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**TREATISES ABOUT THE SUBTERRANEAN WORLD IN
LJUBLJANA BETWEEN 1678 AND 1773**

**RAZPRAVE O PODZEMELJSKEM SVETU V LJUBLJANI
MED LETOMA 1678 IN 1773**

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Izveček

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Stanislav Južnič: Razprave o podzemeljskem svetu v Ljubljani med letoma 1678 in 1773

Popisali smo knjige, razprave in rokopise o podzemeljskih in kraških pojavih, ki so bile na voljo v Ljubljani v času delovanja jezuitskega kolegija. Preučili smo Mayrjev prodajni katalog iz leta 1678. Pregledali smo knjige, ki so jih nabavljali za jezuitsko in druge knjižnice v Ljubljani. Posebno pozornost smo posvetili doslej neraziskanim objavljenim delom in rokopisom ljubljanskih jezuitov. Pokazali smo, kako je v Ljubljani nakopičeno znanje pripomoglo k nastanku pionirskih del modernega krasoslovja v zadnji četrtini osemnajstega stoletja.

Glavne besede: Jezuiti, Ljubljana, kras, Cerkniško jezero.

Abstract

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Stanislav Južnič: Treatises about the subterranean world in Ljubljana between 1678 and 1773

We researched the books, papers, and manuscripts about the subterranean and karst phenomena available in Ljubljana in the time of Jesuit college. We used the data from Mayr's book catalogue of 1678. We analyzed the books in the Jesuit and other Ljubljanes libraries. For the first time in historiography the special concern was put on published works and manuscripts of the Ljubljanes Jesuits. We described how the knowledge accumulated in Ljubljana paved the way for pioneering karstology research in the last quarter of the 18th century.

Key words: Jesuits, Ljubljana, karst, Cerknica Lake.

INTRODUCTION

The research of the subterranean world was not a separate branch of the ancient science. The medieval science of horography covered the parts of modern hydrography, hydrostatics, hydrodynamics, geography, topography, climate, soil, vegetable, and animal world. The horography was a branch of applied mathematics, as we can see in the catalogue of the Janez Klasanec Erberg's (1771-1843) library.

The petrography, crystallography, karstology, and speleology were defined later in the 18th century. The Carniolian contribution to the early karstology was very impressive. Janez Ludvik Schönleben (1618-1681), Janez Vajkard Valvasor (1641-1693), Franc Anton pl. Steinberg (1684-1765) and Baltazar Hacquet de La Motte (1739-1815) published the important research about karst. The ideas of ex Jesuits Gabriel (1740-1805) and Tobias Gruber (1744-1806) were also interesting. Hacquet and G. Gruber taught at the lyceum of Ljubljana. The lyceum library kept several description of the subterranean world.

BOOKS ABOUT SUBTERRANEAN PHENOMENA ON SALE IN LJUBLJANA IN 1678

In the autumn 1678, Mayr printed the first Ljubljane book catalogue. On the opening of his printing office he offered 2566 different titles. All his books about subterranean phenomena were written in Latin language, although he offered many other German, French, and Italian texts.

Author	Title	Mayr's	Format
		page	
Agricola	De Re Metallica	49	12
Bechers	Physicae subterranea libri duo	51	8
Herbinis	Dissertationes de admirandis mundi Catarctis supta & subterraneis...	77	4
Kircheri	Scrutinum Physico-Medicum de Contagione luis, quae Pestis dicitur (1658)	56	
Kircheri	Phonurgia nova (1673)	79	Fol.
Kircheri	De Prodigiosis Crucibus (1661 or 1666)	79	8
Kircheri	Ars Magna Lucis & Umbrae (1646 or 1671)	79	Fol.
Oldenburger	Acta Philosophica	84	4
Schottl G.	Magia Universalis Naturae & Artis (1677)	89	4
Schottl G.	Technica Curiosa (1664)	89	4

