped Area Approximately 8,000 km^2.

Mapping Area Fulda, Mainz, Kassel, and Würzburg counties, recent Germany.

Size of the Document 350×450 mm.

Deposition Information Original deposited in the Library of the Mining Academy, Freiberg. Signature No. 912.

Supplementary Information
This is one of the German maps illustrating increased interest in natural sciences by the end of the eighteenth century. J.C.W. Voigt's map can be classified as proto-geological because it shows several types of rocks placed on a topographic base map. Depiction of volcanic elevations is interesting, as well as that of silicites, sandstones, and limestones. However, a delimitation of occurrences of the individual rock units is not shown. Both stratigraphical and tectonic aspects are missing, as expected with regard to the year of the map's production.

Map 09 Petrographische Karte derer Kameral-Herrschaften Zbirow, Tocznik, Königshof, Miröschau, und Wossek. (Source: Archives of Czech Geological Survey)

Petrographische Karte derer Kameral-Herrschaften Zbirow , Tocznik, Königshof, Miröschau, und Wossek 1786
Johann Jirasek

Title in English Petrographical map of the estates *Zbiroh* (in Czech), *Králův Dvůr* (in Czech), *Mirošov* (in Czech), *Osek* (in Czech).

Scale The scale is given on the map in two ways: (1) in *Prague Klasster* and (2) in *Vienna Klasster*. It is approximately 1:97,200.

Supplement to the Book Versuch über die Naturgeschichte einiger in Berauner Kreisegelegenen Kammeral-Herrschaften, besonders Zbirow, Tocznik, und Königshof, und der anliegenden im Pilsner Kreise gelegenen Herrschaften Miröschau, und Wossek, von dem Landes-Ingenier Jirasek. (An attempt to describe a natural history of the estates of Zbiroh, Točník and and Králův Dvůr situated in the Beroun County together with the estates of Mirošov and Osek lying in the Plzeň County.) Published in the periodical *Abhandlungen der Böhmischen Gesellschaft der Wissenschaften*, auf das Jahr 1786 (*Proceedings of the Bohemian Society of Sciences for 1786*). Böhmische Gesellschaft der Wissenschaften. Waltherische Hofbuchhandlung, Prag–Dresden.

Legend The map has two legends. The first is framed in the upper left corner beneath the title and contains an explanation of topography with special symbols for royal towns, settlements, courts and farmyards, castles, churches and chapels, forester's lodges, mills, till-hammers, and post offices. In the second column are symbols for iron mines, limonite ore, jasper, granite, hard coal, and regolith ore. In the opposite corner there is a true geological legend consisting of squares with colours, symbols, and geological terms as follows: jasper, porphyry, breccia, iron ore, silicite, quartz, chert, limestone, sandstone, shale, gravelly sandstone, clay, loam.

Coordinates No coordinates are given on the map: they are deduced approximately 49°40′–49°55′ N, 13°40′–14°10′ E (in Greenwich).

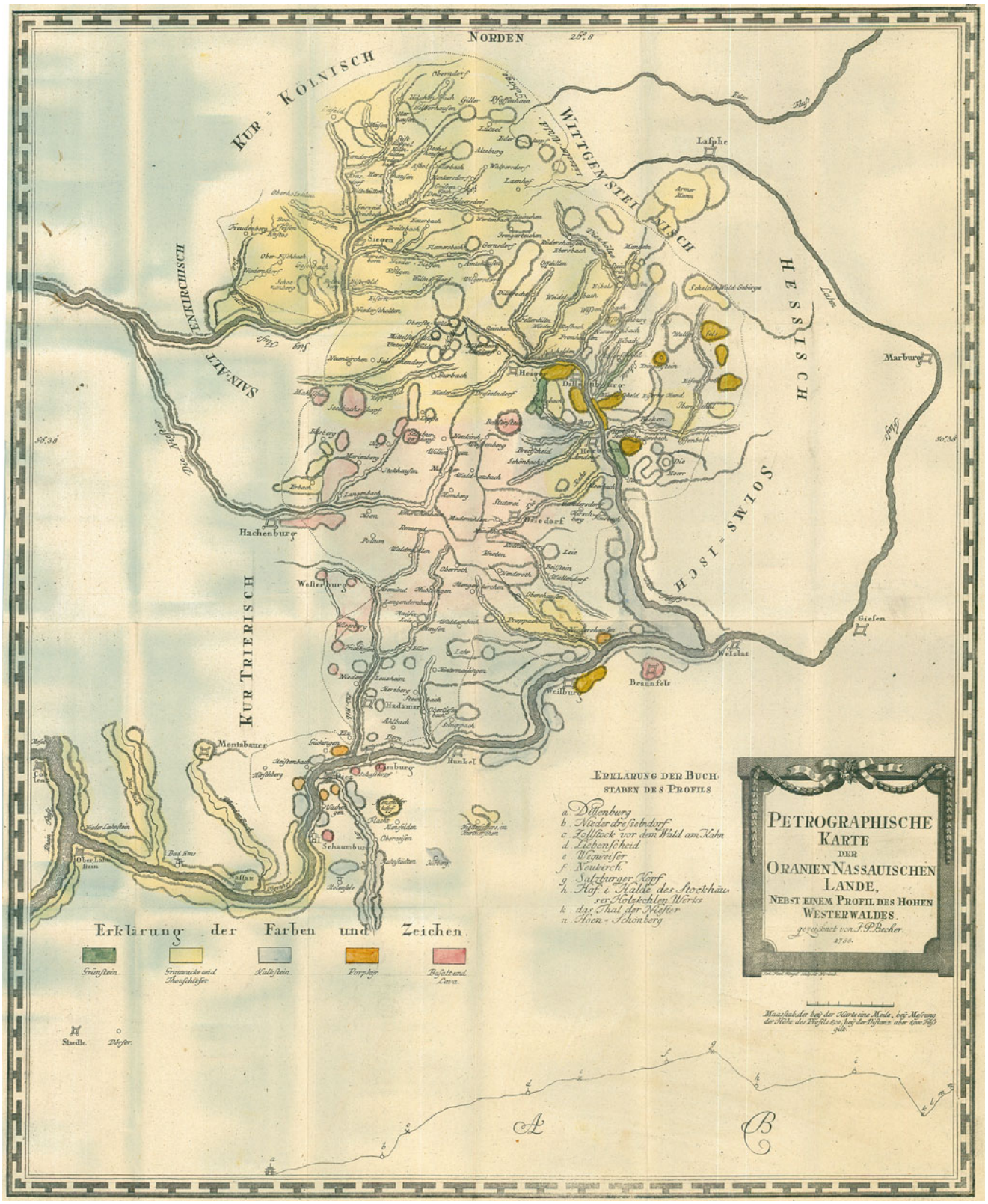
Mapped Area Approximately 1,500 km^2.

Mapping Area Central and Western Bohemia (present Czech Republic).

Size of the Document 354×473 cm.

Deposition Information The digital copy in colours used in this publication is in the Czech Geological Survey, Prague. Original in the National Library, Prague.

Supplementary Information
The map is situated with north at the bottom. J. Jirasek's map represents a petrographical map illustrating distribution of rocks of undefined ages, starting with granites through what we term Proterozoic and Paleozoic, up to Quaternary deposits. Locations of some mineral deposits are also indicated, such as hard coal, iron, and building materials, as well as mine workings. Mapping was based on field trips and description of outcrops not evenly scattered throughout the area. The map is of great importance as an index of development of geological knowledge. Accurately fixed boundaries between the Proterozoic shales with lydites, and Ordovician and Devonian sediments are particularly noteworthy. Volcanic rocks representing the recently known *Křivoklát-Rokycany* Zone are depicted. The map can be considered a milestone in the history of geological mapping in Czech lands. The map also shows increased interest on the part of nobility and landowners regarding mineral resources, as well as awakening involvement of Czech authors in researching the natural history of the Bohemian territory.



Map 10 Petrographische Karte der Oranien Nassauischen Lande. (Source: Library of Mining Academy of Freiberg)

Petrographische Karte der Oranien Nassauischen Lande Nebst einem Profil des Hohen Westerwaldes. Gezeichnet von J.P. Becher
1788
Johann Philipp Becher

Title in English Petrographical map of the Oranien–Nassau Lands, with a cross section through the Hohen Westerwald. Drawn by J.P. Becher.

Scale The scale is given on the map: it is approximately 1:120,000.

Supplement to the Book Mineralogische Beschreibung der Oranien-Nassauischen Lande nebst einer Geschichte des Siegenschen Hütten-und Hammerwesens. (Mineralogical description of the Oranien-Nassau Lands, including notes on a history of the Siegen steelworks and hammer mills.) Marburg, in der Neuen akademischen Buchhandlung.

Legend The legend has five items in coloured rectangles; it is placed in the lower left corner. The legend contains the following items: serpentinite; greywacke with shale; limestone; porphyry; basalt with lava. Depiction of Tertiary basalt occurrences is comparatively precise, with contouring, but boundaries between the Palaeozoic greywacke and limestone are not depicted. Two separate symbols, placed beneath the legend, are used for towns and estates. A topographic map is pictured with towns (in capital letters) and smaller settlements (in italics). A small part of the Rhine River is situated on the left side of the map, and a major part of the Lahn River is shown on the opposite side, which limits the mapped area to the south and east. A cross section below the map shows only surface elevations, not geology.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 50°00′–51°00′ N, 08°00′–09°05′ E (in Greenwich).

Mapped Area Approximately 9,600 km^2.

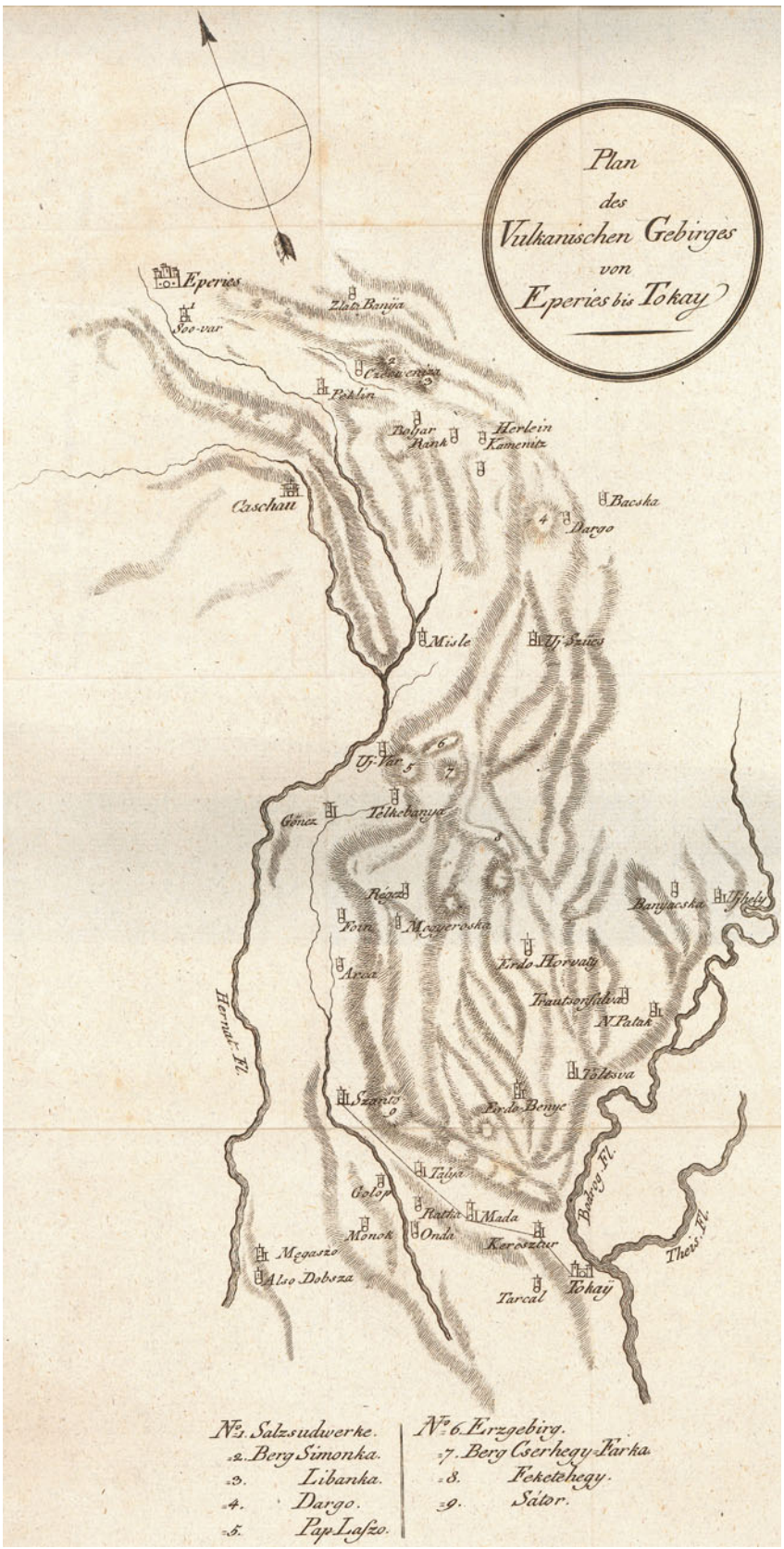
Mapping Area Mapping area includes the former Oranien and Nassau Lands, at present within the Federal Republic of Germany. Confluences of the Mosel River with the Rhine, and of the Lahn with the Rhine, are shown at the left margin of the map. Marburg City is at the right margin of the map.

Size of the Document 400×450 mm.

Deposition Information Original is deposited in the Mining Academy, Freiberg. A coloured copy is in the Czech Geological Survey, Prague.

Supplementary Information
Because J.P. Becher's map, issued in 1788, concerns neither mineral deposits nor mine workings, its main objective was to map topography and rock units. It undoubtedly indicates increasing interest of naturalists and political circles in research and documentation of natural conditions in their lands. This map represents considerable advancement in knowledge of European geology.

Map 11 Plan des Vulkanischen Gebirges von Eperies bis Tokay. (Source: Geological and Geophysical Institute of Hungary)



Plan des Vulkanischen Gebirges von Eperies bis Tokay 1791
Johann Ehrenreich Fichtel

Title in English Map of volcanic mountains from Eperies (*Prešov*) to *Tokaj.*

Year of publication: 1791 (not on the map, but generally known from the book's title page).

Scale The scale is not given on the map: it is approximately 1:360,000.

Supplement to the Book Mineralogische Bemerkungen von den Karpathen. Erster Theil. (Mineralogical notes on the Carpathians. First Part.)
Publisher: Joseph Edlen von Kurzbeck. First edition

Legend A simple legend in the lower part of the map depicts and numbers mineral deposits of salt and ores.

J.E. Fichtel's map is in fact of topographical character, with location of whole volcanic areas portrayed by hachures, as well as individual hills. The mapped area is delimitated by two rivers, namely, *the Hernád* River and *Bodrog* River.

Coordinates No coordinates are given on the map: they are deduced approximately 48°10′–49°00′ N, 21°15′–21°30′ E (in Greenwich). The map has a rotation of 30°.

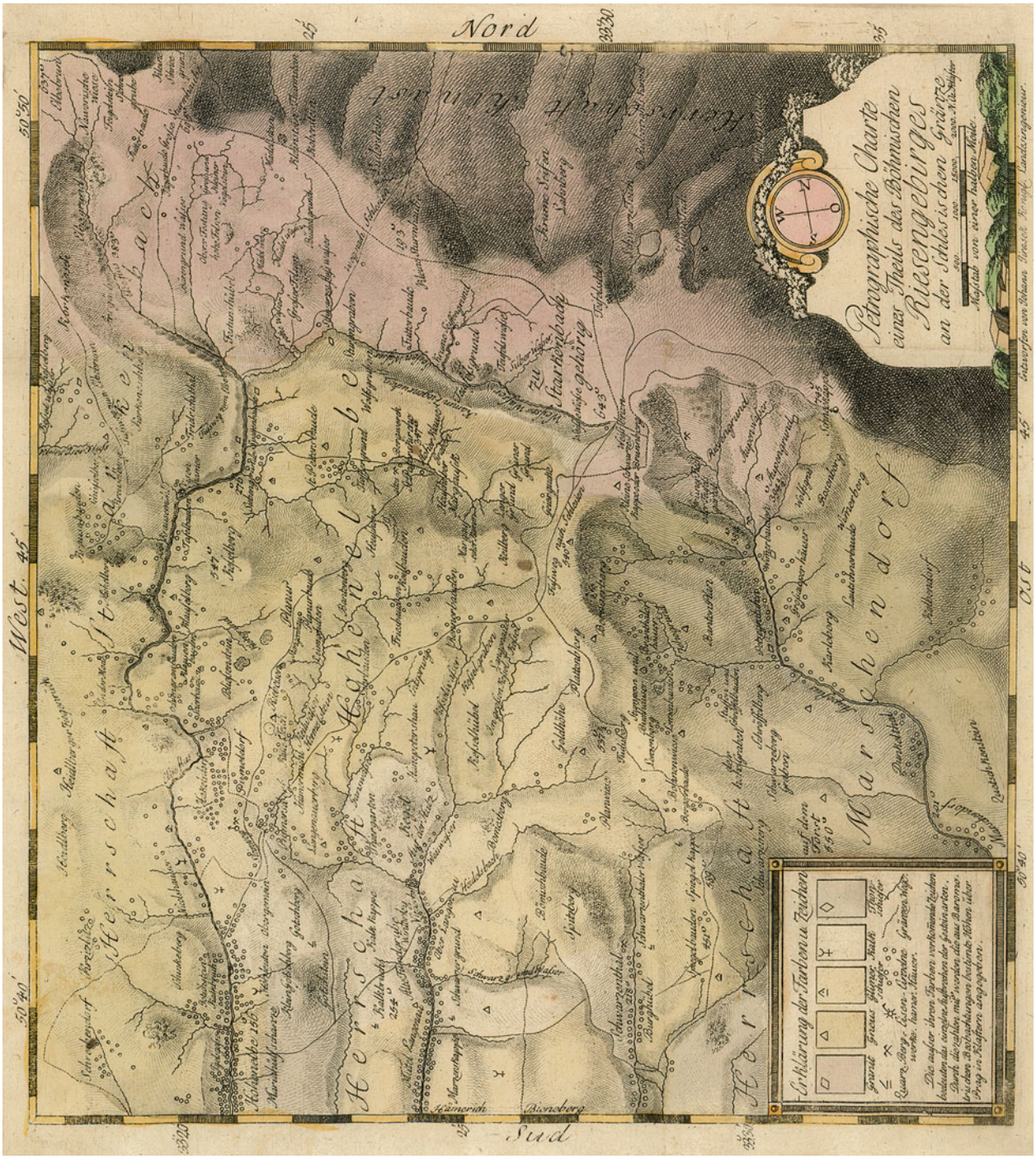
Mapped Area Approximately 3,000 km^2.

Mapping Area An area of *Tokaj–Eperies* (in Slovak *Prešov*) Hills in the Austrian Empire; at present it covers areas in Slovakia and Hungary.

Size of the Document 220×390 mm.

Deposition Information Geological Institute of Hungary. Inventory number 3085.

Supplementary Information
Fichtel's map is a typical topographic map with sparse geological data, concerning only deposits of salt and some ores. Nevertheless, the depiction of a strike and delimitation of volcanic elevations is of importance.



Map 12 Petrographische Charte eines Theils des Böhmischen Riesengebirges an der Schlesischen Gränze. (Source: Private collection, S. Wolkowicz.)

Petrographische Charte eines Theils des Böhmischen Riesengebirges an der Schlesischen Gränze
1791
Johann Jirasek

Title in English Petrographic map of a part of the Bohemian Giant Mts. (*Krkonoše* Mts.) along the Silesian borders.

Scale The scale is given on the map in *Prague* and *Vienna feets*: it is approximately 1:80,000.

Supplement to the Book Beobachtungen auf Reisen nad dem Riesengebirge. (*Observations from the expedition to the Krkonoše Mts.*, by Johann Jirasek, Abbé Gruber, Tadeus Haenke, Franz Gaerstner). 1791. First edition. The Royal Bohemian Society for Sciences and Arts in the Waltherrische Hofbuchhandlung, Dresden.

Legend Decoratively simple cartouche with a title and with lubber line (compass) are situated in right bottom corner of the map. A legend of the map is attached in left bottom corner in opposite. Special attention is paid to the petrography, with rock type identified with a combination of colors and symbols is attached in left bottom corner. The following main rock types are distinguished by colors: granite, gneiss, mica schist, limestone, and shale. Smelters and till hammers are shown by special symbols. The map construction is based on lithology, and main rock types are indicated. Ages of Proterozoic and Palaeozoic metamorphosed complexes, as well as of Upper Palaeozoic sediments and granite, are not specified. The occurrences of youngest Quaternary sediments, such as fluvial sands with gravel and glacial sediments, are missing on the map.

Comparisons of Jirasek's 1791 map to current geological knowledge are worth mentioning, especially the recent establishment of boundaries between the *Krkonoše* Granite Massif and the neighboring metamorphic rocks, as in the *Bílé Labe* (White Elbe) valley.

Coordinates No coordinates are given on the map: they are deduced approximately 50°40′–50°50′ N, 15°30′–15°50′ E (in Greenwich). Map orientation is given: west up, east down, south to the left, and north to the right.

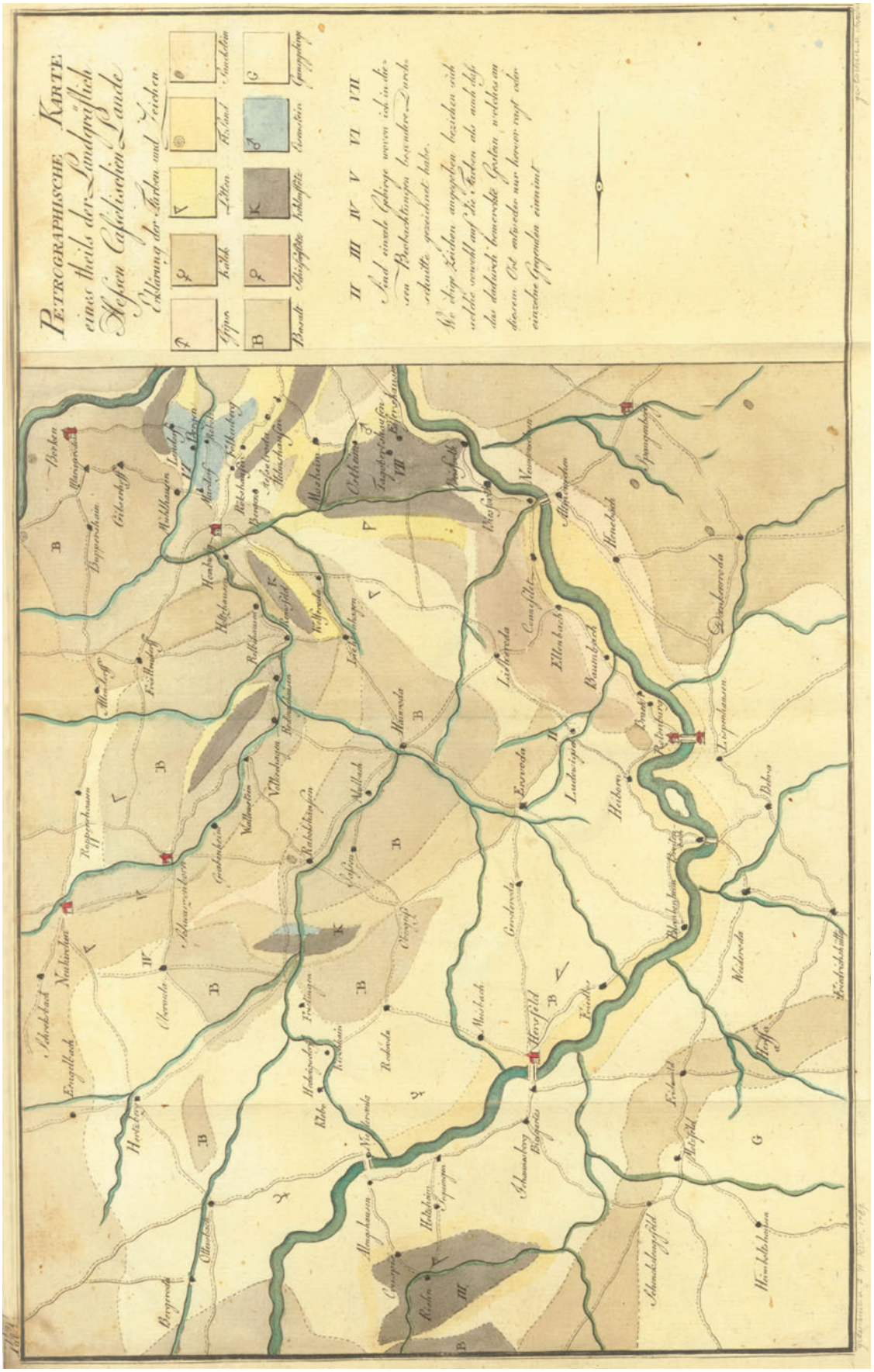
Mapped Area Approximately 400 km^2.

Mapping Area Krkonoše Mts. (Riesengebirge Mts.), and parts of central Bohemia (Czech Republic). Northern Bohemia, in the northern mapped territory, is delimitated by state boundaries.

Size of the Document 254×282 mm.

Deposition Information A copy is at the Czech Geological Survey. Signature M 2 B 329/283. A copy also is in the private collection of S. Wolkowicz.

Supplementary Information
The first geological map of the Giant (*Krkonoše*/ Riesengebirge) Mts., created during the first historical scientific expedition. Geology is described in one of the chapters; the book considers also botany, physical geography, meteorology with climatology, and ethnology. The expedition was organized and sponsored by the Royal Bohemian Society for Sciences, and by nobility and landowners, as well as by local managers, to find and register potential human, biological, and mineral resources of the area. Data on old mine workings and settlements are valuable as well. Some geological observations, such as the fixing of boundaries between the *Krkonoše* Granite and metamorphic rocks, are valid to the present.



Map 13 Petrographische Karte eines Theils der Landgräflich Hessen Casselischen Lande. (Source: The Library of Mining Academy of Freiberg)

Petrographische Karte eines Theils der Landgräflich Hessen Casselischen Lande
1789, 1791
Johann Philipp Riess

Other Authors Dietrich Ludwig Gustav Karsten (mit Anmerkungen begleitet–commented).

Title in English Petrographical map of a part of Hesse and Kassel Counties.

Scale The scale is not given on the map: it is approximately 1:80,000.

Supplement to the Book Johann Philipp Riess und mit einigen Anmerkungen begleitet von Dietrich Ludwig Gustav Karsten: *Mineralogische und bergmänische Beobachtungen über einige Hessische Gebirgsgegenden. (Mineralogical and mining observations on the Hessen rocks*. J.P. Riess, commented by D.G. Karsten.) Königliche Buchdruckerei, Heinrich August Rottmann, Berlin (Royal Printing Office and Publishing House). Publication year 1791. According to inscription on a book page the map was printed in the "Königliche Buchdrucklerei." George Jacob Decker und Sohn.

Legend A legend is given on the right of the map beneath the title. It contains ten items, coloured rectangles with symbols: greenstone, limestone, clay and earth, fluvial deposits, sandstone, basalt, slate, coal seam, ironstone, and dykes. Roman numerals indicate the larger areal extent of individual rock types. Coal seams have some relationship to stratigraphy, together with Quaternary clay and fluvial sediments. Geological boundaries are depicted by dashed or dotted lines.

This map, although named "petrographical," deserves the classification "geological." The topographic base shows river flows, settlements, and historical monuments (churches and a castle at Rotenburg). Main traffic connections are also depicted.

Coordinates No coordinates are given on the map: they are deduced approximately 50°58′–51°19′ N, 09°10′–09°48′ E (in Greenwich).

Mapped Area Approximately 2,000 km^2.

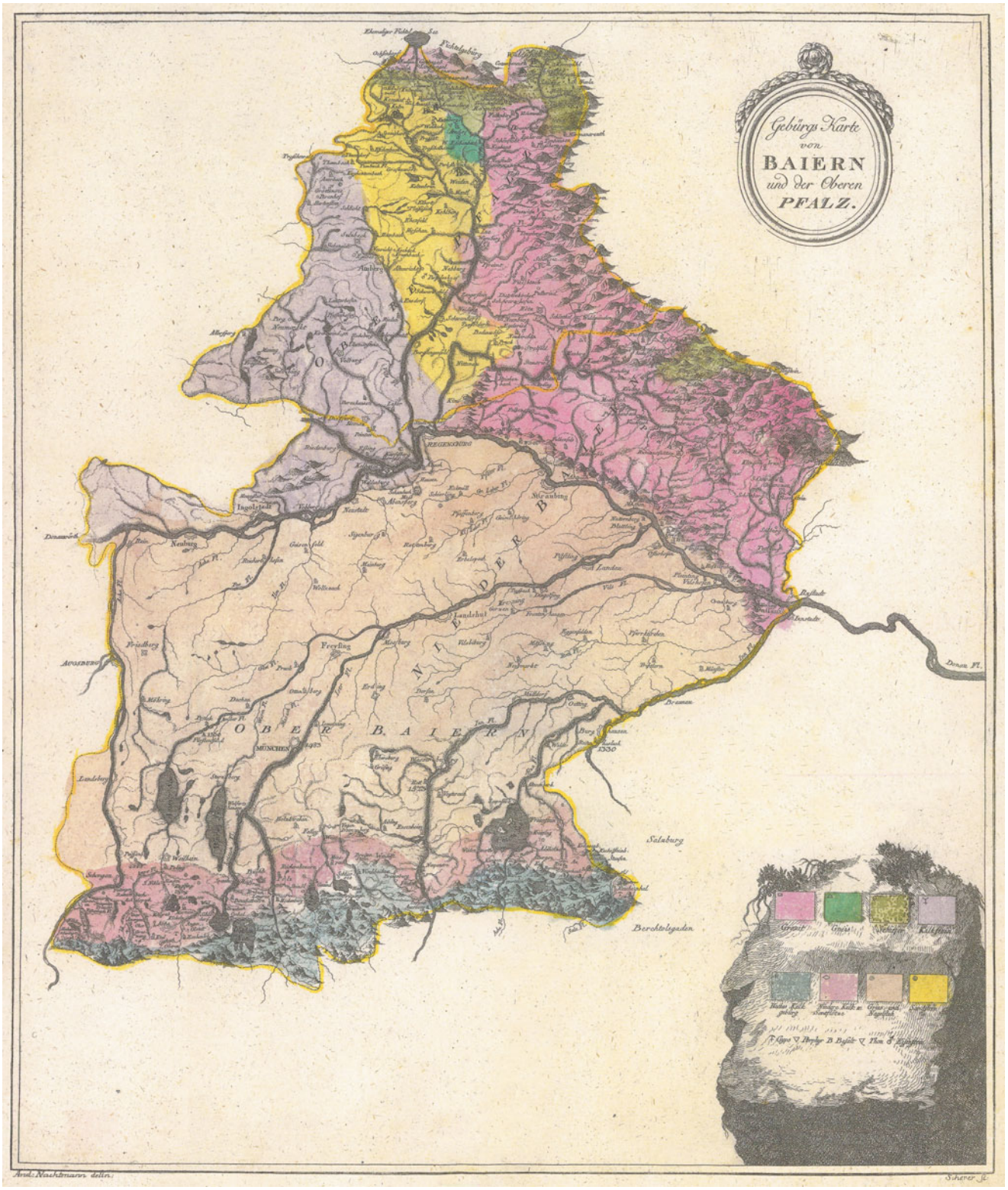
Mapping Area Covers territory occupying the historical Hesse (recent Federal State of Hesse) and a small part of Thuringia, in the recent Federal States of Germany.

Size of the Document 350×400 mm.

Deposition Information The original is in the Library of Mining Academy, Freiberg. Signature IX 595.

Supplementary Information

By the end of the eighteenth century, increased interest appeared within German scientific circles in the value of observation of nature and geological documentation. Mapping and publication of geological map editions increased. The map by Johann Philipp Riess is a very simple geological map, with delimitation of black coal basins, basalt rocks, and Quaternary deposits.



Map 14 Gebürgs-Karte von Baiern und der Oberen Pfalz. (Source: Private collection of B. Fritcher)

Gebürgs-Karte von Baiern und der Oberen Pfalz
1792
Mathias von Flur

Title in English Geognostic-petrographic map [literally: map of the mountains, i.e., rocks] of Bavaria and the Upper Palatinate.

Scale The scale is not given on the map: it is approximately between 1:750,000 and 1:860,000.

Supplement to the Book Mathias von Flurl, *Beschreibung der Gebirge von Baiern und der oberen Pfalz, mitden darinn vorkommenden Fossilien, aufläßigen und noch vorhandenen Berg- und Hüttengebäuden, ihrer älteren und neueren Geschichte, dann einigen Nachrichten über das Porzellan- und Salinenwesen und anderen nützlichen Bemerkungen und Vorschlägen, wie dem verfallenen Bergbau wieder aufzuhelfen ware*.

(Description of the mountains/rocks of Bavaria and the Upper Palatinate, with the fossils contained in them, the terminated and the still existing mining and smelting works, their older and newer histories, moreover some notices on the porcelain and salt works and other valuable annotations and advices, how the mining industries, being in a ruinous state, might be helped.) Published by Joseph Lentner in 1792, Munich. First edition. Drawn by "And. [reas] Nachtmann," engraved by "Scherer." Published by Joseph Lentner (Munich).

The title in the upper right is framed (resembling a picture frame). The map has no grid: mountains and mountain chains are depicted by the molehill method; rough hatching is used to indicate more elevated parts of the relief.

Legend The legend is a combination of colours and symbols and it is situated in the lower right corner within the drawing of occurring rocks. Designated both by colours and symbols are the rocks of larger extensions: granite, gneiss, schist, limestone, "higher limestone mountains" ("Hohes Kalk-Gebürg"), "lower lime (stone) and sand (stone) layers" ("Niedere Kalk- und Sandflötze"), breccia ("Gries") and conglomerates ("Nagelfluh"), and sandstone. Smaller deposits are designated solely by symbols: gypsum, porphyry, basalt, clay, and ironstone. Further items of the map are some topographic features [rivers, localities (i.e., cities and villages), and mountains, and mountain chains], for which, however, there is no legend. According to B. Fritscher (Čejchanová et al. 2010), the map could be called a classical geognostic/petrographic map with particular reference to mineral resources.

Coordinates No coordinates are given on the map: they are deduced approximately 47°30′–50°00′ N, 11°00′–13°30′ E (in Greenwich).

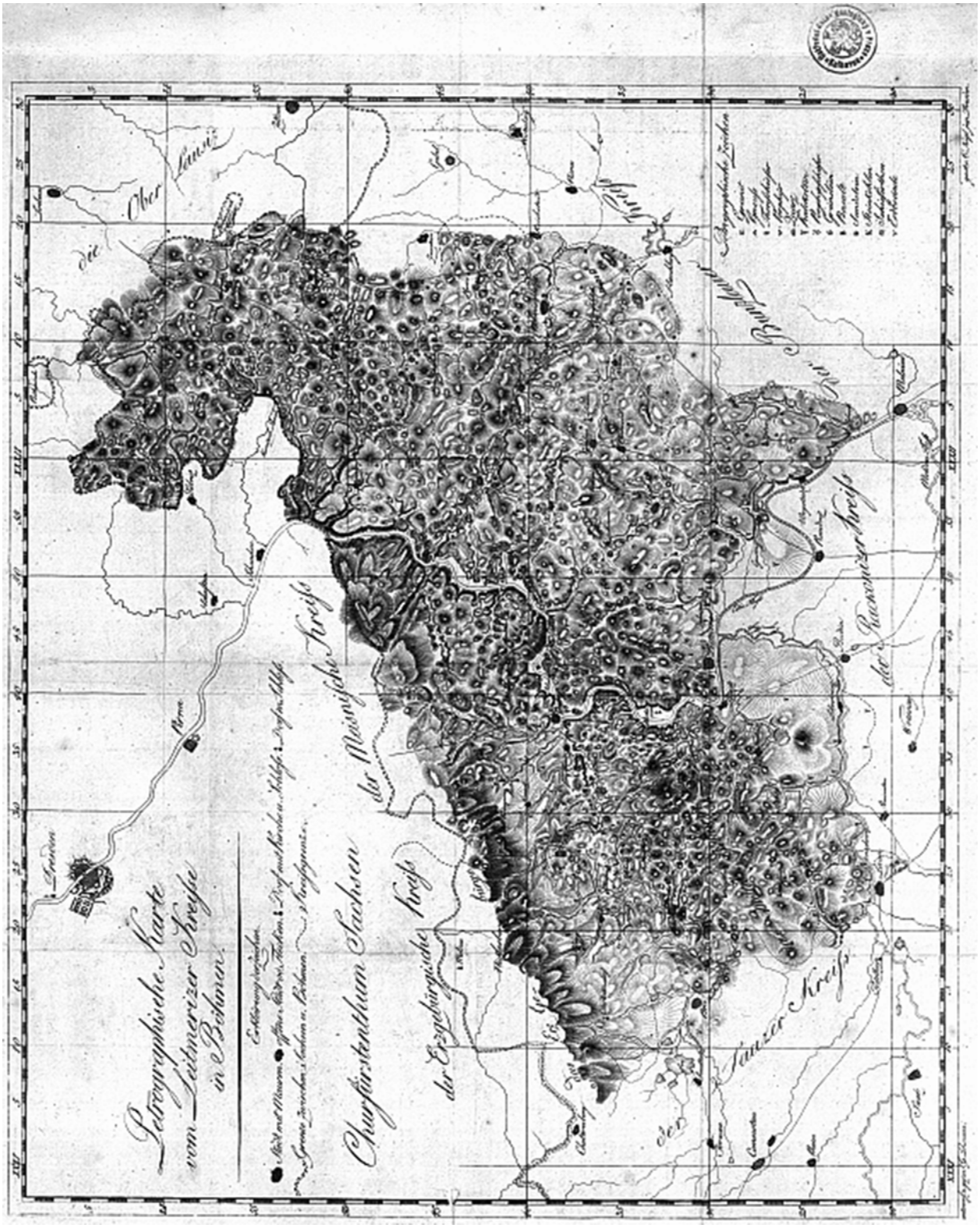
Mapped Area Approximately 60,000 km^2.

Mapping Area The mapped territory occupies the area of modern Bavaria and Upper Palatinate (the recent administrative district of Swabia).

Size of the Document 355 × 422 mm.

Deposition Information The copy of the map that was used in this publication is from the private collection of B. Fritcher. The original, amongst others, is in the Bavarian States Library, Munich. Signature Mapp. XXIV, 82 b.

Supplementary Information
Von Flur's map is usually acknowledged as the first 'geological' map of Bavaria. A rough chronological arrangement is given, using the classical Wernerian system, according to which granites were the oldest rocks, followed by gneiss, schist, sedimentary rocks, and finally unconsolidated sediments. In this spirit, we could follow in the map a rough stratigraphic order, and even a tectonic one, namely the distinction between the Tertiary rocks of the Alpine foreland, south of the Danube River, and, north of it, on the one hand, the Jurassic and Triassic formations, as well as, on the other hand, the Palaeozoic formations of Northern Bavaria.



Map 15 Petrographische Karte vom Leitmeritzer Kreisse in Böhmen. (Source: The Archives and Library of Czech Geological Survey)

Petrographische Karte vom Leitmeritzer Kreisse in Böhmen
1793
Franz Ambrosius Reuss

Title in English Petrographical map of the *Litoměřice* (Leitmeritz) County in Bohemia.

Scale The scale is not given on the map: it is approximately 1:120,000.

The base on the map was constructed by J.G. Lehmann, was drawn by G. Kegl, and was dedicated to his Imperial and Royal Majesty Franz the Second.

Supplement to the Book Franz Ambrosius Reuss: *Mineralogische Geographie von Böhmen (Mineralogical Geography of Bohemia)* 1793. First edition. Waltherische Hofbuchhandlung, Dresden.

Legend The legend contains symbols showing fortified towns, open towns, residences with churches and manors, residences with manors, and borders between Bohemia and Saxony. Borders between the counties are situated in the upper left part of the map, within the frame, beneath the title. In the lower right corner is a list of symbols for observed rocks: granite, gneiss, shale, porphyry, quartz, limestone, porphyritic slate, greenstone, basalt, sandstone, black coal, slate, and porcellanite. This geological map, although called "petrographical," uses a typical early depiction of rock occurrences by symbols.

A black-and-white map, with simple topographic drawing without ornamentation, shows topography, elevations depicted by hatching, location of settlements, the Elbe River and smaller rivers, and communication routes. Some detailed relief, mainly important topographic features, some with names (e.g., table mountain, *Schneeberg–Děčínský Sněžník*), are also shown.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 50°20′–51°10′ N, 13°10′–14°30′ E (in Greenwich).

