KNOWLEDGE AND STUDY OF THE CARPATHIAN BASIN UNTIL 1945

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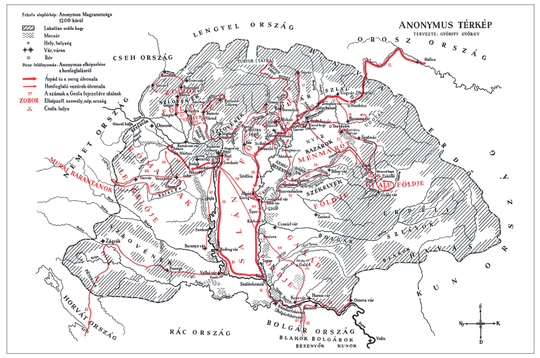
Knowledge of the Carpathian Basin was expanded and enriched by scholars living in Hungary and by 'scholarly travellers' visiting the region. The work of these scholars contributed to the body of geoscientific knowledge both in Hungary and in the surrounding countries.

From the chronicles to the professors in Upper Hungary

The earliest geographical descriptions of the Carpathian Basin stem from the Greek **Strabo** (64 BCE–24 CE). Several geographical names have ancient Greek origins or derive from the languages of the peoples who once lived here; e.g., Carpathians (Greek, Dacian), Tisza (Greek), Danube (Scythian). **Al-Idrisi** (1100–1166) gave a description of the Carpathian Basin (1154), but his account was known only to the Arab world at the time.



1 *The Anonymus map*

3 *János Apáczai Csere: Magyar Encyclopaedia (1653)*

The earliest surveys and reports

The first written survey of Hungary was produced in 1186 at the instruction of Béla III (1172–1196). Thereafter until the 15th century, the chronicles were the main sources of information on the Carpathian Basin. The most important chronicle is *Gesta Hungarorum*, which was composed at the turn of the 13th century by an anonymous author **(Anonymus)** 1.

The Italian **Petrus Ransanus** (1428–1492) authored a manuscript (1490) that mentioned Hungary's major mining towns and the sites of precious stones. **Antonio Bonfini** (1434–1502) gave the first description of the Hungarian counties in his work *Rerum Ungaricarum decades* (1496–97). Around 1500, **Péter Lossai** wrote an excellent manuscript on land surveying and astronomical observation. In this period, **Lazarus Secretarius**, a senior scribe at the chancellery of Tamás Bakócz, archbishop of Esztergom, produced an accurate and detailed map of Hungary (1528), a version of which **Ortelius** (1527–1598) then included in his world atlas.

Geographical descriptions during the early part of Ottoman rule

Cultural and intellectual life in Hungary survived the constant warfare and religious strife that followed the country's tripartite division. **Johannes Honterus** (1498–1549) authored the first geography of Transylvania (*Chorographia Transylvaniae*, 1532), to which he appended his own map. **Nicolaus Olahus** (1493–1568) 2, who became the archbishop of Esztergom, composed a description of the Kingdom of Hungary: *Chorographia Hungariae descriptio* (1536). In the work, he explored the medicinal and mineral waters of the Carpathian Basin (in particular those in Buda) and the sites of precious and non-ferrous metals in Upper Hungary.

2 *Nicolaus Olahus (1493–1568) Archbishop of Esztergom*

By the 16th century, many of Europe's largest and most productive precious and non-ferrous metal mines were to be found in Transylvania and Upper Hungary. Accordingly, the domestic roots of mineralogy lie in the Carpathians. The founder of modern mineralogy in Hungary was the German scholar **Georg Bauer** (Georgius Agricola, 1494–1555).

The Carpathian Basin's wealth of medicinal and mineral waters prompted investigations by natural scientists in the 16th century. In 1549, **Georg Wernher** (1490–1556) wrote a dissertation on Hungary's waters *(De admirandis Hungariae aquis hypomnemation)*, describing the formation of limestone deposits and how the water of certain mines turned iron into copper. In Kolozsvár (Klausenburg) in 1585, the Italian **Marcello Squarcialupi** (1538–1599) published a study in Latin on the origin and effects of the medicinal and mineral waters.

The basic tenets of Pázmány, Frölich and Apáczai

The first physical geographical analyses were undertaken by **Péter Pázmány** (1570–1637), a Jesuit monk who later became a cardinal and served as Archbishop of Esztergom. Published in his *Guide to Divine Truth* (1613), his conclusions about natural phenomena resurfaced in the works of Hungarian Roman Catholic scholars for more than a hundred years.

Dávid Frölich (1591–1648) provided a trilingual (Latin, German and Hungarian) glossary in his book *Medulla Geographiae Practicae*, which was published in 1639. For several decades, the *Medulla* was used as a textbook even in France. A further work by Frölich, *Bibliotheca seu Cynosura Peregrinantium, hoc est Viatorium*, offered an extraordinarily accurate description of Hungary.

The year 1653 was crucially important to the history of Hungarian science: in Utrecht **János Apáczai Csere** (1625–1659) printed his *Magyar Encyclopaedia* 3, the first summary in Hungarian on the natural sciences. Having returned to Hungary, he used the book while teaching in Gyulafehérvár and in Kolozsvár. In the volume, mineralogical terms and settlement descriptions are given in Hungarian for the first time.

Among the various foreign travellers in the period, the Ottoman explorer **Evliya Çelebi** (1611–1687) deserves our special attention. During his travels in Hungary between 1660 and 1666, he composed the *Seyahatnâme* (Book of journeys), a ten-volume description of Ottoman Hungary and Transylvania. Around the same time, the English physician **Edward Browne** (1644–1708) explored Upper Hungary. In London in 1673, he published an account of his experiences, giving descriptions of, among other things, the mining towns and medicinal baths of Upper Hungary.