Mayr listed the famous Agricola's (Georg Bauer, 1494-1555) *Metallica*. Agricola studied in Leipzig and in Italy. Between 1527 and 1531 he was a physician in Joachimsthal (Jachymov), a silver-mining community on the east side of the Erzegebirge mountains in Bohemia. Later he became a town physician in the mining town of Schemnitz in Slovakia (Schemnitzium, Selmečbánya, Banská Štiavnica). In his *Metallica* he collected all practical knowledge of Saxon miners. The lyceum of Ljubljana had four copies of Agricola's *Metallica*, the earliest printed in

1546 on eighty-six pages with additional seven pages of index. The first of two addresses at the beginning of the book was devoted to the late Erasmus of Rotherdam (1469-1536). A copy of Agricola's *Metallica* from the library of the monastery of Kostanjevica was listed during its suppression between 1782-1785 (Minařík 2000, 549).

Agricola's *Metallica* was translated to Italian (Tuscany) language in 1550 and in 1563. It remained a standard textbook on the mining and metallurgy for over two hundred years. In 1549,

Agricola's published another treatise on the subterranean fauna and cave-dwelling animals.

Mayer offered three Johann Joachim Becher's (1635-1682) books. One of them was *Subterranean Physics* (1669), a treatise in the style of Paracelsus and Helmont. In 1666, Becher was appointed the councillor of commerce at Vienna. He gained the powerful support of Count Albrecht Zinzendorf, the prime minister and grand chamberlain of emperor Leopold I (1640-1705). Becher had a considerable influence on the science in Hapsburg monarchy. Georg Stahl (1660-1734) later used Becher's ideas in his theory of the phlogistone.

Mayr offered a brand new work of Johann Herbinus (1633-1676) on 267 pages with the engraved front page, two maps, two engraved whole page pictures and



*Fig. 1: Head page of Mayr's catalogue 1678.
Sl. 1: Naslovnica Mayrovega kataloga iz leta 1678.*

twenty-one big copper-plates inserted into the text. Herbinus studied in Wittenberg. The Polish Protestant church send him to the churches in Germany, Switzerland, and Holland. He traveled a lot and made a good look at the meanders, waterfalls, and subterranean flows described in his book.

Mayr was selling Philosophical Transactions of the Royal Society of London. Their editor Henrich Oldenburg (1628-1678) just passed away. He recently published Edward Brown's (1642-1708) description of the Cerknica Lake. A doctor of medicine Brown was the emperor's librarian in Vienna and influenced the research in Carniola. As a fellow of the Royal Society he traveled through Europe between 1668 and 1673.

Seven years after Mayr's offer, Valvasor read a copy of Oldenburg's Transactions. In December 1685, Valvasor reported to the secretary of Royal Society Thomas Gale

(1635/1636-1702) that he "read Acta Philosophica Societatis Regiae about the mercury mine and Cerknica Lake in those days". He criticized Brown's articles without mentioning his name. On December 14, 1687, Valvasor was elected fellow of the Royal Society for his own description of the Cerknica Lake (Reisp 1983, 171, 184).