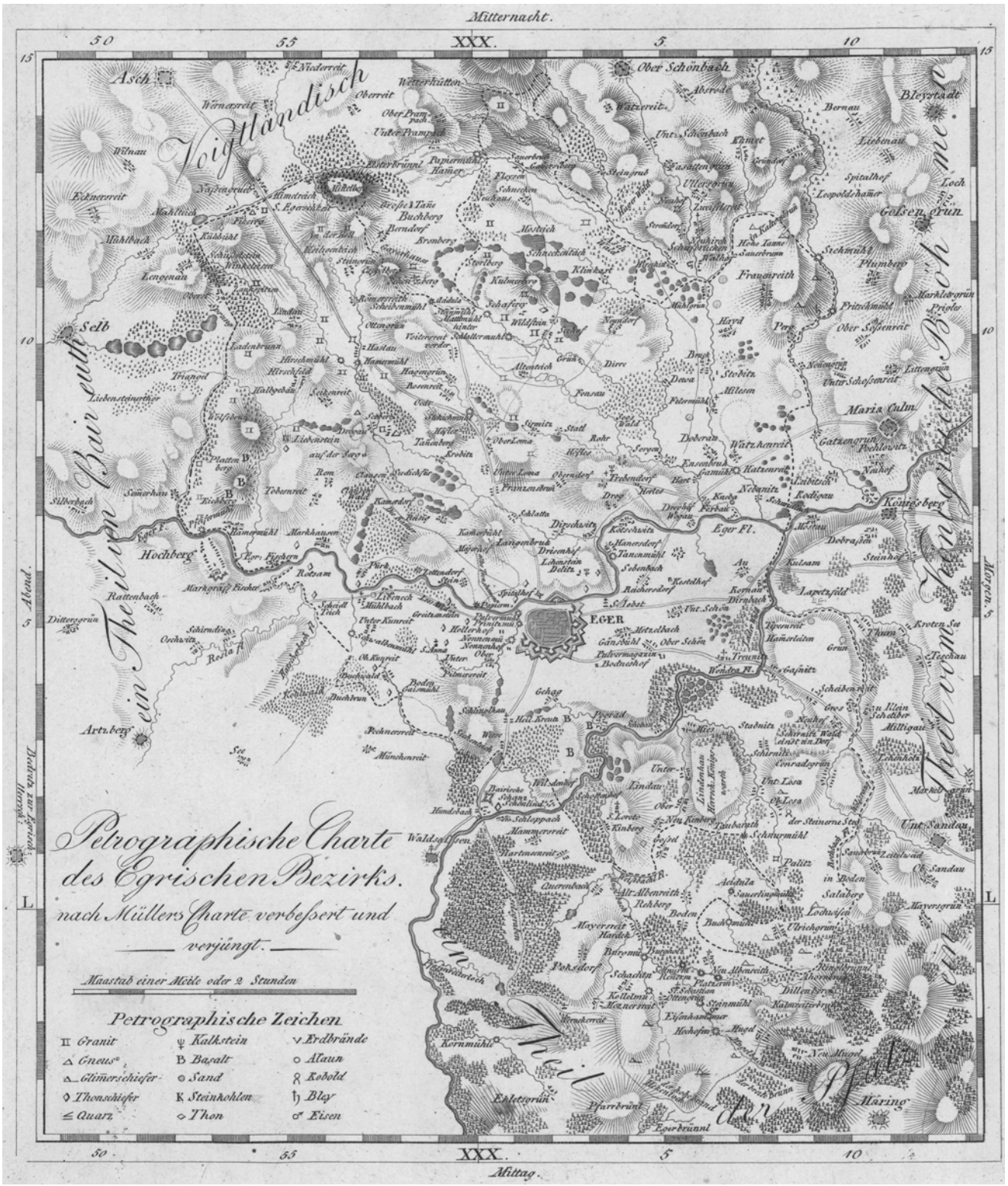
Mapped Area Approximately 9,000 km^2.

Mapping Area It covers historical Northern Bohemia, which at the time was part of the Austrian Empire (recent Czech Republic). Also shown is the historical *Litoměřice* County, including indicated borders with adjacent Bohemian counties, Saxony, and part of Upper Lusatia.

Size of the Document 380×320 mm.

Deposition Information The book with map supplement is deposited in the Library of the Czech Geological Survey, Prague. Signature I C 167.

Supplementary Information
The author took advantage of knowledge of his native country and its surroundings. He was able to recognize main geological provinces, such as the Bohemian Central Mts. (*České Středohoří*), the Erzgebirge Mts. (*Krušné Hory* Mts.), the Elbsandsteingebirge (*Labské pískovce* Mts.), the Bohemian Cretaceous Basin, and also the Lusatian Granite. Most of the observations correspond to recent knowledge. Curiously enough, the coal occurrence near the author's hometown of *Bílina* City is classified as "black coal" instead of "lignite or brown coal." Undoubtedly, this map reflects progress in the geological knowledge of Bohemia and early geological cartography.



Map 16 Petrographische Charte des Egerischen Bezirks nach Müllers Karte verbesset und verjüngt. (Source: Map collection of Charles University Prague)

Petrographische Charte des Egrischen Bezirks nach Müllers Karte verbessert und verjüngt
1794
Franz Ambrosius Reuss

Title in English Petrographic map of Egrischen (in Czech, *Cheb* City) district, after Müller's map, improved and modernized.

Scale The scale is given on the map in miles and a walking distance of 2 hours.

Supplement to the Book The map is a supplement to the book *Chemisch-medizinische Beschreibung des Kaiser Franzesbades oder des Egerbrunnens*. (*Chemical and medical description of the Emperor Franzesbades (Františkovy Lázně) or the springs of Eger.*) Publisher not given.

The topographic base of this map is modified sections from two sheets (Section XI and Section VI) of the Müller's 1720 map of Bohemia, the author of which is Johann Christoph Müller.

Legend The legend depicts 15 petrographic units, using specific graphic symbols for granite, gneiss, mica schist, clay shale, quartz, limestone, basalt, sand, hard coal, clay, porcellanite, alum, cobalt, lead, and iron.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 49°56′–50°15′ N, 12°10′–12°25′ E (in Greenwich).

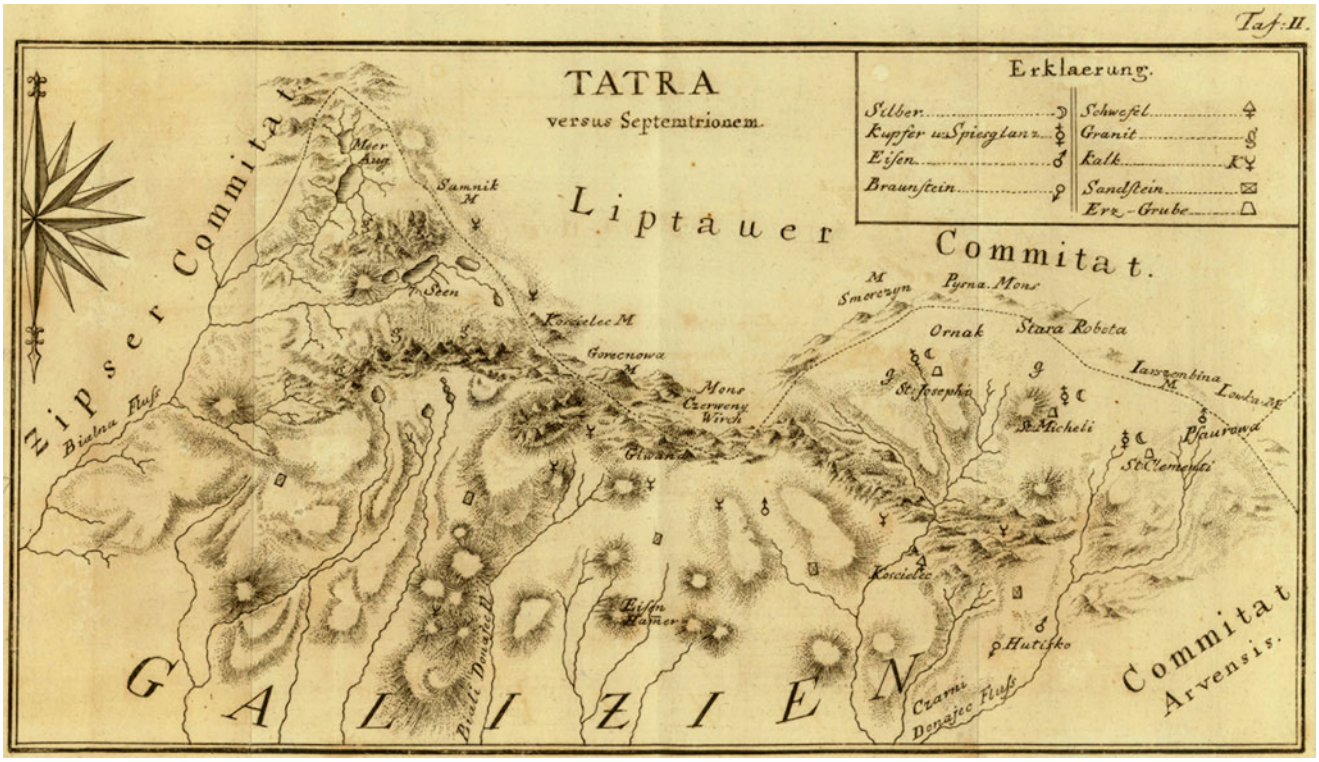
Mapped Area About 750 km^2.

Mapping Area The mapped area covers the western tip of Bohemia plus strips of adjacent parts of Bavaria and Saxony. Eger (*Cheb*) City is plotted in the center of the map. The map shows positions of settlements, the *Ohře* River, creeks and pools, woods, and communication routes.

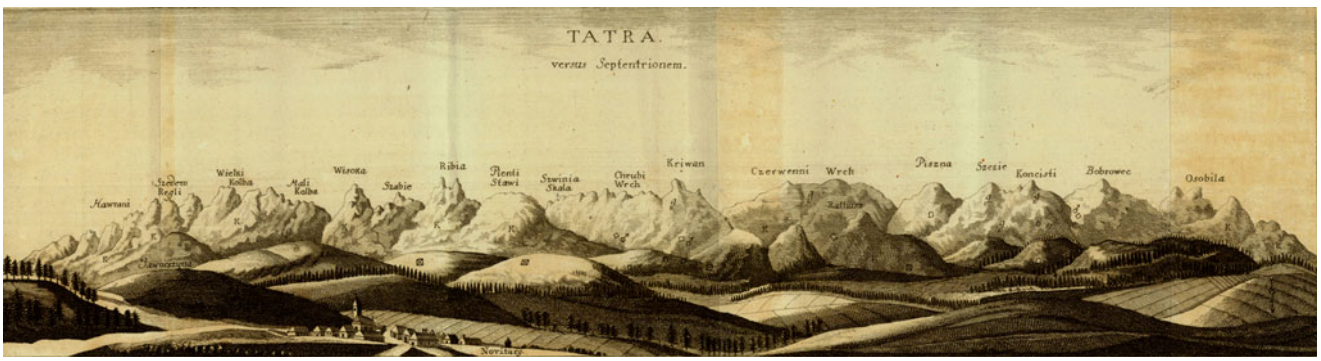
Size of the Document Including the frame, 245 × 340 mm; without the frame, 215 × 250 mm.

Deposition Information The map itself is deposited in Charles University of Prague, Faculty of Science Map Collection. Signature D2/10/19.

Supplementary Information
The map is certainly original, because it is the first of this kind in the given region. However, it is not very efficient, because it only gives a limited number of separate local mineralogical localities personally visited by the author.



Map 17 Northern part of the Tatra Mountains (Source: Private collection, I.Tunyi)



Map 17.1 Panorama of Tatra Mountains as seen from the Polish side of border (Source: Private collection, I.Tunyi)

TATRA versus Septemtrionem
1796
Belsazár (Baltazár) Hacquet

Title in English Northern part of the Tatra Mountains.

Scale The scale is not given on the map: it is very approximately 1:50,000.

Supplement to the Book Belsazár Hacquet: *Neueste physikalisch-politische Reisen in den J. 1788 und 1789 durch die Dacischen und Sarmatischen oder nördlicher Karpathen.* (*New physical-political journeys in the years 1788 and 1789 through the Dacinian and Sarmatian Carpathians.*) Published in Nürnberg, 1790–1796. First edition (earlier editions not known, possibly do not exist).

In general the map is described in Latin, German, and Polish languages.

Legend The legend is in the upper right corner in a frame and is depicted by symbols of rocks and minerals and their occurrences. For metals (silver, copper, and iron) symbols are used corresponding to the alchemistic concept. Thus, metals are depicted with a planetary concept: Ag = Moon; Cu = Venus; Fe = Mars. Minerals or rocks, listed in German, are also shown by symbols: *Braunstein* - pyrolusite; *Schwefel* - sulphur; *Granit* - granite; *Kalk* - limestone; *Sandstein* - sandstone. A mine (*Erz-Grube* ?) is depicted by a trapezoid at the bottom of the legend. A monochrome relief map of the northern part of the Tatra Mountains shows elevations, water flows, lakes, mines, and rocks. A geographical denomination of elevations and water flows is in the Polish language.

At the left side of map an ornamental compass card with a north-oriented arrow is situated.

Coordinates No coordinates are given on the map: they are deduced approximately 49°15′–49°25′ N, 19°55′–20°10′ E (in Greenwich). Map orientation is north reverse.

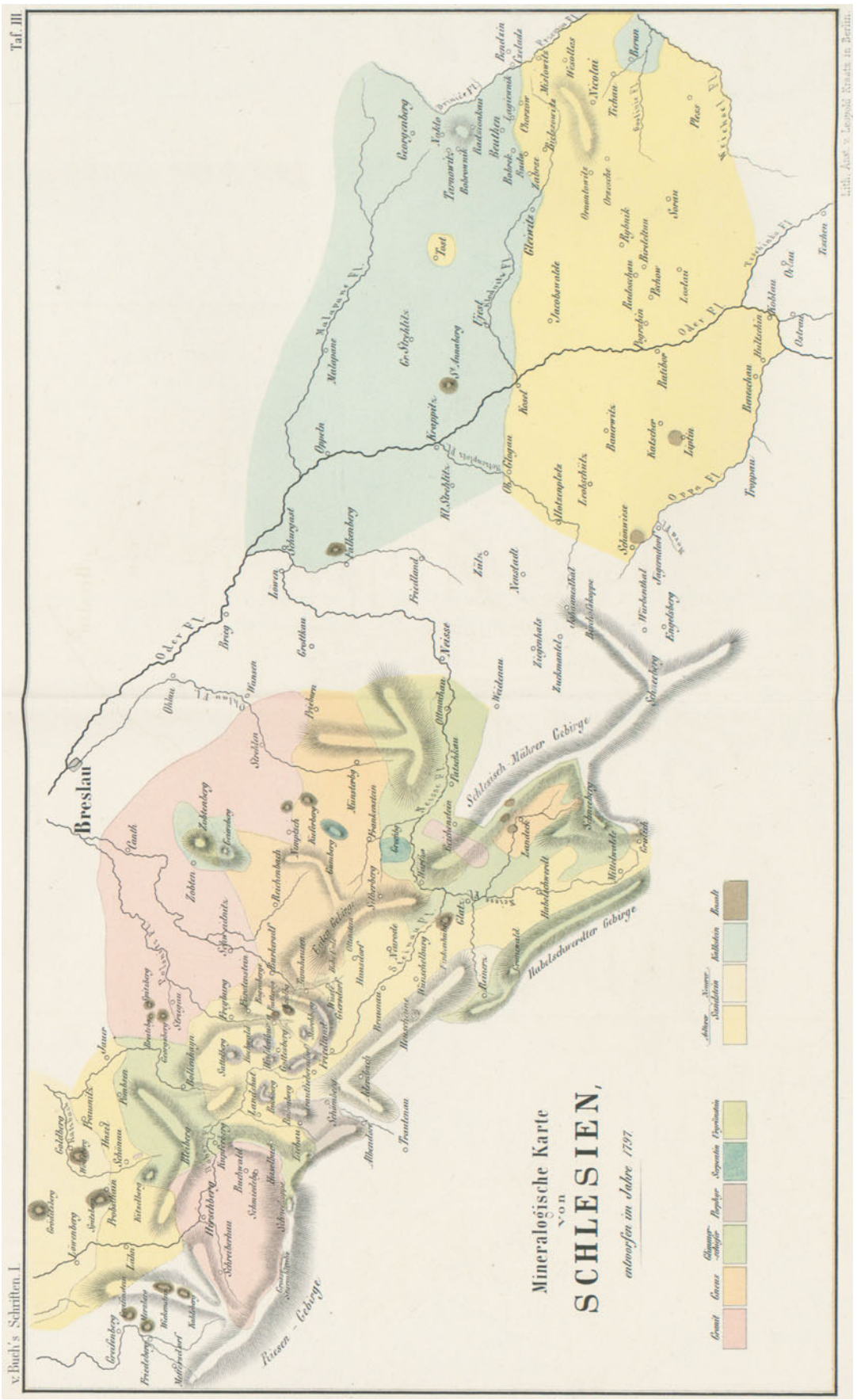
Mapped Area Approximately 1,000 km^2.

Mapping Area The mapped territory occupies the historical northern part of the Tatra Mts. on the territory of Galicia (recent southern Poland). The illustrated part of the Tatra Mts. is attached to *Spiš* County, *Liptov* County, and *Orava* County. As compared with the recent Slovak-Polish state border, this borderline is shifted more to the north in the map.

Size of the Document 450 × 245 mm.

Deposition Information A copy of the map is from the private collection of Igor Tunyi.

Supplementary Information
By the end of the eighteenth and beginning of the nineteenth centuries there was increased interest on the part of European naturalists concerning the Slovak economy and geography. This interest affected the opening of new contacts with foreign scientists and rapid evolution of natural sciences in Slovakia, as well as political awakening of the Slovak nation. The map by Belsazár Hacquet brought a new level of information regarding the geology of the Tatra Mts., and about occurrences of rocks and mineral deposits in the region.



Map 18 Mineralogische Karte von Schlesien, entworfen im Jahre 1797. (Source: Private collection of B. Fritcher)

Mineralogische Karte von Schlesien, entworfen im Jahre 1797
1802
Leopold von Buch

Title in English Mineralogical map of Silesia, designed in the year 1797.

Scale The scale is not given on the map: it is approximately between 1:900,000 and 1:1,000,000.

Supplement to the Book Leopold von Buch: *Geognostische Beobachtungen auf Reisen durch Deutschland und Italien, angestellt von Leopold von Buch, Band 1, Berlin bey Haude und Spener* 1802. (*Geognostical observations on travels in Germany and Italy made by Leopold von Buch.*) First edition. Made by "Lithographische Anstalt" (Lithographical shop) of Leopold Kraatz in Berlin; published by Haude und Spener, Berlin.

Legend Appears in the lower left corner of a map in a frame, outside the mapped area and beneath the title. Ten coloured rectangles are situated, describing ten rocks depicted in the map: granite, gneiss, mica-schist, porphyry, serpentine, primeval greenstone, older and younger sandstone, limestone, and basalt. Topographic features include roughly sketched geomorphology, and cultural elements such as towns, villages, and rivers are also shown. The main relief features (hills and mountain chains) are depicted by hatching.

Although the title refers to a mineralogical map, it is actually a purely petrographical one; that is, it depicts exclusively the distribution of rocks without special attention to mineral resources. Nevertheless, a rough chronological arrangement of the rocks might be implicitly seen by von Buch's use of the classical Wernerian system: that is, granite as the oldest rock, followed by gneiss, schist, sedimentary rock, and finally unconsolidated sediments.

Coordinates No coordinates are given on the map: they are deduced approximately 49°05′–51°07′ N, 15°25′–19°06′ E (in Greenwich).

Mapped Area Approximately 42,000 km^2.

Mapping Area Wrocław (Breslau) and *Ostrava* (Ostrau) indicate its northern and southern extensions; *Bieruń* (Berun) and *Gryfow Śląski* (Greiffenberg) serve as the eastern and western boundaries.

Size of the Document 295 × 173 mm.

Deposition Information A digital copy, which was used in this publication, comes from the private collection of B. Fritscher.

Supplementary Information
This mineralogical map of Silesia by Leopold von Buch is the result of his early work, which realized while still studying at the Freiberg Mining Academy. Its background involved the general geological survey of Saxony, which was influenced by his teacher, A.G. Werner. It was mainly initiated as a prospecting tool for coal. It seems to have been intended as a visual illustration of Buch's detailed discussion of Silesian geognosy in his "Geognostiche Beobachtungen auf Reisen." According to Bernhard Fritscher, this map is the first geognostical map of Silesia.

Map 19 Petrographische Karte wom Bunzlauer Kreis in Böhmen. (Source: the Archives and Library of Czech Geological Survey)

Petrographische Karte vom Bunzlauer Kreis in Böhmen 1797
Franz Ambrosius Reuss

Title in English Petrographical map of the *Mladá Boleslav* County in Bohemia.

Scale The scale is given on the map in miles: it is approximately 1:120,000.

Supplement to the Book The black-and-white map is a supplement (as a folder) to the book by Franz Ambrosius Reuss, *Mineralogische Beschreibung des Bunzlauer Kreises in Böhmen*, which appeared in the book series "Mineralogische Geographie von Böhmen" (*Mineralogical Description of the Boleslav County in Bohemia*). Waltherische Hofbuchandlung, Dresden.

The book represents an integral part of the map, because it contains a register with explanations of numbered localities indicated in the map. An alphabetical detailed register is also attached, with descriptions of rocks and minerals (including, for example, columnar jointing of basalts and fossil occurrences).

The map shows comparatively detailed geomorphology, with undulating and hilly relief depicted by dense hatching. The Elbe River (*Labe*) is in the lower left corner, and the Iser River (*Jizera*) passes through the centre of the area. Position of settlements is also indicated, as well as of fishponds and creeks.

Legend The legend is created with symbols and explanation in the upper left corner of the map, inside the frame of the map. There are two groups of symbols: (1) cartographic symbols: fortified towns, open towns, fishponds, estates, church estates, villages, old manors and castles, and chapels; and (2) petrographic symbols: granite, gneiss, shale, porphyry, quartz, limestone, porphyry, shale, basalt, sandstone, sand, amphibolic shale, mica schist, mercury-rich "Hg" minerals, "amygdaloidal rock" (possibly melaphyre), tin ore, and iron ore.

The author was able to recognize and depict the main rock types, and he indicated the boundaries between outcrop occurrences; mainly between Cretaceous sandstones and metamorphic rocks and granites. Occurrences of Tertiary volcanic rocks clearly correspond with tectonic faults and line breaks in the landscape.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 50°05′–51°05′ N, 14°20′–15°25′ E (in Greenwich).

Mapped Area Approximately 7,000 km^2.

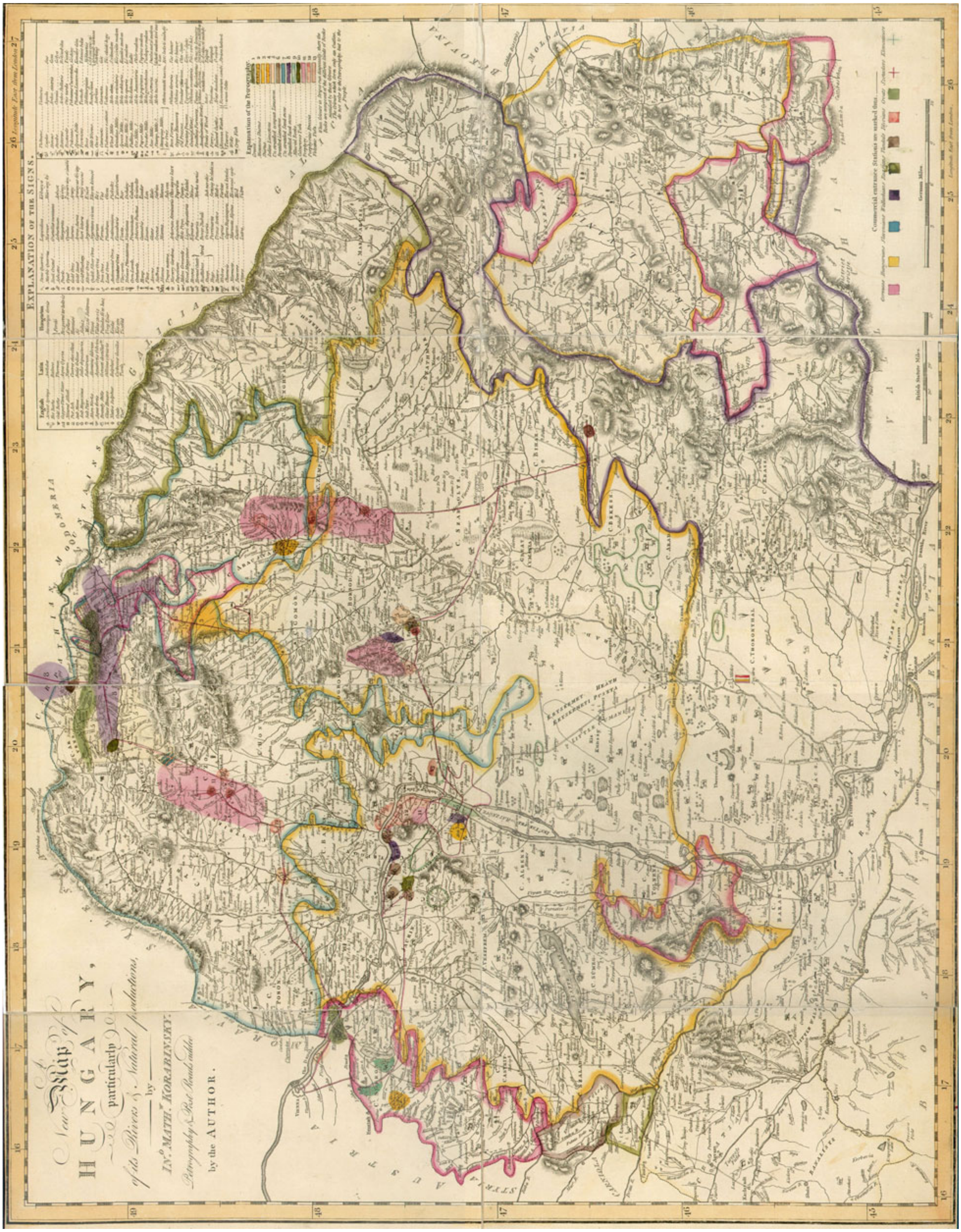
Mapping Area Northern Bohemia, the historical part of the Austrian Empire, what is today the Czech Republic, and Upper Lusatia and Silesia in the north and northeast (today Germany, Poland).

Size of the Document 280×400 mm.

Deposition Information A digital copy is in the Archives of the Czech Geological Survey. The book with its folder map is deposited in the Library of Czech Geological Survey.

Supplementary Information
The map is dedicated to the unspecified nobility of the Bohemian Kingdom and, surprisingly, also to His Royal Majesty, the King of Saxony.

Both the book and the enclosed map show the increased interest on the part of nobility and landowners in surveying for mineral resources. The map can be understood as a initial step in the recognition of Bohemian geology and early mapping of the Bohemian Kingdom.



Map 20 A New Map of Hungary particularly of its Rivers and & Natural productions. (Source: Geological and Geophysical Institute of Hungary)

A New Map of Hungary particularly of its Rivers and & Natural productions. By In. Math. Korabinsky. Petrography and Post Roads added by the Author

1797

Robert Townson, Math. Korabinsky

Language of the title is in English; a legend and a map script are in English, Latin, and Hungarian.

Year of Publication 1797 is not given on the map, but generally is known from the book title page.

Scale The scale is given on the map in *British statue miles* and *German miles*: it is approximately 1:1,260,000.

Supplement to the Book "Travels in Hungary, with a short account of Vienna in the year 1793." First edition. By Robinson, G. I., Paternoster Row, Jany 2d 1797, London.

Legend Located in the upper right corner (explanation of the signs) and contains about 97 items, all listed in English, Latin, and Hungarian. The legend contains hydrogeological features (springs, cold–warm baths), petrographic and mineralogical information (coal, gold ores, gold-bearing sand …), postal roads, economic objects, agricultural data, ethnic information, and so forth. The legend includes a petrographic list, which contains 15 items (granite, micaceous schist, schist, saline limestone, un-stratified compact limestone, stratified limestone, un-stratified sandstone, stratified sandstone, alluvial rocks, calcareous tufa, porphyry, porphyritic breccia, volcanic tufa). The legend distinguishes stratified and unstratified rocks (limestone, sandstone). Each rock type is color highlighted in the map and also contains a number that corresponds to a number in the legend. The legend provides an additional text with detailed explanation. In the lower left corner of the legend, areas containing ten nationalities living in Hungary are color coded.

Coordinates Coordinates are given on the map. Longitudes are east from London: 44°40′–49°30′ N, 16°00′–27°10′ E.

Mapped Area Approximately 300,000 km^2.

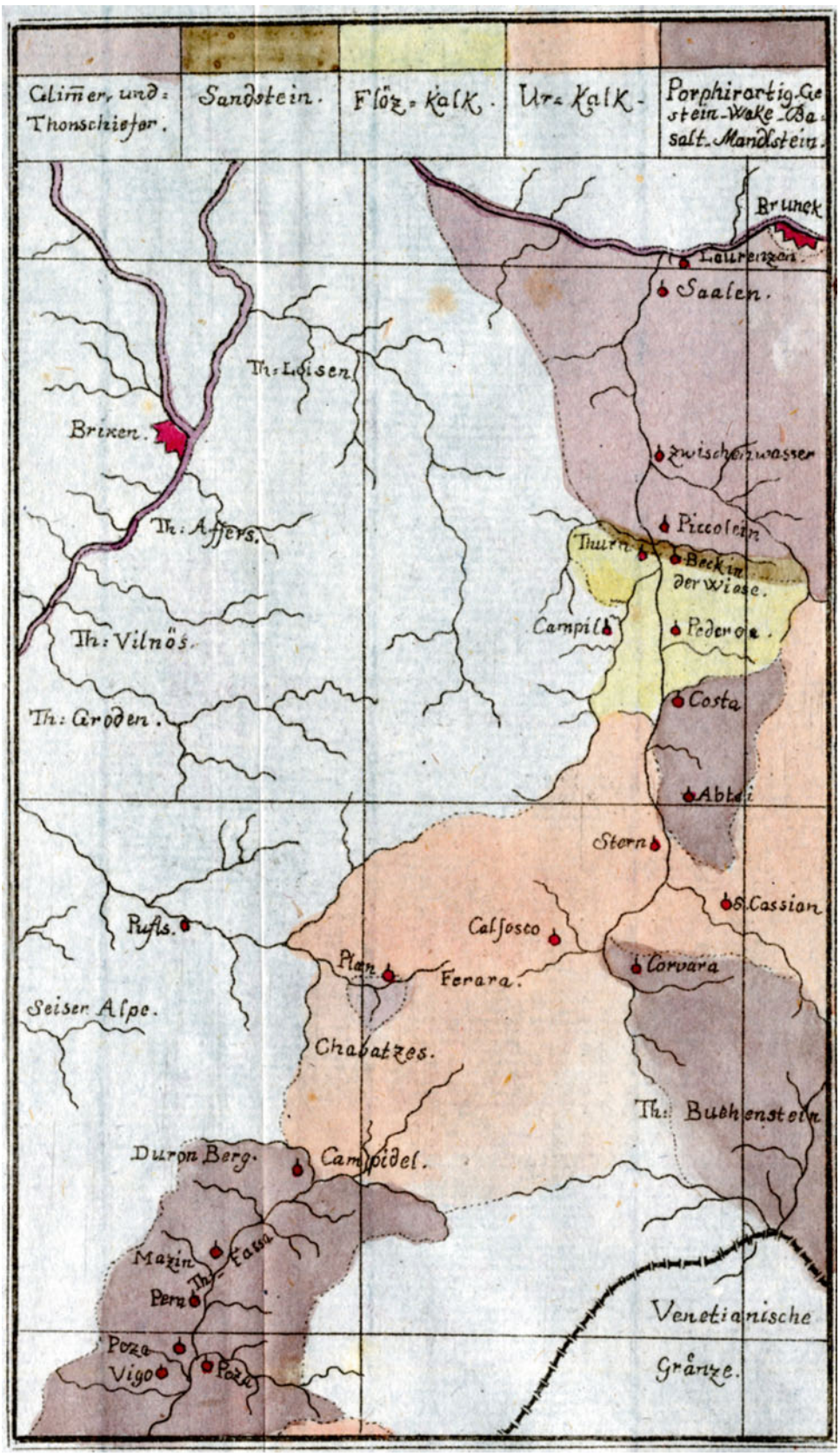
Mapping Area Hungary at the end of the eighteenth century.

Size of the Document 460 × 590 mm.

Deposition Information A digital copy of the map is from Geological and Geophysical Institute of Hungary.

Supplementary Information

Geological and hydrogeological data are used to supplement information regarding national economic and ethnographic register. Geological and mineralogical information are really only additional; in this case it is not a typical geological or mineralogical map.



Map 21 Über die merkwürdige Gegend von Fassa in Tirol: Geologische Karte. (Source: The Library of Geological Survey of Austria; Wien)

Über die merkwürdige Gegend von Fassa in Tirol: Geologische Karte
1803
Alois Pfaundler von Sternfeld

Title in English About the remarkable area of Fassa in the Tyrol: geological map (its title is not given on the map).

Year of publication, 1803, is not given on the map, but is generally known from the book title page.

Scale The scale is not given on the map: it is approximately between 1:10,000 and 1:15,000.

Supplement to the Book Alois Pfaundler von Sternfeld, "Über die merkwürdige Gegend von Fassa in Tirol.- Annalen der Berg- und Hüttenkunde"*(About the remarkable area of Fassa in the Tyrol)* 2, S.161-177, 1 geol. Kte, Salzburg 1803. [Enth. Geologische Karte des Fassatales].

Legend The legend is situated at the top of the map, below the upper line of the map's frame, where five coloured rectangles with a glossary are located: *Glimmer und Thonschiefer* = micaceous and **clay** slate; *Sandstein* = sandstone; *Flöz–Kalk* = bedded limestone (Mesozoic of Southern Alps); *Ur-Kalk* = Old limestone; *Porphirartig Gestein, Wacke, Basalt, Mandlstein* = porphyry, greywacke, basalt, melaphyre.

Coordinates No coordinates are given on the map: they are deduced approximately 45°30′–45°50′ N, 11°10′–12°10′ E (in Greenwich).

Mapped Area Approximately 2,500 km^2.

Mapping Area Southern Tyrol (part of present Italy) east of Brixen, south of Brunneck.

Size of the Document At this moment, the original map is not available.

Deposition Information Original is deposited in the Library of the Austrian Geological Institute. Signature P.S.608.8° B.2.

Supplementary Information
The map incorporates simple contouring, hatching, shading, and hand-coloured sketches of the geological and petrographical situation in the Southern Tyrol. Several types of rocks and minerals in the area are schematically distinguished. Only two terms indicate a stratigraphical aspect, "*Ur-Kalk*" and "*Flöz-Kalk*"; both are used according to the Wernerian scheme (A.G. Werner, 1787).

Map 22 Totius regni Bohemiae Mappa Chrographico-Mineralogico-Hydraulico-Commercialis cum Comitatu Glacensis et District Ergano (Source: Map collection of Charles University Prague)

Totius regni Bohemiae Mappa Chorographico-Mineralogico-Hydraulico-Commercialis cum Comitatu Glacensis et District Ergano
1808
Joseph Ferdinand Bock (predicate von Bock-Polach)

Revision:

Subtitle BOHEMIA in XVI circulos divisa, notitiis plurimis illustrata, Limitibus, viis & post Milleri editionem ex actis publicis emendatis. Opera JOS. FERD. S.R.J. EQUITIS a BOCK & POLACH excelsi Regiminis Austriae inf. Consiliarii actualis, regni Bohemiae quondam consiliarii et comercii inspectoris CARLO LUDOVICO Austriae Arcduci, Imperiali ac Regio Principi Aurei Velleris, et magnae CRUIS MILITARIS Equiti, Supreme Exercituum Belliduci Invicto, BOHEMIAE GUBERNATORI et CAPITANEO GENERALI dicavere ARTARIA et SOCII. Publiée par Artaria et Comp. 1808.

Title in English The orographic-mineralogical-industrial-trading map of the entire Kingdom of Bohemia together with the *Kladsko* region and the *Cheb* region.

Subtitle in English (not literally) Bohemia, divided into 16 counties, illustrated according to numerous personal observations of the author of the map and on the basis of topographic maps by Müller. Bock-Polach created this work as the highest inspector of the Austrian Government and dedicated it to the Grand Duke Carlo Ludovico and Czech mayors and the highest commissioner. Published by Artaria and Assoc. 1808.

Scale The scale is given on the map in *German miles*: it is approximately 1:344,000.

The map is composed of either a set of four separate sheets, which are created by dividing one map into four parts, or it also exists as a united sheet. In this Atlas we present the version of the unified sheet of one map. The map has extremely rich ornamentation. In the two upper corners are situated two angels with a panorama of Prague on the unfolded portion of a scroll, along with a landscape motif with a state symbol. In the lower two corners are various scenes concerning transport, agriculture, topography, landscape, and economy. Also, two working stonemasons are illustrated with rocks, minerals, and metals. It is said that a portrait of the author of the map is situated in the frame, sitting on a stone.

Legend The legend is very rich and is formed into a decorative structure, which is subdivided into two parts (left side and right side). Both legends are decoratively designed in two hemispheres along the edge of the sheet. German, Latin, and French languages are used for description in both legends. The left part of the legend contains 76 entries of symbols and descriptions and concentrates on topography, settlements, towns, industrial works, and mining. The right part of the legend contains 84 entries of minerals and rocks. Outside the frame of the map there are depicted 36 symbols of chemical elements and minerals with descriptions.

Coordinates For the united sheet coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 48°25′–51°15′ N, 12°10′–16°30′E (in Greenwich).

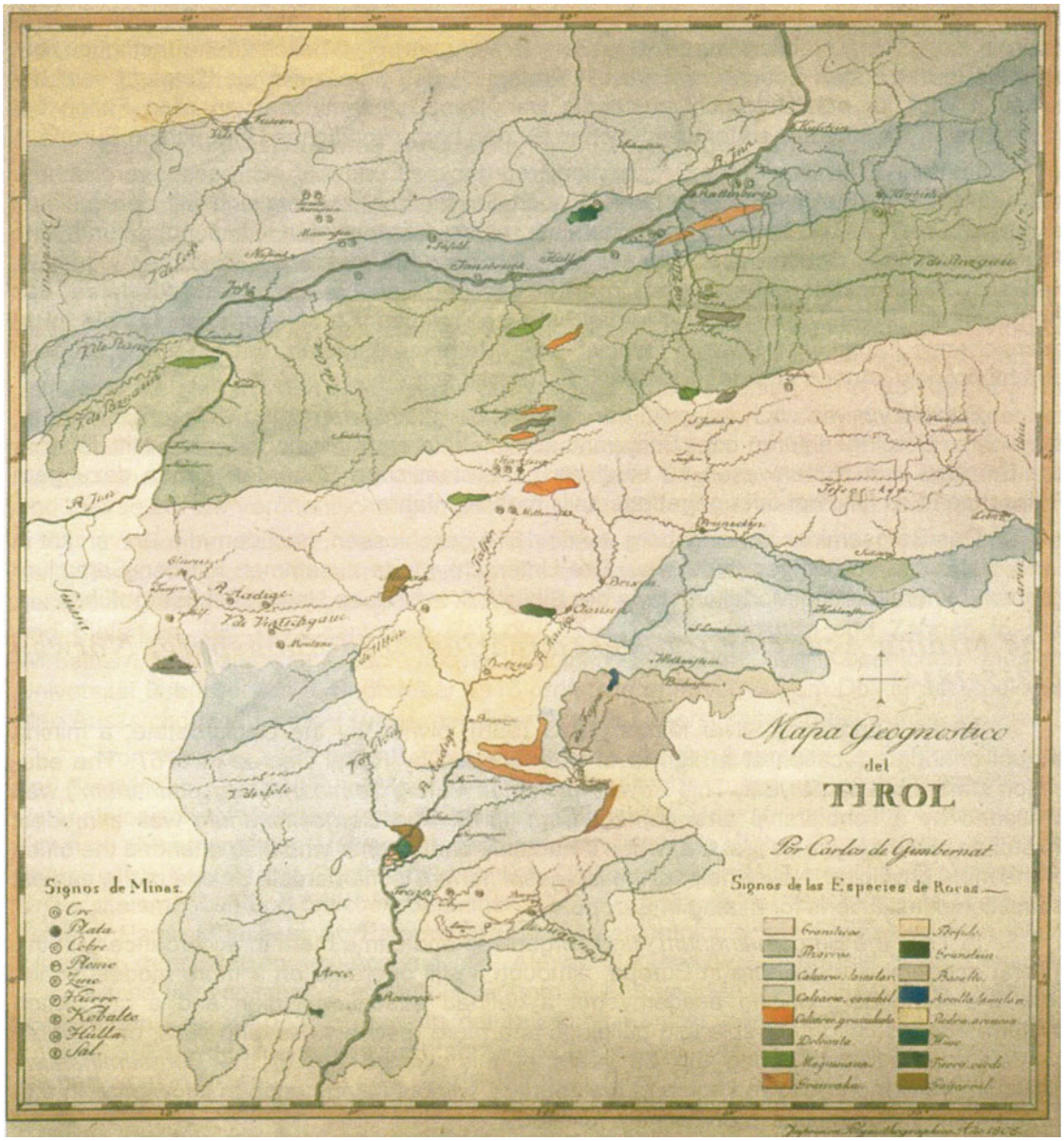
Mapped Area Approximately 70,000 km^2.