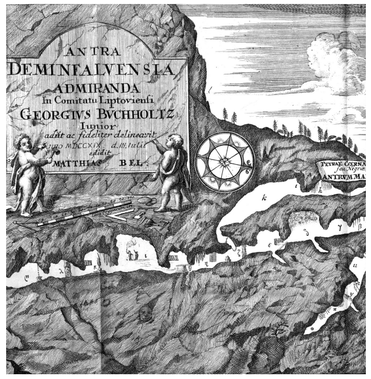
Professors in Upper Hungary in the late 17th century

In 1664, **Georg Buchholtz Snr** (1643–1725) from Szepes (Zips) County published his experiences of mountain climbing in the High Tatras *(Die Besteigung der Schlagendorfer Spitze)*. Among the various professors at the University of Nagyszombat (Tyrnau), an institution founded by Pázmány in 1635, **Márton Szentiványi** (1633–1705) was the first to study astronomy and geosciences. His monumental work, *Curiosa et selectiora variarum scientiarium Miscellanea*, addressed a broad range of subjects, including Hungary's mountains, rivers and lakes, the country's inhabitants and major cities, as well as land fertility. Much space was also given to accounts of adjacent countries and provinces. The book contains detailed descriptions of rocks and minerals, in particular precious metals and stones.

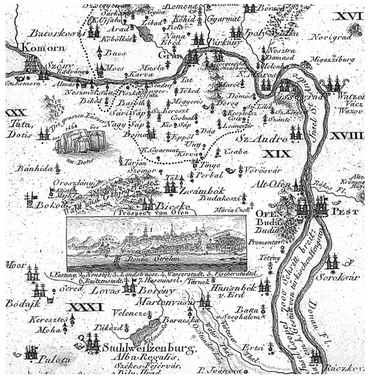
Emergence of the various branches of geoscience in Hungary

The expulsion of the Ottomans from Hungary marked the beginning of a new era in the advancement of geographical knowledge of the Carpathian Basin. The increasingly accurate country surveys and reports were summarized in works by Matthias Bél, who collaborated with Sámuel Mikoviny, one of the most famous cartographers of his age. Between the 1680s and the mid-18th century a series of increasingly accurate maps and country reports were published. In 1689, the Jesuit **Gábor Hevenesi** (1656–1717) published the *Parvus Atlas Hungariae* 4. The work described Hungary's 50 counties and 31 royal free towns, thus facilitating a review of public administration in the country. It also gave the names of 2,605 settlements and 110 rivers, doing so with greater accuracy than ever before. Within the Carpathian Basin, the area along the River Danube was surveyed in detail by **Luigi Ferdinando Marsigli** (1658–1730). He published his findings in the fields of mineralogy, petrology, phyto- and zoogeography.

4 *The Csallóköz and Szigetköz in Gábor Hevenesi's Parvus Atlas Hungariae*



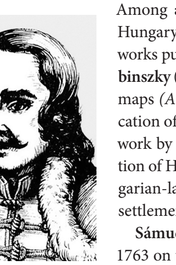
6 *Map by Georg Buchholtz Jnr (1719, Deményfalva Stalactite Cave, detail)*



9 *Johann Mathias Korabinszky: Atlas Regni Hungariae Portatilis (1804, detail)*

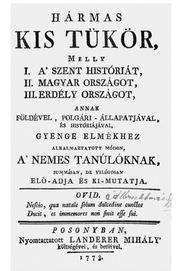
Matthias Bél and his circle

In the early 18th century, **Matthias Bél** (1684–1749) 5 began his unparalleled series on the geography, history and ethnography of settlements and other famous places in Hungary. He and his students, sons and intellectual friends focussed on different parts of the country, accumulating a huge amount of material in the course of their travels and by way of correspondence. Their joint work *Hungariae antiquae et novae Prodromus…* was published in Nuremberg in 1723, with much of the material subsequently being included in *Notitia Hungariae novae Historico-Geographica*. Out of the monumental manuscript, which included sections on each county, no more than five volumes were published in print. The *Prodromus* contains the first map of the largest cave in the Carpathians and in Central Europe (the Deményfalva Stalactite Cave) (6, Low Tatras), which was made by **Georg Buchholtz Jnr** (1688–1737). The map was prepared for printing by **Sámuel Mikoviny** (1700–1750) 7, an engineer-cartographer of world standing who was one of the first teachers at the Berg Schola (mining school) in Selmecbánya (Schemnitz). Most of his beautifully drawn county maps were published in *Notitia*, whose foolscap-sized volumes are among the most prestigious geographical publications of all time. Concurrently with Matthias Bél, **Sámuel Köleséry Jnr** (1663–1732) authored a work describing Transylvania's mineral resources (1717).



5 *Matthias Bél (1684–1749) polyhistor*

7 *Sámuel Mikoviny (1700–1750) polyhistor, cartographer*



8 *István Losontzi: Triple small mirror (1773)*

Fragmentation of the Earth sciences

In 1753, **Ferenc Weiss** (1717–1785) began making regular meteorological observations at the University of Nagyszombat (Trnava). Having moved to Buda (in 1777), he continued this work, even publishing his data in printed volumes.

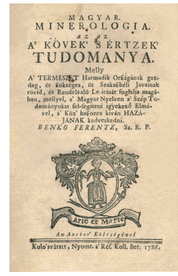
In 1757, **János Csatári** (1730–1782) published the geographical, historical and political description of Hungary. Meanwhile **Pál Bertalanffi** (1706–1763) published a concise overview of the world, a book with 1028 pages. The first part of this latter work addressed astronomy and natural geography. The second part comprised a human geography of the world, with 56 pages devoted to Hungary and Transylvania.