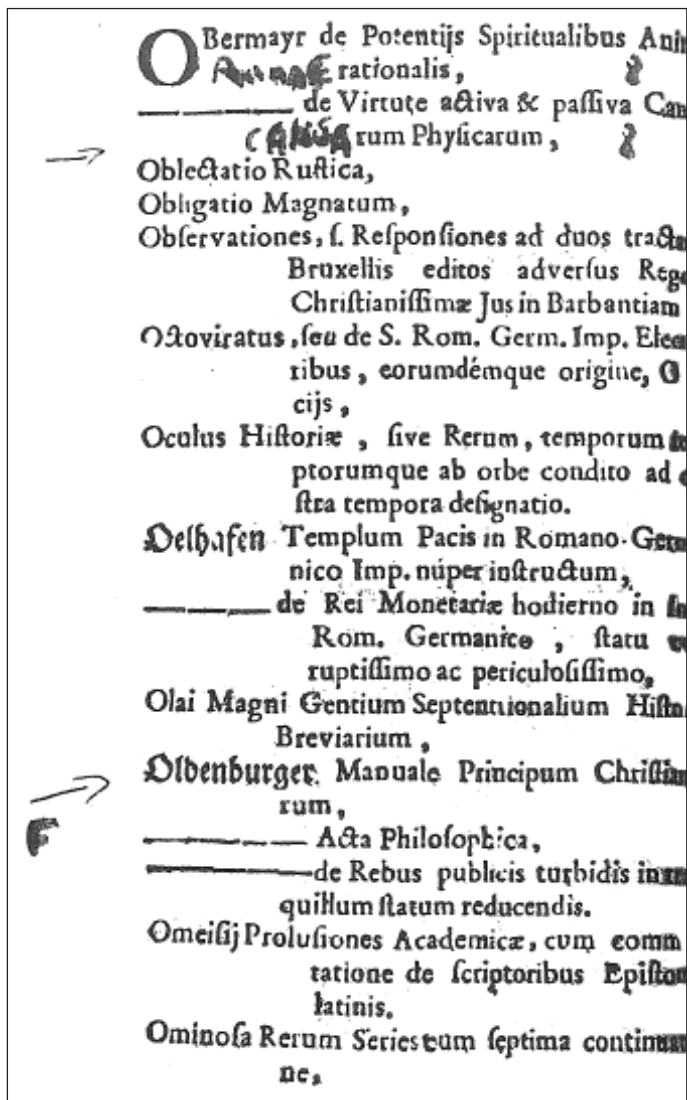


Fig. 2: 84th page of Mayr's catalogue offering the copy of Oldenburg's Philosophical Transactions (*Acta Philosophica*).

Sl. 2: 84. stran Mayrovega kataloga s ponudbo Oldenburgovih Phil. Trans.

The Jesuits Athanasius Kircher (1602-1680) and Kaspar Schott (1608-1666) wrote the most important books about the subterranean phenomena listed in Mayr's catalogue. The Ljubljane Jesuits soon bought for their library Kircher (1650) and Schott's (1677) descriptions of Cerknica Lake.