Mapping Area Historical Czech Crown Lands, small parts of Austria, Saxony, and Lusatia. Recent Czech Republic, Germany, Poland, and Austria.

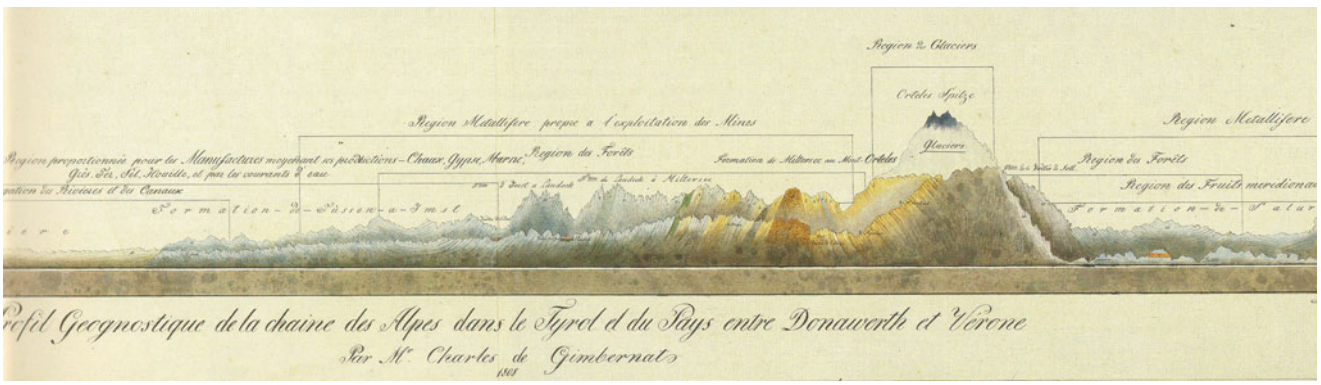
Size of the Document 416×527 mm (integrated sheet, 1000×1170 mm).

Deposition Information The Map Collection of the Faculty of Science, Charles University, in Prague.

Supplementary Information
An interesting example of the method of the hill depiction of illustrating topography of an area is used in this map. A similar method was used in the geological map by S. Staszic 1806, 1815. Extensive legends are embedded in rich ornamental decorations of the map and they give a synoptic view of the geology of the area, along with mineral deposits. Also there are included notes about the political and economic background of the Czech Crown Lands at the beginning of nineteenth century.



Map 23 Geognostical map Tirol (Source: The Library of Geological Survey of Austria; Bibliothek GBA, Wien)



Map 23.1 Geological cross section of the Alps between Tyrol and Donauworth (Source: The Library of Geological Survey of Austria; Bibliothek GBA, Wien)

Mapa Geognostico del Tirol
1808
Carlos de Gimbernat

Title in English Geognostical map of Tyrol.

Scale The scale is not given on the map: it is approximately 1:550,000.

This map is not part of a textbook and it is presented as a single sheet in this publication. According to T. Cernajsek (Čejchanová et al., 2010), a single copy of the map is accompanied by 27 pages of text and a geological cross section, which is called "Profil Geognostique de la chaine des Alpes dans le Tyrol et du Pays entre Donawerth et Vérone." (*Geological cross-section of the Alps between Tyrol and Donauworth*.) It is held at the Museum of Natural History in Madrid.

Legend The legend is incorporated directly into the map in the lower right corner. It contains 16 coloured rectangles with petrographical units: (1) *Graniticas* = granite; (2) *Pizarras* = slate; (3) *Calcare-lamelar* = limestone (Mesozoic?); (4) *Calcareo-conchil* = Muschelkalk (middle Triassic); (5) *Calcareo-granulento* = marble, crystalline limestone; *Dolomita* = dolomite; (6) *Magnesiana* = magnesite; (7) *Grauvaka* = greywacke; (8) *Sandsteine/Konglomerate* = sandstone, conglomerate; (9) *Porfido* = porphyry; (10) *Grunstein* = serpentinite; (11) *Basalto* = basalt; (12) *Arcilla lamelar* = slate; (13) *Piedra arenosa* = sandstone; (14) *Hieso (Yeso)* = gypsum; (15) *Tierra verde* = green earth; (16) *Guijarrat Silex* = silicite.

In the lower left corner there is a separate legend with nine symbols for metals: *Oro* = gold; *Plata* = silver; *Cobre* = copper; *Plomo* = lead; *Zinc* = zinc; *Hierro* = iron; *Kobalto* = cobalt; *Hullo* = hard coal; *Sal* = salt.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 46°15′–47°40′ N, 10°45′–12°25′ E (in Greenwich).

Mapped Area Approximately 26,000 km^2.

Mapping Area Northern, Eastern, and Southern Tyrol, parts of southern Bavaria, and parst of recent Italy and Germany.

Size of the document 590 × 410 mm.

Deposition Information A digital copy is deposited at the Library of Geological Survey of Austria, Wien. Signature 44821,8.

Supplementary Information
The map is the first geological map of the whole Tyrol region. A separate geological cross section is an interesting addition to the map. This is the first cross section through the Alps and it represents an attempt to reconstruct Alpine orogenic structure. The map title "geognostical" follows the Wernerian system and its terminology. The legend on the map is described in Spanish, but according to T. Cernajsek (Čejchanová et al., 2010), the cross section is documented in French.

Map 24 Illuminierte petrographische Karte. (Source: the Library of Mining Academy of Freiberg)

Illuminierte petrographische Karte
1811
Abraham Gottlieb Werner

Other Author It is well known, from the literature, that Carl Emanuel Kühn is the co-author, although his name is not given on the map.

Title in English Coloured petrographical map.

Scale The scale is not given on the map: it is approximately 1:150,000.

The map is in the form of a hand-coloured manuscript document on a topographic base map of Saxony. The map was compiled from 63 sheets of district geological maps constructed by Werner's students according to unified standard methods.

Mining Academy, Freiberg, 1811. First edition.

Legend The very detailed legend was elaborated by Werner. It contains the following 35 items in coloured rectangles with symbols: granite, amphibolite, greywacke, conglomerate, black coal, granulite, greenstone schist, greywacke schist, older limestone, item no. 10 without description, serpentinite, greenstone, older gypsum, brown coal, gneiss, crystalline limestone, older sandstone, red sandstone, loam and clay, limestone and marlstone, mica schist, quartz, amygdaloidal porphyry, young gypsum, sand, item no. 27 without name, older schist, porphyry, clay stone, Muschellkalk, syenite, item no. 33 without name, silicite, and younger porphyry. The legend corresponds with Werner's views on layered rocks, which are subdivided according to their ages into Primitive oldest rocks, Transitional rocks, younger rocks (Flöz), and Alluvial rocks.

Werner's concept is based on lithology mixed up with rock ages. Lithology, however, represents his main point in distinguishing rock units. Some traces of a tectonic concept, for example, straight delimitation of the coal basin, are visible.

Coordinates No coordinates are given on the map: they are deduced approximately 50°30′–52°00′ N, 12°00′–14°00′ E (in Greenwich).

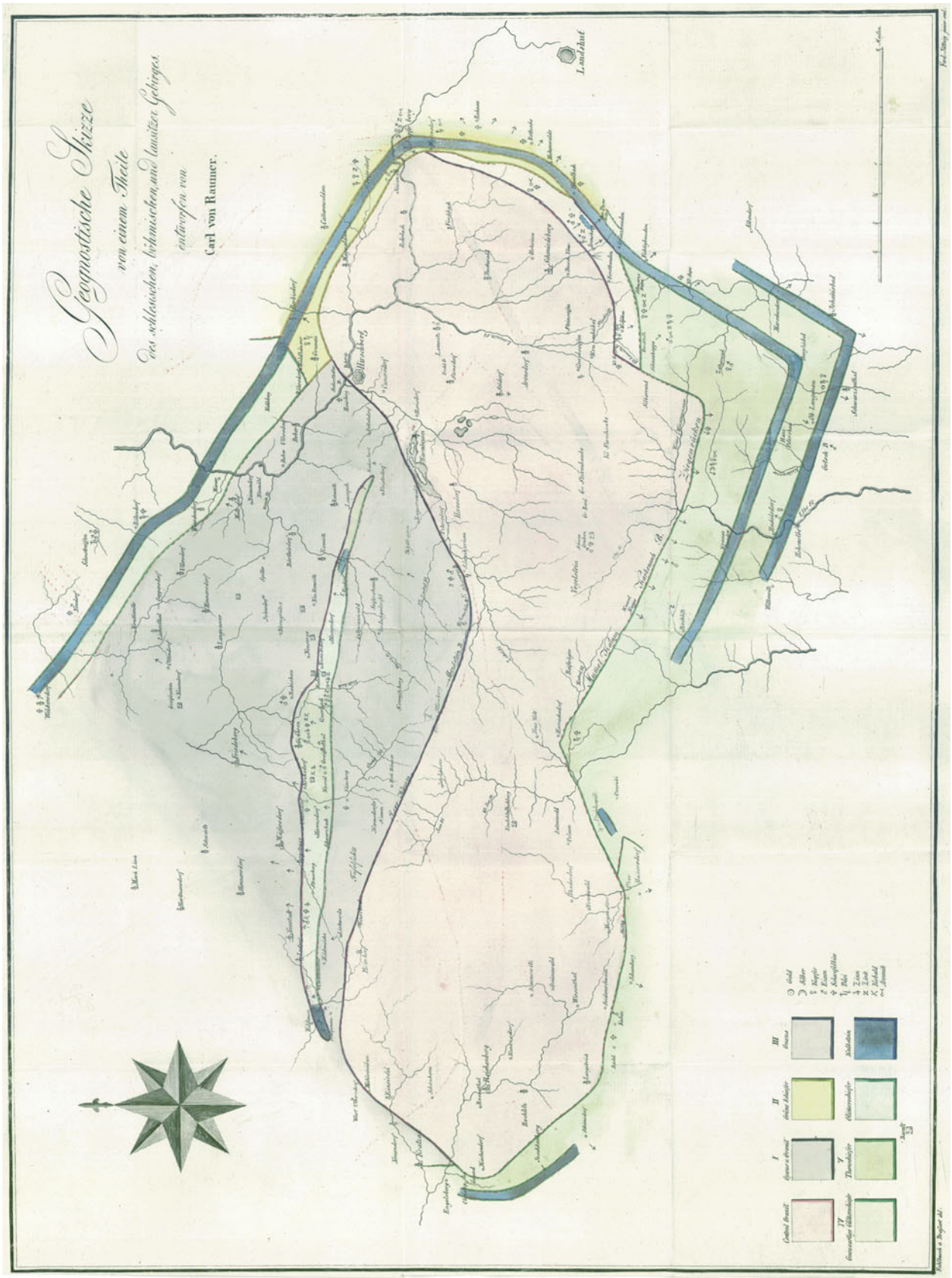
Mapped Area Approximately 30,000 km^2.

Mapping Area Historical Saxony, part of recent Germany.

Size of the Document Format and size of the document are unknown.

Deposition Information An original is in the Library of the Mining Academy, Freiberg. Signature No. 857.

Supplementary Information
In 1791 A.G. Werner was engaged to carry out a systematic regional "geognostic" investigation of Saxony and including mapping of the country. He developed a standard methodology of geological mapping and created an including specific neptunistic map legend. He subdivided all of Saxony into 63 districts, which were mapped mostly by his students. This work was completed in 1811. Werner, with the help of Carl Emanuel Kühn, summarized all the data in the manuscript map. Continuation of this project was interrupted by the Napoleonic wars and the sudden death of Werner. In fact, Karl F. Naumann's systematic mapping in the 1830s continued Werner's work. Definition and delimitation of bodies of some metamorphic rocks are also worth mentioning.



Map 25 Geognostische Skizze von einem Theile des schlesischen, böhmischen, und lausitzer Gebirges. (Source: Private collection, P. Krzywiec)

Geognostische Skizze von einem Theile des schlesischen, böhmischen, und lausitzer Gebirges entworten von Carl von Raumer
1813
Carl von Raumer

Title in English Geological sketch of part of Silesian, Bohemian and Lusitanian Mountains by Carl von Raumer.

Scale The scale is not given on the map in old miles: it is approximately 1:155,200.

Supplement to the Book The map is an attachment to the book by Carl von Raumer, *Der Granit des Riesengebirges und die ihn umgegenden Gebirgs-Familien* (*The granite of the Giant Mountains and the surrounding mountain groups*). 1813. First edition. Realschul Buchhandlung, Berlin.

Legend The legend is located in the lower left part of the map. The colours indicate eight types of rocks. The occurrences of ten types of ore mineralisation are presented by the symbols. An attempt of stratigraphic subdivision on the basis of lithology can be observed, although stratigraphic terms are not applied. Lithologic subdivision is as follows: central granite; gneiss and granite; mica schist; gneiss; gneissic mica schist; clay-slate (claystone); mica schist; limestone; basalt.

Rock units are distinguished by colour; boundaries between them are marked by thin full lines. The map contains detailed information about hydrological systems (rivers), towns, and villages. On the map there is much information about occurrences of mineral deposits, such as gold, silver, copper, iron, pyrite, lead, tin, zinc, cobalt, and arsenic. Some of the ore deposits, as *Kowary* and *Miedzianka*, are precisely located on the map.

Coordinates No coordinates are given on the map: they are deduced approximately 50°40′–51°00′ N, 15°15′–16°00′ E (in Greenwich).

Mapped Area Approximately 2,000 km^2.

Mapping Area Former Silesia, Lusatia, part of Czech Lands, recent Poland, and the present Czech Republic. Geographic and geologic mapping includes the Central *Sudetes-Karkonosze-Izera* Block, and the East-Border Cover of *Karkonosze* Mts.

Size of the Document 335 × 235 mm.

Deposition Information A private collection of Piotr Krzywiec.

Supplementary Information
The map is quite detailed. Granites of the *Karkonosze Massif*, metamorphic rocks of the East-Border of Karkonosze, and Izera gneisses with mica schists of the *Stara Kamienica* Belt are very well distinguished. The author, Carl von Raumer, tried to join the outcrops of limestone rocks in one, partly in two bands. The information about occurrences of ores is precise and detailed.

Map 26 Petrographische Charte der Cservenitzer und Telky-Bányer Gebirgskette oder des Carpathischen Filial-Gebirgszuges von Eperjes bis Tokay. (Source: Geological and Geophysical Institute of Hungary)

Petrographische Charte der Cservenitzer und Telky-Bányer Gebirgskette oder des Carpathischen Filial-Gebirgszuges von Eperies bis Tokaÿ
1813
Matthias Sennovitz

Title in English (literally) Petrographic map of chains of *Cservenitza* and *Telkibánya* namely at the Carpathian side-ridge from Eperjes (*Prešov*) to Tokay (*Tokaj*).

Scale The scale is not given on the map: it is approximately 1:354,000.

According to F. Síkhegyi (Čejchanová et al., 2010), the map is part of the map collection of the Széchenyi family, included in *Adversaria nonnulatum chartarum montanisticarum Hungariae et Transylvaniae*, National Széchenyi Library, Hungary.

This map forms part of a manuscript entitled *Fossils and minerals which occur in this mountain range.*

Legend Presented in manuscript form with ink drawings; hand-coloured with point symbols, and placement of hills, rivers, and settlements. Rock units are subdivided into five categories: sandstone; limestone; porphyry; pearlrock; and shale. Sixteen mines and mine fields are numbered. Mineral waters, spas, and occurrence of opal, gold, silver, copper, salt, iron, and antimony are indicated by special symbols. Thus, this map can be classified as a lithologic map that also shows mineral deposits and some hydrological details.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Buda* (Budapest?); for longitude: approximately 48°02′–49°07′ N, 20°55′–21°10′ E (in Greenwich).

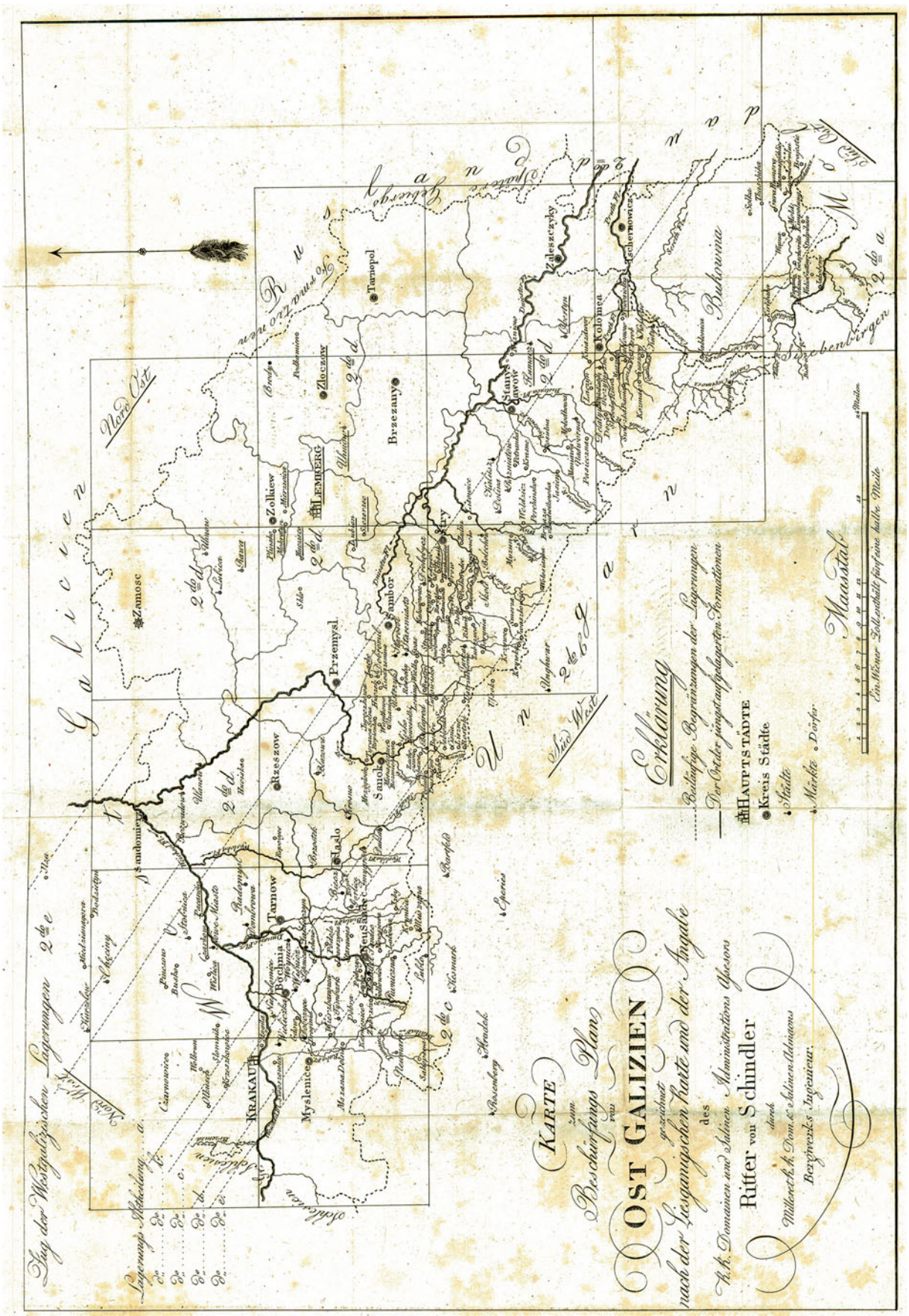
Mapped Area Approximately 5,000 km^2.

Mapping Area Hungary, Slovakia, Tokaj–Eperjes Hills from *Tokaj* to Eperjes (*Prešov*).

Size of the Document 215×340 mm.

Deposition Information A digital copy is deposited in the Geological Institute of Hungary. Manuscript Collection, Fol. Lat. 3748/1.

Supplementary Information
This is a very detailed map showing distribution of rock units, minerals, mines, and some other features, such as spas and mineral waters. The map is a supplement to a short text that describes mainly geographic positions and some geological features within the area studied.



Map 27 Map Karte zum Beschürfungs Plan von Ost Galizien gezeichnet nach der Lieseganigschen Karte. (Source: Private collection, P. Krzywiec)

Karte zum Beschürfungs Plan von Ost Galizien gezeichnet nach der Lieseganigschen Karte und der Angabe des K.K. Domainen und salinen Administrations Assesors Ritter von Schindler
1815
Carl Ritter von Schindler

Title in English Map of eastern Galicia plotted after using the map of Lieseganig and data provided by the Emperor and Royal District and Salt Management by Ritter von Schindler.

Scale The scale is given on the map in *linear scale* and miles: it is approximately 1:1,560,000.

Supplement to the Book The map was published in the book by Carl Ritter von Schindler, *Geognostische Bemerkungen über die Karpathischen Gebirge in dem Königreiche Galizien und Lodomerien und die Art, nach welcher die an diesen Gebirgen liegenden verschiedenen Mineralien am leichtesten und zuverläßigsten aufgefunden werden können.* (*Geognostical notes about the Carpathian Mountains of Galicia and Lodomeria, showing occurences of various minerals and possible ways of their utilisation.*) Camesinaschen Buchhandlung, Wien. 1815. First edition.

Legend The legend of the black-and-white map contains only basic information on location of major, medium, and small cities and also the location and delimitation of some mineral deposits mentioned in the text. Carl Ritter von Schindler managed to show major NW–SE trends that seem to conform to the orientation of the Teisseyre-Tornquist Zone, a major tectonic suture of European importance.

Coordinates No coordinates are given on the map: they are deduced approximately 47°37′–50°49′ N, 19°50′–26°00′ E (in Greenwich).

Mapped Area It is difficult to measure, because the map is oriented diagonally; it is very approximately 60,000 km^2.

Mapping Area Former Galicia, Bukowina, Ukraine, and a small part of Romania, and recent Poland. Geologically the map embraces the Carpathians and Carpathian Foreland, present-day Poland, Ukraine, and a small part of Romania.

Size of the Document 430 × 290 mm.

Deposition Information The private collection of Piotr Krzywiec.

Supplementary Information
The map seems to be the first in which tectonic lineaments, such as along the Teisseyre–Tornquist Zone, have been shown and discussed in the context of their role in distribution of various deposits. The publication and accompanying map were prepared as a result of studies conducted on behalf of the Austrian government, after partitioning of Poland, in search of economic deposits.

Map 28 Geological map of the whole of Poland, Moldavia, Transylvania, and parts of Hungary and Wallachia, prepared by Staszic in 1806, sheet A.(Source: Private collection, S. Wolkowicz.)

Carta Geologica totius Poloniae, Moldaviae, Transilvaniae, et partis Hungariae, et Walachiae inventa per Staszic anno 1806
1806 (1815)
Stanisław Staszic

Title in English Geological map of the whole of Poland, Moldavia, Transylvania, and parts of Hungary and Wallachia, prepared by Staszic in 1806.

Scale The scale is given on the map in old miles: it is approximately 1:1,250,000.

Publication Year 1806 is the year depicted on the map; 1815 is the year when the map was published as a supplement to the book.

Supplement to the Book On the earth-forming of the Carpathian Mountains and other mountains and lowlands of Poland, by S. Staszic. Warsaw. 1815. The book contains 12 articles prepared by Staszic in the period 1805 to 1814. It was printed in "Roczniki Towarzystwa Warszawskiego Przyjaciół Nauk" (*Annuals of the Warsaw Society of Friends of Science*).

An integral part of the book is the geological map, which consists of four separate sheets (A, B, C, D). In this Atlas we present sheet A and a sheet with a cross section.

The Staszic´atlas, besides the geological map, also contains one geological cross section and six tables with information about mines and metallurgy activities in the territories described in the book. It also contains a drawing entitled "*Panorama of Tatras*" (drawn by S. Vogel, 1804, and sculptured by Baltard), a portrait of a highlander (drawn by J.Z. Frey), two separate drawings, "*Royal Eagle*" and "*Chamois*" and three tablets with the drawings of fossils.

Legend The remarkable legend is generally in French, sometimes with German names, and there is a rich combination of colours and numbers. The map contains two types of legends.

(I) Containing 5 coloured items related to stratigraphy (in the sheet A, in the top right corner): *Montagne Primitive* = Primitive (Primary) Mountains (light grey); *Montagne Secondaire ou premiere Stratiforme* = Secondary Mountains or Primary layered units (light pink); *Montagne Antemarine* = Pre-Marine Mountains (light yellow); *Montagne Marine* = Marine Mountains (light blue); *Terres d' alluvion* = Alluvial Terrains (light green).

(II) A very detailed and complicated legend, containing 142 items, which corresponds to the first legend (on sheet B, left part of the sheet) with continuation on sheet D (top right corner).

The Primitive (Primary) Mountains contain 8 subdivisions; for the Secondary Mountains or Primary layered units 53 subdivisions are depicted. The Pre-Marine Mountains contain 18 subdivisions starting from transitional conglomerates from Secondary Mountains to the Pre-Marine Mountains; the Marine Mountains include 17 subdivisions with transitional conglomerates on the base and overlying limy sandstones and other rocks. Alluvial Terrains are depicted as 25 subdivisions.

All points with geological descriptions (numbers related to the second legend) also contain information about altitude. Staszic distinguished nine classes of altitude. What is the most interesting is that Staszic made the measurements of altitude himself.

Cross Section One cross section is on a separate sheet (see Map 28.1). It starts from the High Tatra Mountains and ends at the Baltic Sea (*Gdansk Gulf*). The cross section is very suggestive and contains much information on subsurface strata.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 43°00′–55°00′ N, 16°00′–33°00′ E (in Greenwich).

Mapped Area Approximately 1,350,000 km^2.

Mapping Area Poland, Russia (Kaliningrad region and Smolensk area), southern part of Lithuania, Belarus, Ukraine, Slovakia, Czech Republic (from the line *Olomouc-Brno* eastwards), Hungary, Romania, Moldova.

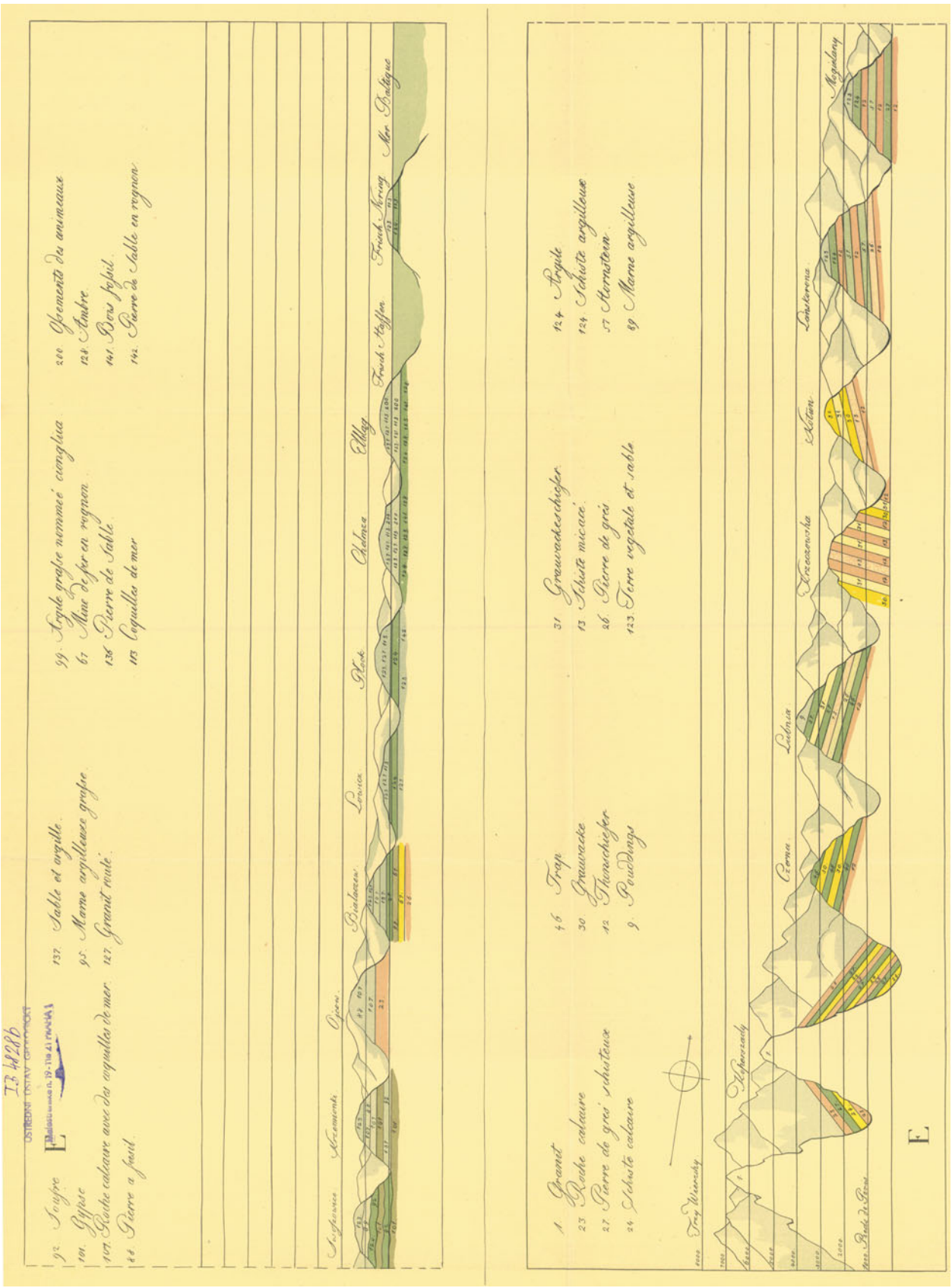
Size of the Document Each of the four sheets is 665 × 480 mm.

Deposition Information The private collection of S. Wolkowitz.

Supplementary Information

The entire map can be considered a milestone in the history of geological mapping of Central Europe.

The map is an original work by Stanislaw Staszic and was based on his detailed observations and researches. The accuracy of mapping and depiction of geological situation in the map parts is unusual. The Carpathians and their surroundings are described very precisely. The author distinguished Carpathian flysch (composed of sandstones and claystones) from the calcareous Pieniny Klippen Belt and granites of the High Tatra Mountain. The Carpathians are clearly separated from the Black Sea Plate by the rocks of "Pre-Marine and Marine Mountains" (of Carboniferous to Tertiary ages). Northern and central parts of Poland are also correctly mapped. Quaternary sediments with rare outcrops of older rocks cover the largest part of the map. Information on occurrences of mineral deposits is extensive, accurate, and valuable. The author also depicted scarce occurrences of titanium, chromium, and uranium ores. This work was sponsored by scientific societies, and nobility – in its own interest – supported studies of the land's animate and inanimate resources.



Map 28.1 Cross section from the High Tatra Mountains and ends up to Baltic Sea (Source: Private collection, S. Wolkowicz.)

Map 29 Orographische Charte von dem Fichtel-Gebirge. Trigonometrisch aufgenomen und mit Zuziehung der besten Hülfsmittel (Source: Private collection of B. Fritcher)

Orographische Charte von dem Fichtel-Gebirge Trigonometrisch aufgenomen und mit Zuziehung der besten Hülfsmittel gezeichnet von Dr. Bischof u. Dr. Goldfuss
1816/1817
August Goldfuß; Gustav Bischof

Title in English Orographic map of the Fichtelgebirge [literally, 'Spruce Mountains'; in Czech '*Smrčiny*']. Trigonometrically charted and with the aid of the best resources delineated by Dr. Bischof and Dr. Goldfuss.

Year of Publication Both the map and the preface of the book to which it is attached bear the date 1816; the date of the publication of the book, however, is 1817, and, as far as it is known, there is no separate edition of the map.

Scale The scale is given on the map in three *geographical miles* (with 1 *geographical mile* = 22,840 *Parisian feet*): it is approximately 1:150,000.

Supplement to the Book The map is an attachment to the book by August Goldfuß and Gustav Bischof entitled *Physikalisch-statistische Beschreibung des Fichtelgebirges. Bd. 2* (*Physical and statistical description of the Fichtelgebirge*, Vol. 2.). Published in Nürnberg by Steinsche Buchhandlung (Johann Adam Stein), Nürnberg, 1817 (preface dated 1816).

Legend The legend consists of eight items, in the lower left corner, depicted by coloured rectangles: granite, gneiss and mica schist, slate, limestone, serpentine and steatite/soapstone (*Speckstein*), sand and clay, primeval and transitional rocks, and basalt. In the lower right corner there are 23 symbols for geographical features, 9 different symbols for cities, villages, etc. of different size, administrative function, etc., further symbols for hammer mills, (water) mills, political borders, wire mills (*Drahthammer*), posting houses, borders of the mountains, monasteries, blast furnaces, ruins, country roads, chapels, glassworks, individual towers, and mineral springs.

A rough chronological arrangement, however, is implicitly given by the classical Wernerian system, according to which granites were the oldest rocks, followed by gneiss, schist, sedimentary rocks, and finally unconsolidated sediments. Holding this background in mind, one might identify (from a modern point of view) the boundary between the Palaeozoic (crystalline) rocks and the Mesozoic foothills (with Early and Late Triassic rocks, i.e., *Buntsandstein* and *Keuper*, and, accordingly, the so-called *Frankische Linie* (Franconian Line) as a tectonic fault line separating the two formations. Moreover, the *Münchberger Gneismasse* (Münchberg Gneiss Mass) might be identified, although, to be sure, Bischof did not use these terms, nor did he discuss these features in a modern stratigraphical or even tectonic sense.

Cross Section None within the map itself; however, there is a cross section in vol. 1 of the book *Physikalisch-statistische Beschreibung des Fichtelgebirges*, accompanying a section of the morphology, that is, of the altitudes along a line of approximately 63 km (for which a length of 190,000 *Parisian feet* is given in the text). The line runs south–north, that is, from the *Rauher Kulm* Mountain in the south up to (Bad) Steben in the north. To be sure, again, the cross section gives no stratigraphic order, but solely the occurrences of individual rocks that exist along that line.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 49°50′–50°30′ N, 11°40′–12°05′ E (in Greenwich).

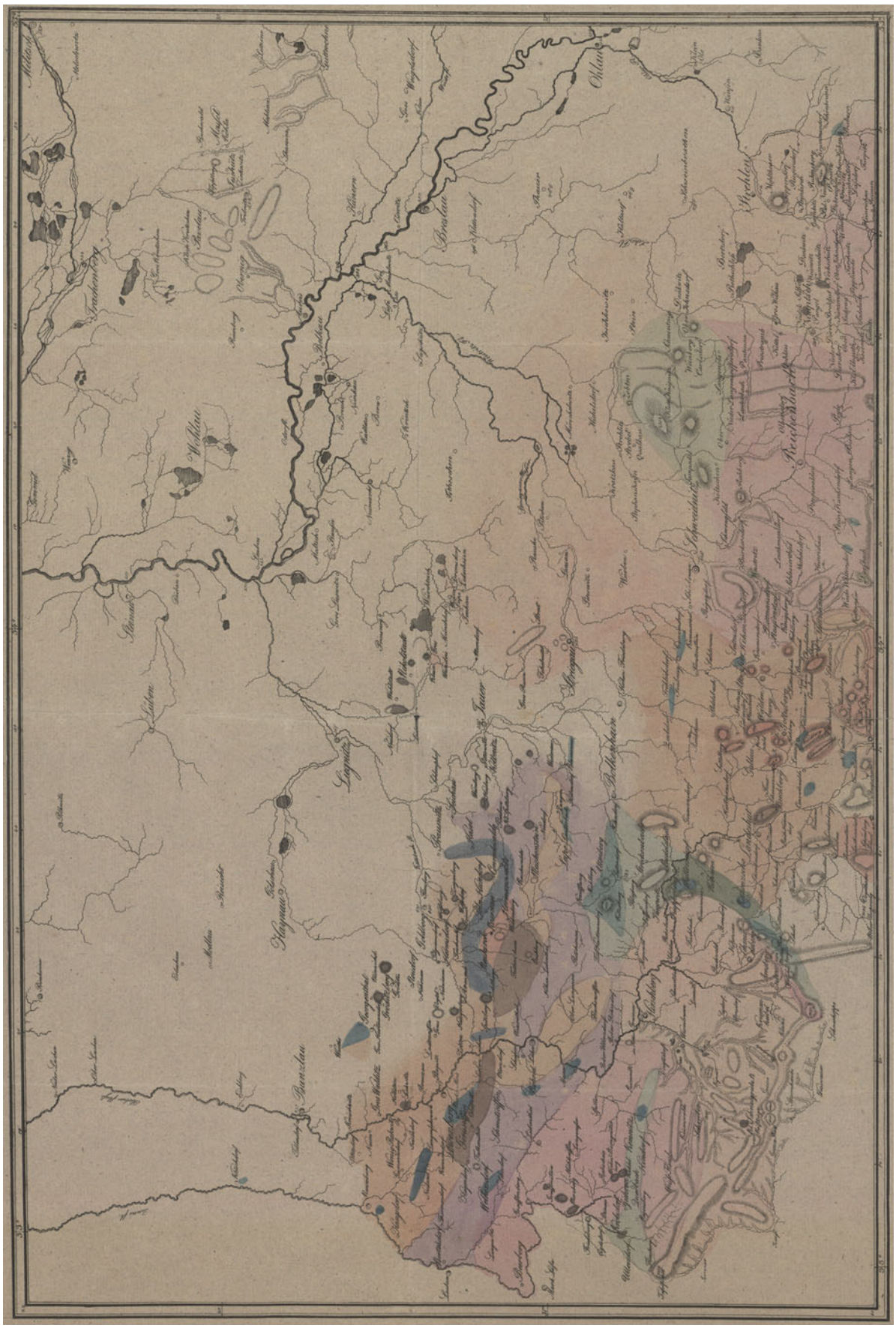
Mapped Area Approximately 3,600 km^2.

Mapping Area Fichtelgebirge (Bavaria) is shown within its geographical boundaries, with Hirschberg/Saale (Thuringia) and Neustadt am Kulm as its northern and southern extensions, respectively, and *Kulmbach* (Culmbach) and *Pomezi nad Ohři* (Muhlbach) as the Western and Eastern limits.

Size of the Document 390 × 420 mm.

Deposition Information A digital copy, which was used in this Atlas, is from the private collection of B. Fritcher. Originals are in Bavarian States Library, Munich, and University Library Munich.

Supplementary Information
The orographical map is the first 'geognostical' map of the Fichtelgebirge, and, together with the map of Mathias von Flur (1792), they are the earliest geognostical maps of Northern Bavaria. The map of the Fichtelgebirge by August Goldfuß and Gustav Bischof, together with the book to which it has been originally attached, represent the earliest comprehensive geological/petrographical survey of these mountains. It is the result of frequent travels in the area by both authors.



Map 30.1 Mineralogische Karte von Schlesien. Sheet 1 (Source: The National Library, Warsaw)

Mineralogische Karte von Schlesien
1818
August Kaluža

Title in English Mineralogical map of Silesia.

Scale The scale is not given on the map: it is approximately 1:280,000.

Supplement to the Book The map consists of four separate sheets as a supplement to the book by August Kaluža, *Uebersicht der Mineralien Schlesiens und Glatz nebst ihren Fundorten und vielen neuen Höhemessungen auf 4 Karten dargestellt* (*Overview about Silesian and Klodsko minerals with their localities and with many new data on topographic elevations*). 1818. Kreuzer und Scholz, Breslau (Wrocław). First edition.

Legend The first map of a set of four sheets contains a legend in the left bottom corner of the sheet. The legend consists of 14 coloured squares that correspond to 14 types of rocks: granite, gneiss, mica schist, porphyry, serpentine, amphibolite, old greenstone, limestone, marlstone, amygdaloidal vulcanite, basalt, clayey shale, coal sandstone, and younger sandstone.

The set of maps is based on lithology and simple topography. An attempt to distinguish between "older and younger" formations can be observed. In the legend we could see an influence of Werner's school. The map is without tectonic concept and does not contain any cross section.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 49°50'–51°00′ N, 16°00′–20°00′ E (in Greenwich).