The same period saw the publication of the first school geography textbooks (including a textbook by **László Gyalakúti** in 1750 and one by **István Szatmárnémeti Papp** in 1760). The most influential textbook was *Hármas kis tükör* [Triple small mirror] 8 by **István Losontzi** (1709–1780), of which 73 editions were published between 1773 and 1868. Providing information in question-and-answer format, the textbook was used by students during the Enlightenment and the Reform Era. An early work by **Ferenc Kazinczy** (1759–1831) was his geography book translation: *Magyar ország Geographica*. Among an increasing number of works presenting Hungary, special attention should be given to two works published in German by **Johann Mathias Korabinszky** (1740–1811), as well as his atlas with engraved maps *(Atlas Regni Hungariae Portatilis*, 9). A publication of similarly high quality was the three-volume work by **András Vályi** (1764–1801), entitled Description of Hungary 10. This latter work was the first Hungarian-language survey of Hungary by regions and settlements.

Sámuel Domby (1729–1807) published a work in 1763 on the mineral content of waterways in Borsod County. There followed a work by **Jusztusz János Torkos** on alkaline salts in Hungary. In 1777, a work on the thermal springs in Nagyvárad was published by **István Hatvani** (1718–1786) and **István Gömöri**. In 1783, **Jean Baptiste Lalangue** (1743–1799) published a work about the medicinal waters in Hungary. These works helped establish medical geography in Hungary.

Mineralogy and petrology were established in Hungary with the publications on Transylvania (1763) and the entire Carpathian Basin (1773) by **János Fridvalszky** (1730–1784) and by **Ignaz Edler von Born** (1742–1791). The first Hungarian publication on crystallography was authored by the expert **Giovanni Antonio Scopoli** (1723–1788). His scientific investigation of Hungary's mineral resources was continued in the late 18th century by **Johann E. Fichtel** (1732–1795), who also pioneered palaeontology. The earliest works in Hungarian on mineralogy were published by **Ferenc Benkő** (1745–1816) and **Sámuel Zay** (1753–1812). The first stratigraphic observations featured in a work by Benkő entitled *Magyar minerologia* 11 and in a major natural scientific series by **István Mátyus** (1725–1802).

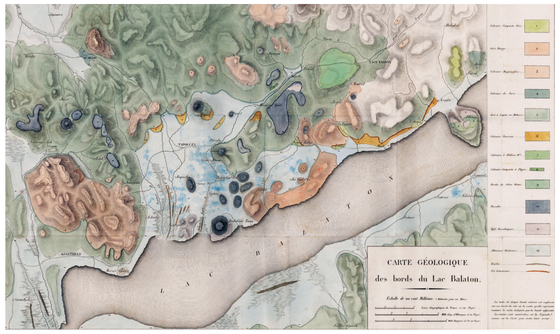
10 *András Vályi: Description of Hungary (1796–1799)*



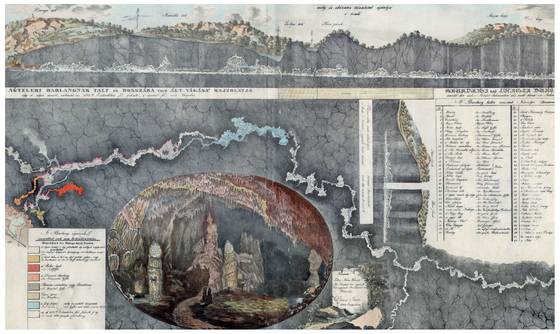
11 *Ferenc Benkő: Magyar minerologia (1786)*

In the latter half of the 18th century, the attention of naturalists was particularly drawn to Lake Fertő (Neusiedlersee). In 1760–61, **Anton Jukovits** wrote a treatise in German on fluctuations in the level of the lake. The year 1815 saw the publication of a geographical, historical and natural description of Fertő by **József Kis**. As early as 1774, **Elek Nedeczky** (1737–1809) published the first detailed description of a cave in Hungary, namely the stalactite cave in Fonóháza (Fânaţe, Bihar County).

In the final two decades of the 18th century, Hungarian statistics and economics emerged from geography as separate disciplines. Among the pioneers in these fields, **Johann Severinus** (1783–1863) published a work on urban settlements in Hungary, **Lajos J. Schedius** (1768–1847) a work on industry, and **Gergely Berzeviczy** (1763–1822) a work on agriculture.



13 *François S. Beudant: Geological map of Lake Balaton (1822, detail)*



14 *Map of the Baradla Cave in Aggtelek (1831, detail) by Imre Vass*

The English traveller **Robert Townson** (1762–1827) helped spread knowledge of Hungary further afield, publishing a work describing his travels in Hungary in 1793 (*Travels in Hungary*, London, 1797).

Outstanding results at the turn of the 19th century

In the field of geoscience, the scientific enlightenment resulted in the work of **Pál Kitaibel** (1757–1817) 12 and **Christian Andreas Zipser** (1783–1864). By collecting plants, minerals and rocks, Kitaibel gained unprecedented knowledge of the Carpathian Basin's geology. He and **Ádám Tomtsányi** (1755–1831) were the first to draw a map showing the extent of destruction of the Mór earthquake of 1810. Kitaibel's books on the Mátra Mts. (1799) and Hungary's hydrography (1829) attest to a vast knowledge of these subjects.