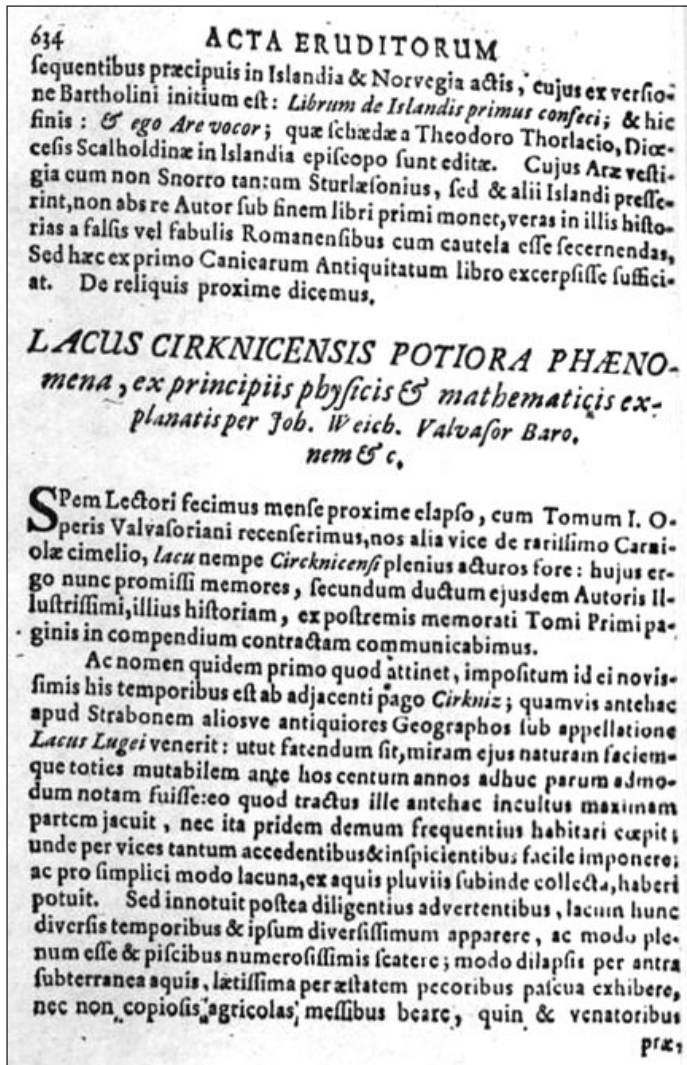


Fig. 3: Leipzig reprint of Valvasor's article that won his election into the Royal Society (Valvasor, J. V., 1687: *The Zirchnitzer Sea in Carniola described*. By M. J. Weichard Valvasor. *Phil. Trans. XVII* 191: 414. Reprint: November 1689: *Acta Eruditorum*. Pp. 634-644. Sl. 3: *Leipziški ponatis Valvazorjeve razprave, ki mu je prinesla izvolitev v londonsko Kraljevo družbo*.

Kircher accompanied count Friedrich von Hessen-Darmstadt who recently reentered the catholic faith. During their travels in 1637 and 1638, Kircher researched the crater of Vesuvius and made other observations. Kircher's publications of 1665 and 1666 were the very first modern physical descriptions of the subterranean.

The Governor general of Carniola and landlord of Gottschee Wolfgang Engelbert Auersperg (1610-1673) had several Kircher's works in his Ljubljane library. Between 1655 and 1663 Schönleben catalogued Auersperg's library. In 1656, he wrote ex libris into Kircher's *Magnes* (1641) and in 1663 into Kircher's *De prodigiosis crucibus* (1661). Later, the Brigham Young University Library from USA bought both books (Merill 1989, 6, 38). In 1697, the Ljubljane Jesuits bought Auersperg's copy of Kircher's *Ars magna* (1646).

During his work in Auersperg's library, Schönleben read Auersperg's copy of Kircher's *De prodigiosis crucibus* and accepted Kircher's opinion about the Cerknica Lake. Mayr published Schönleben's research of Carniolan Karst in the year of Schönleben's death. Two other Schönleben's books, and certainly also Valvasor's masterpiece (1689), were kept at the library of the Jesuit college of Ljubljana.

Among the Latin works about "philosophy, philology, history, mathematics, gymnastic, and mechanic" and the German books about "history, politics and philosophy" Mayr offered many books about geography and horology. Five of them were Erasmus Francisci's (1627-1694) German geographical books. A decade after Mayr's offer, Francisci edited Valvasor's *Ehre* and added devils and supernatural powers to explain some natural phenomena. That intervention damaged Valvasor's reputation, but he was unable to authorize Francisci's edition (Reisp 1983, 80).

LECTURES ABOUT SUBTERRANEAN WORLD AT THE LJUBLJANESE HIGHER STUDIES

We can trace an important tradition of the Jesuit research of subterranean in Ljubljana before Gruber. Between the years 1704 and 1773, the Jesuits taught at the higher studies in Ljubljana. In 1709, the students of the professor of mathematics Janez Krstnik Thullner (1668-1747) published the oldest preserved Ljubljane examination theses. Thullner taught philosophy in Gorizia between 1703 and 1704. In Ljubljana, he published the geographical and historical book about the region of Gorizia. After he left Gorizia, Thullner spent three more years teaching philosophy and mathematics in Linz. Between 1708 and 1713, he taught mathematics in Vienna and in Ljubljana.

In Gorizia, Thullner's student Aleš Žiga Dolničar (1685-1708) noted his lessons about physics and horography. In third lesson Thullner commented three Aristotle's books about *Generation And Corruption*. He accepted Kircher's hypothesis about the connection of the subterranean fire and the sulphur. He used the theory of four antique elements and their mixing (Thullner 1704).