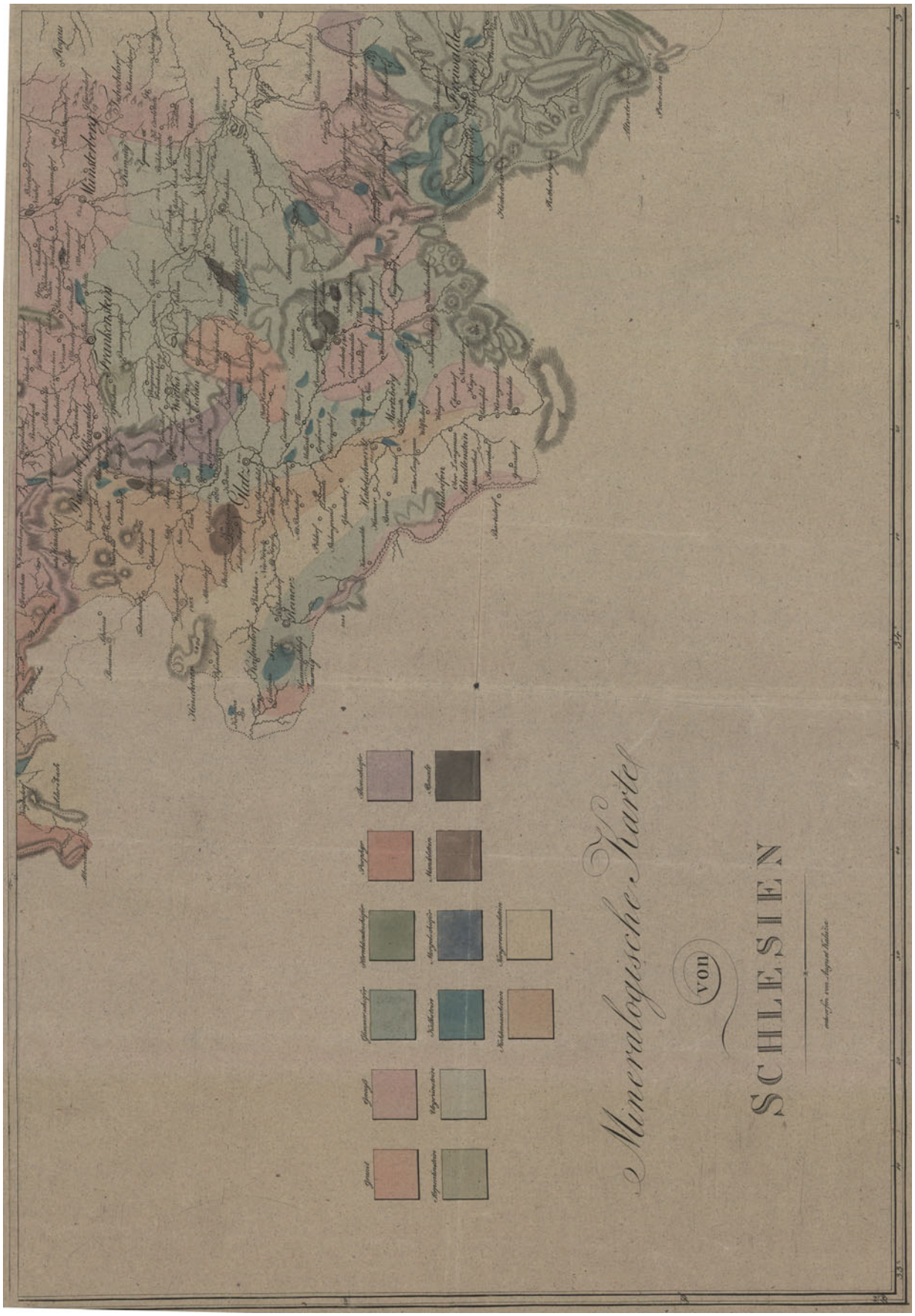
Mapped Area Approximately 15,000 km^2.

Mapping Area Part of Bohemian and Polish Silesia, Klodsko region, recent Czech Republic and Poland.

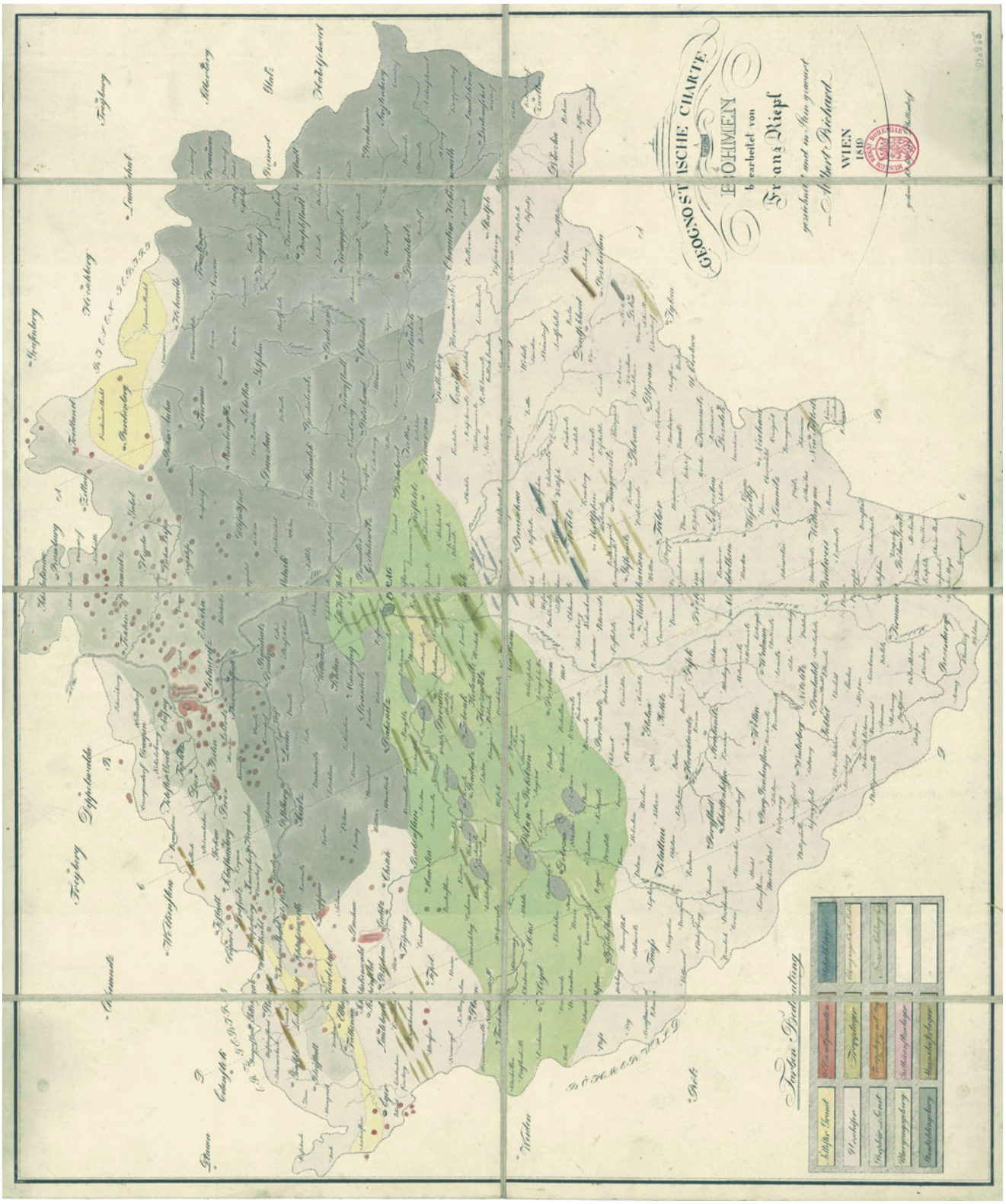
Size of the Document Four sheets, each 490 × 320 mm.

Deposition Information Original is in the National Library, Warsaw. Signature No. 559.

Supplementary Information
This map was unknown to experts in the history of geosciences until recently. The set of maps was discovered in the Warsaw National Library during the VISEGRAD project in 2010. It is interesting to compare the view of geology by A. Kaluža in 1818 to that of L. von Buch in 1802 on the same area of the southwest parts of Poland. According to S. Wolkowicz (Čejchanová et al., 2010), we can observe many more details in the Kaluža map, especially in the case of the Sudety Mountains. The map shows the work and enthusiasm of a Catholic priest, a native from Kouty (a Moravian town). He was an autodidact, but was an expert in the natural sciences. The mineralogical map is comparatively simple and mirrors geological knowledge at the beginning of the nineteenth century. It is not known who sponsored the map and book production. It is possible that the author's membership in the Society for the Patriotic Culture supported him to gain some grant funds.



Map 30.2 Mineralogische Karte von Schlesien. Sheet 2 with the title (Source: The National Library, Warsaw)



Map 31 Geognostic map of Bohemia (Source: The Archives and Library of Czech Geological Survey)

Geognostische Charte von Böhmen bearbeited von Franz Riepl, gezeichnet und in Stein graviert von Albert Richard
1819
Franz Xaver Riepl

Title in English Geognostic map of Bohemia, constructed by Franz Riepl. Drawn and engraved in stone by Albert Richard.

Scale The scale is not given on the map: it is approximately 1:576,000.

Legend There are some differences between the legends of several available map copies. Here, only one of them is described. The legend is in the lower left corner and contains 13 filled rectangles with the following descriptions in German: old granite; old schist; porphyry and syenite; transitional formations; black coal formation; basalt formation; trap formation; trap with magnetite; ironstone; alum shale; old limestone; transitional limestone; limestone; and brown coal formation (lignite). Several stratigraphic units are defined, mapped, and included in the legend: Proterozoic with Cambrian; Early Palaeozoic; and Late Palaeozoic and younger formations, mainly Cretaceous. The map is based on lithology. The NE–SW strike of geological bodies and formations can be considered as an initial tectonic interpretation of geological structure.

The map contains some topographic and hydrological data, but altimetry is missing.

Cross Sections The cross sections represent graphical supplements to the separate map (see Map 31.1); four sections are on one sheet, all of which are oriented in the NNW-SSE trend. Cross section A: between *Žďarec* and *Liberec*; cross section B: between *Nova Bystřice* and *Lovosice*; cross section C: between *Jirkov* and *Nové Hrady* near *Třeboň*; and cross section D: between *Loket* and *Klatovy*. In the cross sections termed "Geognostische Profil-Risse von Böhmen (Geognostic cross-sections from Bohemia)," Franz Riepl distinguished several units, as well as black coal and brown coal basins. Thus, he contributed to the geological knowledge of Bohemia. His cross sections resemble Beudant's cross sections, which were supplements to the geological map of Hungary.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 48°30′–51°00′ N; 12°00′–16°30′ E (in Greenwich).

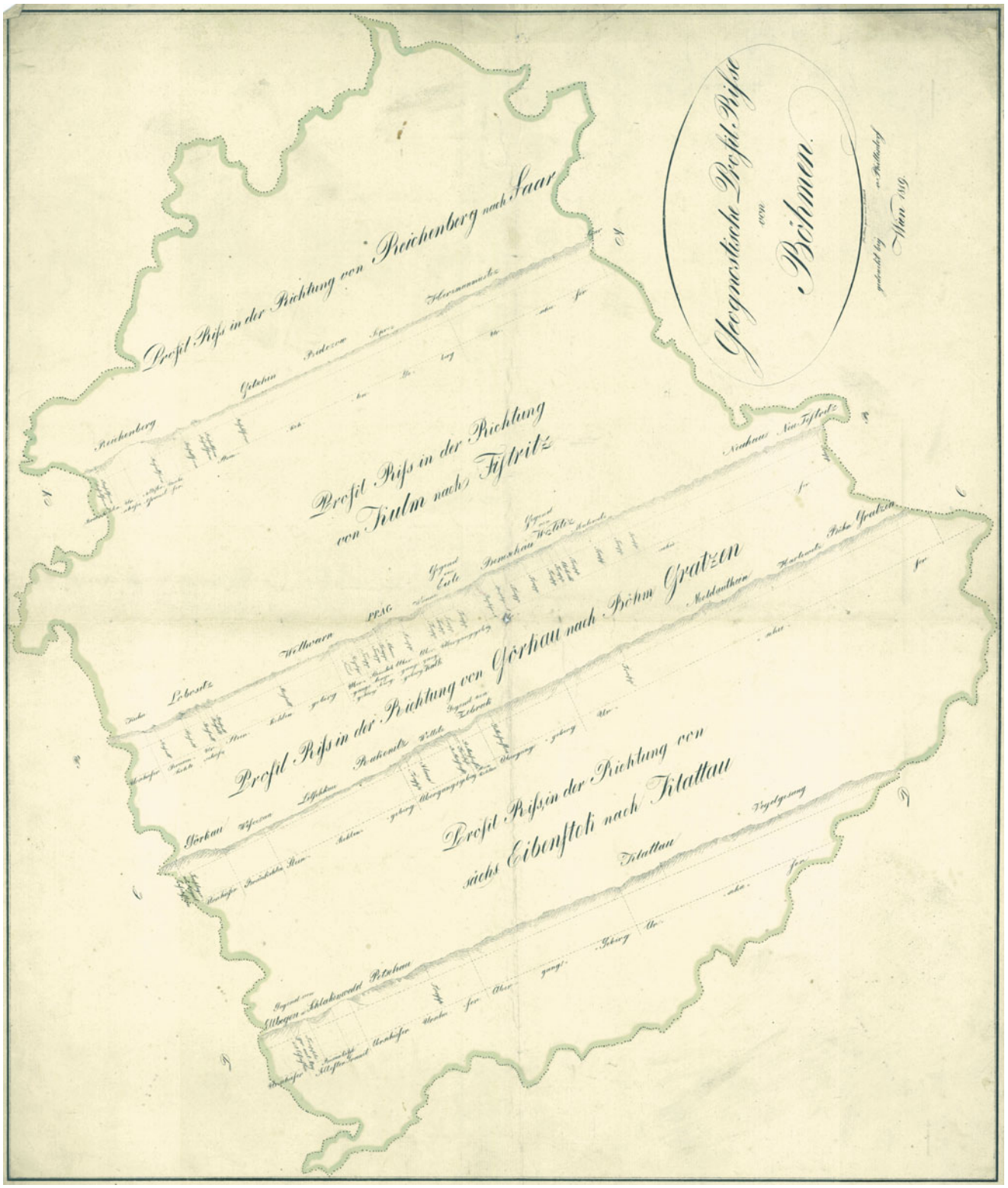
Mapped Area 50,000 km^2.

Mapping Area Czech Lands Kingdom, part of the Austrian Empire, negligible part of Poland (recent Czech Republic and Poland).

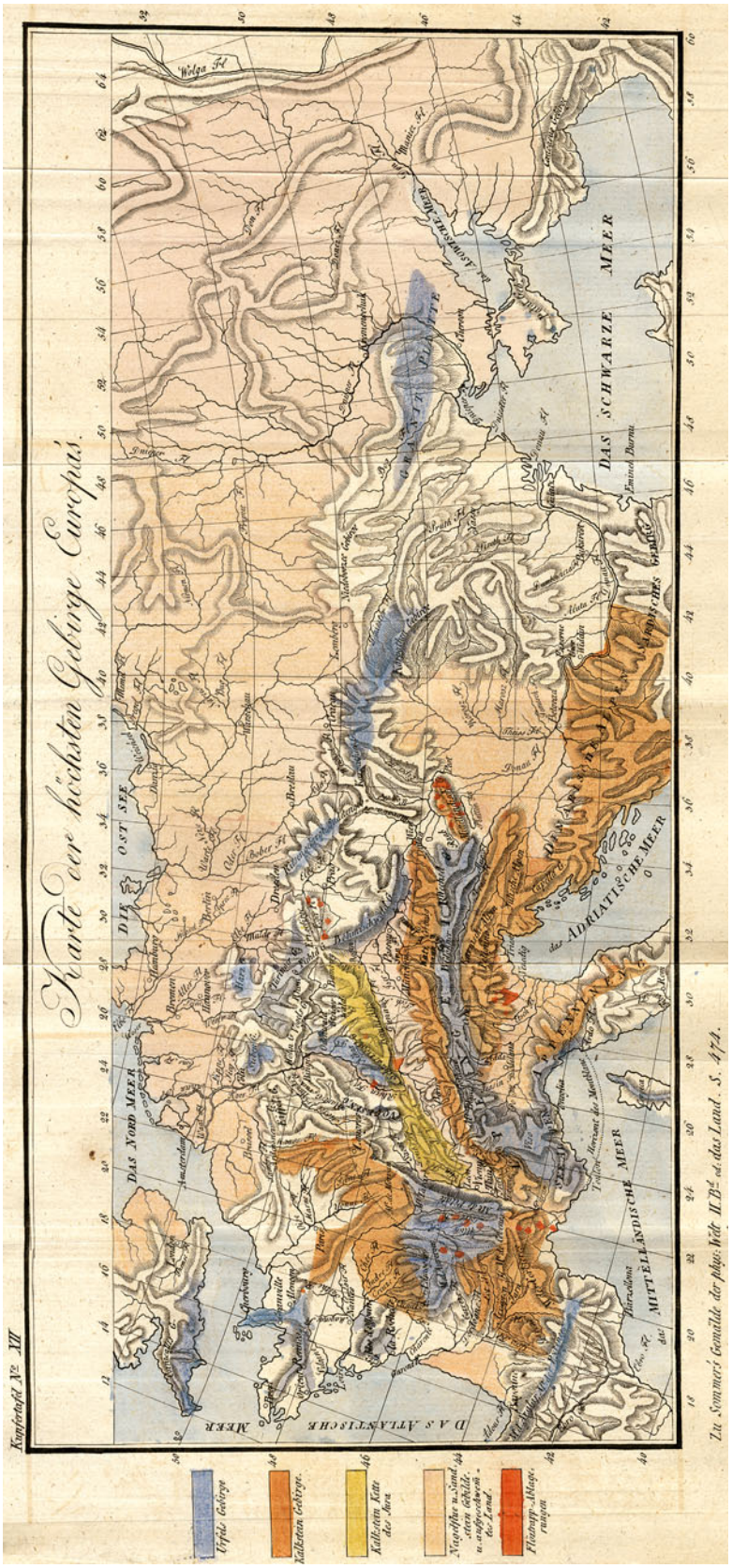
Size of the Document 516×610 mm.

Deposition Information A digital copy, which was used in this Atlas, is from the Archives of the Czech Geological Survey.

Supplementary Information
Riepl's interest is concerned with mineral deposits, mainly coal and iron. His "black coal formation," which includes both black and brown coal basins, covers nearly half of the map. Iron ores are subdivided into four types, whereas "shales" of different ages are grouped together, and porphyry, basaltic traps, and magnetite rocks are depicted separately. As a whole, the map shows two major units: a northern one, grouped under black coal formation, and a southern one, consisting of crystalline rocks. Franz Riepl was a keen supporter of the Neptunistic view, and the impact of this concept is clear in his map.



Map 31.1 Cross section: Geognostische Profil-Risse von Böhmen (Source: The Archives and Library of Czech Geological Survey)



Map 32 The map of the highest European mountains (Source: Private collection, J. Kozák)

Karte der höchsten Gebirge Europa's
1821
Johann Gottfried Sommer

Title in English The map of the highest European mountains.

Scale The scale is not given on the map: it is approximately 1:2,800,000.

Supplement to the Book Gemälde der physischen Welt von Johann Gottfried Sommer (*Image of the physical world by Johann Gottfried Sommer*), 2. Teil. (mit Kupfern und Charten). J.G. Calve'sche, Buchhandlung, Prag 1821.

Legend Five units are mapped and depicted by colours: old mountain belts; limestone mountain belts; Jurassic limestone; Nagelfluh and sandstone units; and "Flöz" units (coal seams and associated deposits). Except for colours, some units are indicated on the map by script, such as the Variscan belts of Central Europe, the French Central Massif, the Granitic block in Russia, and parts of the Carpathians, Alps, and Pyrenees. Coal basins in northwest Bohemia, along the Rhine River, and in some other areas are mapped, but some of them are not placed properly. Black coal is not differentiated from lignite, nor are old massifs (e.g., Variscan belts) distinguished from Alpine units.

The map is completed with three geological cross sections across the Alps. The geological situation is idealized, but ten geological units are depicted: granite; gneiss; mica schist; clayey schist; porphyry; quartz; serpentine; limestone; black coal; basalt; and sandstone.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 42°00′–54°00′ N, 04°00′W–44°00′ E (in Greenwich).

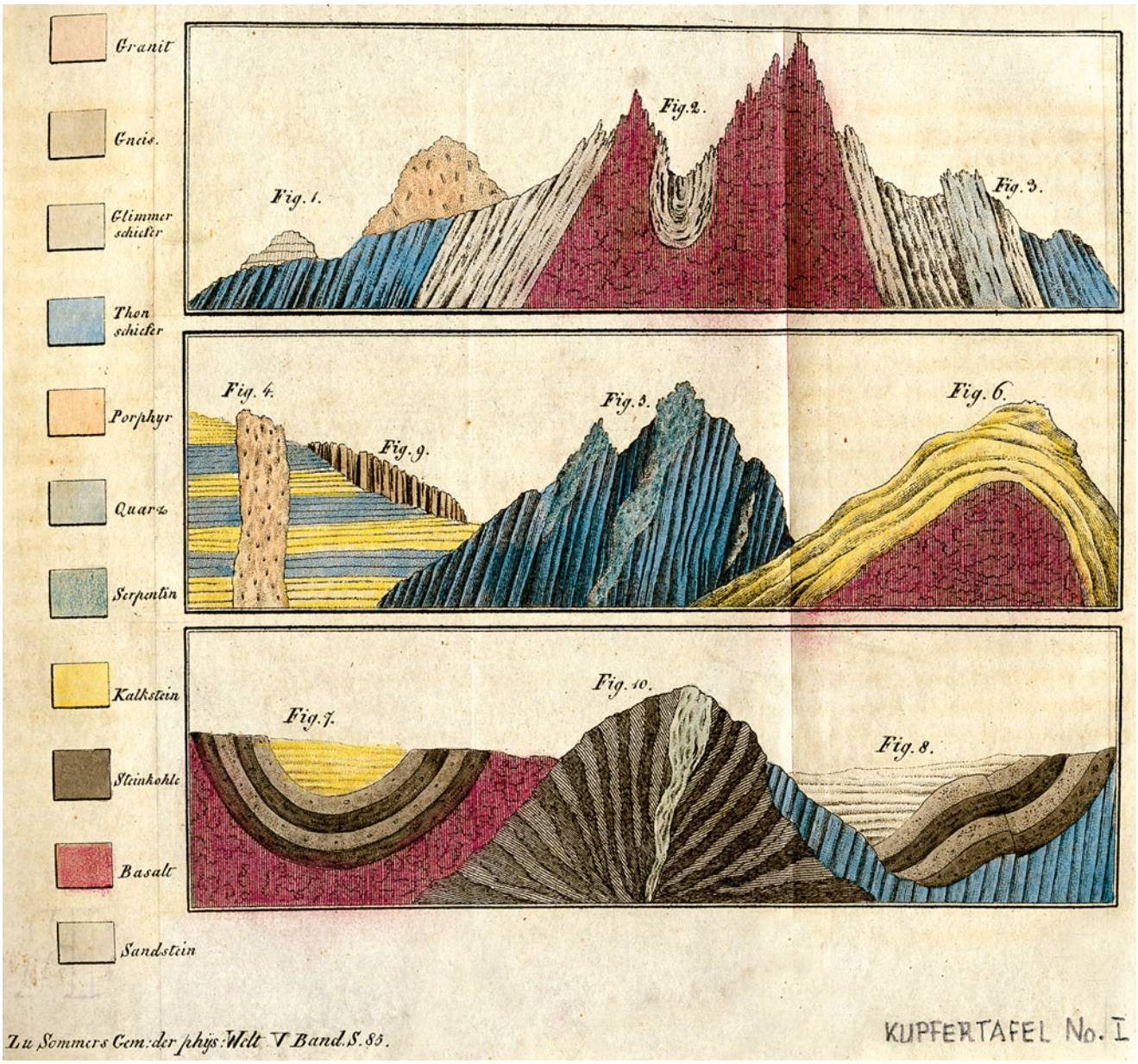
Mapped Area About 5,800,000 km^2.

Mapping Area The whole of Europe, without southern parts of Italy, the Balkans, the greater part of the Pyrenean Peninsula, Scandinavia, northern Great Britain, and Russian territory to the east of the Volga River.

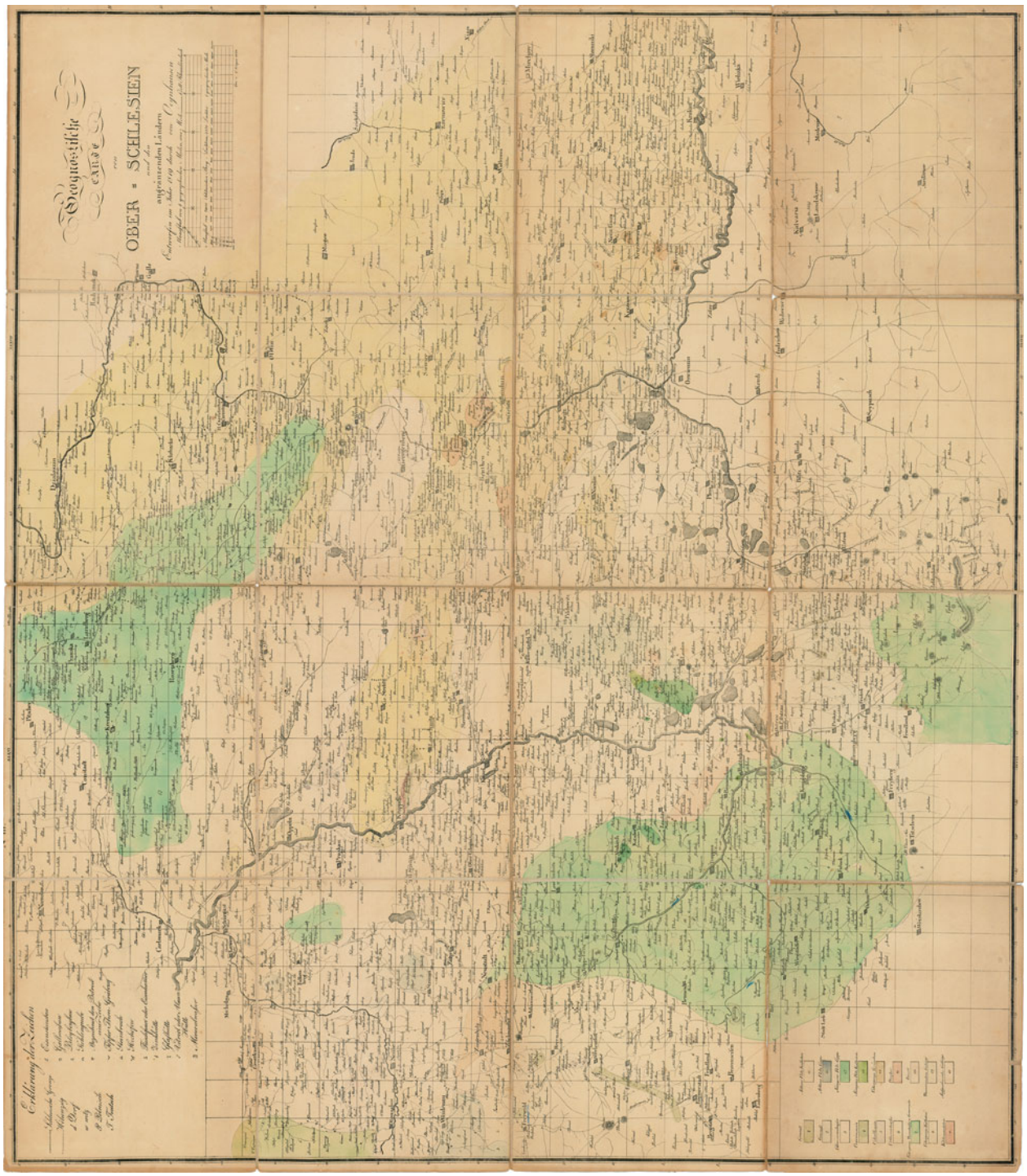
Size of the Document 335 × 155 mm.

Deposition Information Original is in the private collection of Jan Kozák.

Supplementary Information
The map shows some geology, and so it could be called "protogeological." The influence of the A.G. Werner concept of geological evolution is recognizable, because the geological units are classified and named in Wernerian style. Depiction of the central Alpine belt with its Nagelfluh and limestone foreland is worth mentioning, as well as application of some stratigraphic terms (Jurassic, Nagelfluh). On the other hand, this map does not show any traces of a tectonic concept.



Map 32.1 Idealized geological cross sections across the Alps (Source: Private collection, J. Kozák)



Map 33 Geognostische Carte von Ober-Schlesien und den angrenzenden Ländern. (Source: The Library of Polish Geological Institute. National Research Institute)

Geognostische Carte von Ober-Schlesien und den angrenzenden Ländern. Entworten im Jahr 1819 durch von Oeynhausen
(1819) 1822
Carl von Oeynhausen

Title in English Geognostic map of Upper Silesia and surrounding territories. Prepared in 1819 by von Oeynhausen.

Scale The scale is not given on the map: it is approximately 1:286,000.

Supplement to the Book Carl von Oeynhausen: *Versuch einer geonostischen Beschreibung von Oberschlesien und den nachst angrenzenden Gegenden von Polen,* Galizien und Oesterreichisch-Schlesien. 1822. Essen, bei G.D. Badefer. (*Geognostical description of Upper Silesia and surrounding countries of Poland, Galicia and Austrian Silesia*.)

Legend Identifies granite, gneisses, mica-schist, old greywacke, old limestone, intermediate limestone, coal-bearing sandstones, older limestone beds, older gypsum beds, younger gypsum beds, younger limestone beds, transitional greywackes, porphyry, basalt, tills, and sands.

This map is of a lithological character with information on places of exploitation and treatment of mineral deposits. The map also contains information on hydrology, showing some rivers and water reservoirs.

Coordinates No coordinates are given on the map: they are deduced approximately 49°30′–51°10′ N, 17°00′–19°15′ E (in Greenwich).

Mapped Area Approximately 28,000 km^2.

Mapping Area Southwestern part of Poland (Upper Silesia and Eastern part of Fore-Sudeten Block), Jura *Krakowsko-Częstochowska*, and a small part of the Czech Republic (*Ostrava* region).

Size of the Document 790×683 mm.

Deposition Information Library of Polish Geological Institute-National Research Institute. Signature 21534.

Supplementary Information
This map can be considered as the first lithological map with information on places of exploitation and treatment of mineral deposits map of Upper Silesia. The author, Carl von Oeynhausen, distinguished coal-bearing series in Upper Silesia, magmatic rocks in the *Krzeszowice* Trough, Jurassic limestone of Jura *Krakowsko* (up to Czech territory), granite of the *Strzelin–Żulova* massif, and gneisses. The map contains information about places of exploitation of iron and lead ores, coals, clays and building materials, and places of occurrence of mineral waters. There is also information about the location of primitive smelting furnaces, foundries, forges, zinc smelters, and glass works.

Map 34 Carte Géologique de la Hongrie et de la Transylvanie (Source: Geological and Geophysical Institute of Hungary)

1. Carte Géologique de la Hongrie et de la Transylvanie avec une partie des pays limitrophes
2. Carte Géologique des bords du Lac Balaton
3. Carte Géologique de la contrée de Schemnitz. Offrant l'ensemble et les details des terrains de Trachyte, de Sienite et Grünstein porphyrique, de Basalte etc.
1822
François Sulpice Beudant

Title in English (1) Geological map of Hungary, Transylvania, and part of the bordering territories. (2) Geological map of the surroundings of the Lake Balaton. (3) Geological map of the Schemnitz (*Banská Štiavnica*) region. Proposing complex view and details of the occurrences of the trachyte, syenite, greenstone, porphyry, basalt, etc.

Scale The scales are given on the main sheet and also on the map of Lake Balaton and Schemnitz *in French, German*, and *Hungarian miles*: for the main sheet it is approximately 1:1,000,000 and 1:200,000 (for Balaton and Schemnitz sheets).

Supplement to the Book Voyage minéralogique et Géologique en Hongrie pendant l'année 1818. Tome quatrième (*Mineralogical and geological voyage through Hungary in 1818*, 4th volume). Publisher: Verdiére, Libraire, Quai des Augustins No. 25, Paris. Separate (IV) volume for maps and sections; 6 attachments of maps, 7 attachments of geological sections, 1 table (Tableau géologique de la Hongrie).

Legend All three map sheets have the same graphical depictions. Legends are always in the right part of the sheets, mostly within the map frame. The first map of Hungary contains 24 kinds of geological formations in five groups, five terrains: *Primitifs* = primitive; *Intermédiaires* = transitional; *Secondaires* = secondary; *Tertiaires* = Tertiary; *Indépendants* = not classified. In the map of surroundings of Balaton Lake there are 12 kinds of geological formations according to their descending ages, plus dykes, basalts, and tuffs. In the map of the *Banská Štiavnica* region there are 16 kinds of geological formations with nine lithological units; silver deposits are also identified.

Coordinates No coordinates are given on the individual map: they are deduced approximately (1) Hungary 44°20′–49°30′ N, 13°00′–24°00′ E; (2) Balaton Lake 46°38′–47°02′ N, 17°10′–17°55′ E (Greenwich); (3) Schemnitz 48°14′–48°45′ N, 18°15′–19°00′ E (in Greenwich).

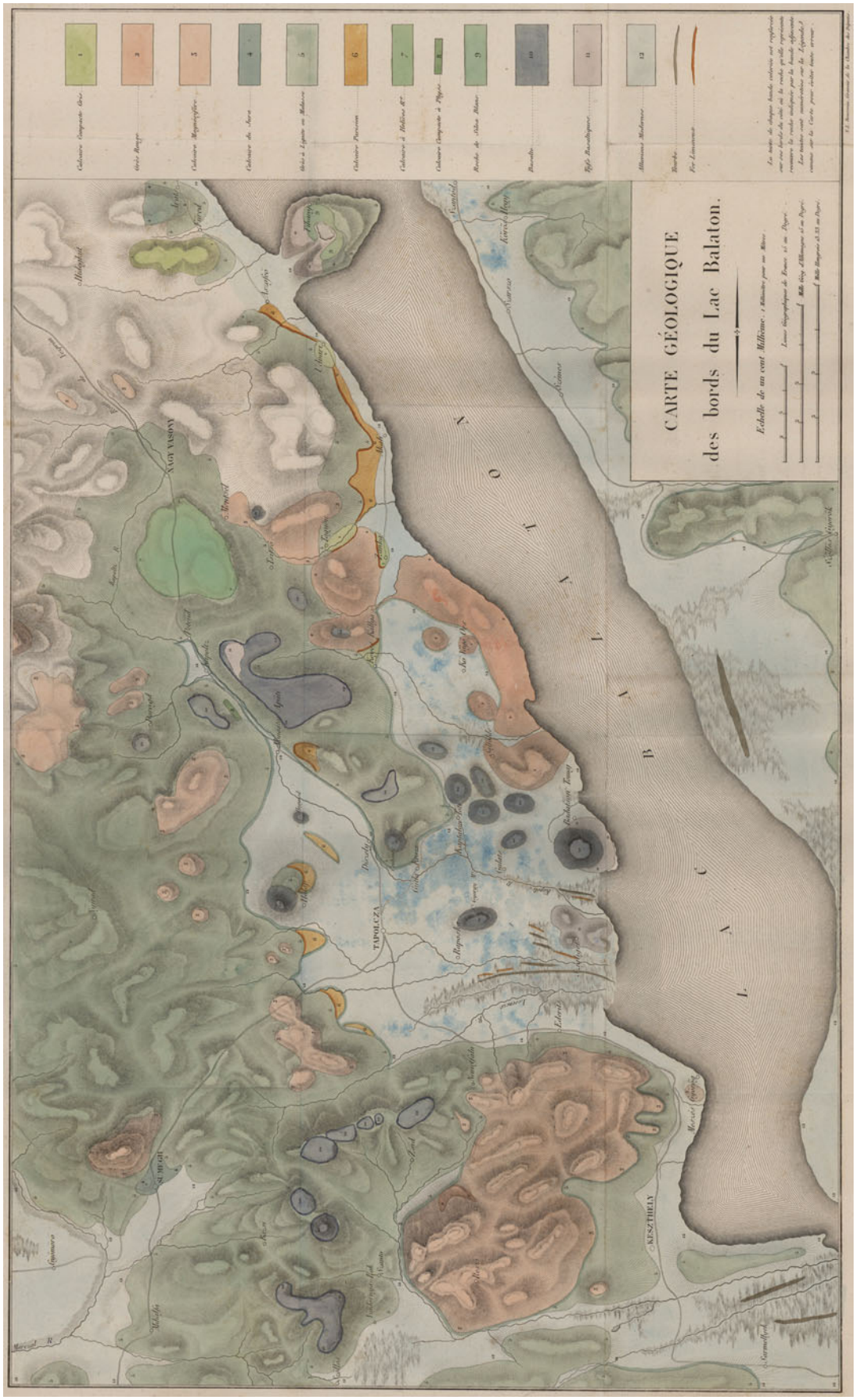
Mapped Area Sheet (1) Hungary, about 254,000 km^2; sheet (2) Balaton Lake, about 1,440 km^2; sheet (3) District of Banská Štiavnica, approximately 1,285 km^2.

Mapping Area (1) The Hungarian Kingdom, with part of Balkan and Czech lands (recent Hungary, Slovakia, Czech Republic, Croatia, Serbia, Bosnia-Herzegovina, Rumania, Poland). (2) Surroundings of Lake Balaton. (3) The mining district of Schemnitz (Banská Štiavnica).

Size of the Document (1) Hungary: 613×955 mm. (2) Surroundings of Lake Balaton: 385×630 mm. (3) The mining district of Schemnitz (Banská Štiavnica): 460×545 mm.

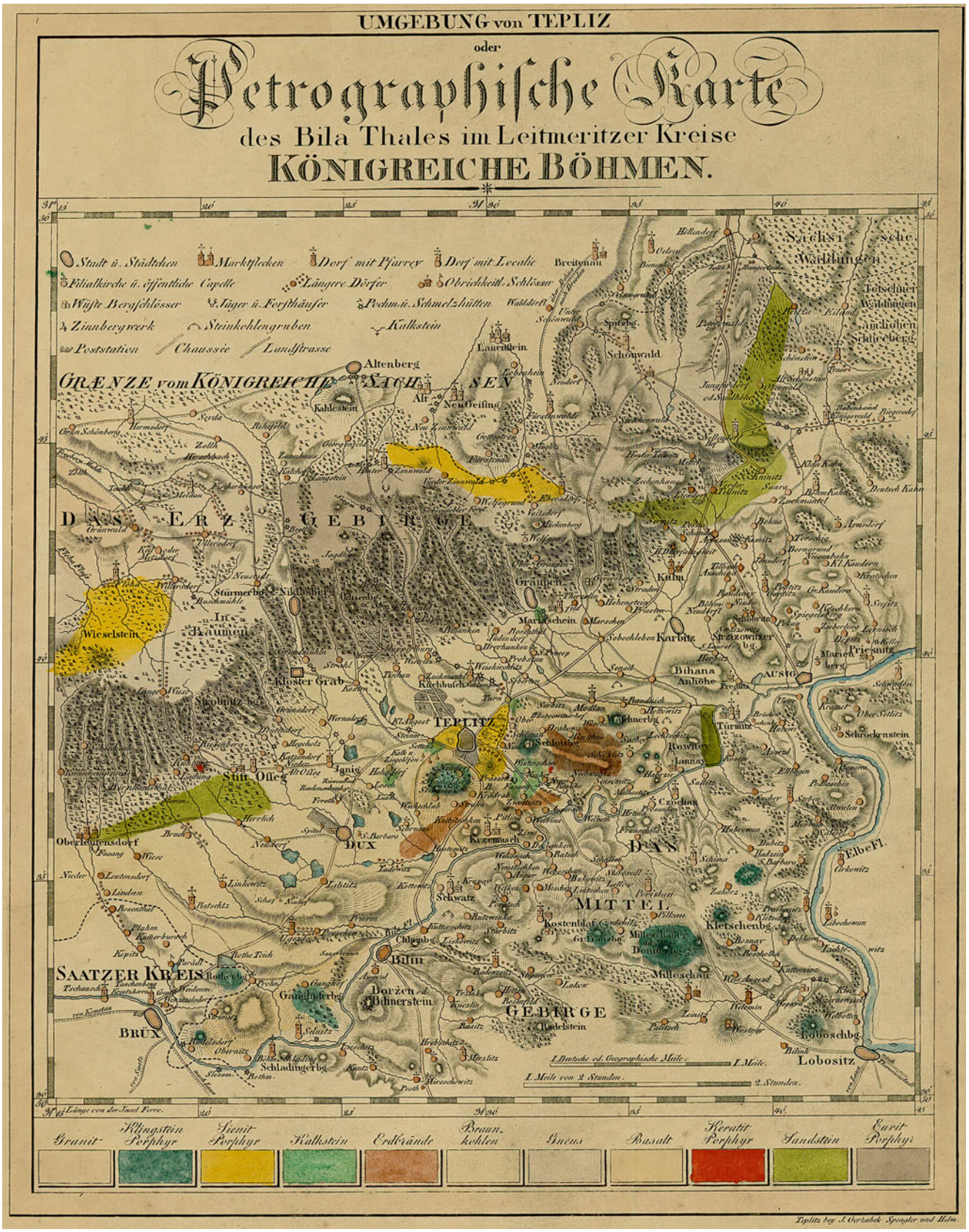
Deposition Information Originals in Geological and Geophysical Institute of Hungary, Dept. of Geo-informatics.