12 *Pál Kitaibel (1757–1817) botanist, chemist*

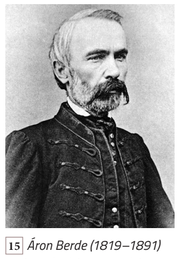
In 1817, Zipser published an alphabetical list of Hungary's mines and mineral resources. He was a principal advocate for establishing the Hungarian Geological Society (1848–1850). In 1818, with Zipser's book as his guide, the French geologist and mineralogist **François Sulpice Beudant** (1787–1850) undertook study trips in Hungary, subsequently publishing his field observations in a four-volume work. The fourth volume contains 47 geological engravings showing the landscapes of Upper Hungary and Transdanubia. It also contains the first colour geological map of the Balaton Uplands 13 with a monochrome geological sketch of Selmecbánya (Schemnitz) and the surrounding area.

First half of the 19th century

From the 1830s onwards, the geoscientific exploration of the Carpathian Basin slowed down. Although an increasing number of geoscientific books were published, they contained few novel ideas. Rather, they served to disseminate existing knowledge more widely. Such works included the historical and economic country descriptions by **István Lassu** (1797–1852), a book on weather forecasting by **Simon Puky** (1776–1846), and the first sky and earth globes in Hungarian, the use of which was described in a book by **Károly Nagy** (1797–1868).

In 1821, **Imre Vass** (1795–1863) began surveying the Baradla cave system at Aggtelek. In a book on the cave, he was among the first to describe and interpret karst formations on the surface. The colour surface and cave maps appended to the book were regarded as some of the world's most accurate and beautiful maps in this genre 14.

A similarly valuable and pioneering book was on meteorology and the climate of Hungary by **Áron Berde** (1819–1891) 15. In the mid-19th century, **Elek Fényes** (1807–1876) 16 published statistical and geographical volumes of unprecedented detail on Hungary.



15 *Áron Berde (1819–1891) meteorologist, economist*

16 *Elek Fényes (1807–1876) statistician, geographer*

After the Hungarian War of Independence (1848–1849), several beautiful geography books illustrated with engravings, lithographs and maps were published: Hungary and Transylvania in original pictures (1856–1864), Budapest and its environs (1859), and Hungary in pictures (1870). The country's most distinguished scholars and artists contributed to these volumes, with papers and pictures on Hungarian history, the national monuments, folk art and geography. Some of the authors became leading figures in Hungarian geosciences, including the paleontologist **Ferenc Kubinyi** (1796–1874), the Transylvania expert **László Kővári** (1819–1907), the versatile geographer **János Hunfalvy** (1820–1888), and the geologist **József Szabó** (1822–1894). The standard was raised even higher with the publication of a work by **Balázs Orbán** (1830–1890): A description of Székely Land (1868–1873).

17 *József Szabó (1822–1894) geologist*

The development of today's Earth sciences

In the latter half of the 19th century, the various branches of geoscience were cultivated by many Hungarian scholars of European standing. The period saw the establishment of the Hungarian Royal Geological Institute and the making of the first detailed geological surveys of the Carpathian Basin. At the turn of the century, an outstanding geologist and physical geographer was Lajos Lóczy Snr, who oversaw the compilation of the thirty-two volume Balaton monograph. The publication exemplified a rare spirit of cooperation among geoscientists working in different fields.

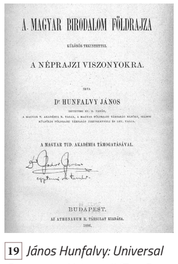
József Szabó and his circle

From the 1850s onwards, the various branches of Earth sciences were directed by experts working at the universities in Pest and Kolozsvár or at one of a growing number of research institutes. **József Szabó** (1822–1894) 17 authored the first major university textbook on Hungarian mineralogy and petrology, becoming a founder of Hungarian geology. Among his various geological studies and maps, his work on the Selmecbánya area deserves special mention (1885). His mineralogical research was continued by **József Krenner** (1839–1920) and **Antal Koch** (1843–1927). Krenner collaborated with the distinguished patron of the natural sciences, **Andor Semsey** (1833–1923), to establish the world-class mineral collection at the National Museum. After the publication of Antal Koch's work on minerals in Transylvania (1880), it was left to **Mike Mihály Tóth** (1838–1932) to publish a work describing minerals throughout the Carpathian Basin (1882). Regarding Transylvania, the books published by **Ferenc Herbich** (1821–1887) in the latter half of the 19th century are seminal works even today.

At the intersection of geology and physical geography

A prominent Hungarian practitioner of the new descriptive geography that was based on scientific investigation was **János Hunfalvy** (1820–1888) 18, who was instrumental in founding *Földrajzi Közlemények* [Geographical Review] (1872, and 1873), the official journal of the Hungarian Geographical Society. In a three-volume work (Description of the natural conditions of the Hungarian Empire), Hunfalvy offered a uniquely accurate, detailed and comprehensive description of the geology, topography, climate and hydrography of the Carpathian Basin. In 1870, having been commissioned by the University of Pest, he established Hungary's first (Europe's

18 *János Hunfalvy (1820–1888) geographer*



19 *János Hunfalvy: Universal Geography, Volume II (The Geography of the Hungarian Empire, 1886)*

fourth) university department of geography, which he then headed until his death. The second volume of *Egyetemes Földrajz* [Universal Geography], a country-by-country survey of Europe, addressed Hungary 19.