On the last forty paged pages Dolničar copied Thullner's lectures on Aristotle's *Meteorology*. Thullner agreed with Kircher about fluids, seas, vapors, and caves under the surface of the Earth. He described the catastrophic eruption of Vesuvius in June 1668 to support Kircher's ideas (Thullner 1703, 5-6).

In the paragraph about fire of the second lesson about comets Thullner cited the observations of Jesuit Schott and his students in Sicily, and observations of Schott's teacher Kircher (Thullner 1703, 19, 22-24). Thullner cited Schott's works that Mayr offered in Ljubljana in 1678.

Thullner described the rivers Danube, Save, Po, and Cerknica Lake with its unusual changing of the level during the year. He described the hot springs and the earthquake in the area of Naples on February 2, 1671. He claimed that the sulphur vapors caused the disaster (Thullner 1703, 33, 36).

Between 1719 and 1720, Janez Kaugg (1681-1746) from Maribor taught physics and metaphysics as the parts of philosophy in Ljubljana. In 1719, he noted his physical lessons. The front page with author's name and the first fifteen pages of the manuscript were lost. In his commentary of Aristotle's book about meteorology Kaugg discussed volcanoes, different metals, and stones (Kaugg 1719, 323).

In 1748, a court mathematician and director of the physical cabinet in Vienna Joseph Anton

Nagel began his research of karst phenomena in Carniola for the reparation of the road Vienna-Trieste (Habe & Kranjc 1981, 22). But his report remained unpublished and didn't affect the lecturing at Ljubljane college.

One of the most popular authors in Ljubljana in the mid-18th century was Noël Regnault (1683-1762), the Jesuit professor in Amsterdam and at Collège Louis-le-Grand in Paris. In Ljubljana they bought three copies of Regnault's medical and natural historical Dialogs About Physics. The professor of philosophy in Graz Karel Dollenc (1703-1751) published an extracts of Regnault's work. The text contained seventeen dialogues between Aristus and Eudoxus in Galileo's style. The subterranean phenomena were discussed in three dialogues: Earth and minerals (II), Subterranean fire (III), and Mineral water (IV).

In 1755, the professor of physics in Graz Franc Tricarico (1719-1788) published his examination theses bound with another Regnault's book about the ancient fundaments of contemporary physics. In that work Regnault discussed the subterranean cold and seas. He published fictive dialogues between Aristotle, Aristarh, Descartes, Kircher, Albertus Magnus, and others (Regnault 1755, 67, 321). In 1757, Tricarico taught physics in Ljubljane college.

Between 1759 and 1767, the Cartesian Inocenc Taufferer (1722-1794) taught physics as a part of philosophy at the Ljubljane higher studies. In 1760, the students published his examination theses bound with the work of Jean Jacques Dortoux de Mairan (1678-1771),