Supplementary Information
These first maps of Hungary show outlines of the geology of Hungary and surrounding countries in a comparatively modern way. The smaller-scale maps (Lake Balaton and Schemnitz) are accompanied by two large-scale maps and cross sections showing geological details of mapped areas.



Map 34.1 Carte Géologique des bords du Lac Balaton (Source: Geological and Geophysical Institute of Hungary)

Map 34.2 Carte Géologique de la contrée de Schemnitz (Source: Geological and Geophysical Institute of Hungary)



Map 35 Umgebung von Teplitz oder Petrographischer Karte des Bila Thales im Leitmeritz Kreise Königreiche Böhmen. (Source: Private collection, J. Kozák)

Umgebung von Teplitz oder Petrographische Karte des Bila Thales im Leitmeritzer Kreise Königreiche Böhmen 1823?
Franz Ambrosius Reuss

Title in English The environs of *Teplice* or petrographical map of the valley of the *Bílina* River in *Litoměřice* (Leitmeritz) County in the Bohemian Kingdom.

The year of map edition is not given in the map, and in fact there were published several ideas about the correct year. V.J. Procházka (1897) dated this map as 1829 (with a question mark), but in papers by N. Krutský and in the bibliography of F.A. Reuss (2001), this map is dated as 1823.

Scale The scale is given on the map in *German miles* and miles converted to hours. According to J. Beneš (1996), scale is approximately 1:137,000.

Supplement to the Book Whether this map is a supplement of a book is not yet known. It is interesting that J. Beneš (1996) is not persuaded about F.A. Reuss's authorship of this map.

Legend Two legends are attached to the map. In the upper left corner there are symbols for settlements, roads, estates, manors, post offices, forest lodges, and, last but not least, coal mines, tin mines, and steelworks. A typical geological legend is placed below the map, consisting of 11 items: granite, porphyry, syenite porphyry, limestone, porcellanite, lignite, gneiss, keratite porphyry, basalt, sandstone, and various types of porphyry.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 50°25′–50°40′ N, 13°25′–14°10′ E (in Greenwich).

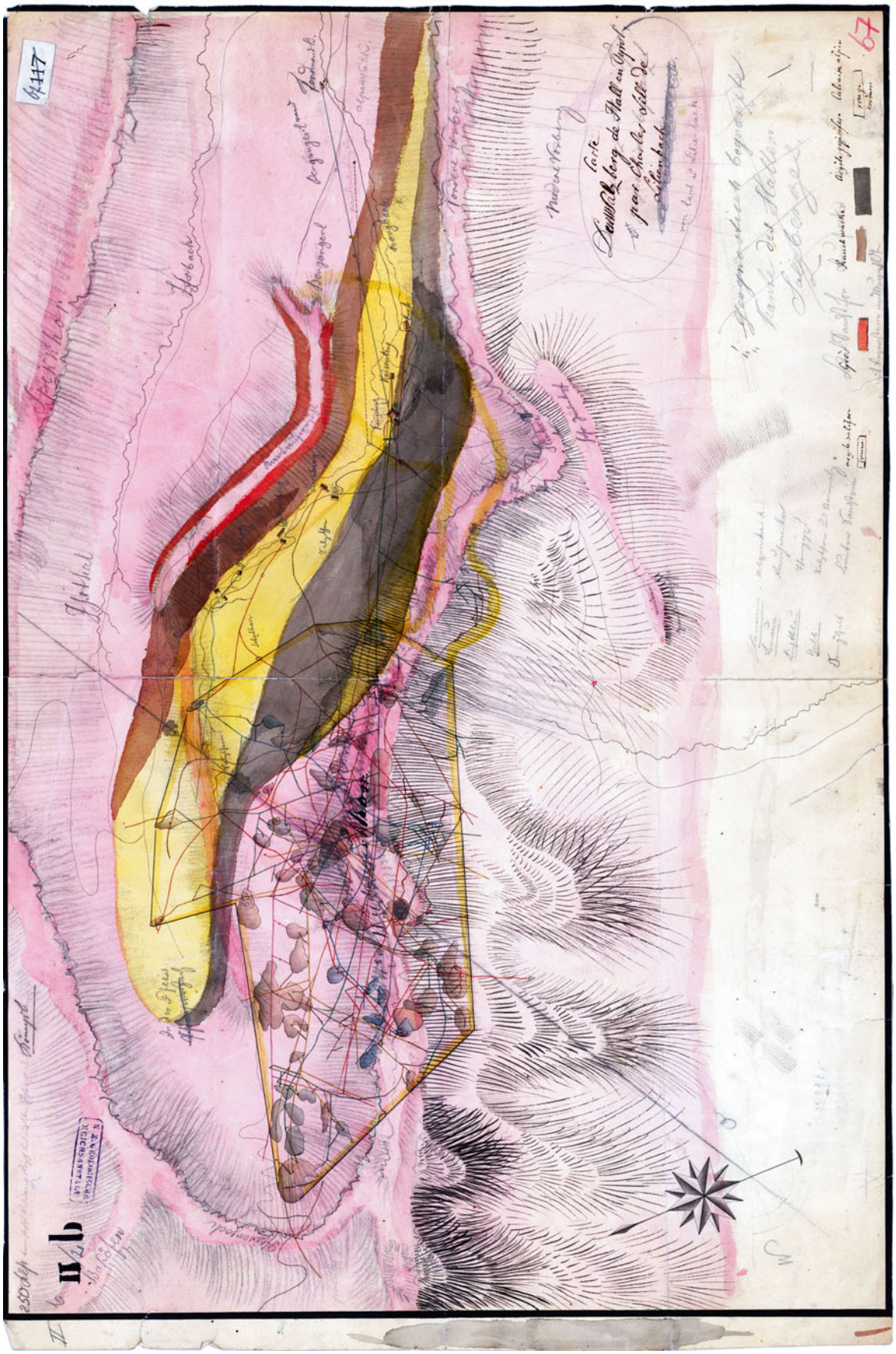
Mapped Area Approximately 1,500 km^2.

Mapping Area The area comprises historical Northern Bohemia, at that time part of the Austrian Empire (recent Czech Republic) with a very small part of Saxony.

Size of the Document 354×281 mm.

Deposition Information A digital copy of this map, which is used in this Atlas, is from the private collection of J. Kozák. (*The original is in the National Technical Museum, Prague.*)

Supplementary Information
The Reuss family (father Franz Ambrosius and son August Emanuel), both of whom were employed as doctors in *Bílina* City spa, were also geology enthusiasts, and undoubtedly contributed knowledge to the geology of northern Bohemia. Unfortunately, in the literature one can find some errors in referring to authorship by the father or the son. As already mentioned, some doubts also concern the map described here. In this Atlas we follow the idea of N. Krutský (2001) about the authorship by Franz Ambrosius, and we accept 1823 as the date of this map. We also refer to the map by August Emanuel Reuss from 1838, which also is included in this Atlas. Comparing the father's and son's maps, which covered roughly the same territory of Northern Bohemia, we can see a different approach by the son, August Emanuel, with his more modern view of geological mapping and of regional geology.



Map 36 [Carte de Salzberg de Hall en Tyrol]. (Source: The Library of Polish Geological Institute - National Research Institute)

[Carte de Salzberg de Hall en Tyrol]
1826
Karl Lill von Lilienbach

Title in English Map of Salzberg, Hall in Tyrol.

Scale The scale is not given on the map: it is approximately 1:20,000.

Legend A manuscript of the hand-coloured map has a legend that is very simple, in which rocks and units are indicated by rectangles and colours. Handwritten descriptions are in French and German. It contains the following items: (1) uncoloured=*Argile sulifor*? (salt clay); (2) orange–yellow=*Grès* (sandstone); (3) yellow=*Argile gypsum* (gypsiferous clay and rock salt); (4) brown=*Rauchwacke* (greywacke); (5) carminred=*Calcaire alpine* (Alpine limestone).

Coordinates No coordinates are given on the map: they are deduced approximately 46°30′–46°50′ N, 03°50′–04°00′ E (in Greenwich).

Mapped Area About 400 km^2.

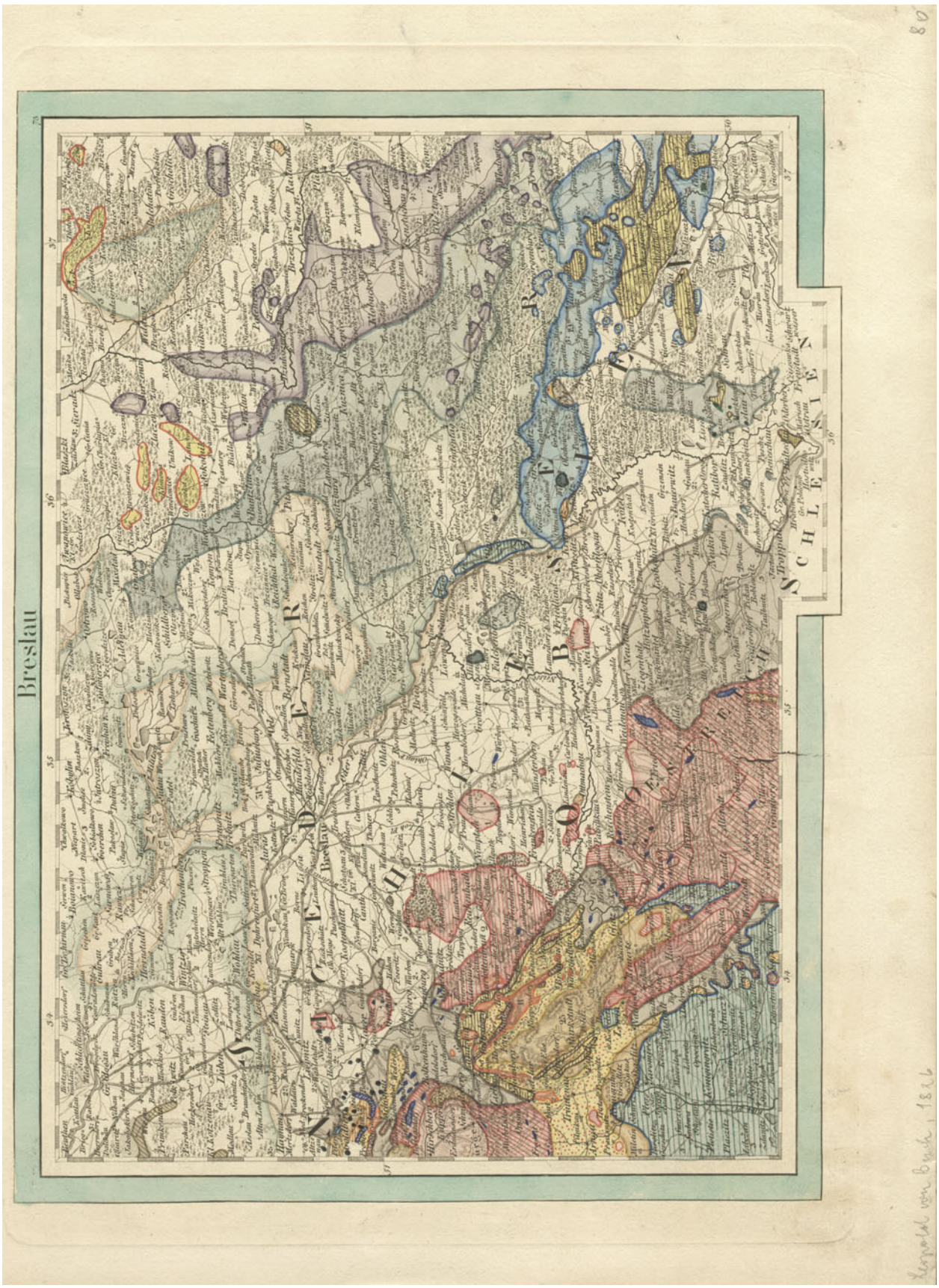
Mapping Area Part of Tyrol, Austria.

Size of the Document 550×369 mm.

Deposition Information Bibliothek der Geologischen Bundesanstalt, Wien.

Supplementary Information
The map is of purely lithologic character and is concentrated on depiction of occurrences of interesting rocks of the Northern Alps.

This manuscript of a hand-coloured map was probably made by Lill von Lilienbach during his employment as mine surveyor of Hall in Tirol. This work represents one of the first known large-scale field mapping projects in Austria!



Map 37 Sheet Breslau (Source: Private collection, P. Krzywiec)

Geognostische Karte von Deutschland und den umliegenden Staaten in 42 Blattern
1826
Leopold von Buch

Title in English Geological map of Germany and surrounding countries in 42 sheets.

Scale The scale is not given on the map: it is approximately 1:1,000,000.

Publication year: 1826. First edition. Publisher: Simon Schropp & Comp.

The atlas contains 42 sheets of geological maps with emphasis on rock types, plus one sheet of legend (in German). In our publication only three sheets are reproduced: Breslau (*Wrocław*), Brünn (*Brno*), Eperies (*Prešov*).

Legend The legend is a combination of colours, symbols (letters and numerals marks), and patterns. It contains 48 subdivisions. Descriptions of subdivisions are mostly in German and French, but in some cases are also in English. The legend is very extensive from a lithologic point of view. It contains granite, gneiss, mica schist, calcareous mica schist, syenite, clayey schist, greywacke, hornfels, hard coal formation, "older" limestone, gabbro, serpentine, diorite, amphibolite, "black" porphyre?, dolomite, gypsum, different regional types of limestones (e.g., metalliferous limestones of Upper Silesia), sandstones, different types of clays (Weald clay, plastic clay, London clay), chalk, sand, till, peat, as well as volcanic trachyte and basalt.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately for selected sheets: 1. ***Breslau*** 49°50′–51°45′ N, 33°20′–37°25′ E; 2. ***Brünn*** 48°00′–51°00′ N, 33°00′–37°00′ E; 3. ***Eperies*** 47°50′–49°30′ N, 37°00′–41° 00′ E (in Greenwich).

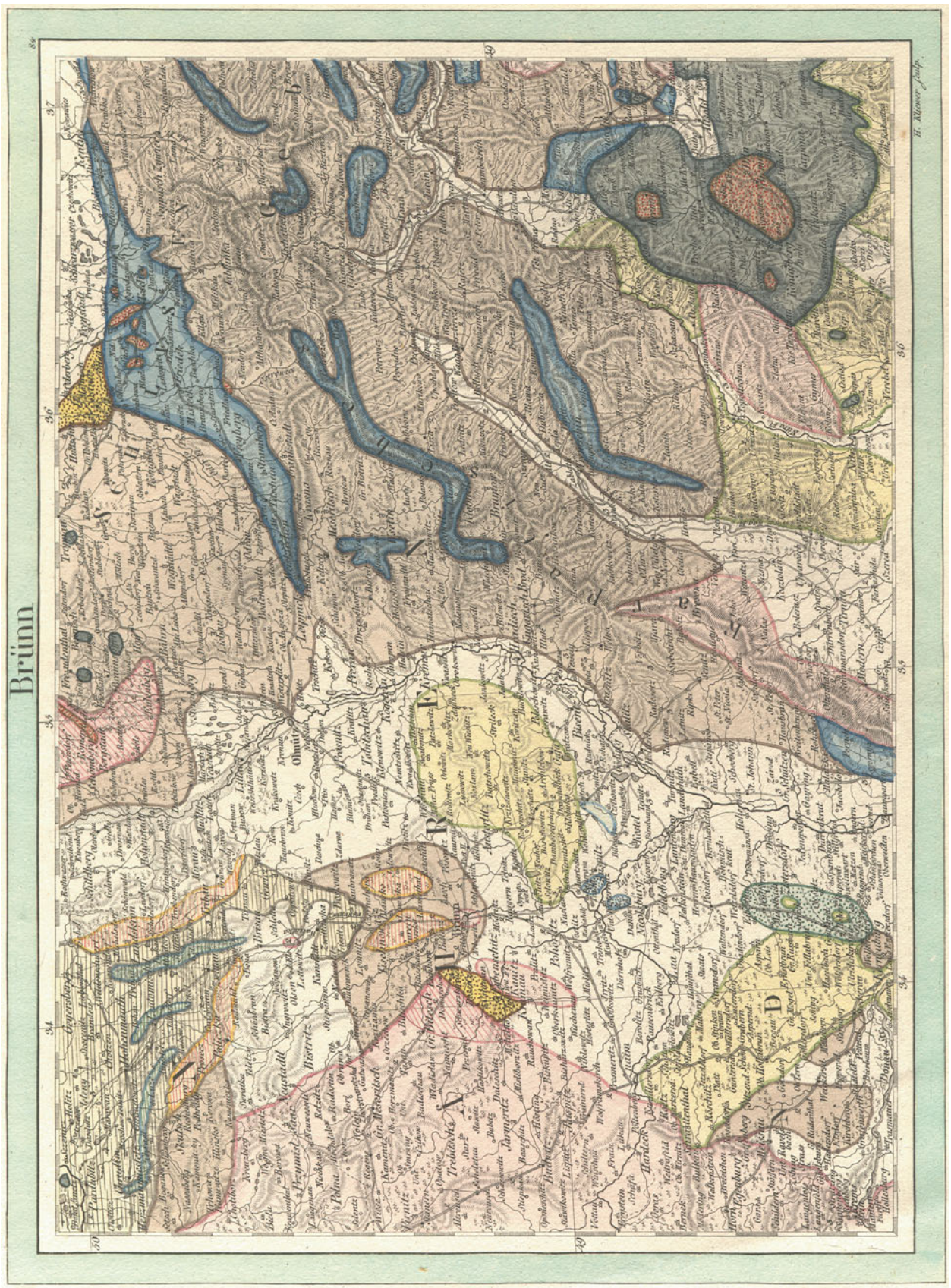
Mapped Area Same for every sheet: approximately 50,000 km^2.

Mapping Area of Selected Sheets Poland, Czech Republic, and Slovakia. Geological units: West Outer Carpathians, Upper Silesian Basin, part of the Bohemian Massif, including Sudetes and Fore-Sudeten block.

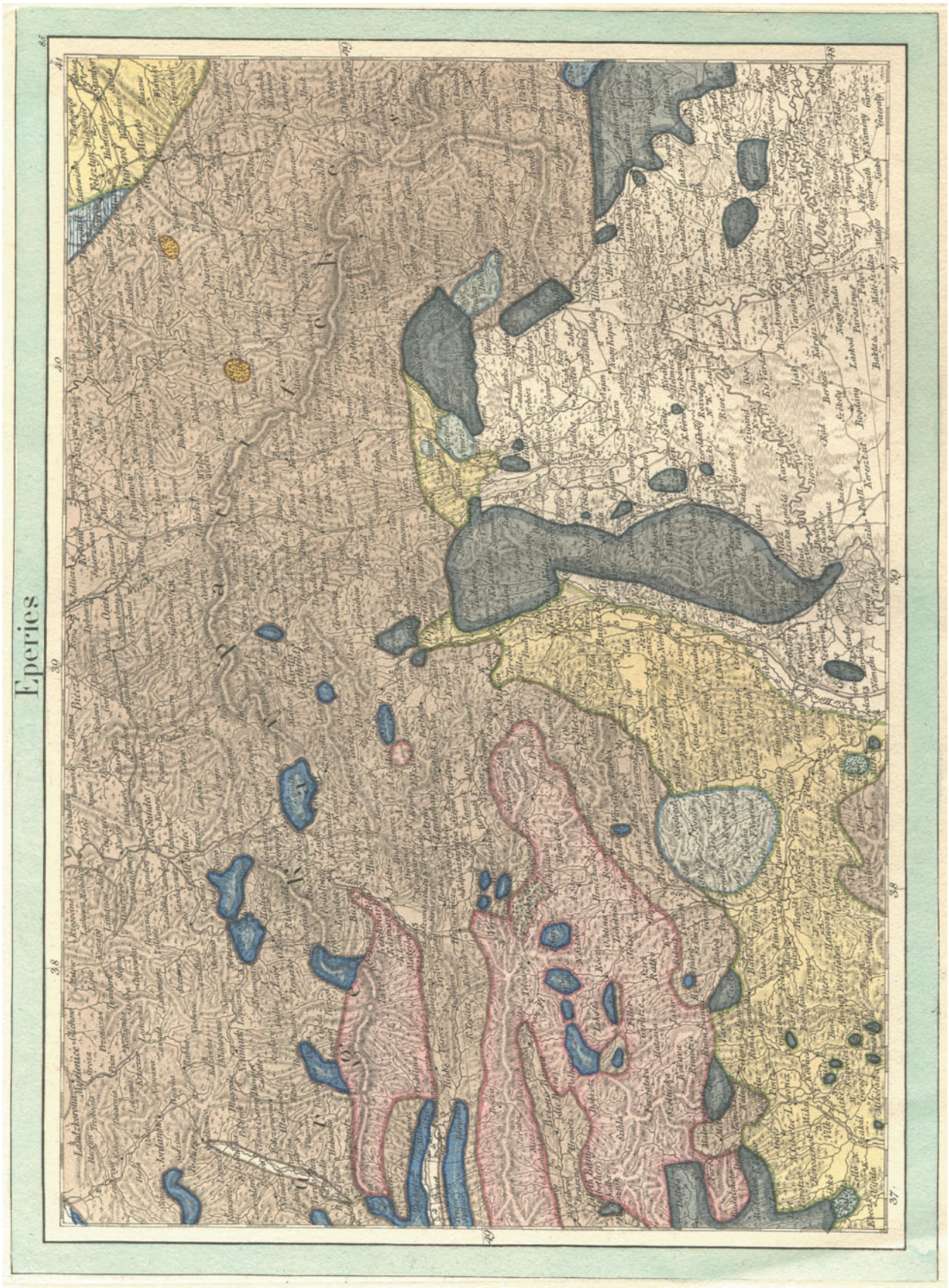
Size of the Document 200×270 mm (for each sheet).

Deposition Information Described copies of the maps are from the private collection of Jerzy B. Miecznik and P. Krzywiec. This atlas is very rare; nine sheets can be found in the Central Geological Archive of Polish Geological Institute. National Research Institute in Warsaw.

Supplementary Information
The Atlas covers a large part of Central Europe and parts of surrounding countries: Southern Bavaria, Tyrol, Salzburg, Upper Austria, Northern Carinthia, Western Styria, Western Lower Austria, northern Italy, Bohemia, Lower and Upper Silesia, Moravia, Northern Slovakia (part of the Carpathians), Pomerania, Brandenburg, Mazuria, and western Lithuania, as well as Belgium and northern France. These maps can be classified as pre-stratigraphic and proto-tectonic; for details, see p. 126.



Map 37.1 Sheet Brünn (Source: Private collection, P. Krzywiec)



Map 37.2 Sheet Eperies (Source: Private collection, P. Krzywiec)

Map 38 Geognostical map of Southern Bavaria. (Source: The Library of Geological Survey of Austria)

Geognostical map of Southern Bavaria. Versuch einer geognostisch-topographischen Karte von Süd-Baiern nebst den angrenzenden Laendern zwischen dem Inn und der Donau
1830
Ami Boué

Title in English Geognostical-topographical map of Southern Bavaria and surrounding countries between the Inn and Danube rivers. (*A hand-written note on the top of this map is as follows: "Geognostical map of Southern Bavaria by Ami Boué."*)

Scale The scale is given on the map in the *geographical miles* and metres: it is approximately 1:800,000.

Supplement to the Book "Sketches explanatory of Geological Maps of the Archduchy of Austria and of the South of Bavaria." *Proceedings of the Geological Society of London*, 1830, No. 17, S. 223–231, London 1830.

"Erklärende Skizzen einer geognostischen Karte von Oesterreich und Südbaiern." *Archiv für Mineralogie, Geognosie, Bergbau und Hüttenkunde* (Hrsg. C.J.B. Karsten), 3:562–566, Berlin (G. Reimer), 1831.

Printed topographic base of the manuscript map is "Versuch einer geognostisch-topographischen Karte von Süd-Baiern nebst den angrenzenden Laendern zwischen dem Inn und der Donau."

Legend Presented in English in the form of 20 items in colours and hand-drawn descriptions, is placed in the right-hand part of the map sheet, outside the map frame. It contains the following lithologies: (1) Gneiss; (2) Quartz; (3) Alpine red sandstone = *Werfenformation* = lower Triassic; (4) *Muschelkalk* = middle Triassic; (5) *Keuper* = Upper Triassic; (6) Jurassic Alpine limestone; (7) Sandstone with salt = *Haselgebirge*; (8) Gypsum of the Alpine limestone = *Haselgebirge*?; (9) Diorite & Trap; (10) Vienna Sandstone = *Flyschzone*; (11) Greensand; (12) *Molasse* = Tertiary of the Alpine Forelands, Interalpine basins; (13) Upper Tertiary; (14) Tertiary freshwater uppermost limestone; (15) Basaltic rocks; (16) Lignite; (17) Alluvial old calcareous deposits = Quaternary; (18) Old alluvial marl = Quaternary; (19) Old Alluvium, gravel, etc.; (20) Granite. (Bavarian and Austrian geological equivalents are also added here.)

Coordinates No coordinates are given on the map: they are deduced approximately 46°30′–48°20′ N, 08°30′–13°10′ E (in Greenwich).

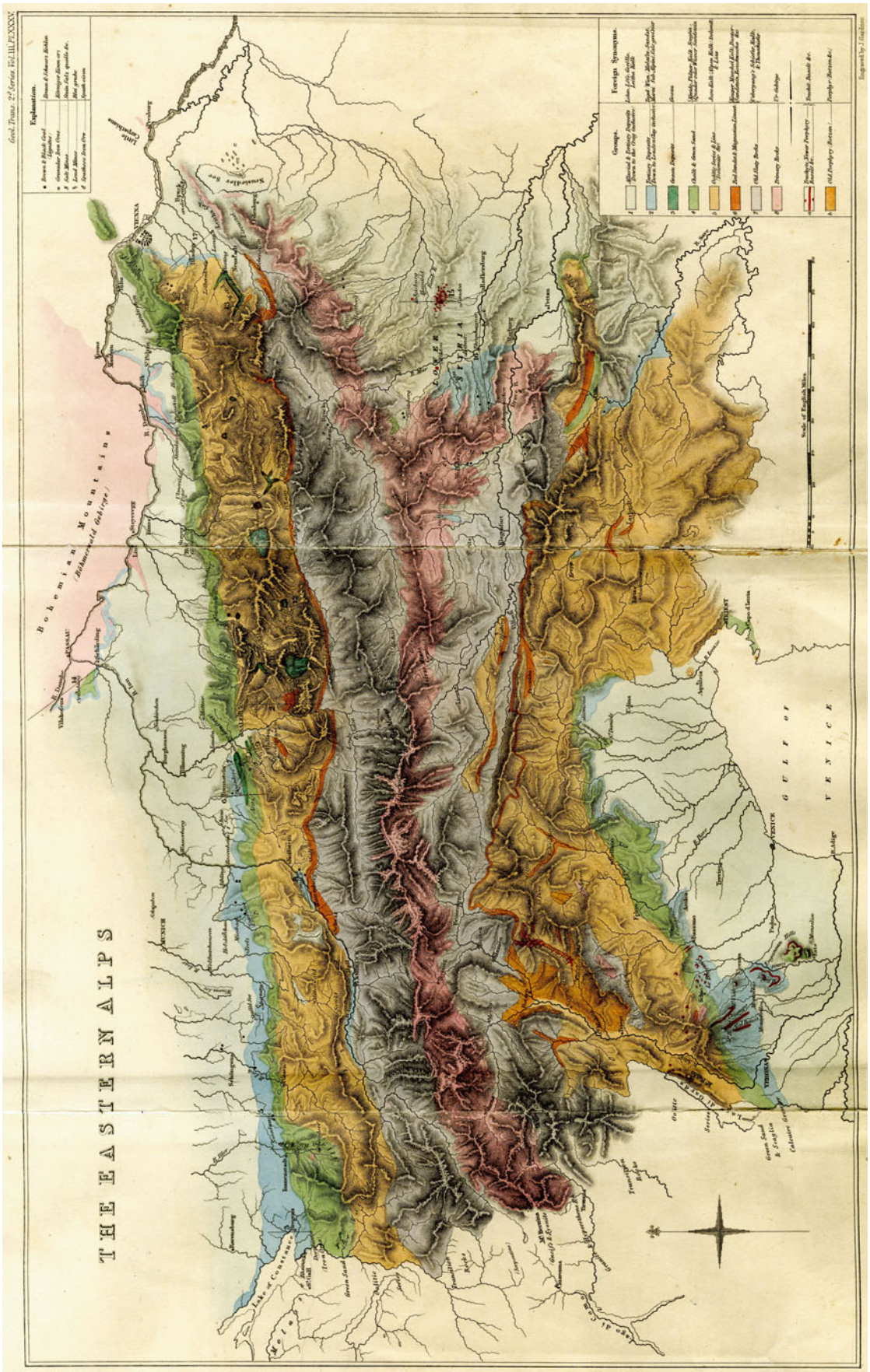
Mapped Area Approximately 84,000 km^2.

Mapping Area Bavaria, eastern part of Switzerland, Baden-Württemberg, Vorarlberg, Tyrolia, Southern Tyrolia, Northern Italy, parts of Salzburg and Upper Austria.

Size of the Document 522 × 383 mm.

Deposition Information The original is deposited in Geologische Bundesanstalt. Bibliothek, Wien. Signature K IV 3552.

Supplementary Information
This manuscript map by Ami Boué was used as a base by the Austrian geologist W. Haidinger for his "Geognostische Uebersichtskarte des Österreichischen Kaiserstaates" in 1845.



Map 39 The Eastern Alps. (Source: The Library of Geological Survey of Austria)

The Eastern Alps
1831
Roderick Impey Murchison, Adam Sedgwick

Scale The scale is given on the map in *English miles*: it is approximately 1:1,500,000.

Supplement to the Book Murchison, Roderick Impey; Sedgwick, Adam: *A sketch of the structure of the Eastern Alps; with sections through the newer formations on the northern flanks of the chain and through the Tertiary deposits of Styria etc.*," London, 1831. pp. 301–420: 6 tables. *Geological Transactions*, -2nd series; 3. 1831. Geological Society of London.

Legend The legend is in English, with some French and German. It is divided into two parts: Groups and Foreign Synonyms. Under "Groups" are terms in English with their foreign synonyms in German or French: (1) *Alluvial & Tertiary Deposits* (Down to the Crag inclusive) = Lehm, Löss, Gerölle, Leithakalk; (2) *Tertiary Deposits* (Down to London Clay inclusive) = Tegel/Wien/Molasse/Sandstein/Marni Sub-Alpini/Calc grossier; (3) *Gosau Deposits* = Gosau; (4) *Chalk & Greensand* = Kreide, Pläner-Kalk, Scaglia, Quader – oder (?) Wiener Sandstein; (5) *Oolithic Series & Lias (Dolomite etc.)* = Jura – Kalk (Alpenkalk/Dolomit & Lias); (6) *Red Sandstone & Magnesium Limestone* = Keuper Muschelkalk, Bunter Sandstein, Rauchwacke, etc; (7) *Old Slaty rocks* = Uebergang's Schiefer, Kalk & Tonschiefer; (8) *Primary Rocks* = Urgebirge (Böhmische Masse, Zentralalpen) (a) *Trachyte Newer Porphyr Basal*, etc. = Trachit, Basalt etc.; (b) *Old Porphyry* (*Botzen*) = Porphyr (Botzen, etc.).

The legend of mineral resources is situated in the right top corner, inside the frame of the map. The separate items are in English and German: (1) Brown & black coal = *Braun & Schwarzkohlen*; (2) Granular Iron Ores = *Körniges Eisenerz*; (3) Salt Mines = *Steinsalzquelle Ex.*; (4) Lead Mines = *Bleigrube*; (5) Spathose Iron ore = *Spatheisen*.

Coordinates No coordinates are given on the map: they are deduced approximately 46°00′–48°20′ N, 11°10′–16°30′ E (in Greenwich).

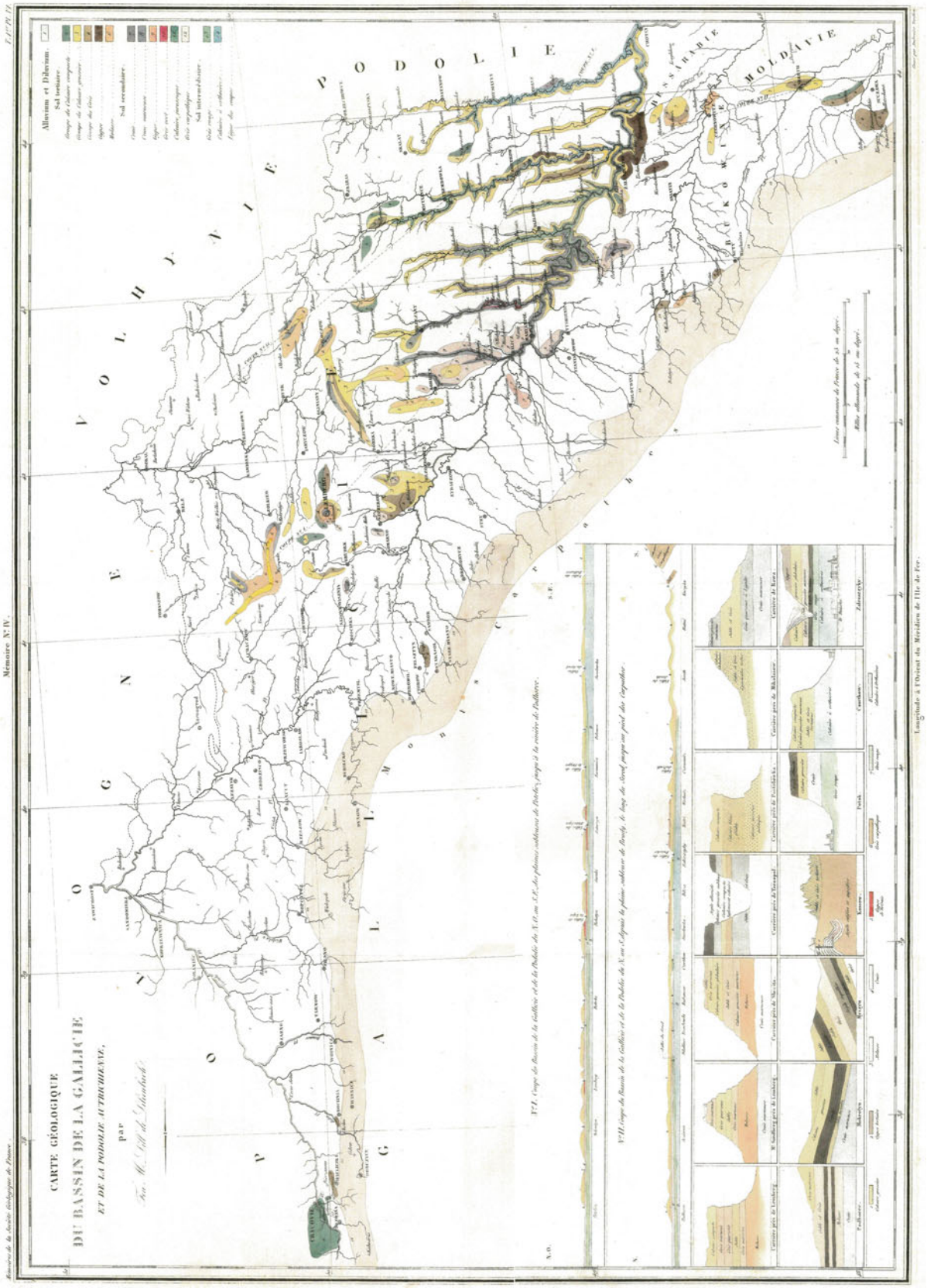
Mapped Area Approximately 140,000 km^2.

Mapping Area Southern part of Bavaria, Austria, up to the Danube River, northern part of Italy, Slovenia.

Size of the Document 377 × 234 mm.

Deposition Information The original is deposited in Geologische Bundesanstalt. Bibliothek, Wien. Signature 1791, 40 Rara-Sammlung 4.

Supplementary Information
The legend on this map is probably the first attempt to correlate British stratigraphy with the Alpine stratigraphy of the Austrian Empire. In their explanation of the map, Adam Sedgwick and Roderick Impey Murchison probably presented the first international geological correlation. They compared the British geological terms with the European continental geological terms.



Map 40 Carté géologique du bassin de la Gallicie et de la Podolie Autrichienne. (Source: Private collection, P. Krzywiec)

Carte géologique du bassin de la Gallicie et de la Podolie Autrichienne
1833
Karl Lill von Lilienbach

(French name is given as Lill de Lilienbach)

Title in English Geological map of basins of Galicia and Austrian Podolie.

Scale The scale is given on the map in *French* and *German miles*: it is approximately 1:850,000.

Supplement to the Book "Description du bassin de la Gallicie et de la Podolie" (*Description of basins of Galicia and Podolie*), published in Mémoires de la Société Géologique de France, tome premier, première partie. Mémoires de la Société Géologique de France contain several papers by different authors, Lill von Lilienbach being one of them. But none of the authors, nor anyone else, is given as the volume's editor. 1833. F.G. Levrault, Paris.

Legend A legend is located in the right upper corner of the map. Different colours are given for 14 petrographic rock types, subdivided into three main groups: Alluvium and Diluvium (Alluvial sediments); (I) Tertiary rocks: Group of Massive Limestone; Group of coarse-grained limestone; Group of sandstone; Gypsum; Molasse Sediments; (II) Secondary rocks, i.e., Mesozoic: chalk; Marly chalk; Gypsum; Green Sandstone; Jurassic Limestone; Carpathian Sandstone; (III) Transitional rocks, i.e., Palaeozoic: Red Sandstone; Orthoceras Limestone.

Lilienbach managed to subdivide the studied rocks into four main stratigraphic units: Quaternary (Alluvium and Diluvium), Tertiary, Mesozoic, and Palaeozoic. He directly defined two stratigraphic units: Jurassic limestone (Calcaire jurassique) and Cretaceous chalk (Craie, Craie marneuse).

Cross Section There are two large-scale regional cross sections; additionally there are 14 small-scale local cross sections. All the cross sections occupy the lower left corner and have their own legend, placed beneath them: (1) Coarse Limestone, (2) Tertiary Gypsum, (3) Molasse, (4) Chalk, (5) Chalky Gypsum, (6) Carpathian Sandstone, (7) Red Sandstone, (8) Orthoceras Limestone.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 47°37′–50°49′ N, 19°50′–26°00′ E (in Greenwich).

Mapped Area It is difficult to calculate, because it does not cover the entire map and is located diagonally. Very roughly, according to P. Krzywiec (Čejchanová et al., 2010), it is calculated as 95,400 km^2.