Lóczy and his disciples

In 1889, Hunfalvy was succeeded as head of the geography department by **Lajos Lóczy Snr** (1849–1920) 20. As head of the Balaton Committee (est. 1891) of the Hungarian Geographical Society, he initiated unprecedented research on the lake. Exemplary cooperation arose among natural scientists, archaeologists, ethnographers and art historians, resulting in a book series (The results of scientific study of Lake Balaton, 1898–1913) 21, with Lóczy authoring the chapters on geology and physical geography. In 1907, Lajos Lóczy asked one of Hunfalvy's students, **Gusztáv Thirring** (1864–1941), to give lectures on population geography. Thirring, who later also taught statistics, was appointed as the deputy and then general director of the Hungarian Royal Central Statistical Office in Budapest. As a hiking enthusiast, Thirring was a founder of the Hungarian Tourism Association (1888), authoring several guidebooks.

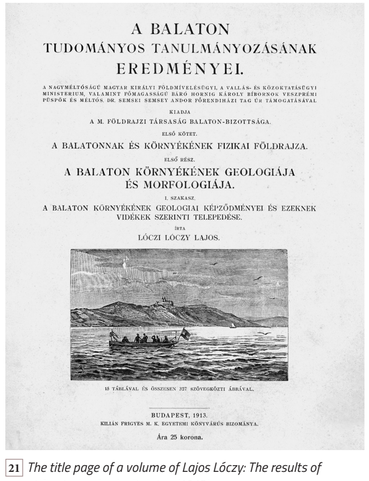
20 *Lajos Lóczy Snr (1849–1920) geologist, geographer*

János Jankó Jnr (1868–1902) wrote a trailblazing study on the grouping of Hungary's mountain regions (1893). He then turned his attention to human geography and the ethnography of the Transylvanian Hungarians. In a further work, he published the findings of research in the Balaton region (Ethnography of the populace of the Balaton region, 1902).

For a period of ten years beginning in late 1908, **Lajos Lóczy Snr**, in his position as head of the Hungarian Royal Geological Institute, oversaw an evaluation of the country's geological maps, which tended to cover the upland regions. In 1908, based on his instructions, a natural gas field – Europe's largest at the time – was discovered at Nagysármás and Kissármás in Transylvania. In 1918, he edited and co-authored a famous book on the geographical, social, cultural and economic features of Hungary.

Outstanding achievements in the Earth sciences at the turn of the 20th century

The year 1869 saw the establishment of the Hungarian Royal Geological Institute, which initiated a national geological survey. Then, in 1891, **Béla Inkey** (1847–1921) oversaw the country's systematic geological mapping. The Geological Institute was also home to a paleontology department. Antal Koch and Lajos Lóczy Snr created a geological map of the country at a scale of 1:360,000, which won a gold medal at the Paris Exposition in 1900, as did also a map of Hungary's soil regions produced by Treitz and Timkó. Among the Geological Institute's staff, there were many scientists of international standing, including **Péter Treitz** (1866–1935), **Imre Timkó** (1875–1940) and **Róbert Ballenegger** (1882–1969), who – assisted by **Elek Sigmond** (1873–1939) – organized the first international conference on agrogeology (soil science), which was held in Budapest in 1909. In 1907, as the outcome of the cooperative efforts of **Ottó Herman** (1835–1914) 22 and **Ottokár Kadić** (1876–1957) 23, the first prehistoric finds were excavated at the Szeleta Cave in the Bükk Mountains. This development led, in 1910, to the establishment of a Cave Research Committee under the auspices of the Hungarian Geological Society. Thus began a systematic appraisal of the karst regions in the Carpathian Basin.



21 *The title page of a volume of Lajos Lóczy: The results of scientific study of Lake Balaton (1913)*

Also in 1869, **Miklós Konkoly-Thege** (1842–1916) 24 founded a modern observatory at his own expense. Situated in Ógyalla, the observatory also monitored weather conditions. Established in 1870, the Hungarian Royal Meteorological and Geomagnetism Institute was the forerunner of today's HungaroMet. Between 1890 and 1911, the Institute was headed by Konkoly-Thege, who introduced the making of weather forecasts. It was here that the geophysicists, whose work required a good knowledge of mathematics, began making regular investigations. Konkoly-Thege was succeeded as head of the Institute by **Zsigmond Róna** (1860–1941), a Hungarian pioneer of climatology and the author of numerous seminal works on meteorology. In 1925, Róna became the first chairman of the Hungarian Meteorological Society.

22 *Ottó Herman (1835–1914) polyhistor*

23 *Ottokár Kadić (1876–1957) palaeontologist, geologist, speleologist*

24 *Miklós Konkoly-Thege (1842–1916) astronomer, meteorologist*

25 *Loránd Eötvös (1848–1919) physicist*

Inspired by developments at Ógyalla, in 1891 **Loránd Eötvös** (1848–1919) 25, head of the experimental physics department at Budapest University, conceived the torsion pendulum (later named after him), enabling scientists to assess the structure of the earth's crust and indicate the probability of the presence of mineral deposits without deep drilling. Eötvös tested the usability of the pendulum on the ice cover of the frozen Lake Balaton and on Ság Hill on the Kisalföld. In 1914, based on his observations, Hungary's first oil and natural gas field was discovered near Egbell.

Between 1883 and 1887, **Radó Kövesligethy** (1862–1934) also practiced at Ógyalla; he was, after Eötvös, the second-most proficient seismologist in Hungary. Ógyalla was also the initial training ground for **Aurél Anderkó** (1869–1940) and **Lajos Steiner** (1871–1944), both of whom later taught privately at the university's Geological Institute. Anderkó drafted a precipitation map for the whole of Hungary, utilizing the existing precipitation data, which he augmented with the help of an ombrograph that he had constructed. At Lóczy's invitation, he also held lectures at Budapest University on atmospheric science. From 1907 until 1937 he worked on developing modern forecasting methods. Lajos Steiner conducted pioneering investigations in the field of geomagnetism and served as head of the Hungarian Meteorological and Geomagnetism Institute from 1927 until 1935.