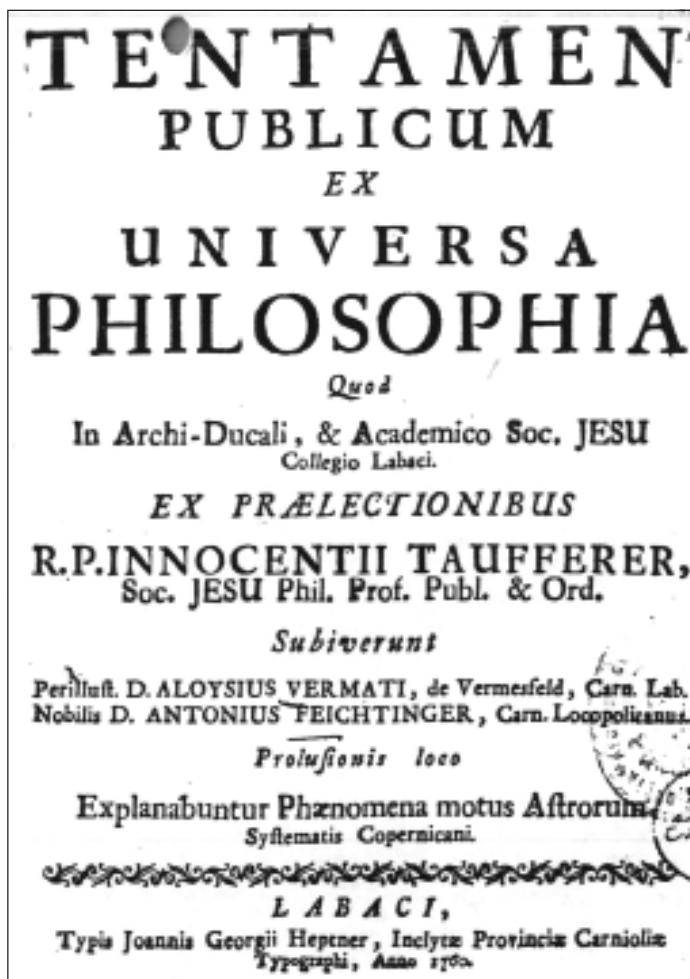


Fig. 4: Head page of Taufferer's examination theses of 1760.

Sl. 4: Naslovnica Tauffererjevih izpitnih tez iz leta 1760.

a member and later secretary of the Paris Academy. Few years before, Bernard Ferdinand Erberg (1718-1773) bought another Mairan's work for the Ljubjanese college. B. F. Erberg was the professor of mathematics and the younger cousin of Anton Erberg.

Taufferer borrowed most of his opinions from de Mairan. He claimed that most of the mountains were as old as the Earth itself. The streams get their water from rain, melted snow, and also from subterranean vapors. The flow of the different metals, semimetals and fluids created subterranean minerals. During the outbreaks of lava, the heat of subterranean fires separated and mixed the "molecules". Taufferer thought that metals are not chemical elements, but the mixtures made by the influence of the subterranean fire mostly at the time of the creation of the world. Some mountains and metals were created afterwards. He claimed that subterranean caves full of water and fire were separated by the sand and stones and connected with the central Earth's fire. He took advantage of the Roman congregation (1757) that allowed the physical reality of Copernicus' movable Earth. Taufferer stated that the quick movement of the Earth and its subterranean fire expands and rarefies the air and vapors in the subterranean caves.

The Ljubljane Jesuits bought Johann Gottfried Jugel's (1707-1786) new Subterranean Geometry, a modern version of the Agricola's work. Jugel from Berlin lead the mining activities in Prussia. He also published some alchemic treatises.



Fig. 5: Taufferer's 33rd examination thesis of 1760. Students had to discuss the caves and subterranean world.

Sl. 5: 33. Taufferejeva teza iz leta 1760 v kateri so študentje opisovali jame in podzemeljski svet.

BOOKS ABOUT GEOGRAPHY AND TOPOGRAPHY AT THE LJUBLJANESE JESUIT COLLEGE

The Jesuits from Rijeka (Fiume) gave Bernhard Varen's (1622-1650) Geography to the Ljubljane Jesuits. It was the leading geographical textbook of their time. Fleming Varen was a doctor of medicine, but he researched mostly geography. He discussed the subterranean vapors and their influence on the atmosphere (Varen 1650, 338-387). The researchers used Varen geography for whole century and translated it to many languages. Twenty-two years after its first printing, Isaac Newton improved Varen's textbook for his lectures at Cambridge.

Several geographical and topographical works were published by the Jesuits from Ljubljana. In 1717, Styrian Jožef Kraus (1678-1718) published the verses about geography and mathematics at Mayr's Ljubljane printing office. At that time, Kraus was teaching mathematics and physics at Ljubljane college. The author of the verses was probably a jurist from Ljubljana Ivan Štefan Florjančič de Grienfeld (1663 -1709) under the pseudonym Joannes Poeta de Grienthal (SBL 1925-1932, 183).