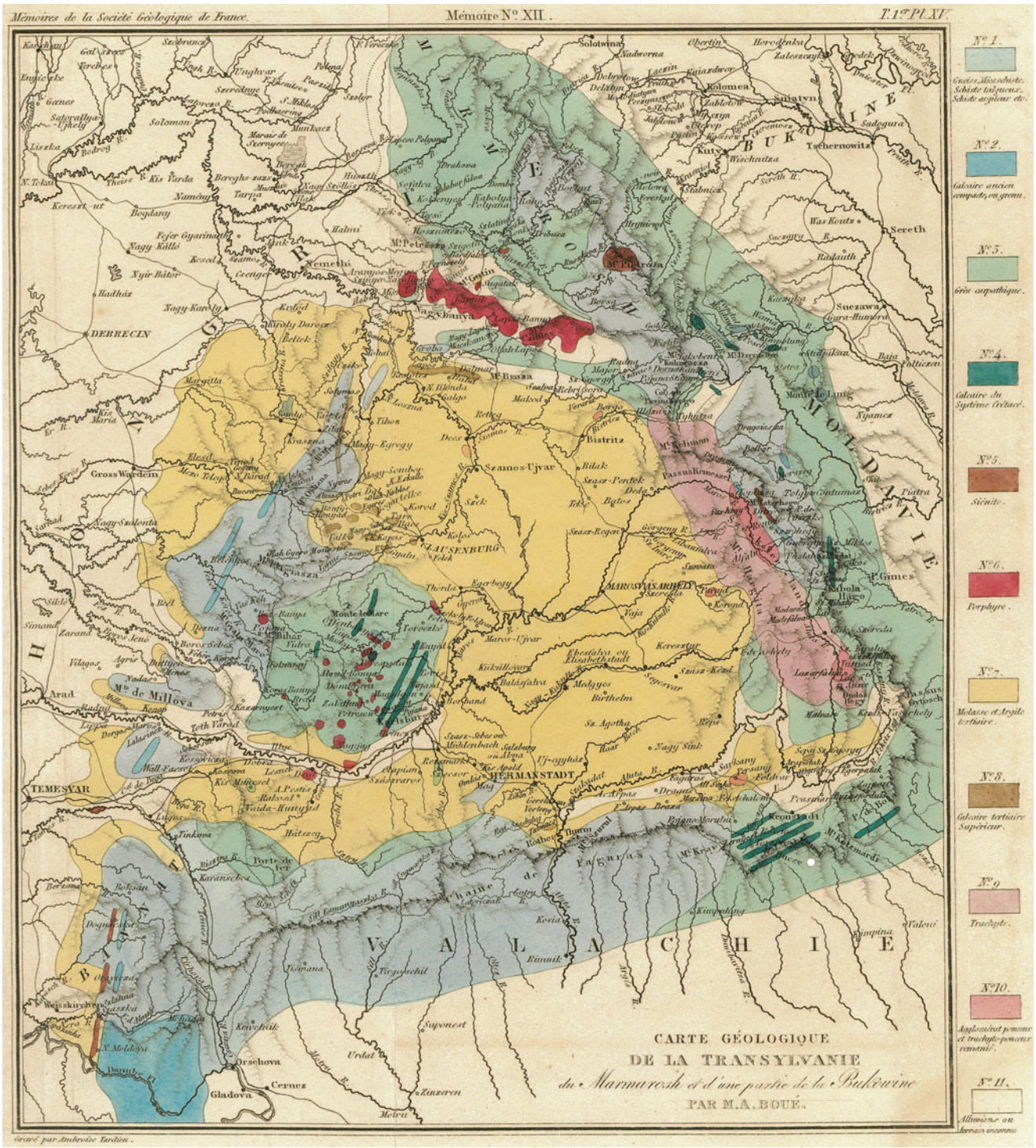
Mapping Area Outer Carpathians and Carpathian Foreland, modern Poland, Ukraine, part of Moldavia, and small part of Romania.

Size of the Document 600×420 mm.

Deposition Information Described copy of maps is from the private collection of Piotr Krzywiec.

Supplementary Information

This is the first petrographical (it is possible to say geological) map illustrated a distribution of rock types with some stratigraphic information. It is one of the geological maps of the Carpathian Foreland in central and eastern Poland and in Ukraine, including Miocene Carpathian Foredeep and Mesozoic–Palaeozoic series of the foreland plain. Tectonic structures are not given directly, but the Outer Carpathian thrust could be inferred from the northern limits of the Grés carpathique (Carpathian Sandstone).



Map 41 Carte géologique de la Transylvanie du Marmarosh et d´une partie de la Bukowine (Source: Private collection, P. Krzywiec)

Carte géologique de la Transylvanie du Marmarosh et d'une partie de la Bukowine
1834
Ami Boué

Title in English Geological map of Transylvania, Marmarosh and part of Bukowine.

Scale The scale is not given on the map: it is approximately 1:1,900,000.

Supplement to the Book The map is an attachment to the paper "Coup d'oeil d'ensemble sur les Carpathes, la Marmarosh, la Transylvanie, et certaines parties de la Hongrie, redigé, en grande partie d'après les journaux de voyages feu M. Lill de Lilienbach" (*An overview of the Carpathians, the Marmarosh, Transylvania and some parts of Hungary, edited largely by the late Mr. Lill Lilienbach*), published in *Mémoires de la Société Géologique de France*, tome premier, deuxième partie. 1834. F.-G. Levrault, Paris; map engraved by Ambroise Tardieu.

This volume of the *Mémoires de la Société Géologique de France* contains several papers by different authors, Ami Boué being one of them, but none of the authors, nor anyone else, is given as volume editor.

Legend The legend is located along the right margin of the map, outside the frame. Different colours are given for 11 petrographic rock types: (1) gneiss, mica schist, schist with talc, clayey schist, (2) old limestone, crystalline or massive, (3) Carpathian sandstone, (4) Cretaceous limestone, (5) syenite, (6) porphyry, (7) Tertiary molasse and claystone, (8) Late Tertiary limestone, (9) trachyte, (10) trachytic agglomerate, massive and reworked, (11) Alluvium and formations not identified.

Coordinates No coordinates are given on the map: they are deduced approximately 44°28′–48°45′ N, 21°00′–27°00′ E (in Greenwich).

Mapped Area Approximately 160,000 km^2.

Mapping Area East Carpathians–Transylvanian Basin, present-day Romania, also part of Hungary and Ukraine.

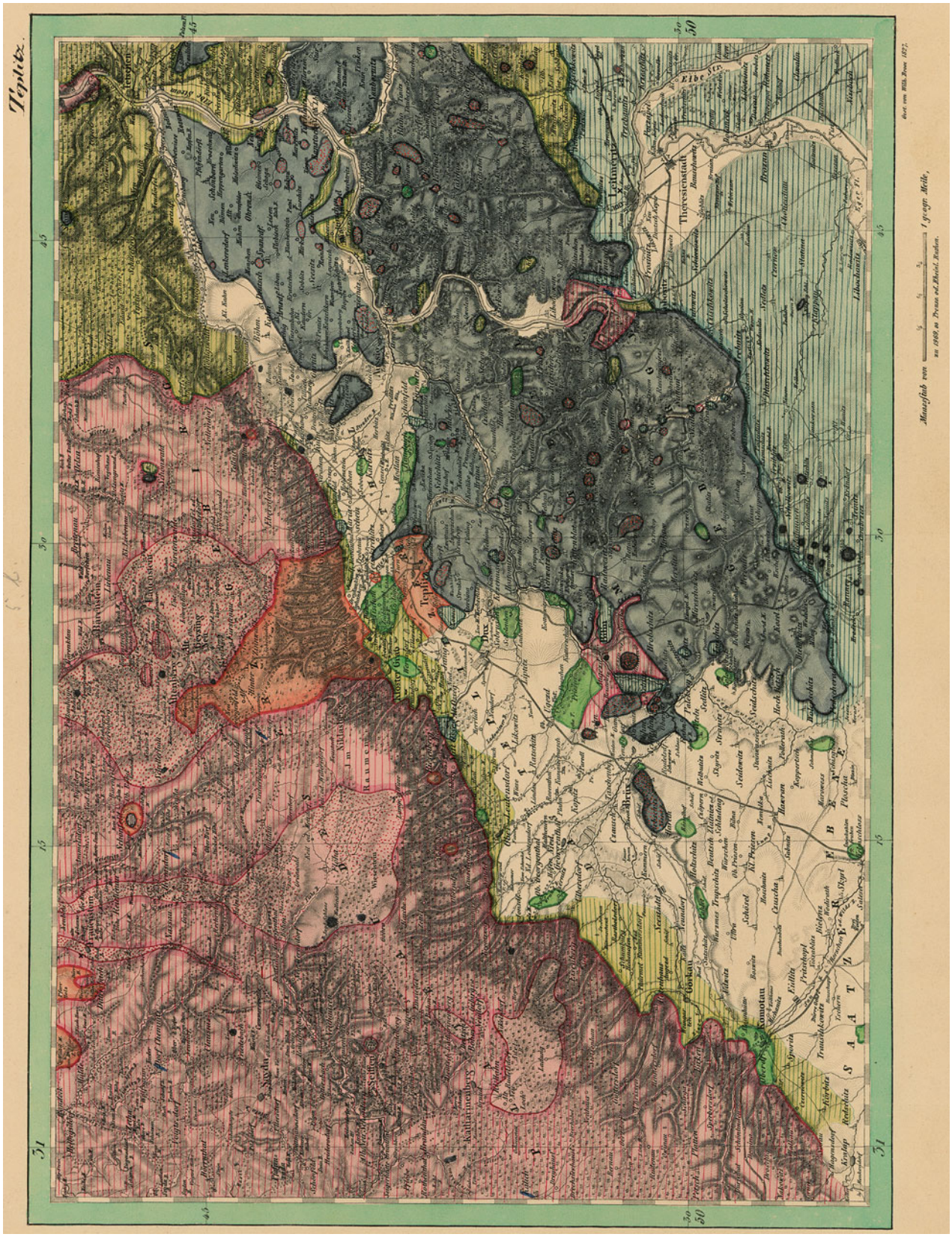
Size of the Document 220×260 mm.

Deposition Information A digital copy comes from the private collection of P. Krzywiec.

Supplementary Information

This is one of the first geological maps of the eastern Carpathians and Transylvanian basin. Publication of this map and the accompanying paper reflects increasing interest in geology and mineral resources of the eastern (Romanian) Carpathians.

In early nineteenth-century maps, there is typically a mixture of lithologic and stratigraphic connotations. Stratigraphic names are given directly for the Cretaceous limestone (Calcaire du Système Crétacé), Tertiary siliciclastics (Molasse and Tertiary claystone), and upper Tertiary limestone (Calcaire tertiare Supérieur). Indirectly, other lithologic subdivisions could be also interpreted in terms of their stratigraphy, for example, Tertiary vulcanite, Cretaceous–Paleogene Carpathian sandstones or Quaternary deposits.
Tectonic features are not directly depicted and names are not given, although some major tectonic features could indirectly be easily inferred, such as outer Carpathian thrusts, back-arc extensional zones defined by extent of Tertiary deposits of the Transylvanian basin, or some fault zones within the basin, along which volcanic eruptions took place.



Map 42 The sheet of Teplitz (Source: Central Geological Archive of Polish Geological Institute-National Research Institute)

Geognostische Charte von Sachsen, Schlesien einem Theile Böhmens und der Rheinlande in 50 Blättern zur östlichen und westlichen Erweiterung der geognostischen Charte vom nordwestlichen Deutchland
1836
Fredrich Hoffmann

Title in English Geognostical map of Saxony, Silesia and parts of Bohemia and Rhenish Lands, in 50 sheets as the eastern and western enlargement of the geognostical map of northwestern Germany.

Scale The scale is given in individual sheets in *geographical miles*: it is approximately 1:200,000.

Atlas publisher: Simon Schropp et Comp., Berlin, The atlas contains 50 sheets, including one title page and a sheet with a legend in German and French. Attached notes below the legend are only in German.

Here presented atlas contains reproductions of only 3 sheets of the total 50 sheets: (1) the title page of the atlas; (2) the sheet with the geological map of Teplitz; and (3) the sheet with the legend.

Legend The legend is a combination of colours, numbers, and patterns. It contains 44 items, as follows: granite, syenite, granulite, porphyry, melaphyre, diorite, gabbro, variolite, serpentinite, dolerite, basalt, phonolite, trachyte, volcanic tuff, gypsum, dolomite, gneiss, mica schist, amphibolitic schist, greywacke, quartzite, conglomerate, limestone, hard coal formation, copper shale, sandstone, shell limestone, marlstone, oolitic limestone, glauconitic sandstone, lignite, plastic clays. Also, the southern limits of occurrence of Scandinavian erratic blocks are shown. Descriptions of subdivisions are in German and French. Hoffmann sometimes used stratigraphic terms such as Rothliegendes, Zechstein, Muschelkalkstein, Keuper, Jurassic, Kreide (meaning Cretaceous), and Tertiary.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 50°25′–50°50′ N, 13°18′–14°15′ E (in Greenwich), for the sheet Teplitz.

Mapped Area Approximately 3,250 km^2.

Mapping Area The Teplitz sheet covers part of northwest Bohemia and part of Saxony (recent Czech Republic and Germany).

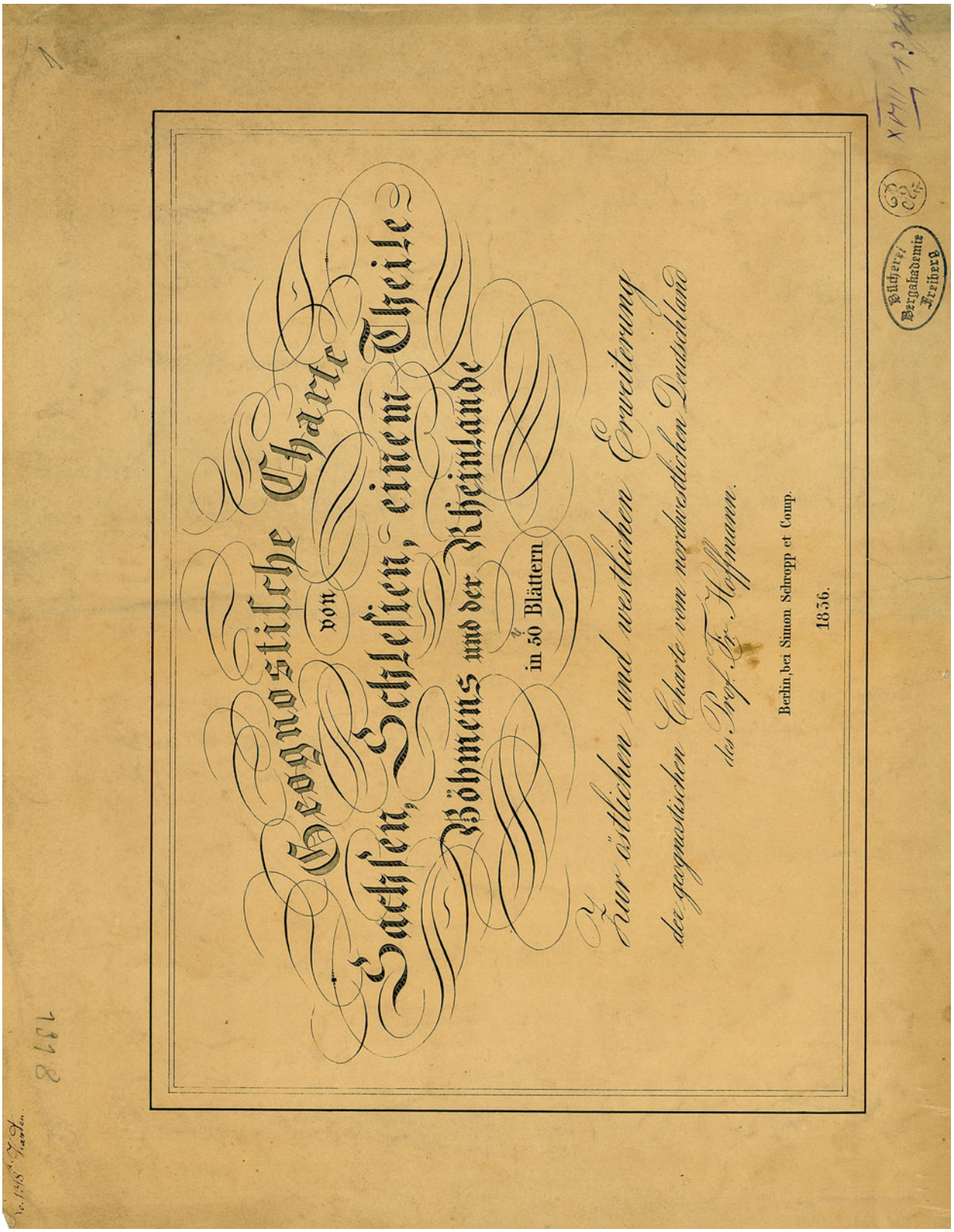
Size of the Document 335 × 235 mm.

Deposition Information: Central Geological Archive of Polish Geological Institute. National Research Institute.

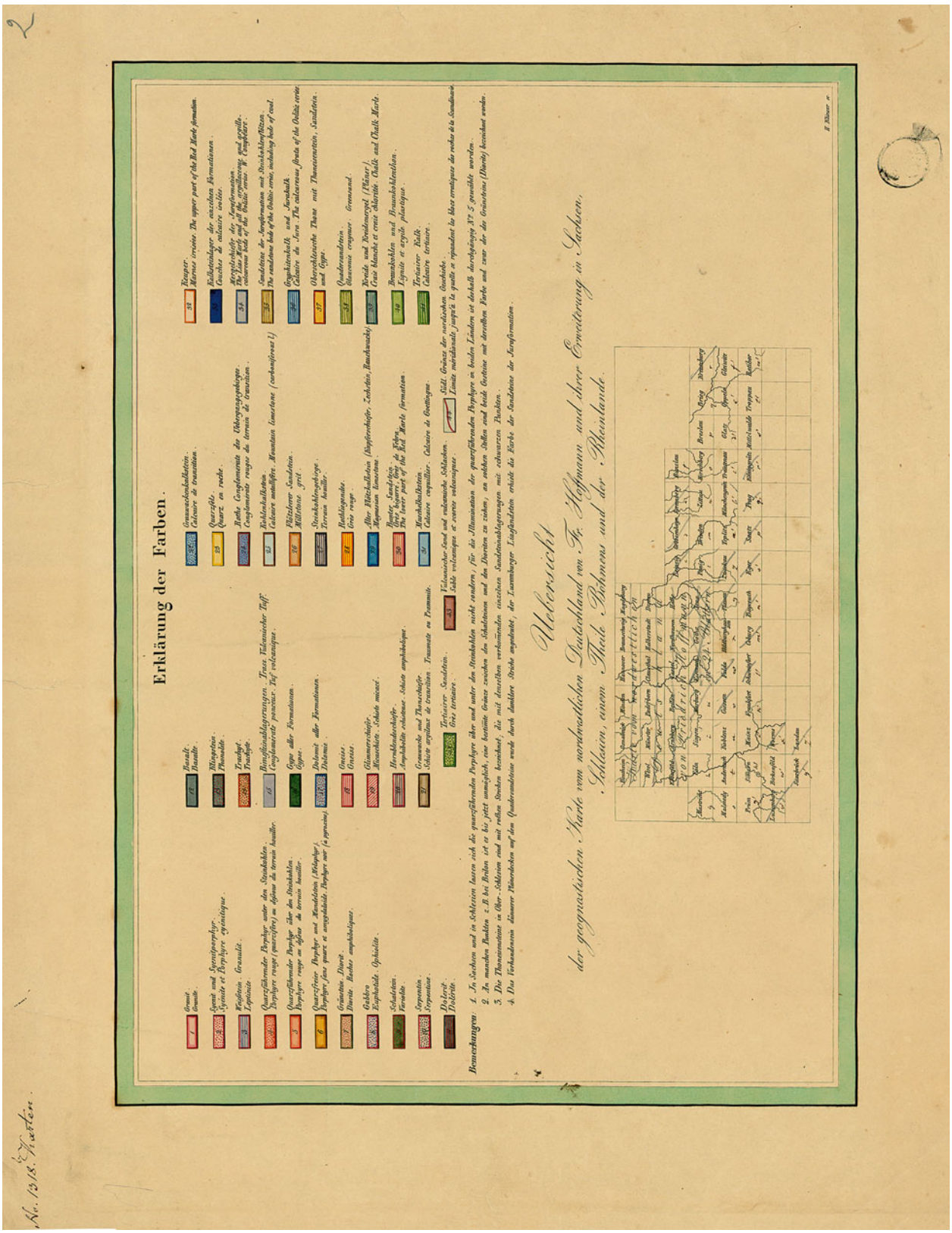
Supplementary Information
The entire atlas covers large territories of northern and western Germany, the northern Czech Republic, and southwestern Poland (Lower Silesia and western part of Upper Silesia). Geologically, maps show, for example, the Karkonosze–Izera Block, the Kaczawa Structure, North Sudetic Basin, and the Swierzawa Trough. Maps are very detailed. All structural geological units are well depicted.

Hoffmann's atlas is very rare; even individual maps are rare. In the Central Geological Archive of Polish Geological Institute. National Research Institute in Warsaw are 18 sheets (Ardenach, Breslau, Bunzlau, Cöln, Frankfurt, Glatz, Hirschberg, Koblenz, Mainz, Malmedy, Mastricht, Mittelvalde, Münchengratz, Prüm, Simern, Teplitz, Trautenau, Zittau).

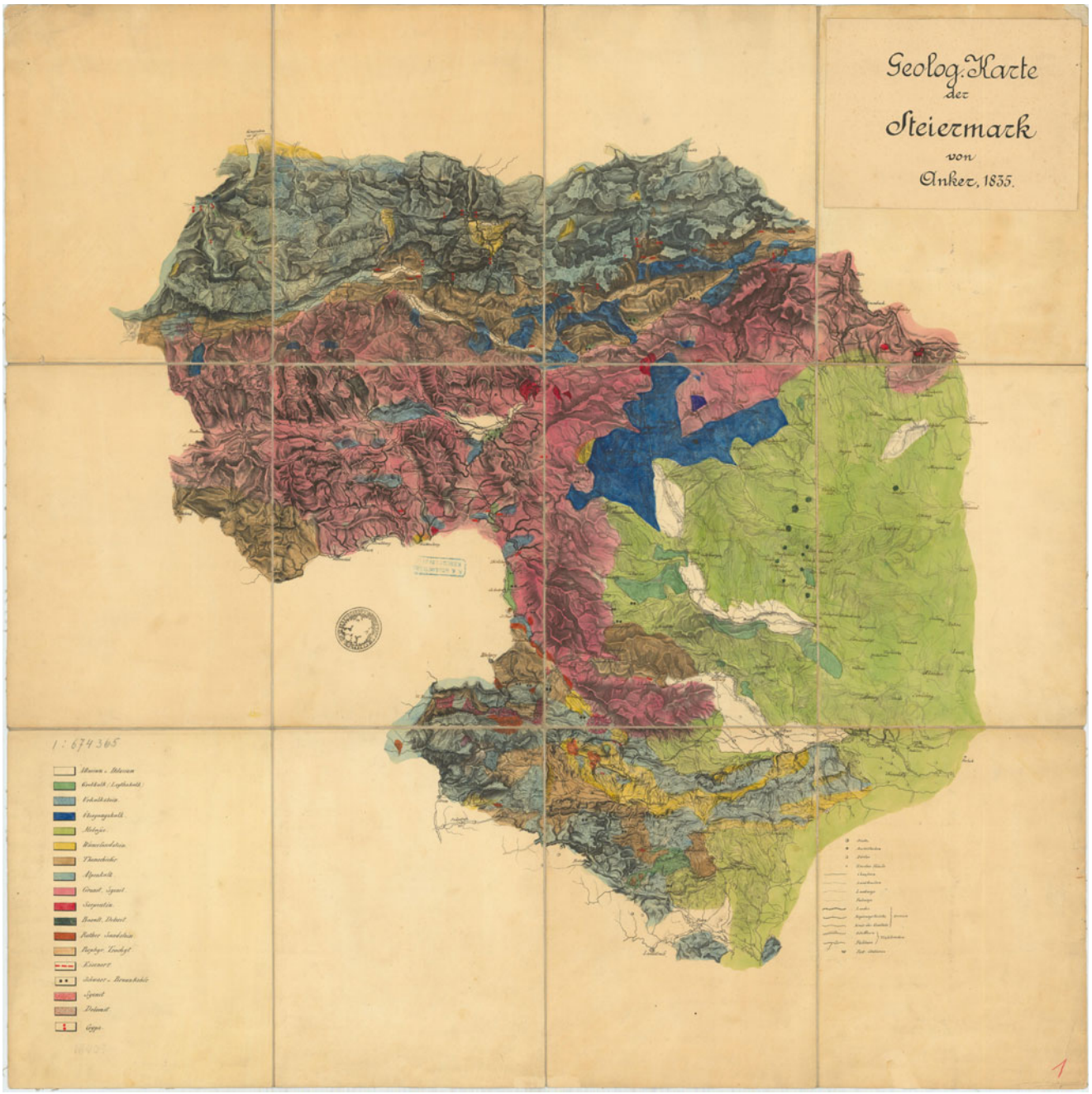
The atlas by Fredrich Hoffmann is related to the set of maps from the "Geognostical map of Germany and surrounding states in 42 sheets" by Leopold von Buch (1826) but contains many more geological data. Thus, it mirrors the progress of geological investigations throughout those years.



Map 42.1 The title page of the atlas (Source: Central Geological Archive of Polish Geological Institute-National Research Institute)



Map 42.2 The sheet with the legend and list of maps (Source: Central Geological Archive of Polish Geological Institute-National Research Institute)



Map 43 Geologische Karte der Steiermark. (Source: The Library of Geological Survey of Austria)

Geologische Karte der Steiermark
1835
Mathias Josef Anker

Title in English Geological map of Styria.

Scale The scale is not given on the map: it is approximately 1:450,000.

Supplement to the Book Anker, Mathias Josef: *Kurze Darstellung der mineralogisch – geognostischen Gebirgsverhältnisse der Steiermark* (*Short description of mineralogical and geognostical mountain forms of Styria).*– Graz: Gebr. Tanzer, 1835.– 84 S.: 20 cm. Bibliothek der Geologischen Bundesanstalt, Wien: Signature 206,8.

Legend Rocks and geological units are indicated in colours and are described in the German language, as follows: (1) *Alluvium and Diluvium*=Quaternary; (2) *Coarse limestone* (Leithakalk)=Neogene; (3) *Urkalkstein* (Old limestone)= Palaeozoic of Graz?; (4) *Übergangskalk* (Transitional limestone)=Palaeozoic of Graz?; (5) *Molasse*=Neogene of the Styrian basin; (6) *Wiener Sandstein*=Gosau-beds?; (7) *Thonschiefer* (clayey slate); (8) *Alpenkalk*=Mesozoic of the Northern Calcareous Alps; (9) *Granit, Syenit* (granite, syenite); (10) *Serpentin* (serpentine); (11) *Basalt, Dolerit*=basalt, dolerite (volcanics of the inter-alpine Neogene in the Styrian Basin); (12) *Rother Sandstein* (red sandstone); (13) *Porphyr, Trachyt* (porphyry, trachyte); (14) *Eisenerz* (iron ores); (15) *Schwarz u.* Braunkohle (black coal, lignite of the Styrian Basin); (16) *Dolomit* (dolomite); (17) *Gyps* (gypsum).

The map's stratigraphy is very poor, as only Quaternary (Alluvium u. Diluvium) and Tertiary (Gr*obkalk, Leithakalk, Molasse*) are clearly defined. *Alpenkalk* is generally comparable with the Mesozoic of the Northern Calcareous Alps, *Urkalkstein and Übergangskalk* are comparable with the Palaeozoic of Graz (Grazer Paläozoikum). Crystalline rocks are also mapped, but only a few types of mineral resources are shown: black coal, brown coal (lignite), iron ores, and gypsum.

Coordinates No coordinates are given on the map: they are deduced approximately 46°30′–47°30′ N, 12°30′–16°55′ E (in Greenwich).

Mapped Area Approximately 26,000 km^2.

Mapping Area Former Southern Styria and part of Slovenia, recent Austrian federal county of Styria and Stejerska.

Size of the Document 700×703 mm.

Deposition Information The Library of Geological Survey of Austria, Wien, Bibliothek. Signature K B 365.

Supplementary Information
Anker's map represents the first result of mapping carried out by an Austrian geologist in the Austrian Empire! His work was sponsored by Austrian Archduke Johann of Austria. In the early nineteenth century there existed no standardized colours for the legends and explanations that were used. However, white was still the general colour for the Quaternary. Green was used for Tertiary units. Yellow in those times was used for the so-called *Wiener Sandstein*, later known as *Flyschzone* and *Gosaubeds*. Limestones are coloured by varieties of blue, and crystalline rocks are in shades of red.

Map 44 Sheet C of the general map (Source: The Library of Polish Geological Institute. National Research Institute)

Geognostischer Atlas von Polen
1836
Georg Gottlieb (Jerzy Bogumił) Pusch

Title in English Geognostical Atlas of Poland.

Verlag der J.G. Cotta'schen Buchhandlung in Stuttgart. First edition.

Supplement to the Book Although this atlas represents a separate work, it is administratively and thematically related to the book "Geognostische Beschreibung von Polen" (vols. 1 and 2, edited in 1833 and 1836, respectively, in Tübingen and Stuttgart). The first map contains four sheets (Bl. I–IV).

Scale The scale of the general map is approximately 1:790,000.

The atlas contains five maps (one general map and four regional maps in more detailed scales) and two sheets of cross sections. The general map (in English translation, "*Geognostical General Map of Kingdom of Poland and Galicia with surrounding parts of Upper Silesia, Hungary, Transylvania, Moldavia and Podolia*") is composed of four sheets, wherein the second (Sheet B) contains the title of the document, and the third (Sheet C) depicts a common legend for all the maps.

The regional maps are as follows (in English translation): (1) Geognostical Map of *Polish Sandomierz Mts*. between *Sandomierz* and *Malogoszcz* (a geological map of Holy Cross Mountains); (2) Geognostical map of the area between *Krzeszowice, Czeladz* and *Pilica*; (3) Geognostical Special Map of vicinities of *Krzeszowice, Nowagora* and *Szklary*; (4) Geognostical Map of vicinities between *Vistula* and *Nida*.

Cross sections On two separate sheets there are 32 different cross sections, from which 24 are indicated by lines on the General Map.

Three sheets from Pusch's atlas were selected for a reproduction in this Atlas: (1) Sheet B: Title page, (2) Sheet C of the general map, and (3) one sheet with cross sections.

Legend The whole atlas has a common legend, shown on map No. 1, sheet III.

The legend is a combination of colours, symbols (letters, numerals, and marks), and patterns. It occupies the largest part of this sheet. Besides lithology and stratigraphy, the legend contains information about occurrences of coal, iron-bearing formations, sulphur, gypsum, lead-bearing horizons, and veins with lead mineralization, as well as about old mining places of iron, lead, and zinc (galmans ore). Also provided is information on brines and sulphurous, oily, and carbonated springs. The legend contains detailed information about lithology, including granite, gneiss, mica-schist, greywacke, limestone, sandstone, dolomite, Carpathian sandstone, salt, gypsum, oolitic breccias, iron-sandstones, chalkstone, plastic clay, till, loess, different kinds of sand, and peat. Some atypical rocks are also noted: syenite, porphyry, diorite, melaphyre, trachyte, trachytic tuff, and basalt.

A rough stratigraphic sequence consists of descriptions of the Lower Palaeozoic series made of greywackes and Transitional formations (mica-schists, greywackes, Transitional limestones and limestone breccias). Upper Paleozoic rocks are described as Old Red Sandstone, black coal formation and red sandstones. Mesozoic rocks are described as Muschelkalk, Lias, Jurassic, Cretaceous, Tertiary, Diluvium, and Alluvium.

Coordinates No coordinates are given on the map: they are deduced approximately 46°00′–53°15′ N, 18°00′–31°00′ E (in Greenwich).

Mapped Area About 470,000 km^2.

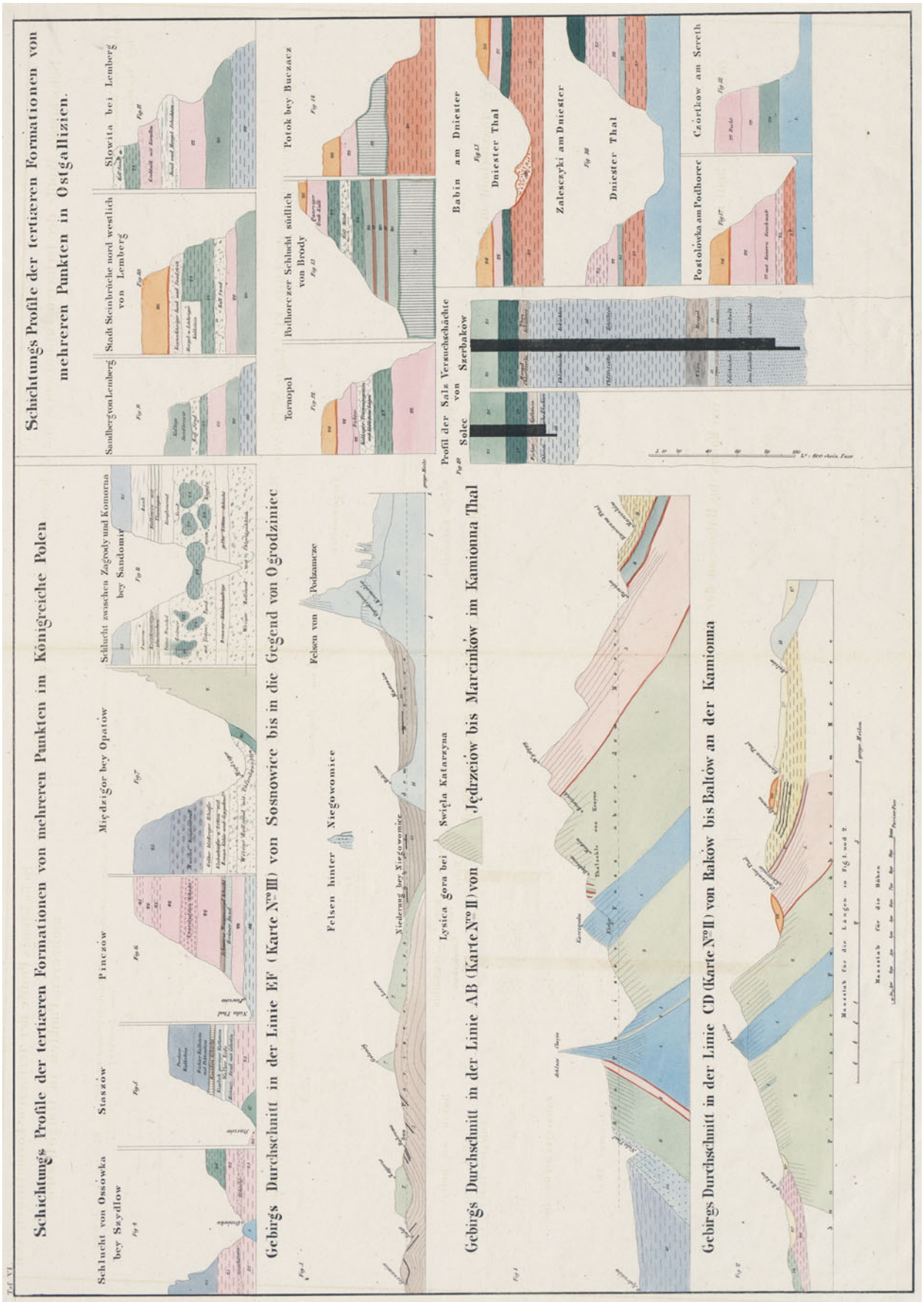
Mapping Area Poland, Slovakia, Ukraine, Hungary, Moldova, Romania.

Size of the Document Sheet A, 595×750 mm; sheet B, 750×585 mm; sheet C, 740×585; sheet D, 740×585 mm.

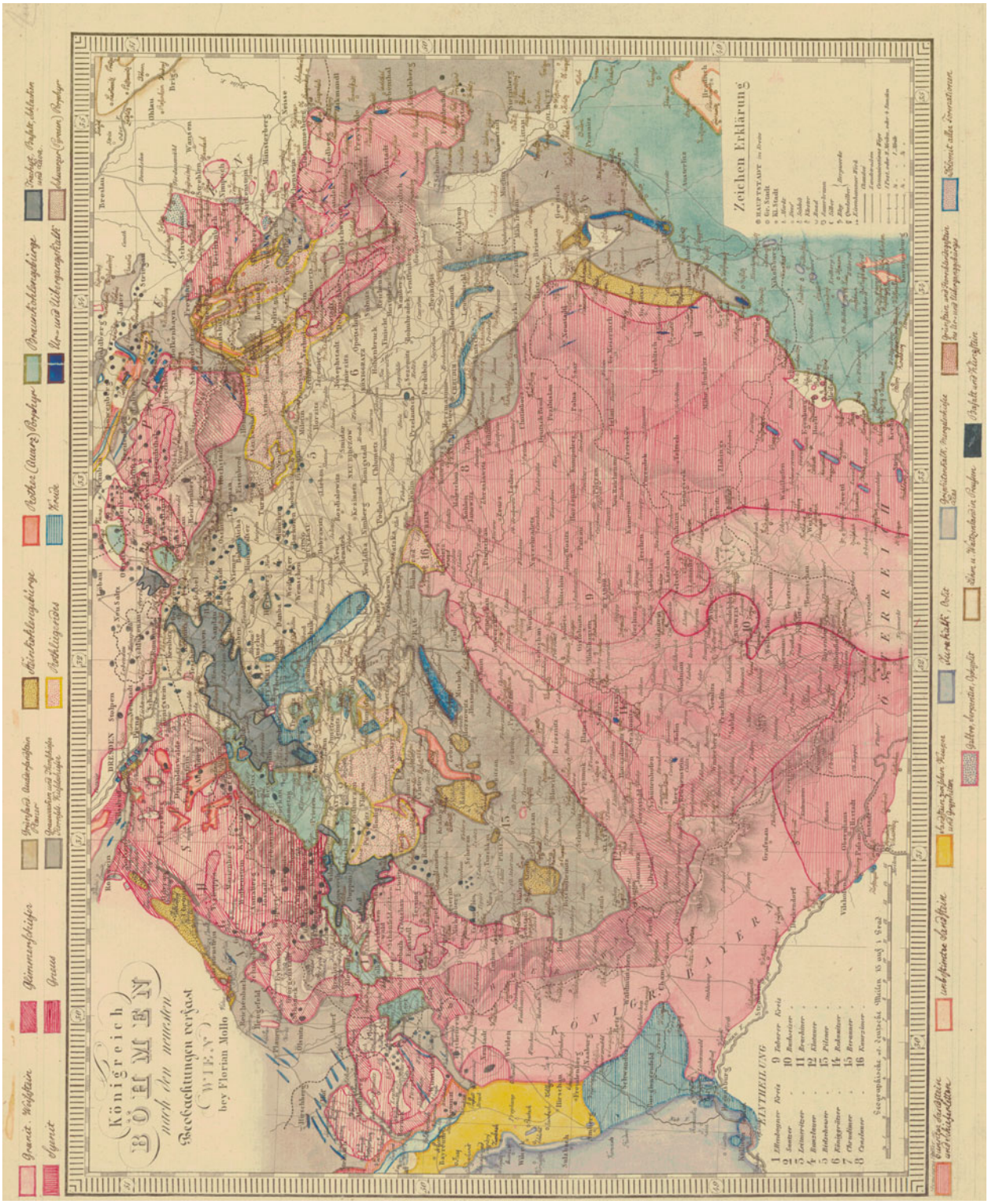
Deposition Information The original of maps are in the National Library in Warsaw. A digital copies of the maps are in the Polish Geological Institute.

Supplementary Information
The set of maps is an original work of Johann Gottlieb Pusch and it is one of the first geological maps of a large part of Central Europe. The author illustrated the structure of the Holy Cross Mts., Jura *Krakowsko-Czestochowska*, Upper Silesia Coal Basin, the Carpathians (Flysch series, Pieniny Clippen Belt, crystalline rocks of Tatra Mountains, and the district of *Marmarosch* quartz crystals). In the *Podolia* region the author described Palaeozoic rocks in deep valleys of the tributaries of the Dniestr River, as well as granites of the Ukrainian Shield. The map can be considered as a milestone in the history of geological mapping of Central Europe.

Map 44.1 The sheet B: Title page (Source: The Library of Polish Geological Institute. National Research Institute)



Map 44.2 The sheet with cross sections (Source: The Library of Polish Geological Institute. National Research Institute)



Map 45 Königreich Böhmen nach den neuesten Beobachtungen verfast (Wien). (Source: the Archives of Czech Geological Survey)

Königreich Böhmen nach den neuesten Beobachtungen verfast (Wien) bey Florian Mollo
1837
Andreas Preininger

Title in English Bohemian kingdom worked out according to new observations by Florian Mollo (Vienna).

Scale The scale is given on the map in *geographical* and *German miles*: it is approximately 1:1,100,000.

Publisher is not given. Engraver Dominicus Biller.

The printed topographic map with watercolour coloration has been found in a file containing different German written excerpts by several authors (F.A. Reuss, A.E. Reuss, F.M. Zippe) on geological, mineralogical, and hydrogeological themes during 1770–1849. The text is paginated (474 pages) but the file is not complete. The title page and the first 17 pages are missing, and the last page contains content. The form of manuscript text (book) is 340 × 220 mm. A cross section is sketched on a separate sheet of manuscript (p. 67).