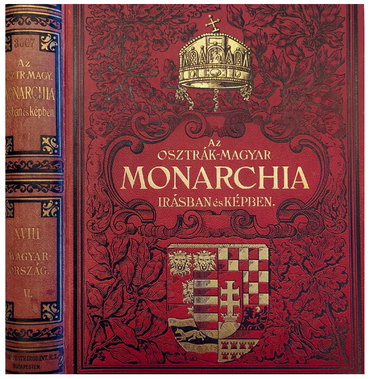
Kabos Hegyfoki (1847–1919) from 1882 until his death used the instruments available at the Institute to monitor weather conditions on the Alföld, identifying the conditions resulting in May frosts. He also investigated changes in cloudiness throughout the country, the occurrence of thunderstorms and wind gusts, and hill-valley wind systems.

In 1874, the Earth sciences began to be taught at the University of Kolozsvár, with lectures being given by Áron Berde, Antal Koch, and **Gyula Szádeczky-Kardoss** (1860–1935). The department of botany was headed by **Ágost Kanitz** (1843–1896) and **Vince Borbás** (1844–1905). Kanitz had previously summarized his research results in the field of botany and phytogeography, while Borbás was an authority on changes in vegetation since the glacial period. Another teacher at the university was **Géza Entz** (1842–1919), who also directed zoological research of the Balaton research programme. Until 1905, **Adolf Terner** (1835–1918) headed the department of geography. He was succeeded by **Jenő Cholnoky** (1870–1950), who headed the department until 1919 and whose principal research interests were the mountains and rivers of Transylvania. Even today, Cholnoky's field observations and karst studies are considered seminal works.

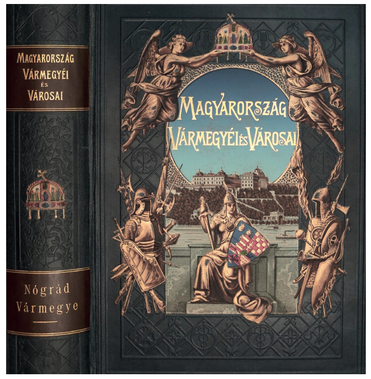
In the 1870s and 1880s, the focus of the geosciences shifted to investigating connections between different phenomena. Meanwhile, the descriptive approach lived on in publications intended for the general public. Particularly richly illustrated works were The Austro-Hungarian Monarchy in writing and pictures (1887–1901) 26 and The counties and towns of Hungary (1896–1914) 27. The latter multi-volume work was edited by **Samu Borovszky** (1860–1912).

Around this time, the young French geographer **Emmanuel de Martonne** (1873–1955) began to investigate the geography of the Southern Carpathians, naming the mountain range the Transylvanian Alps.

In 1909, **Géza Czirbusz** (1853–1920) became head of the Geographical Institute of Budapest University, where he continued the teaching of human geography.



26 *Cover of a volume in the series The Austro-Hungarian Monarchy in writing and pictures (1900)*



27 *Cover of the Nógrád County volume of Borovszky's series of The counties and towns of Hungary (1911)*

As early as 1886, he had published a work about the Bulgarians of South Hungary, and in 1902 a book about Hungary at the beginning of the 20th century. With the publication of his work, *Anthropogeographia* (1915–1919), Czirbusz became Hungary's principal expert on human geography.

In Croatia-Slavonia, which at the time was an autonomous kingdom of the Hungarian Holy Crown, the University of Zagreb was established in 1874. The following year (1875) saw the appointment of the first Croatian professor to head the newly formed Department of Mineralogy and Geology, **Gjuro Pilar** (1846–1893). A versatile geologist, Pilar laid the foundations of karst hydrology and also investigated the causes of earthquakes. In 1883, his professional legacy was shared between the first Croatian mineralogist **Mijo Kišpatić** (1851–1926), and the first Croatian paleontologist **Dragutin Gorjanović-Kramberger** (1856–1936) 28. The latter achieved international renown after his discovery of ancient Neanderthal remains at Krapina.

The first professor at Zagreb University's department of geography (founded in 1883) was **Petar Matković** (1830–1898) 29, whose particular interests were historical geography and statistics. Geography studies in Croatia were further enriched by **Vjekoslav Klaić** (1849–1928), a historian, geographer and musicologist. In 1893, Matković was succeeded as head of department at Zagreb University by **Hinko Hranilović** (1860–1922), a founder of the Croatian Geographical Society (1897). A major work by Hranilović was A geographical and ethnographic description of the kingdoms of Croatia, Slavonia and Dalmatia (1905).

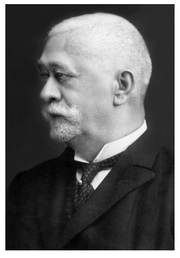
The Earth sciences in a politically divided Carpathian Basin between 1920 and 1945

After 1920 almost a two-thirds share of Hungary's territory was ceded to the recently founded or expanded neighbouring countries. Geoscientific study and research in the annexed areas was promoted not only by the Czech, Romanian, Serbian, Croatian and Austrian authorities but also – for irredentist purposes – by 'Remnant-Hungary', a country much reduced in territory. In the post-World War I period, the centres of geographical study and research in Hungary were Budapest, Debrecen, Szeged and Pécs. In the ceded territories, such centres were to be found at Bratislava (Pozsony), Cluj (Kolozsvár), Belgrade, Zagreb, and Vienna.