Anton Erberg (1695-1746) was born at the manor Dol near Ljubljana. In 1727 and 1728, he published topography of Styria, Carinthia, and Carniola. He followed the work of the Jesuit Karl Granelli (1701), the professor of mathematics and history in Vienna. Erberg discussed the research of Schönleben and other authors. At that time, A. Erberg taught ethics and philosophy in Graz. In 1744, he became the rector of the Ljubljane college. He discussed earthquakes in his Physics (Erberg 1751, 241). In 1766, the professor of physics in Ljubljana Janez Krstnik Pogrietsnig (1722-after 1773) published topography of Ljubljana extracted from the Granelli's work.

CONCLUSION

The mine of Idrija was among the most profitable ones in the world. The wonders of Cerknica Lake were widely known. Therefore the Carniolians were deeply interested in the subterranean and karst phenomena. Hacquet research in Ljubljana between 1773 and 1787 had many predecessors.

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RAZPRAVE O PODZEMELJSKEM SVETU V LJUBLJANI MED LETOMA 1678 IN 1773

Povzetek

Ocenili smo raven poznavanja podzemeljskih in kraških pojavov v Ljubljani v času delovanja tamkajšnjega jezuitskega kolegija. Posebno pozornost smo posvetili knjigam v ljubljanskih knjigarnah in knjižnicah ter delom objavljenim v Ljubljani. Dokazali smo, da so bila raziskovanja Janeza Ludvika Schönlebena (1618-1681), Janeza Vajkarda Valvasorja (1641-1693), Franca Antona pl. Steinberga (1684-1765), Baltazarja Hacqueta de La Motteja (1739-1815) ter polbratov Gabrijela (1740-1805) in Tobije Gruberja (1744-1806) utemeljena na znanju in interesih njihovih kranjskih predhodnikov in sodobnikov.

Knjige o podzemeljskem svetu Geoga Agricole (1494-1555), Athanasiusa Kircherja (1602-1680), Kasparja Schotta (1608-1666), Erasmusa Franciscija (1627-1694), Johanna Herbinususa (1633-1676) in Johanna Joachima Becherja (1635-1682) so v Ljubljani prodajali kmalu po natisu. Brownove (1642-1708) opise Cerkniškega jezera so ponujali v razpravah londonske Kraljeve družbe. Številna Kircherjeva dela je kupil deželni glavar grof Wolff Engelbert Auersperg (1610-1673) za svojo knjižnico v Ljubljani.

Ohranile so se tiskane knjige, rokopisi in izpitne teze o podzemeljskih pojavih ljubljanskih profesorjev fizike in matematike Janeza Krstnika Thullnera (1668-1747), Jožefa Krausa (1678-1718), Janeza Kaugga (1681-1746), Antona Erberga (1695-1746), Franca Tricarica (1719-1788) in Inocenca Tauffererja (1722-1794). Njihovi študentje so se pri pouku fizike na višjih študijih seznanili tudi s sodobnimi raziskavami podzemeljskega sveta. Tricarico in Taufferer sta dala vezati svoje izpitne teze ob knjigi jezuita Noëla Regnaulta (1683-1762) in pariškega akademika Jeana Jacquesa Dortoux de Mairana (1678-1771), ki sta raziskovala tudi podzemeljske pojave. Nekaj let prej je ljubljanski profesor matematike Bernard Ferdinand Erberg (1718-1773) nabavil druge Regnaultove in de Mairanove knjige za knjižnico ljubljanskih jezuitov. Ljubljanski jezuiti so imeli tudi številna geografska in topografska dela kranjskih in drugih avtorjev.

Po prepovedi jezuitske družbe leta 1773, so ljubljanske višje študije spremenili v Licej. Tam sta predavala Hacquet in Gruber, ki sodita med vodilne raziskovalce krasi svoje dobe. Hacquet je svoja dognanja utemeljil na raziskovanjih številnih kranjskih predhodnikov in na literaturi o podzemeljskih pojavih, ki so jo že stoletje zbirali v ljubljanskih knjižnicah.