Legend I. The legend is detailed, mixing stratigraphic and lithological terms. It contains 24 small coloured rectangles, in upper and lower parts beneath the map frame: (1) *Granite, Weißstein* = pale granite; (2) *Glimmerschiefer* = mica schist; (3) *Grünsand* = Green sands; (4) *Pläner* = *"opuka,"* mainly marlstone; (5) *Steinkohlengebürge* = black coal basins; (6) *Rother (Quartz) Porphyr* = red quartz porphyry; (7) *Braunkohlengebürge* = brown coal basins; (8) *Trachyt, Bazalt, Schlacken und Lava* = trachyte, basalt, scoria, and lava; (9) *Syenit* = syenite; (10) *Gneuss* = gneiss; (11) *Grauwacken und Thonschiefer, Hornfels* = greywacke and shale, chert; (12) *Kieselschiefer* = silicite; (13) *Rothliegendes* (Permian); (14) *Kreide* = Cretaceous; (15) *Ur-und Uebergangskalk* = Old and Transitional limestone; (16) *Schwarzer (Pyroxen) Porphyr* = black (pyroxene) porphyry; (17) *Bunter Sandstein und Schieferletten* = Buntsandstein, schist (Early Triassic); (18) *Unbestimter Sandstein* = Sandstone (not specified); (19) *Sandstein zwischen Keuper und Gryphiten* = sandstone between Keuper and Griphiten strata; (20) *Jurakalk, Oolit* = Jurassic limestone, oolite; (21) *"Griphitenkalk," Mergelschiefer Lias* = graphitic limestone, marlstone (Lias); (22) *Grünstein und Hornblendegestein des Ur-und Ueberganggebürges* = greenstone and amphibolite (Precambrian and younger); (23) *Dolomit aller Formationen* = dolomite (in all the formations); (24) *Gabro, Serpentin, Ophyolit* = gabbro, serpentinite, ophiolite; (25) *Lehm und Wattzenland in Preußen* = loam and saprolite of Prussia; (26) *Bazalt und Klingstein* = basalt and phonolite.

II. *(Eintheilungen)* subdivision: (16 numbers with explanations).

III. *(Zeichen Erklärung):* topographic legend (towns, settlements…).

The map contains a comparatively detailed stratigraphy. Stratigraphic subdivision is according to the German model. Many stratigraphic units are distinguished, starting from the geological basement, thorough the Early and Late Paleozoic, Triassic, Jurassic, Cretaceous, up to the Quaternary. As concerns volcanics, old magmatites are distinguished from the neo-volcanics (basalts, phonolites). Lithologic terms are very detailed and are mixed in with stratigraphic terms. Many types of rocks are given in the legend: magmatic and metamorphic as well as sedimentary rocks. Some magmatites are defined according to rock-forming minerals.

The tectonic boundaries of some units are clearly drawn, such as those of the *Boskovice* Graben and delimitation of some other sedimentary basins.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 48°20′–51°07′ N, 12°00′–17°30′ E (in Greenwich).

Mapped Area Approximately 70,000 km^2.

Mapping Area The whole of Bohemia with adjoining parts of Moravia, Silesia, Austria, Bavaria, and Saxony. The map covers a large part of the Austrian Empire (Bohemia, Moravia, Austria, Silesia) and adjoining parts of Bavaria and Saxony.

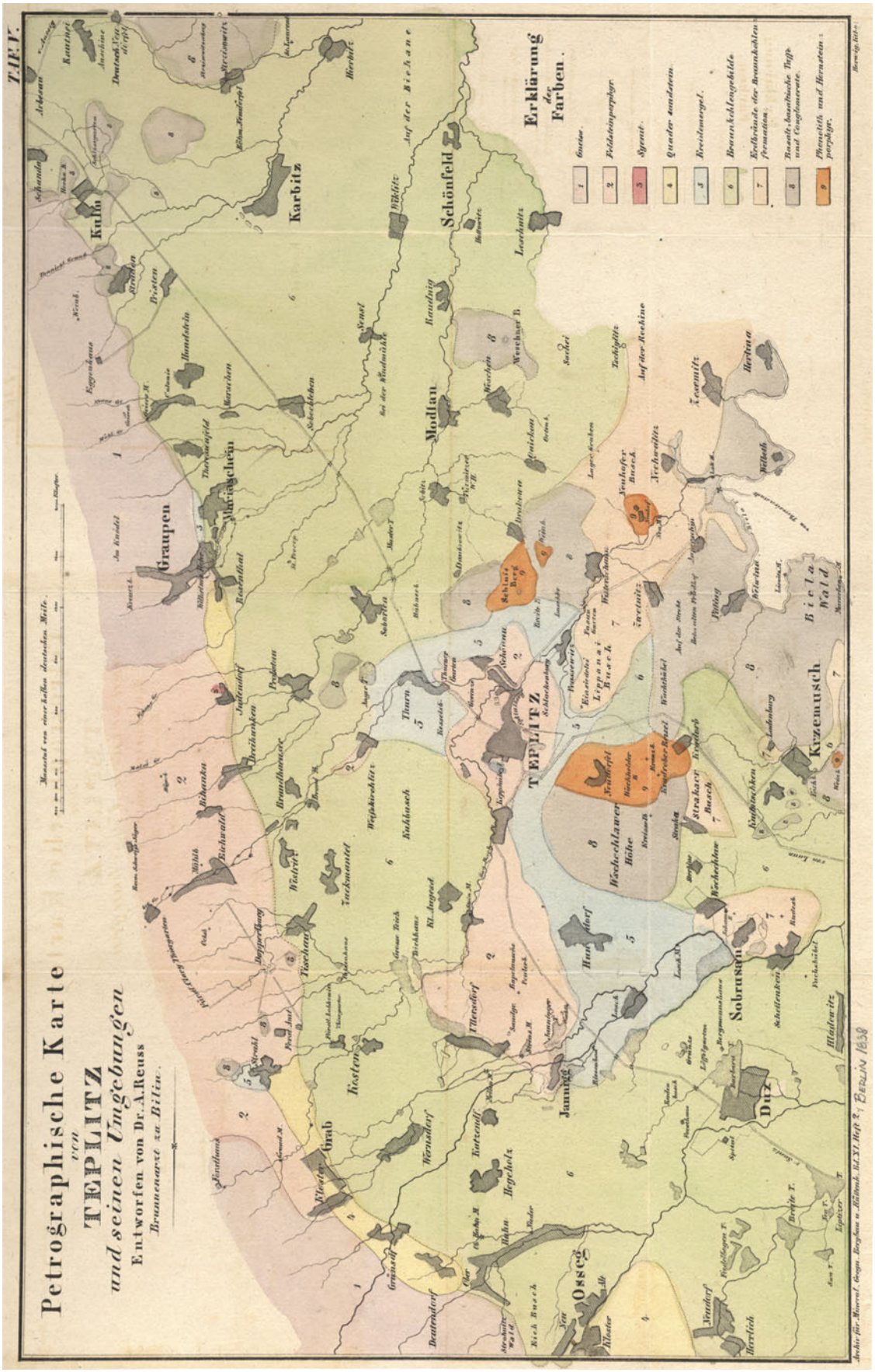
Size of the Document 316 × 424 mm.

Deposition Information Archives of the Czech Geological Survey (the Fond of hand-written documents). Signature R 65.

Supplementary Information

The origin of this map is not clear, especially its relationship to the map by F.X.M. Zippe, which is mentioned in the literature (Beneš J, 1996) but has not been found up to now. It is presumed that the authorship of this described map belongs to A. Preininger, because his name is written on its reverse side. However, in 2014, a similar map was discovered in the Map Collection of the Faculty of Science, Charles University in Prague. This map is dated as 1841 and bears a different title: the word "*Geognostic*" is added as well as the statement, "after the newest observations by L. Buch, Dechen and Zippe, Wien, by Florian Mollo, by A. Preininger" (the words "Wien" and "bey Florian Mollo" are crossed out). This newly discovered map differs from the first one by extent of the mapped area, as its southeastern mapped borders correspond to the borders of Bohemia. Small differences can also be observed in the depiction of some geological formations.

Curiously enough, the author depicted tectonic boundaries between some units, such as of the *Boskovice* Graben, and foreshadowed tectonic relationships between the Moldanubicum and Moravicum. This first general (synoptic) geological map of Bohemia therefore shows many signs of modern geological maps.



Map 46 Petrographische Karte von Teplitz und seinen Umgebung. (Source: the Archives and Library of Czech Geological Survey)

Petrographische Karte von Teplitz und seinen Umgebung. Entworfen von Dr. A. Reuss, Brunnenartzt von Bilin 1838
August Emanuel Reuss

Title in English Petrologic map of *Teplice* and its surrounding. Created by Dr. A. Reuss, spa resort doctor at *Bilina* town.

Scale The scale is given on the map in *old German miles*: it is approximately 1:50,000.

Supplement to the Book The map was published in 1838 in Karstens *Archiv für Mineralogie, Geognosie, Bergbau und Hüttenkunde.* Bd. XI, H. 2, Berlin 1838.

C.W. Medau, Prag, Litmeritz und Teplitz

Legend The legend is in the lower right corner, with nine rock types in colours and numbers in rectangles: (1) gneiss; (2) feldspathic porphyry; (3) syenite; (4) quadersandstone; (5) Cretaceous marlstone; (6) brown coal; (7) porcellanite in brown coal formations; (8) basalt, basalt tuff and conglomerate; (9) phonolite and siliceous porphyry. This legend is comparatively advanced, with rock formations distinguished not only by colours but also by numbers. Only Cretaceous marlstone is stratigraphically defined. Ages of a brown coal are not mentioned. Quaternary deposits are missing. This petrographical map is based on lithology, that is, rock types. Volcanic rocks are carefully mapped. The recognition and location of porcellanite are interesting. The boundary between the brown coal basin and the Erzgebirge (*Krušné hory*) Mts. is more or less correctly located.

Although there is no mention of tectonics, the boundary between the Erzgebirge (*Krušné hory*) Mts. and Tertiary brown coal basin is depicted by an almost straight line.

Coordinates No coordinates are given on the map: they are deduced approximately 50°30′–50°43′ N, 13°30′–13°55′ E (in Greenwich).

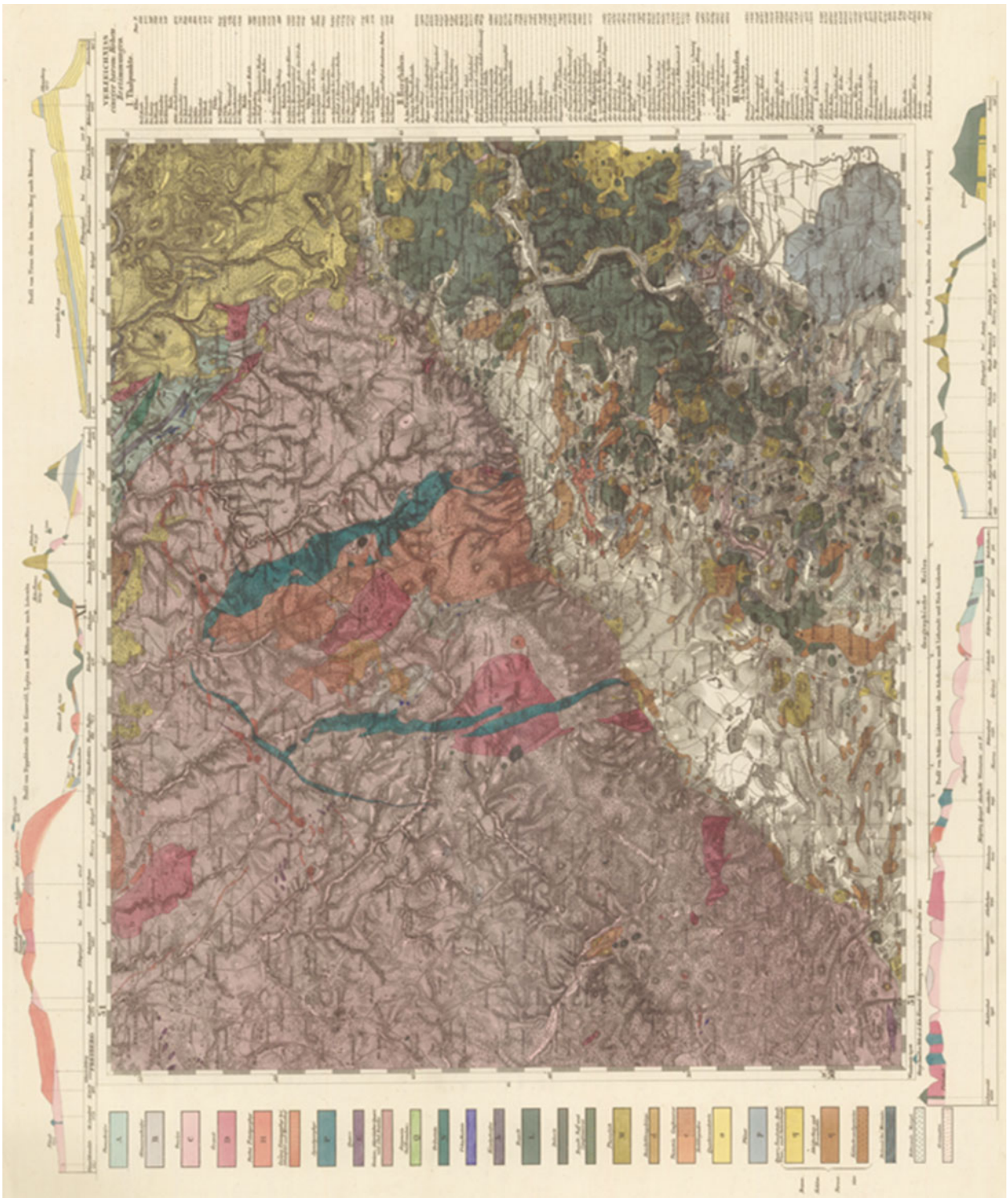
Mapped Area Approximately 660 km^2.

Mapping Area Northwestern Bohemia, part of the Austrian Empire, recent Czech Republic.

Size of the Document 210×330 mm.

Deposition Information Original map is deposited in the private collection of Jan Kozák in Prague. A digital copy is in the Archives of Czech Geological Survey.

Supplementary Information
The map represents an original geological document, partly based on earlier data, but reworked and completed. The author investigated and mapped his homeland where massive economic development took place in the beginning of the nineteenth century. His post in the spa resort in *the estates of Count Lobkowitz* was prestigious.



Map 47 The sheet XI Freiberg (Source: Map collection of Charles University Prague)

Geognostische Charte des Königreichs Sachsen und der angrenzenden Länderabtheilungen. Unter der Aufsichtes des Königreichs Oberbergamtes.
Bearbeitet von den Professoren C. F. Naumann und B. Cotta
1829–1850
Carl Friedrich Naumann

Co-Author B. Cotta

Title in English Geognostic map of the Kingdom of Saxony and adjacent counties. Supervised by the Royal Supreme Mining Office. Worked out by professors C.F. Naumann and B. Cotta.

Royal Mining Academy, Freiberg, Saxony

This map collection is a product of systematic mapping of Saxony. The edition consists of 12 individual sheets, designated by the Roman numerals.

The title page bears the number VIII; two sheets concern the whole of Saxony, the rest covering individual counties. The mapping project and edition were coordinated by C.F. Naumann.

The set of 12 map sheets offered a base for construction of the "General-Charte" (the "General map") embracing the entire mapped territory. The individual sheets are designated by Roman numerals. This general map was issued in 1845. Its legend contains 24 items, similar to those in the "Title Map" described below.

In this publication is devoted special attention to two sheets: the Title sheet and sheet XI Freiberg.

Scale Scale Scale is given only on the title sheet in *German*, *New Saxonian Post, Saxonian Police, Prussian* and *Bohemian miles*: i tis approximately 1:400,000. Individual map sheets are at a scale 1:150,000.

Legend The title of geological maps for the whole of Saxony and adjacent counties contains a legend comprising 70 items in coloured rectangles with symbols inside. Individual map sheets contain a reduced number of geological items. The following units are illustrated: shale, mica schist, gneiss, quartz greisen, granulite, granite with syenite, greenstone, serpentine with eclogite, porphyry with melaphyre, syenite porphyry, basalt with dolerite and tuff, phonolite, greywacke, black coal, shale with porphyry tuff, Rothliegendes (Permian), Zechstein (Permian), Buntsandstein, Muschelkalk, Keuper, Jurassic limestone, quartz sandstone, marlstone (Cretaceous Pläner), and brown coal.

The individual sheets are accompanied with reduced legends. They also contain a list of settlements and of morphological points, also of barometrically measured elevations and depressions. Each map contains several geological cross sections in front of a map frame, the situation of which is indicated on the map by straight lines.

For detailed description of stratigraphic and tectonic concept, see special chapters.

Coordinates Coordinates are given on the map, they are derived from *the zero meridian Ferro*; they are approximately 50°00′–51°50′ N, 11°30′–15°00′ E for the whole area (in Greenwich).

Mapped Area Approximately 50,000 km^2.

Mapping Area Kingdom of Saxony, parts of Silesia, Thuringia, and Bohemia (the Austrian Empire). Thus, present-day Germany (the Free State of Saxony), and the northern parts of the Czech Republic are involved.

Size of the Document Each map is 700×500 mm.

Deposition Information The set of ten maps is deposited in Charles University of Prague, Faculty of Science Map Collection. Signature D2/104/8.

Supplementary Information
This valuable and advanced map set shows the prestigious position of the Mining Academy in Freiberg in scientific and economic circles of Saxony and all of Central Europe. This achievement can be compared with the somewhat younger systematic geological mapping of the Austrian Empire supervised by Prof. W. Haidinger from the Royal Imperial Austrian Geological Survey in the 1850s and 1860s.

The map can be considered a modern geological map with all the attributes of contemporary advanced knowledge. Almost all the geological formations are properly recognized and mapped, with boundaries between them properly placed. Although modern tectonic concepts are still missing, the whole work is really remarkable.

Map 47.1 The title sheet (Source: Map collection of Charles University Prague)

2.2 List of Maps

1	Marsigli, Luigi	1726	Mappam Mineralographicam in qua neglecta accurata locorum diftantia. Hungarie Superioris Fodinae magis diftinete exhibentur.
2	Marsigli, Luigi	1741–1744	Mappa mineralographica Fondinas in Hungaria.
3	Guettard, Jean-Étienne	1764	Carte Mineralogiques de Pologne.
4	Lommer, Christian	1768	Mineralogische Bemerkungen bey einer Reise von Freiberg bis an das Riesengebirge.
5	Glaeser, Friedrich Gottlob	1774	Geographischer Plan der Gefürsteten Graffschaft Henneberg.
6	Charpentier, Johann Friedrich Wilhelm von	1778	Petrographische Karte des Churfürstenthums Sachsen und der Incorporirten Lande.
7	Fichtel, Johann Ehrenreich	1780	Beitrag zur Mineralogeschichte von Siebenbürgen.
8	Voigt, Johann Wilhelm	1782	Petrographische Landkarte des Hochstifts Fuld.
9	Jirasek, Johann	1786	Petrographische Karte derer Kameral-Herrschaften Zbirow, Tocznik, Königshof, Miröschau und Wossek.
10	Becher, Johann Philipp	1788	Petrographische Karte der Oranien Nassauischen Lande.
11	Fichtel, Johann Ehrenreich	1791	Plan des Vulkanischen Gebirges von Eperies von Tokay.
12	Jirasek, Johann	1791	Petrographische Charte eines Theils de Bohmischen Riesengebirges an der Schlesischen Granze.
13	Riess, Johann Philipp	1791	Petrographische Karte eines Theils der Landgräflich Hessen Casselischen Lande.
14	Flurl, Mathias von	1792	Gebürgs Karte von Baiern und der Oberen Pfalz.
15	Reuss, Franz Ambros	1793	Petrographische Karte vom Leitmerizer Kreisse in Böhmen.
16	Reuss, Franz Ambros	1794	Petrographische Karte des Egrischen Bezirks.
17	Hacquet, Baltazár	1796	Northern part of the Tatra Mountains.
17.1	Hacquet, Baltazár	1796	Panorama of Tatra Mountains as seen from the Polish side of border.
18	Buch, Leopold von	1797	Mineralogische Karte von Schlesien.
19	Reuss, Franz Ambros	1797	Petrographische Karte vom Bunzlauer Kreis in Böhmen.
20	Townson, Robert	1797	A New Map of Hungary particularly of its Rivers and & Natural Productions. By In. Math. Korabinsky. Petrography and Post Roads added by the author.
21	Pfaundler, Alois von	1803	Über die merkwürdige Gegend von Fassa in Tirol.
22	Bock-Polach, Joseph Ferdinand von	1808	Totius regni Bohemia mappa chorographico-mineralogico-hydraulico-commercialis cum commitatu Glacensi et districtu Egrano.
23	Carlos, de Gimbernat	1808	Mapa geognostica del Tirol.
23.1	Carlos, de Gimbernat	1808	Geological crosssection of the Alps between Tyrol and Donauworth.
24	Werner, Abraham Gottlob	1811	Illuminierte petrographische Karte.
25	Raumer, von, Karl	1813	Geognostische Skizze von einem Theile des schlesischen, böhmischen und lausitzer Gebirges entworfen von …
26	Sennovitz, Matthias	1813	Petrographische Charte der Cservenitz und Telky Bányer Gebirgskette …
27	Schindler, Carl Ritter von	1815	Karte zum Beschurfungs Plan von Ost Galizien gezeichnet nach der Liesganigschen Karte und der Angabe des K.K. Domainen und Salinen Administrations Assesors Ritter von Schindler.
28	Staszic, Stanisław	1815	Carta geologica Poloniae, Moldaviae, Transylvaniae, et partis Hungariae, et Valachiae.
28.1	Staszic, Stanisław	1815	Cross section from the High Tatra Mountains and ends at the Baltic Sea.
29	August Goldfuß; Gustav Bischof	1816–1817	Orographische Charte von dem Fichtel-Gebirge.
30.1	Kaluža, August	1818	Mineralogische Karte von Schlesien. Sheet 1.
30.2	Kaluža, August	1818	Mineralogische Karte von Schlesien. Sheet 2 with the title.
31	Riepl, Franz Xaver	1819	Geognostische Karte von Böhmen bearbeited von Franz Riepl.
31.1	Riepl, Franz Xaver	1819	Cross section – Geognostische Profil-Risse von Böhmen.
32	Sommer, Johann Gottfried	1821	Karte der höchsten Gebirge Europás.
32.1	Sommer, Johann Gottfried	1821	Idealized geological cross-sections across the Alps.
33	Oyenhausen, Carl von	1822	Geognostische Carte von Ober-Schlesien und den angrenzenden Ländern.
34	Beudant, François Sulpice	1822	Voyage mineralogique et Géologique en Hongrie.
34.1	Beudant, François Sulpice	1822	Carte Géologique des bords du Lac Balaton.
34.2	Beudant, François Sulpice	1822	Carte Géologique de la contrée de Schemnitz.

(continued)

35	Reuss, Franz Ambrosius	1823	Umgebung von Teplitz oder Petrographische Karte des Bila Thales im Leitmeritzer Kreise.
36	Lill de Lilienbach, Karl	1826	Carte de Salzberg de Hall et Tyrol.-o.O.
37	Buch, Leopold von	1826	Geognostische Karte von Deutschland und den umliegenden Staaten in 42 Blattern. Section Breslau (4 maps).
37.1	Buch, Leopold von	1826	Geognostische Karte von Deutschland und den umliegenden Staaten in 42 Blattern. Section Brünn.
37.2	Buch, Leopold von	1826	Geognostische Karte von Deutschland und den umliegenden Staaten in 42 Blattern. Section Eperies.
38	Boué, Ami; Weiss, I.F.	1829	Geognostical Map of Southern Bavaria 1:800.000.
39	Murchison, Roderick Impey; Sedgwick, Adam	1831	A sketch of the structure of the Eastern Alps.
40	Lill von Lilienbach, Karl	1833	Carte géologique du bassin de la Gallicie et de la Podolie Autrichienne.
41	Boué, Ami	1834	Carte géologique de la Transylvanie du Marmarosh et d'une partie de la Bukowine.
42	F. Hoffmann	1836	Atlas maps (4 sheets) – The title page of the atlas.
42.1	F. Hoffmann	1836	Atlas maps (4 sheets) – The sheet of Teplitz.
42.2	F. Hoffmann	1836	Atlas maps (4 sheets – The sheet with the legend and list of maps.
43	Anker, Mathias Josef	1835	Geologische Karte der Steiermark 1:450.000.
44	Pusch, Georg Gottlieb	1836	Geognostischer Atlas von Polen –The Sheet B –Title page.
44.1	Pusch, Georg Gottlieb	1836	Geognostischer Atlas von Polen – The Sheet C of the general map.
44.2	Pusch, Georg Gottlieb	1836	Geognostischer Atlas von Polen – The sheet with cross-sections.
45	Preininger, Andreas	1837	Königreich Böhmen nach den neuesten Beobachtungen verfast.
46	Reuss, August Emanuel	1838	Petrographische Karte von Teplitz und seinen Umgebung.
47	Naumann, Carl Friedrich	1830–1846	Geognostische Charte des Königreichs Sachsen – The Title sheet.
47.1	Naumann, Carl Friedrich	1830–1846	Geognostische Charte des Königreichs Sachsen – The sheet XI, Freiberg.

Stratigraphic Approach in the Early Geological Maps of Central Europe

3

Stratigraphy is a geological scientific discipline concerned with the description of rock succession and their interpretation in terms of a general time scale.

Stratigraphy is one of the most important geological branches and encompasses not only sedimentary rocks, but also layered igneous and metamorphic rocks.

A stratigraphic concept can be found in the Bible (e.g., description of pre-Flood environment, Flood era, and post-Flood conditions) and in some works of Antic philosophers (e.g., Pythagoras, sixth century B.C., Herodotus, fifth century B.C., described the Earth covered by an ocean, which retreated at least once and had left traces on the Earth surface). The real background of it was laid by the Danish scientist Nicolaus (also Nicholas) Steno in 1669, while doing natural history in Tuscany. He recognized the significance of rock strata and formulated three principles: the second one, the Principle of Superposition, can be taken for the very beginning of a stratigraphic approach.

Full text of the Principle of Superposition is as follows:

Sedimentary layers are deposited in a time sequence, with the oldest on the bottom and the youngest on the top.

The Principle of Original Horizontality reads that "rock layers were originally deposited close to horizontal."

The Principle of Lateral Continuity reads: A rock unit continues laterally unless there is a change to prevent their extension.

All the three principles are currently in force.

Old geological maps of Central Europe, described and analyzed in this book, are evaluated here from the aspect of the presence or absence of the stratigraphic concept. Thus, the described maps witness not only knowledge about superficial distribution of rocks and mineral resources but also advances in the basic geological discipline of stratigraphy.

Legends displayed on the map itself can disclose whether an author's concept is pre-stratigraphic, proto-stratigraphic, or clearly stratigraphic (the term "proto-stratigraphic" means that it bears traces of the stratigraphic outlook). Some early maps also contain geological cross sections, which show more clearly the arrangement and succession of rock formations.

3.1 Pre-stratigraphy and Proto-stratigraphy

Our first example concerns the "Mineralogical map of Poland" by ***J.-E. Guettard*** from 1764 (reproduced on figure). The map represents the enclosure to a special paper in which four belts ("*bandes"* in the French original) are described: belt of sands, belt of marls, belt of salt, and belt of schists and metals. Although the ages of rocks of the individual belts are not mentioned, their position might fit well with a rock succession.

Ch. H. Lommer, in his map of 1768, documented results of an expedition and described two typical tectono-stratigraphic and morphological units without mentioning their ages.

In the legend to a map by ***J.F.W. von Charpentier*** (1778), two different units can be distinguished: (1) a complex of metamorphic, igneous, and older sedimentary rocks, and (2) Quaternary river sand with clay and loam. With a little exaggeration, even this can be considered a "proto-stratigraphic" approach.

The next map, by ***J. Jirasek*** (1786), can undoubtedly be considered "proto-stratigraphic."

It illustrates the geology of Central and Western Bohemia. Although stratigraphic terms are not applied, lithology is based on a rough stratigraphic background. The author clearly separates older Proterozoic from Early Palaeozoic and, moreover, the Koněprusy Devonian from surrounding Ordovician.

The petrographic map by ***J. P. Riess*** (1789) can be also classified as "proto-stratigraphic." The author foreshadows

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recognition of the stratigraphic importance of coal seams and young Quaternary fluvial sediments.

M. von Flurl (1792) presented a map of Bavaria and the Upper Palatinate (Oberen Pfalz) in which the arrangement of rock units into a rough stratigraphical order can be seen.

This chronological sequence follows the well-known Wernerian system, in which succession starts with primitive igneous and metamorphic rocks and continues through old and young sedimentary strata, ending with "alluvial" sediments at the top. Flurl's map clearly shows differences between Tertiary rocks of the Alpine Foreland, Jurassic and Triassic formations, and Palaeozoic sediments.

F.A. Reuss does not specify ages of rock formations in his petrographical map of Northern Bohemia (1793), but their succession can be derived from both the maps and legends.

L. von Buch compiled his mineralogical map of Silesia in 1797 (edited in 1802) with a definite chronological arrangement of rocks. His Wernerian system is more than clear: the oldest rock is granite, then younger gneisses and schists overlain by bedded sediments, and finally by unconsolidated sediments. The geological evolution of Saxony can be roughly deduced from the distribution of geological units on this map.

3.2 The Period of "Wernerian" Stratigraphy

The map of Poland and neighbouring countries by ***S. Staszic*** (1806, edited in 1815) represents a milestone in geological cartography. The author was influenced by Werner, as were many others, but Staszic revised and extended the Wernerian system. This map therefore deserves a designation as truly "stratigraphic." Five "Wernerian" formations are defined (primitive, secondary, pre-marine, marine, alluvial) and each of them is further subdivided into numerous units. Their chronological arrangement and superposition are respected, and their subdivision is detailed. In the individual localities, the numbers arranged in vertical columns denote a rock chronological succession.

C. de Gimbernat, in his first geological map of the whole Tyrolia (1808), defined 16 formations but neglected a stratigraphic approach. Nevertheless, granite and slate are clearly separated from overlying sediments, and on a separate cross section the law of superposition is respected.

A.G. Werner applied his geological system of rock chronological succession in his own petrographical map of Saxony (1811). The legend is detailed and is based on the author's view on naming layered rocks (see foregoing).

A. Goldfuss and ***G. Bischof*** published an orographic map of the Fichtelgebirge (1816/1817) and also used the classical Wernerian system. From the modern point of view, the boundary between the Palaeozoic crystalline rocks and the Mesozoic formations can be identified.

A. Kaluža in his mineralogical map of Silesia (1818) made a feeble attempt to distinguish "older" and "younger" sediments.

F.X. Riepl in his geognostic map of Bohemia used a clearly stratigraphic approach (1819). His concept is also documented by four geological cross sections. The following lithostratigraphic units are defined: Proterozoic, together with Cambrian; Early Palaeozoic; Late Palaeozoic; and younger formations, mainly Cretaceous.

F.S. Beudant applied the Wernerian system in his geological map of Hungary (1822), with subdivision into five units: in French original, Primitifs, Intermédiaires, Secondaires, Tertiaires, and Indépendant

3.3 Stratigraphy in the Widest Sense of the Word

C. von Oeynhausen is the author of a geognostic map of the Upper Silesia (1819, 1822). His stratigraphic approach is simple. The formations are subdivided only into older, intermediate, and younger, but each one is then subdivided into lithologic units named after prevailing rock.

L. von Buch presented a geognostic map of Germany and adjacent countries in 42 sheets (1826). This gigantic work is partly focused on stratigraphy. Some modern stratigraphic terms are used, such as Rothliegendes, Zechstein, Jurassic. Those terms are mixed up with regional designations, even of British provenance (Purbeck Limestone, Kimmeridge Clay, etc). Stratigraphy and the law of superposition are roughly respected.

A map of Southern Bavaria was published by ***A. Boué*** (1830). The age of individual formations is not specified, but stratigraphic terms are used. Basement gneiss is overlain by Triassic and Jurassic sediments, by flysch and molasse units, by Tertiary freshwater deposits, and by Quaternary alluvial deposits. This map offers important data on stratigraphy and was later used for a compilation of a geological map of Austria.

R.I. Murchison and ***A. Sedwick*** published, in London, a map of the Eastern Alps (1831). This map combines lithologic and stratigragraphic approaches. Stratigraphic succession embraces all known units, from crystalline basement through Palaeozoic, Mesozoic, and Tertiary units up to Quaternary (Werner's terms of Urgebirge and Uebergangsgebirge are also used). This map possibly represents the first international stratigraphic correlation. It compares British stratigraphy with European continental stratigraphic units.

K.L. von Lilienbach presented a geological map of the basins of Galicia and Austrian Podolie in 1833. Four main stratigraphic units (Quaternary, Tertiary, Mesozoic, Palaeozoic) are subdivided into 14 lithologic (petrological)

units. Mixing up of lithologic and stratigraphic terms is typical for this work. Two terms have a typical stratigraphic connotation: Jurassic limestone and Cretaceous chalk.

A geognostic atlas of Poland was published by ***J.G. Pusch*** in 1836. As above, it represents a mixture of lithologic and stratigraphic terms. Lithologic subdivision is clear, because it defines Early Paleozoic greywacke, intermediate formations with limestones, Late Palaeozoic rocks such as the Old Red Sandstone, which belongs to the Late Paleozoic here, and black coal formations also containing sandstones. The Mesozoic is represented by Muschelkalk, Lias, Jurassic, and Cretaceous units. Overlying formations are termed Tertiary, Diluvium, and Alluvium.

F. Hoffmann published 50 map sheets embracing substantial parts of Central Europe (1836). Rough stratigraphic subdivision is used in the form of a mixture of official stratigraphic terms (e.g., Rothliegendes, Zechstein, Keuper, Jurassic, Creetaceous, Tertiary) and numerous lithologic terms. Their position in his stratigraphic system is often uncertain. Nevertheless, as seen in his map, the stratigraphic approach was already routine at that time. An attempted division of the Quaternary, according to the occurrence of erratic boulders, is also applied.

A. Preininger presented, in 1837, a geological map of the Czech Kingdom and neighbouring countries. In this map comparatively advanced stratigraphic classification is used. The mapped rock sequence starts with the geological basement, following through with the Early and Late Palaeozoic, Triassic, Jurassic, Cretaceous, up to the Quaternary. Two sorts of volcanic rocks are recognized according to their ages.

A regional map of Northern Bohemia, presented by ***A.E. Reuss*** in 1838, shows a limited stratigraphic concept. The age of Cretaceous marlstone is defined, but the stratigraphic classification of lignite (brown coal) is omitted and Quaternary cover is neglected.

A geognostic map of Saxony and neighbouring regions by ***C.F. Naumann*** (1829–1850) signifies real culmination in following up with a development of the stratigraphic approach begun on early geological maps. This map shows a very advanced stratigraphic model.

Knowledge of stratigraphic systems of that period was applied: Permian, Triassic, Jurassic, and Cretaceous sediments were properly depicted. Quaternary was somewhat underestimated and was mapped only on several map sheets. Attached cross sections also clearly show the unit sequences with data about their age and thickness.

3.4 The Heritage of Stratigraphy in Early Maps

The development of the stratigraphic approach in geological maps was followed from a pre-stratigraphic stage up to comparatively advanced presentations. The increasing level of geological mapping and new scientific achievements proved that geological maps need illustration of unit sequences according to their ages and the law of superposition. Finally, in the 1830s, portrayal of the stratigraphy on geological maps had reached the modern standard in the true sense.

Tectonic Approach in the Early Geological Maps of Central Europe

4

The reconstruction of tectonic images represents an integral part of modern geological mapping. Today's maps are full of heavy lines, dashed lines, and crenulated lines indicating observed faults, assumed faults, and direction of movement of fault blocks. Such symbols are explained in legends. A fault is a break in rock layers and blocks, so each block should end against it. According to the fit of opposed layers we can estimate the displacement along the fault line. The flat T-shaped symbols with numbers are called strike-and-dip symbols, and they give the direction and amount of slope of the fault plane. The numbers give the inclination (dip) in degrees.

The tectonic framework of Europe is described and illustrated, for instance, by J.A. Plant et al. (1998) and P.A. Ziegler (1990), as well as in textbooks dedicated to the development of geosciences (e.g., F.D. Adams, 1954).

We tried to trace the evolution of tectonic concepts of old geological maps in the same way as the evaluation of the development of the stratigraphic concept in a special chapter. Our main attention is focused on boundaries between geological units, because straight lines might indicate tectonic contacts and breaks.

In legends of old maps, symbols for faults cannot be found, although the tectonic conceptual thinking of some authors can be presumed.

J. Jirasek, in his map of Central and Western Bohemia (1786), did not mention tectonics, but boundaries between some formations are drawn as straight lines. We are not sure whether they are of tectonic character. The same holds for Jirasek's more recent map of Riesengebirge (Giant Mountains, Krkonoše), from 1791. Although boundaries between main geological units are properly defined, the author did not take tectonics into consideration. Unfortunately, the author did not construct an additional geological cross section.

M. von Flurl did not attach cross sections to his map of Bavaria (1792), so that we cannot presume whether his boundaries between the Tertiary of the Alpine Foreland, northern Triassic and Jurassic, and margin of the Bohemian Massif are of tectonic character.

Curiously enough, the map of ***F.A. Reuss*** concerning North Bohemia (1793) does not show any tectonic approach, even though boundaries between the main regional units are properly drawn, such as between the Lusatia Granite, the crystalline rocks of the Erzgebirge (Ore Mts.), and the Bohemian Cretaceous basin.

The same holds for the same author's map of Central and Northern Bohemia (1797). There are no traces of tectonic approach in it, although boundaries between geological units are properly drawn.

Tectonic information is also missing in the map of Silesia (***L. von Buch, 1802***). The author, as some authors before, did not take tectonic processes into account in the illustration of geological development. These authors focused their work mainly on rock distribution and location of mineral resources.

S. Staszic mapped the whole of Poland in four sheets, with parts of adjacent countries are also shown (1806, 1815). His work, as explained in special chapters on map description and authors' biography, can be considered a milestone in a development of geological cartography. Stratigraphic subdivision based on Werner's system was extended and units are properly depicted for the most part. Unfortunately, any tectonic approach is missing.

C. de Gimbernat mapped Northern, Eastern, and Southern Tyrolean regions, with a small part of Bavaria, in 1808. He also constructed six cross sections through the Alps, in which a tectonic approach can be deduced, although this is not pointed out by the author himself.

A.G. Werner, the well-known "Neptunist," in his compiled geological map of Saxony (1811) depicted boundaries of coal basins by a straight line. It is difficult to say whether he supposed tectonic contact. The cross sections are not attached. It is important that Werner in fact presumed an angular unconformity between his "transitional" and "layered, flötz" units. It is well known that such unconformities evidence tectonic movement.

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C. Ritter von Schindler mapped eastern Galicia in 1815 to locate mineral deposits. We would like to emphasise that Schindler managed to show major NW–SE-trending lineaments that match up with the well-known Tornquist–Teisseyre Suture Zone, a tectonic suture of importance in Europe; it is also called the Trans-European Suture Zone.

So, this map is the first one where tectonic breaks are taken into account in relationship to the spatial distribution of geological units.

A. Goldfuss and ***G. Bischof*** published "the Orographic map of the Fichtelgebirge," covering westernmost Bohemia and part of Bavaria (1816/1817). According to Bernhard Fischer (Čejchanová et al., 2010), the authors recognized the boundary between crystalline Palaeozoic rocks and Mesozoic foothills, the so-called Frankish Line (Franconia Line), which is really of tectonic origin. However, the authors did not use the term "tectonics," nor did they discuss the aforementioned features.

F.X. Riepl published the Geognostical map of Bohemia in 1819. The special sheet, with four cross sections, was also attached. All the cross section lines are directed from NNW to SSE. Geological units on the map, mainly Proterozoic, Early Palaeozoic, and Late Palaeozoic formations, are elongated and oriented in a parallel direction, which can be considered as an initial tectonic interpretation.

François Sulpice Beudant attached to his geological map of Hungary (1822) 47 geological cross sections, but their image is far from a tectonic concept.

The map by ***L. von Buch*** illustrating Germany and surrounding countries (1826) is also worth mentioning. This author properly depicted crystalline blocks, boundary lines around coal-bearing basins, and boundaries between basaltic rocks and Mesozoic structures. However, tectonics are neither discussed nor mentioned in the legend.

R.I. Murchison and ***A. Sedgwick*** tried to reconstruct the structure of the Eastern Alps on their geological map (1831). The two authors did their best to reveal geological structures but neither depicted nor mentioned tectonics of this region. Their bilingual English–German legend is worth mentioning, but the Alpine geological structure is presented as purely atectonic.

The 1833 map of Galicia and Austrian Podolie by ***K.L. von Lilienbach*** is based, as was typical at the time, on lithologic subdivision. Tectonics are not mentioned by the author, but the northern margin of the Carpathian sandstones shows clear tectonic delimitation.

A. Boué presented his map of Transylvania, Marmarosh and part of Bucovina in 1834. According to P. Krzywiec (Čejchanová et al., 2010), one can read from this map the line of Carpathian thrust and back-arc extensional zones limiting Tertiary units of the Transylvanian basins. Straight and parallel elongation of volcanic bodies also shows their eruption along tectonic lines.