Hungary

In the aftermath of World War I and following the signing of the Treaty of Trianon, geography and geology continued to be taught at the universities of Budapest and Debrecen. Further institutions for the study of geography were the former institutes of the universities of Kolozsvár (Cluj) and Pozsony (Bratislava), which had been reconstituted in Szeged and Pécs, and the Faculty of Economics in Budapest (which subsequently became a university), where a department of geography had been established at the initiative of **Pál Teleki** (1879–1941) 30. Among the teachers at the new university departments were **Jenő Cholnoky** (1870–1950) 31, who had fled Kolozsvár to teach at the Pázmány Péter University in Budapest, and **Gyula Prinz** (1882–1973), who had moved from Pozsony to Pécs. Cholnoky, who gave fascinating lectures and was appointed as head of the Geographical Institute in 1921, focussed his research on river systems in Hungary, on the blownsand dunes of the Alföld, and on karst formations. His geomorphological findings were summarized in his book Geomorphology (1926). 32 Cholnoky also devised Hungarian terminology for geomorphology by interpreting and utilitizing the vernacular names. In 1923 he proposed the formation of national parks in areas with the most valuable landscapes. As chairman of the Nature Conservation Council (1940–45), he was instrumental in preparing for the protection of 219 valuable natural features in 2,844 hectares of land. His lectures were well attended and his books on geographical matters (The Earth and life, 1937, 33, From the stars to the ocean depths, 1940) were highly popular among the general public.

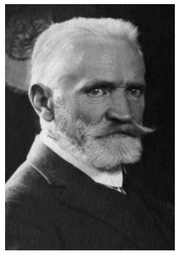
After the Trianon Treaty (1920) Hungary lost most of its energy resources (hydrocarbons and coal) and ore deposits. The deficiencies naturally gave rise to a boom in geological research. In the field of coal exploration and use, outstanding research was undertaken by **István Vitális** (1871–1947), **Elemér Vadász** (1885–1970), and **Károly Telegdi-Roth** (1886–1955). Following in the footsteps of **Hugó Böckh** (1874–1931), who had overseen oil and natural gas research in the period 1909–1918, **Simon Papp** (1886–1970) and **Ferenc Pávai-Vajna** (1886–1964) pioneered hydrocarbon research in Hungary's present-day territory. Ferenc Pávai-Vajna came to be known as the 'father of the thermal waters', for he discovered many medicinal and thermal springs (for example, at Hajdúszoboszló, Debrecen, Karcag, Szolnok, and Szeged). Bauxite deposits were explored in the Vértes and Bakony regions, bauxite being a raw material in the production of aluminium. In this field, **Jenő Balás** (1882–1938) and Károly Telegdi-Roth played pioneering roles. The results of successful research were reflected in numerous excellent monographs on the geology of Hungary at both regional and national levels, including the following works: Hungary's geology (1929) by Károly Telegdi-Roth; Historical geology of Hungary (1932) and The Hungarian land I–II (1934) by **László Bendefy-Benda** (1904–1977); and Transylvania's geology (1925) by **János Tulogdy** (1891–1979).



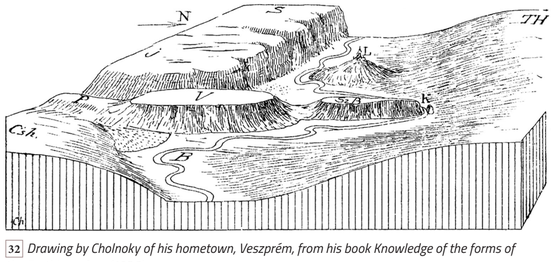
28 *Dragutin Gorjanović-Kramberger (1856–1936) Croatian geologist, palaeontologist*

29 *Petar Matković (1830–1898) Croatian geographer*

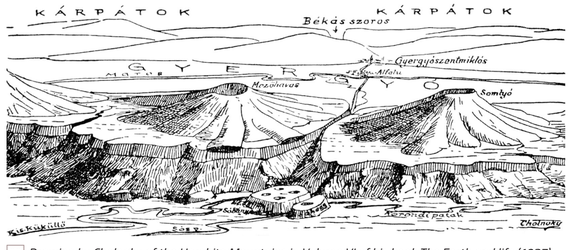
30 *Pál Teleki (1879–1941) geographer, politician, Prime Minister*



31 *Jenő Cholnoky (1870–1950) geographer*



32 *Drawing by Cholnoky of his hometown, Veszprém, from his book Knowledge of the forms of the Earth's surface (1926)*



33 *Drawing by Cholnoky of the Harghita Mountains in Volume VI of his book The Earth and life (1937)*

34 *Gyula Prinz (1882–1973) geographer*

35 *Ferenc Fodor (1887–1962) geographer*

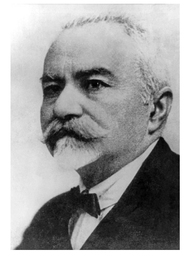
Geology in Slovakia was given a significant boost by the establishment (in 1938) of a geological institute in Martin. In 1939, the institute moved to Bratislava (Pozsony), becoming a part of the Science Faculty of the Slovak University (today Comenius University) in 1940. The institute was headed by **Dmitrij Nikolaevich Andrusov** (1897–1976), a geologist of Russian origin who had moved from Prague to Bratislava. He is regarded as the founder of modern geology in Slovakia.

Romania – Transylvania

In the territory annexed from Hungary to Romania in 1919, the Romanian authorities transformed the Hungarian University of Kolozsvár (Cluj), where studies and research in geography had been underway, in Bratislava (Pozsony) in 1919. From 1921 onwards, several Czech professors (Karel Chotek, 1881–1967; Jiří Viktor Daneš, 1880–1928; František Štůla, 1883–1943; and Jiří Král, 1893–1975) taught geography at this university. Real progress in geographical and ethnographic research was made by **Ján Hromádka** (1886–1968) 37, who received a professorship at Bratislava University in 1938. A book by Hromádka (A general geography of Slovakia) was published in 1943 at the time of the first Slovak Republic.

37 *Jan Hromádka (1886–1968) Czech geographer*

38 *George Vâlsan (1885–1935) Romanian geographer*



39 *Emil Racoviță (1868–1947) Romanian biologist, speleologist*

40 *Ion Popescu-Voitești (1876–1944) Romanian geologist*

university in Cluj (Kolozsvár) and its geographical and geological institutes moved to Sibiu (Nagyszeben) or Timişoara (Temesvár). They were replaced by the Hungarian university of Kolozsvár and its institutes, which returned from exile in Szeged. From 1940 until 1944, the geography departments at University Kolozsvár (Cluj) were directed by **Gyula Prinz** (physical geography), **Gyula Hantos** (1903–1945, human geography) and **Géza Teleki** (1911–1983, geology and economic geography).

Yugoslavia – Croatia, Vojvodina

The interwar period saw considerable achievements in the Earth sciences in the Kingdom of Serbs, Croats and Slovenes (later Yugoslavia). In 1918, the historian **Ivo Pilar** (1874–1933), the father of Croatian geopolitics, published The political geography of the Croatian countries. In 1927, **Artur Gavazzi** (1861–1944) took charge of the geography department at Zagreb University, subsequently founding the journal *Hrvatski geografski glasnik* [Croatian Geographical Bulletin]. His successor, **Zvonimir Dugački** (1903–1974), compiled and edited a geographical monograph entitled Geography of Croatia (1942).

In the Vojvodina region, today a part of Serbia, the accomplishments of Serbian researchers were relatively modest in the first half of the 20th century. **Jovan Cvijić** (1865–1927), the father of Serbian geography, focussed his research activities on the Balkan peninsula. He was interested in Vojvodina (historic South Hungary) primarily as a human geographer (*La frontière septentrionale des Yougoslaves, 1919, Paris*), yet he also published a work on the physical geography of the region entitled Geomorphology (1924–1926). Among the geologists, the Russian-born geologist and paleontologist **Vladimir Dimitrijevič Laskarev** (1868–1954) deserves special mention. From 1920 onwards, while teaching at Belgrade University, he researched Syrmia and the southern part of the Banat.

Austria – Burgenland

In Burgenland, a province established in 1921 in territories annexed to Austria from Hungary, geographical, geological and tourism research (conducted with the objective of legitimizing the annexation of territory) was undertaken by academics from the universities of Graz and Vienna and by local intellectuals. Mention should be made of **Eduard Stepan** (1874–1953, *Burgenland*, 1920), **Georg A. Lukas** (1875–1957, *Deutschwestungarn*, 1922) and **Norbert Krebs** (1876–1947, *Die Ostalpen…*, 1928). After the annexation of Austria by the German Reich in 1938, the cartographer **Fritz Bodo** (1893–1978) and the Viennese academic **Hugo Hassinger** (1877–1952) published their *Burgenland* atlas (1941), a broadly sourced and professional publication that was nevertheless tainted by pan-Germanic (and at times Nazi) ideology.

Czechoslovakia – Slovakia

After the closure of the Royal Hungarian Erzsébet University, a new Czech(Slovak) university was established into a Romanian institution. During subsequent decades, research and tuition in Romanian (and French) focussed on institutional organizational and programmatic issues. **De Martonne** continued his field research in Transylvania. An outstanding academic during this period was **George Vâlsan** (1885–1935) 38, who founded the Geographical Institute's journal *(Lucările Institutului de Geografie)*. In the first issue (published in 1924), Vâlsan identified field research in the western part of the new Romania as the main objective of the institute in Cluj (Kolozsvár). De Martonne's disciple, the French geomorphologist **Robert Ficheux** (1898–2005), conducted his research in the Apuseni Mountains. The research conducted by **Emil Racoviță** (1868–1947) 39 on the fauna of cave systems and the geological and paleogeographical work of Ion Popescu-Voitești (1876–1944) 40 bore international significance. Among the various Transylvanian Romanian scholars, particular attention should be given to **Vasile Meruțiu** (1881–1943), who headed the Department of Physical Geography established in 1919, to the ethnographic researcher **Romulus Vuia** (1887–1963), and to **Tiberiu Morariu** (1905–1982). The latter, who had studied under Vâlsan, conducted valuable research in the field of human geography; his work on the Rodna Mountains is seen as exemplary even today. After the Second Vienna Award (return of Northern Transylvania to Hungary) in 1940, the Romanian

The interwar period saw the publication of several new works on meteorological and climate conditions in Hungary, including The weather (1931) by Lajos Steiner and Weather-climate and Hungary's climate (1938) by **Antal Réthly** (1879–1975) and **Nándor Bacsó** (1904–1974). In the mid-1930s, **Lajos Kreybig** (1879–1956) oversaw the soil mapping of Hungary at a scale of 1:25,000.

The results of such research conducted throughout the Carpathian Basin were summarized in Hungarian land, Hungarian race (1936–1938) 36 by **Lajos Bartucz** (1885–1966), **Jenő Cholnoky, Gyula Prinz** and **Pál Teleki**. The four-volume work was richly illustrated with maps and aerial photographs.

36 *Four volumes of Hungarian land, Hungarian race (1936–1938)*

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