A voluminous geognostical atlas of Poland and surrounding countries was published by ***J.G. Pusch*** in 1836. Two sheets of cross sections are attached. Based on lithology, geological units can be distinguished and defined, as well as tectonic boundaries between them. The authors already used marks for strike and dip of beds and thus indicated their style of tectonic deformation.

F. Hoffmann's map in 50 sheets (1836), embracing a large area of Central Europe, contains a very detailed legend with combination of colours, symbols, and numbers. Main geological structural units are recognizable; the boundary between the Sudetes and Fore-Sudetes block is properly placed, but it is clear that a tectonic origin is not mentioned.

A. Preininger presented his geological map of the Czech Kingdom and surrounding areas in 1837. This compiled map shows many aspects of modern geological maps. A tectonic approach can be detected in the depiction of boundary lines of some units, such as the Boskovice Graben and sedimentary basins.

A.E. Reuss, in his petrographic map of North Bohemia (1838), did not mention tectonics at all, but his straight-drawn contact between the Erzgebirge and Tertiary brown coal basins shows a clear tectonic boundary.

The geological map of Saxony and surrounding countries by ***C.F. Naumann*** (1829–1850) can be considered as a comparatively modern and advanced map, even from a tectonic aspect. Straight lines show tectonic boundaries between the Erzgebirge Massif and North Bohemian lignite coal basins. Tectonic contact can also be read from mapped boundaries between granites and gneisses, as well as between the crystalline basement and sedimentary basins.

4.1 Economic Geology in the Early Geological Maps of Central Europe (Mineral Deposits, Waters, Mine Workings)

Why were old geological maps constructed, and by whom? These questions can be partly answered by evaluating their purpose and contents. Old geologic maps tried to illustrate geological units and occurrences of mineral resources. Exploited mineral deposits were depicted, sometimes also showing processing plants and mine workings.

The literature on mineral deposits of the individual Central European countries is extremely rich. A general outline on mineral deposits of Central Europe by F.W. Dunnings and A.M. Evans (editors, 1986) deserves our attention.

The oldest map in our volume (***L.F. Marsigli***, 1726) is called "Mappam mineralographicam…" It shows some gold occurrences by using symbols. The next maps by Marsigli maps are more detailed (1741). The first focused on the area of Banska Štiavnica (Schemnitz) in Slovakia and the second on Northern and Eastern Hungary, Transylvania, Croatia, Slavonia, and Bosnia. Metal resources are shown by alchemist's signs. Also, occurrences of opal, garnet, salt, and copper are given.

In ***Lommer***'s "Mineralogical notes…" distribution of six rock types is shown in colours, and that of metals and non-metallic minerals by symbols. We find localities of hematite, copper, zinc, and tungsten ores, as well as alum shales. Some mines are localted without specification as to exact mineral or element.

The title of ***Gottlob***'s map (1774) mentions neither petrology nor minerals, but contains important data on mineral deposits, such as rock distribution, mineral deposits, and also glass and iron processing plants.

J.E. Fichtel (1780) mapped subsurface salt deposits in the Carpathians, from Valachia up to the well-known Wieliczka salt mines in Poland. Saltwater springs are also located on the map.

Johann Jirasek published a comparatively detailed geologic map of Central and West Bohemia in 1786. His interest in mineral deposits is evident from this map. Remarkable details on location of iron mining workings, limonite ores, and red silicite (*Jaspis* in the original German) are designed. Also mapped is the Permo-Carboniferous basin with black coal seams. Jirasek's later map, concerning the Krkonoše Mts. (Giant Mts.), shows, both in the legend and on the map itself, positions of processing plants, such as smelters and hammer mills.

Coal basins are also shown on the map by ***Johann Philipp Riess*** (1789), called "the petrographic map of Hessen-Kassel Counties." This map is a supplement to the book on mineralogical and mining curiosities. Thus, some of tbose features are shown on it. Special attention is drawn to iron ores and coal seams. Also, "dykes" are identified, both in the legend and on the map, however, without specification as to petrography.

The 1791 map by ***J.E. Fichtel*** is dedicated mainly to the localities where ore minerals and salts were mined. Individual localities are numbered, and are described in the legend and in the book. The map represents only a supplement to the book *Mineralogical notes from the Carpathians*.

Mathias von Flurl, in his map of Bavaria and the Upper Palatinate (1792), used special symbols to indicate iron ores and gypsum. These symbols are explained in the legend. Flurl was commissioned to survey the mineral resources in Bavaria, and this map is now highly appreciated as a milestone in Bavarian mineralogy and geology.

Baltazár Hacquet's map (1796) is focused mainly on some mineral resources. Locations of ore mines, silver, copper, sulphur, and iron in the Tatra Mts are depicted by special symbols.

In the set of map sheets by ***Franz Ambrosius Reuss*** (1793, 1794, 1797), embracing several Bohemian districts (counties), distribution of rock types, as well as of some mineral deposits, is illustrated. Coal occurrences are shown on all the maps, but in some maps only alum, lead, tin, quartz, iron, and, surprisingly enough, also quicksilver and cobalt are depicted.

The map of Hungary by ***Robert Townson*** (1797) offers a general overview of Hungarian mineral deposits and hydrogeology, with geological background provided in 13 lithologic units.

Leopold von Buch focused his mineralogical map of Silesia (1802) on the geological history, lithologic units, and previously almost neglected mineral deposits of economic value.

Stanislaw Staszic and his map (1815) deserve special attention from the point of view of economic geology. The legend to his map is divided into three categories, according to Werner's scheme (Werner, 1787). The oldest stage is represented by occurrences of certain minerals, such as asbestos, bronzite (*schiller Spar* in the original), soapstone, cyanite, talc, opal, chalcedony, agate, and also mineral waters. The second category shows economically valuable and exploited mineral deposits, such as native gold, native silver, different types of iron ores, copper, lead, zinc, manganese, bismuth, antimonite, titanite, chromium, and uranium (!) mines. Among 18 items of the Pre-Marine stage, sulphur, vitriol, bituminous sediments, coal, gypsum, strontium deposits, glauberite salts, and sulphuric waters appear.

J.F. Bock-Polach's map (1808) is focused mainly on economic geology and so it summarizes data on occurrences of both ore and industrial minerals, chemical elements, mines, and industrial enterprises. The legend contains 84 types of rocks and minerals and, separately, 76 symbols for mines, mine workings, and industrial plants.

Abraham Gottlieb Werner published a petrographic map of Saxony (1811) with some data on mineral deposits. He subdivided them into categories according to his concept of geological history. Black coal belongs to the Transitional stage, but brown coal to younger formations.

Carl von Raumer, in his map of 1813, used colours for lithologic units and symbols for minerals and their deposits. There are many data on occurrences of mineral deposits, such as gold, silver, copper, iron, pyrite, lead, tin, zinc, cobalt, and arsenic.

The map of Galicia by ***Carl Ritter von Schindler*** (1815) is partly focused on the search for mineral deposits, so their occurrences are shown on it. The author explains the map's purpose as follows: "We show, where mineral deposits can be found and in the most profitable way utilized."

August Goldfuss and ***Gustav Bischof*****,** in their map of the Fichtelgebirge (1816/1817), called "the Orographic map," put down symbols for hammer mills, blast furnaces, glassworks, and mineral springs. Therefore, reference to mineral resources is indirect. It is worth adding that Professor Gustav Bischof was an expert on groundwater and mineral springs.

Franz Xaver Riepl's geognostic map of Bohemia (1819) is an except of geological units focused on some mineral deposits, such as black coal and iron. In a supplemental cross section, black coal seams and lignite deposits are shown. Reiepel's "black coal formation" unfortunately does not distinguish between black coal and lignite, although it covers an extensive northern part of the map. Iron ores are subdivided into four types.

François Sulpice Beudant published, in 1822, two geological maps of Hungary and one mining map of the mine field of Banská Štiavnica (Schemnitz in Slovakia). Maps are based on lithologic units and arranged in descending age. Up to 16 units are mapped, with a standard list and symbols of mineral deposits and hydrogeological features.

A comparatively simple geognostic map by ***Carl von Oeynhausen*** of Upper Silesia and adjoining territories (1822) is again based on lithology, but contains numerous data on exploitation and processing of mineral resources. The coal-bearing series of Upper Silesia is properly depicted. Also indicated are iron and lead deposits. Moreover, industrial minerals, such as building stones and clays, are not neglected. Symbols indicate the location of primitive furnaces, foundries, zinc smelters, and glassworks.

A geognostic map of Germany and surrounding coutries, in 42 sheets, was published by ***Leopold von Buch*** in 1826. This map is based on lithology, but valuable data on mineral resources are added, for example, on black coal deposits, gypsum, metalliferous limestones, plastic and London clays, and dolomites. The presentation of von Buch's whole atlas is considered as a start of modern geological mapping.

Ami Boué presented his geognostic map of Southern Bavaria in 1830. Within the frame of mapping of lithologic geological units some mineral resources are included, such as Tertiary lignite, as well as Mesozoic salt and gypsum.

The atlas of the geognostic map of Poland by ***Johann Gotlieb Pusch*** (1836) contains five map sheets and two sheets with cross sections. The legend explains designation of the following mineral resources: coal, different types of iron ores, lead-bearing rocks, polymetallic veins, zinc ores, sulphur, and gypsum occurences. Information about brines, and sulphuric, oily, and carbonated spring waters, can also be found.

Friedrich Hoffman's geognostic map in 50 sheets covers Saxony, Silesia, part of Bohemia, and German territory up to the Rhine River. The maps are focused on lithology, with some additional data on mineral deposits. Black coal basins are located, also interesting occurrences of metalliferous shales (e.g., copper formation). Industrial products are represented by plastic clays and sands.

August Emanuel Reuss presented a petrographic map of North Bohemia (1838), focused mainly on neo-volcanic areas. A lignite basin is properly outlined. Mapping of porcellanite ooccurrences is worth mentioning.

As our outline shows, a tectonic approach evolved very slowly in the geology of the eighteen and first half of the nineteenth centuries. Our analysis of old maps of Central Europe bears witness to this evolution. This fact is actually amazing, because a tectonic concept showing rock distribution could often be the simplest and most plausible explanation. This unfair "depreciation" of old geological maps can be justified by the fact that the map evaluation in this chapter looks at them from the point of view of the twenty-first century.

Summary - Of Maps and Men: To Have the Last Say

The set of old geological maps collected in this atlas includes map produced in the late eighteenth and early nineteenth centuries. It is, of course, a set that is to a certain extent heterogeneous, depending upon from what viewpoint these maps are looked at and assessed.

There is no doubt that the origin of geological maps, as well as other special-purpose or thematic maps, which were compiled, was determined by the progress of cartography, namely the development of cartographic imaging, which allowed the establishment of a basis for such activities, and to produce such a kind of superstructure. Topographic data were therefore an essential "base layer" for displaying additional data, if we use the terminology of modern GIS.

The collected geological maps can, of course, be looked at from more viewpoints, especially from the historical aspect, informatics (information science) aspect, geological point of view or collector's view. Each of them has its own logic, but only an integrated approach taking into account more views, would result in a better quality and comprehensive evaluation and analysis of these maps. However, a problem arises in the fact that we do not have the appropriate quality data of these maps and usually we also do not know their former, i.e., historical context.

The historical aspect would emphasize certain contemporary context associated with the development of economy, the links between the landscape and mining and processing industry. **Information science** would monitor the quality of input data into the decision-making process, their reliability, what was the composition of user groups and what were the intentions of map makers. **Geologists** and **mining engineers** would observe the maps from the viewpoint of the development and progress of earth sciences from their beginnings until the early nineteenth century. It can be said that it is a similar view that originated with a map compiled by William Smith. There is also a clear view of **collectors** that is dominated by the uniqueness, rarity and aesthetic value of these maps.

Geological maps of that period would be understood in the context with a whole range of other emerging thematic maps, which were obviously created by the social demand. *Military maps* were most important in terms of national interest; examples are maps compiled within the first military mapping undertaken by the Austrian monarchy (the so-called Joseph's mapping) that emphasized the possibility of military operations. Although appropriate topographic maps were available, it is not known whether they were used for the later geological maps. Other examples include maps that can be used for *regional economic purposes*, such as maps depicting the distribution of *large manor farms and domains* which were also used, among other things, as a basis for tax collection. These could also include numerous and various *forest maps,* protecting, for example, royal property, sometimes associated with the need for wood to be used in mine workings, and thus were actually driven by higher national interests. Maps also served to tackle historical *border disputes* between various countries, such as between Bohemia and Silesia.

The question is to what extent the social demands or "social order" and "user group" interests played a role in here presented maps. We can be sure that some maps were compiled in the national interest, which can be demonstrated in particular on Riepl's maps of Bohemia, by then a sort of mosaic of maps used to evaluate the potential of selected raw materials (coal and iron) for industrial needs of the Austrian monarchy. Another group of maps clearly shows that they were initially based on maps depicting mineral occurrences and their areal distribution, but then have developed into special-purpose maps which by contemporary means and methods best displayed the geological character and development of certain areas. Structural geology and stratigraphy were already applied in these maps reflecting higher levels of emerging and fast developing palaeontology. Clear influence of the Enlightenment, the scientific pursuit of knowledge and relatively fast development of the society are mirrored in these maps. A sort of feedback may result in practical applications and use of these maps in the mining industry. The mapmakers

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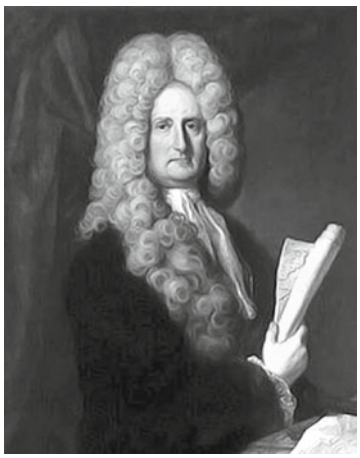
were often inspired by the mining companies and factory owners themselves. Efforts for accuracy during their further development then influenced their designation as geological or geognostic maps. These include the majority our selected and presented maps. They can also be seen as a reflection of the development of West European science, leading in the case of geology to the founding of individual Geological Institutes or Geological Surveys at the turn of the first and second half of the nineteenth century. The quality of these maps is different especially due to the level and inspiration their makers had at the given time period, when certain improvement of geological knowledge and also better technical imaging were evident.

The aspect of training, didactic and representative function of maps should not be forgotten either. As follows from the above text, the value of results lies in the contribution to the strategy of further investigative efforts on the study of the oldest geological maps. Our investigation also showed that there still exists a range of issues that deserve to be studied and questions to be answered. They include:

- What topographic materials were used by compilers of the oldest geological maps and what was their accuracy. Without them, such maps could not be constructed?
- What was the methodology of geological mapping, geological documentation and what measurements were used?
- What was the impact of needs of mining activities to launch a detailed study of geology, including tectonics and structures and, consequently, their influence on the construction of geological maps?
- What were the mutual contemporary interactions and needs leading to the compilation of geological and other old special-purpose maps (maps of forests, maps of domains, etc.)?
- What could have caused a "jump" in professional improvement of geological maps during the eighteenth and the first half of the nineteenth century? Where was all the future professionals trained?
- The need for historical study of individual important maps similar to those which were compiled e.g. by Riepl and Jirasek in the Czech side?
- The need to search for and find other maps and sets of maps in the archives of European countries in order to discover other interesting objects, which would contribute to a better understanding of the history and contemporary significance of geological maps?

Answers to these questions may be the subject of further map research.

Appendix: Biography and Portrait of Map Authors



Luigi Fernando Marsigli (1658–1730) Marsigli was an Italian soldier and naturalist. He travelled throughout Europe from Istanbul to London, but spent much of his time in the Balkan countries and the lands south of the Danube. He moved through the Habsburg Empire, mapping the terrain, and determining boundary lines and the correct course of River Danube, while also participating in a train of events with a crucial impact on Bosnia and Croatia today. L.F. Marsigli pursued his varied interests, classifying mushrooms, finding geological specimens, describing the mining district of Schemnitz, observing Roman ruins, studying marine biology, and making his place in the increasingly scientific community of the early Enlightenment. Marsigli was also one of the pioneers of modern oceanography. He measured the depths of the Mediterranean Sea and published the classic book entitled *Histoire physique de la mer* (Amsterdam, 1725).

Jean-Étienne Guettard (1715–1786) Guettard was a French geologist and mineralogist who was the first to survey and map the geological features of France and to study the exposed bedrock of the Paris Basin. He was also the first to recognize the volcanic nature of the Auvergne region of central France. The keeper of the Duc d'Orléans's natural history collection, J.É. Guettard was the first to identify several fossil species from the Paris area and to suspect the volcanic origin of mountains in central France. He spent two consecutive years (1760–1762) in Poland, and upon return to France published a suite of papers concerned with various aspects of the geology of Poland.

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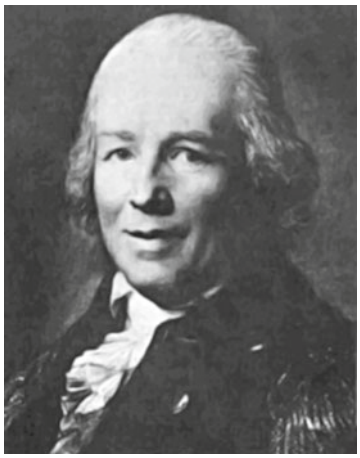
Christian Hieronymus Lommer (1741–1787) Lommer worked as a mine inspector and teacher of mining and ore geology at the Mining Academy of Freiberg. His map was constructed as a result of an expedition carried out in 1766. Dozens of rock, mineral, and ore specimens were taken and deposited in collections. He is also known for his mineralogical notes made while on a journey from Freiberg to the Giant Mts.–Krkonoše Mountains.

Friedrich Gottlob Glaeser (1749–1804) Only very scanty information on his life is available. Glaeser worked as a mining master in several places. He had both practical and theoretical knowledge of mining and a general view of the character of mineral deposits. F.G. Glaeser published a book describing mainly mineral deposits, but also discussed general geology and mine workings. Glaeser's merits lie in the field of regional geology.



Johann Friedrich Wilhelm von Charpentier (1728–1805) von Charpentier worked as a professor in the Mining Academy in Freiberg, Saxony. He was an expert in mineralogy, geology, and mining, as well as economic geology. J.F.W. von Charpentier was a colleague and contemporary of A.G. Werner at the Freiberg Academy and was partly influenced by Wernerian principles. In his books and maps he utilised long years of field and mining experience, so that his map is based on facts and observations. Charpentier wrote several books, one about mining geology, and another about observations on metallic mineral deposits. According to many experts, his publications have a definite bearing on the question of ore genesis.

Johann Ehrenreich Fichtel (1737–1795) Fichtel served as a jurist, clerk in the Austrian Administration to Transylvania, and "gubernial counceilor" at Siebenbürgen. In his spare time he studied mineralogy, petrography, and geology. He travelled often to the Carpathians and visited all the mining regions of former Upper Hungary (now Slovakia), among other areas such as Banská Bystrica, Banská Kremnica and Banská Štiavnica. He visited the foothills of the Tatra Mountains, observing mainly abandoned mines in Krywaniu. He was a member of the Gesellschaft Freunde Naturforschender in Berlin (from 1775) and Leipziger ökonomische Societät in Leipzig (1781).

Johann Karl Wilhelm Voigt (1752–1821) Voight studied at the Freiberg Mining Academy under Professor Abraham Gottlob Werner. After finishing, he entered the civil service of the Grand Duchy of Saxe-Weimar-Eisenach. During this time, J.K.W. Voigt led intensive mineralogical investigations throughout the Grand Duchy. The work was done on behalf of Minister Johann Wolfgang von Goethe. Voight published several mineralogical works and supported Werner's doctrine of neptunism.

Johann Jirasek (1754–1797) Jirasek was a natural scientist with a broad outlook. He acquired a wide education in natural science at the Faculty of Engineering, Technical University in Prague. He became an agricultural engineer and was nominated as the Royal Provincial Engineer in the region of Prague. As an associate member of Bohemian Society of Science, under the title of Royal Provincial Engineer, he took part in one of the first scientific expeditions to the Giant Mts. (Krkonoše Mts.) in the year 1786.

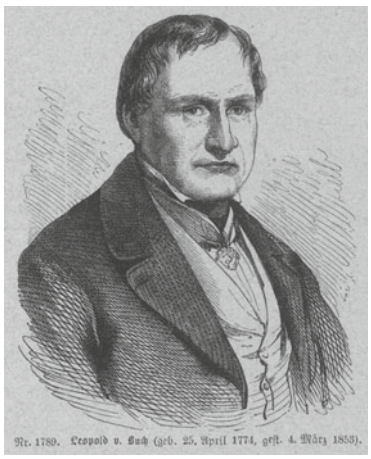
Johann Philipp Becher (1752–1831) Becher studied in Herborn and, as the son of a metallurgist, he educated himself in his father's discipline as an auto-didact. For a short time he also attended the Mining Academy in Freiberg. His knowledge and experience were acknowledged, and J.P. Becher was appointed as a counsellor in Dillenburg and later as Chief Counsellor and inspector of mines and smelters in Bonn. He was decorated according to his merits by the "Red Eaglemedal." After retirement he spent his "Ruhestand" in Wiesbaden. Becher published "Mineralogical description of Westerwald" (Berlin, 1786) and "Mineralogical description of Oranien-Nassau area" (1789).

Johann Philipp Riess We have no information about the life of J.P. Riess. In this publication we just present his work: Petrographische Karte eines Theils der Landgräflich Hessen Casselischen Lande.

Mathias von Flurl (1756–1823) von Flurl is commonly acknowledged as the founder of scientific geology in Bavaria. He started his career as a professor of physics and natural history at the so-called "Landakademie" in Munich (actually a Military Academy). Early interest in mineralogy, and mineralogical resources, led to his discovery of a deposit of porcelain clay in 1788, which, again, brought him an official position at the Bavarian states porcelain factory at Nymphenburg. Only a short time later, after some studies with Abraham Gottlob Werner at Freiberg, M. von Flurl became a mining official ("Bergrat"). He was immediately commissioned to survey the mineral resources of Bavaria. His famous map shows his interests and success at fulfilling the goal of his commission. Although from a modern point of view one might find some geological features in his map (as indicated above), it remains predominantly a mineralogical one. Nevertheless, Flurl's work started the beginning of scientific mineralogy and geology in Bavaria.

Franz Ambrosius (also Ambros) Reuss (1761–1830) F.A. Reuss, the son of a tailor, studied philosophy, natural science, and medicine at the Prague University. In 1784 he also went to Freiberg and visited Werner's lectures. In 1784 F.A. Reuss became a physician, and he moved with Prince Lobkowicz to Bílina (in German, Bilin) City in northwestern Bohemia, where he spent the rest of his life. He had four daughters and four sons, one of whom, August Emanuel, became a famous stratigrapher and micropaleontologist (see p. 145). F.A. Reuss studied mineral springs and mines, published balneological works, and later geological studies on Bílina, Karlovy Vary (Carlsbad), and other north Bohemian regions. Eight volumes of his *Lehrbuch der Mineralogie* (*Mineralogical Textbook*) were published between 1801 and 1806. F.A. Reuss propagated in this book, and in geological maps, Werner's neptunism model. F.A. Reuss' publications and geological maps represent a comprehensive starting line for later works on the Tertiary sediments and volcanic rocks of northern Bohemia.

Baltazár Hacquet (1739 or 1740–1815) Hacquet worked, after completing his education, as a physician, naturalist, mineralogist, and ethnographer. From 1761 he worked in the Civil Services of the Habsburg government, mainly in the Corinthians and Slovenia. He also was one of the first alpinists (mountaineers) in the Austrian Empire. His journeys through the Alps resulted in a publication describing the nature of the Eastern Alps, and his attached geological map was issued between 1778 and 1779. His first visit to Slovakia took place in 1770. In 1787, B. Hacquet was designated professor of natural sciences at the Lvov University, and after that time he conducted research of the Carpathian system, mainly the Tatra Mts. He climbed Kriváň Mt. several times and measured its height by using a barometer. In addition to geological features he registered old mine workings and described vegetation zones in mountains. In his publications he compared Carpathian geology with Alpine, underlining special geological structures of the Tatra Mts. Thus, B. Hacquet can be considered the pioneer of Carpathian geological research.



Christian Leopold von Buch (1774–1853) von Buch was a German geologist and palaeontologist, born in Stolpe an der Oder (now a part of Angermünde, Brandenburg), and is remembered as one of the most important contributors to geology in the first half of the nineteenth century. His scientific interest was devoted to a broad spectrum of geological topics, including volcanism, fossils, and stratigraphy. His best remembered accomplishment is the scientific definition of the Jurassic system. His mineralogical map of Silesia is the result of his early work, which he carried out while still pursuing his studies at the Freiberg Mining Academy. It was conducted within the realm of the general geological survey of Saxony, which had been started, according to a royal order, by his teacher A.G. Werner in 1791. The best known result of C.L. von Buch's work in Silesia is his "Versuch einer mineralogischen Beschreibung von Landeck" (1797), actually an early attempt to discuss the geological history of a particular area, based on the Wernerian geognostical system. Therefore, it might be deduced that his map of Silesia is also based on a Wernerian geological background to a considerable extent.

Robert Townson (1762?–1827) Townson was a scholar, scientist, and settler. He travelled widely as a gentleman scholar, collaborating with the professors at the universities he visited. In 1791 he was elected a fellow of the Royal Society of Edinburgh. He then visited the Universities of Copenhagen and Uppsala. After contributing a paper to the Linnean Society of London in 1792 on "The Perceptivity of Plants," his headquarters site was at Göttingen University. He travelled to France and Austria, visited the University of Vienna, spent some time in Hungary, and published "Observationes Physiologicae de Amphibiis" (Göttingen, 1794). In 1797 he published "Travels in Hungary," which appeared in French in Paris in 1798. In the same year he wrote "Philosophy of Mineralogy" and in 1799 "Tracts and Observations in Natural History and Physiology." Robert Townson planned to visit India and Australia and study minerals there, but his plans fell through. In 1793 he visited Slovakia and for several weeks studied the mineral potential of the High Tatra Mts. The results of his studies were described in Chapters XV to XVII of his comprehensive work on his journey through Hungary ("Travels in Hungary"), which was published in London in 1797 and later translated into French.

Carlos de Gimbernat (1768–1834) Of Catalonian nationality, de Gimbernat was the son of a famous surgeon. To augment his education, the Spanish King Carlos IV sponsored Gimbernat's studies in Britain (at Oxford and Edinburgh, where he was influenced by neptunist ideas). He visited Ireland and France, where he was in contact with Prof. Dolomieu, and later with A.G. Werner in Freiberg. He probably also worked with Dr. Joseph Townsend and William Smith as well. He did not wish to return to Spain, because of the changed political situation, and thus he went to Bavaria and was hosted by King Maximilian II. He spent the years

between 1817 and 1822 in Italy. He did not use fossils for chronostratigraphy but did use them to gauge the ancient depositional environment (marine, lacustrine, terrestrial, etc.). A single copy of the map, accompanied by 27 pages of text and 6 sections, is held at the Museum of Natural History in Madrid. His geological cross section through Mt. St. Gotthard suggests the tectonic structure of the Alps.

Abraham Gottlob Werner (1749–1817) A German geologist, Werner was born in a village of Prussian Silesia. His father worked in the mining industry. A.G. Werner was educated at Freiberg and Leipzig, where he studied law and mining, and later was appointed as inspector and teacher at the influential and prestigious Freiberg Mining Academy in 1775. In Leipzig he published a textbook on mineralogy and fossils. A.G. Werner was a founder, and the most famous advocate, of the neptunistic theory. He believed that the Earth could be divided into five formations from the oldest (called Urgebirge), through Transitional and Flöz with layered rocks (Flöz means coal seam in German) units up to the alluvial unit. So, this model can be called "proto-stratigraphic" and to certain extent respects a law of superposition. Although he did not publish much, his pedagogical and educational abilities influenced quite a number of students, who then took over his system. Abraham Gottlob Werner believed that an all-encompassing ocean was the source of all the rocks and mineral in the Earth's crust. Werner's views left their traces in geology for several decades of the nineteenth century and also in early geological maps. Werner died in Dresden.

Karl Ludwig Georg von Raumer (1783–1865) A German geologist, geographer, and teacher, von Raumer was born in Wörlitz and educated in Göttingen, Halle, and Freiberg. In 1811 he was appointed professor of mineralogy at Breslau (Wrocław), later moved to Halle in 1819, and in 1827 settled permanently as professor of natural history at Erlangen. He died in Erlangen.

Matthias Sennovitz (1763–1823) Sennovitz was born in Kežmarok (recent Slovakia) and worked for several decades as a teacher in an evangelical girls' school in former Eperjes (recent Prešov in Slovakia). In 1784 he took over the Lutheran school and focused his work on the education of maids. He was also interested in mineralogy and described mineral occurrences in the Eastern Slovakia and Tokay area in Hungary.

Stanislaw Staszic (1755–1826) Staszic was called a "father of geology" in Poland. He was born in the small town of Pila in Western Poland. His father was a landowner and for a time was a town mayor. S. Staszic studied theology in Poznan and later natural sciences in Paris. After 1781 he decided to carry out regional geological studies of Poland, and he also travelled through Europe. Back in Poland he was employed as a tutor to families of nobility. In 1809 S. Staszic wrote his first geological report and later enlarged his studies to adjacent countries. In 1815 he wrote his monograph and produced the first large geological map of Central and Eastern Europe. From 1808 to 1826 S. Staszic was president of the Society of Friends of Sciences in Warsaw. Selected works of S. Staszic appeared in Moscow in 1951. His geological map is considered a milestone of geological cartography and regional geology. He elaborated more detailed stratigraphy on the basis of Werner's system.

Georg August Goldfuss (1782–1848) G.A. Goldfuss was a German zoologist, palaeontologist, and botanist. He was born at Thurnau near Bayreuth, and studied in Erlangen, where he graduated with his Ph.D. in 1804. After graduation, G.A. Goldfuss was appointed a professor of zoology and mineralogy at the University of Bonn. He was deeply interested in fossils and during 1826–1844 he wrote his encyclopaedic work "Petrefacta Germaniae" (*German Fossils*). Moreover, Georg Goldfuss published "Handbuch der Zoologie" (*Textbook of Zoology*), vol. 1, which was edited in Nürnberg in 1820. In this volume, sponges, corals, crinoids, echinoderms, and some molluscs, were described. G.A. Goldfuss worked also as the first director of the mineralogical, paleontological, and zoological collections of Bonn University. He cooperated with Karl Gustaf Bischoff in geological investigation and mapping of the Fichtelgebirge Mts. Georg Goldfuss died at Bonn.

Karl Gustav Bischof (1792–1870) Born in Wöhrd (now part of Nürnberg), K.G. Bischof finished his university studies in Erlangen, where he concentrated mostly on chemistry and astronomy, and later also on physics and natural sciences. After graduation in 1822, K.G. Bischof was appointed a professor of chemistry and technology at Bonn University. There he began to be deeply interested in geology as well. Even though K.G. Bischof did not underestimate the process of heat production in the Earth's interior and experimented with rock melting, we can call him a "neoneptunist." He emphasized namely the role of water in the rock origin, and that is to say, he was partly on Werner's heels. Some of his papers concerned hot water springs and rock minerals. K.G. Bischof published books on the internal heat of the Earth, on the Alpine glaciers, on mineral springs in Germany and France, and on the origin of quartz and ore veins. Later, in 1846, K.G. Bischof wrote a highly appreciated book titled "Textbook of chemical and physical geology," which appeared in German and English. Karl Bischof died in Bonn.

Joseph Ferdinand Bock-Polach Little information on this author is available. A knight, J.F. Bock was an Austrian clerk with deep interest in the management of industry. He collected precious documents on economics and business in the Austrian Monarchy. He corrected and completed Müller's 1720 map of Bohemia; for example, he subdivided Bohemia into 16 counties. He prepared his own map for publication in 1774, but this map was published with great delay, after many revisions, in 1808. In the subtitle of the map J.F. Bock-Polach called himself an adviser to the Austrian government. Before that, he also worked as an adviser and business inspector in the Bohemian government. He dedicated his map to Austrian Grand Duke Carlo Ludvico.

Augustine Kaluža (1776–1836) Kaluža studied theology in Breslau (Wrocław) and later worked as tutor in a count's family. In 1811 he became professor of science at a Catholic secondary school in Breslau, where he worked until 1818. Later he became a parish priest and devoted his life also to natural sciences. A. Kaluža was known as an 'ardent' supporter of charity. He founded a scholarship for talented Breslau students. A. Kaluža published several papers on Silesian mineralogy and fauna, and also carried out barometric measurements; he founded botanical and mineralogical collections in a Wrocław secondary school.

Johann Gottfried Sommer (1782–1848) Sommer (proper name, "Volte") was born at Leuben, near Dresden, in 1782. He was an autodidact, and lived by casual labour as a schoolmaster. He taught geography, languages, and music. He settled in Prague and wrote pocket books on the geography of individual districts of the Bohemian Kingdom. For many years he worked as a private tutor and supply teacher at a conservatory. He cooperated with the famous mineralogist Franz Xaver Zippe, who supplied him with geological data for his map. J.G. Sommer was very active in writing paperbacks, not only about Bohemia but also other countries of the world. Johan Gottfried Sommer died in 1848 in Prague.

Franz Xaver Riepl (1790–1857) Riepl was born in Steyer in Austria. He became a professor at the Vienna Polytechnic School. His main interests were geology, the mining industry, and economics. He carried out geological mapping in the Alps, studied mining conditions in the Austrian Erzberg, investigated geology and mineral deposits in Croatia, and organized mine workings in Příbram and in some other mining districts of Bohemia, Moravia, and Silesia. F.X. Riepl was a well-known personality in Austria, so his work had remarkable impact on both economics and natural sciences.

Karl von Oeynhausen (1795–1865) von Oeynhausen came from noble Westphalian stock. Born in 1795, he attended secondary school in Mannheim and Stuttgart. His university studies at Göttingen and Eisleben were focused on mathematics and natural sciences. After that, he passed the examination for mining and metallurgy and became a mining counsellor and adviser for the Prussian Ministry of the Interior. He published several papers on geology and mineral resources, concerning mainly Upper Silesia. After this, he joined the Mining Office in Bochum, Berlin, and Brieg. Finally, he was appointed Chief Mining Counsellor and Head of the Mining Office in Dortmund. He travelled extensively, visited France, Belgium, and Silesia and published papers on the geology of the Upper Silesia. He retired in 1864 and died in 1865.

François Sulpice Beudant (1787–1850) Beudant was a French mineralogist and geologist. From 1813 he filled the post of professor of physics at the Lycée of Marseilles. In 1818 he undertook, at the expense of the French government, a geological journey through Hungary. From 1820 he was appointed professor of mineralogy at the Paris Faculty of Science.

Karl Lill von Lilienbach (1798–1831) von Lilienbach trained at the Schemnitz (*Banská Štiavnica*) mining academy. In 1804 he was transferred to the Holy Cross Mts. (Góry Świętokrzyskie) to study copper deposits in the Miedziana Góra district. In 1808 he was appointed head of the Mining Directorate (Dyrekcja Górnicza) in Kielce. In 1809 K.L. von Lilienbach returned to Wieliczka and worked as a geologist, mining counsellor and manager in the local salt mines. In the years 1823–1827 he conducted geological studies in the Carpathians. His work resulted in several published papers, including the geological map "Carte géologique du bassin de la Gallicie et de la Podolie Autrichienne."

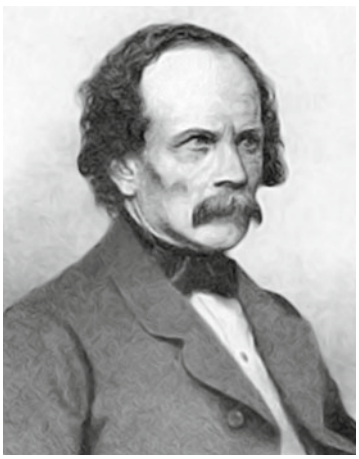
Ami Boué (1794–1881) Boué was an Austrian geologist who worked under the influence of Robert Jameson, whose teachings in geology and mineralogy inspired his future career. Ami Boué was thus led to undertake geological expeditions to various parts of Scotland and the Hebrides. He travelled also through much of Germany, Austria (with Paul Partsch), and southern Europe, studying various geological formations. And so he became one of the pioneers in geological research; he was one of the founders of the Société Géologique de France in 1830, and was its president in 1835. From 1836 until 1839 he travelled through the European part of the Turkish Empire. In 1841 he settled and married in Vienna. A. Boué published 275 papers, maps, and books. He produced many unpublished geological maps, and also the first geological map of the world, of Europe, and a collection of geological maps of European Turkey and other areas.

Roderick Impey Murchison (1792–1871) Murchison was a Scottish geologist and palaeontologist. He studied the geology of the south of England, devoting special attention to the rocks of the northwest of Sussex and the adjoining parts of Hampshire and Surrey. Aided by Fitton, he wrote his first scientific paper on that region, reading it to the Geological Society of London in 1825. His colleagues there included Adam Sedgwick, William Conybeare, William Buckland, William Fitton, Charles Lyell, and Charles Darwin. Roderick Impey Murchison established in 1839 the Silurian system according to distinctive groups of fossils and the order of succession of sediments along the border of England and Wales. Later he took part in a definition of the Devonian system and its correlation with the Continental Palaeozoic sediment sequence. R.I. Murchison also gave the name of Perm to the last period of Palaeozoic.

Adam Sedgwick (1785–1873) Sedgwick served as Professor of Geology at Cambridge. He studied the geology of the British Isles and Europe. Adam Sedgwick founded the system for the classification of Cambrian rocks, and with Roderick Murchison worked out the order of the Carboniferous and underlying Devonian strata. These studies were mostly carried out in 1830. Sedgwick investigated the phenomena of metamorphism, and was the first to distinguish clearly between stratification, jointing, and slaty cleavage.

Georg Gotlieb Pusch (1790–1846) Pusch studied at the Mining Academy in Freiberg as a very notable student. After finishing his studies he took part in a geological survey of Saxony, and at the same time he studied theology. G.G. Pusch was Werner's devoted student and spread his doctrine. In 1816 G.G. Pusch was brought to Kielce on S. Staszic's initiative. Pusch later taught geology, chemistry, and metallurgy at the Kielce Mining School. He also carried out intensive geological research. G.G. Pusch and his children are buried at the Evangelical-Augsburg Cemetery in Warsaw. His outstanding geological unpublished manuscripts were later printed along with the Polish Kingdom Geognostic Map, appearing in the first few annuals of *Physiografic Journals*. Vast fragments of Pusch's masterpiece of 1833–1836 were published in 1903 because of their topicality.

Andreas Preininger (?) We have only scarce information on his life and work. According to some documents, A. Preininger worked as a teacher in a secondary school. He presented himself, in a preserved manuscript, as "chemist and mineralogist." Some notes in that manuscript indicate his interests in hydrology.



August Emanuel Rudolph von Reuss (1811–1873) von Reuss was an Austrian geologist and palaeontologist. Between 1836 and 1840 he wrote some comments on the geology of North Bohemia, mainly on the Cretaceous and Tertiary formations. In the same time he started publishing geological sketches and, later on, geological maps. In the 1840s he published his masterworks on the Cretaceous and Tertiary formations of Bohemia, along with special paleontological papers. His stratigraphic scheme of the Bohemian Cretaceous and correlation with European strata was highly appreciated abroad. In 1848 A.E.R. von Reuss became a member of the Imperial Academy of Sciences in Vienna, and in 1849 he was appointed professor of mineralogy at Prague University. In 1871 he was raised to the peerage, with a shield of his family mirroring his professional interests (volcanic scenery, fossils). A.E. von Reuss produced and published several geological maps of the rocks and geological formations of northern and northwestern Bohemia.

Georg Amadeus Carl Friedrich Naumann (1797–1873) Naumann, a German mineralogist and geologist, was born at Dresden on May 30, 1797, the son of a distinguished musician and composer. He received his early education at Pforta, studied at Freiberg under Werner, and later at Leipzig and Jena. He graduated at Jena, and was occupied in 1823 in teaching in that town and in 1824 at Leipzig. In 1826 he succeeded Mohs as professor of crystallography; in 1835 he became professor of geognosy at Freiberg; and in 1842 he was appointed professor of mineralogy and geognosy at the University of Leipzig. At Freiberg he was charged with the preparation of a geological map of Saxony, which he carried out with the aid of Bernhard von Cotta in 1846. He was a man of encyclopaedic knowledge, lucid and fluent as a teacher. Early in life (1821–1822) he travelled to Norway, and his observations on that country, and his subsequent publications on crystallography, mineralogy, and geology, established his reputation. His geological map of Saxony is quite modern, even from the present-day point of view. He was awarded the Wollaston Medal by the Geological Society of London in 1868. He died at Leipzig on November 26, 1873. One of the Moon craters bears his name.

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