

ROBERT TOWNSON, TRAVELLER IN HUNGARY IN 1793 - HIS LIFE AND WORK

ROBERT TOWNSON, POPOTNIK PO MADŽARSKEM LETA 1793 - NJEGOVO ŽIVLJENJE IN DELO

TREVOR R. SHAW¹

Izvleček

UDC 55(439)(091):929 Townson R.

Trevor R. Shaw: Robert Townson, popotnik po Madžarskem leta 1793 - njegovo življenje in delo

Robert Townson (1762 - 1827) je študiral medicino, kemijo in naravoslovje na univerzah v Edinburgu, Parizu, Dunaju in Göttingenu in bil imenovan za častnega doktorja prava v Edinburgu leta 1796. Bil je na petmesečnem potovanju po Madžarski in Slovaški ter leta 1797 objavil knjigo *Travels in Hungary*. V tem delu opisuje jame pri Aggteleku, na Silicki planini ter brezna v Alsó-hegy. Dodana je tudi geološka karta, sestavljena na podlagi Townsonovih lastnih opazovanj. 1798 in 1799 je izdal še deli geološke in naravoslovne vsebine. 1807 se je izselil v Avstralijo.

Ključne besede: Townson, speologija, geologija, zgodovina, biografija, objave, Madžarska, Slovaška, Baradla, helektit.

Abstract

UDC 55(439)(091):929 Townson R.

Trevor R. Shaw: Robert Townson, traveller in Hungary in 1793 - his life and work

Robert Townson (1762 - 1827) studied medicine, chemistry and natural history at the universities of Edinburgh, Paris, Vienna and Göttingen and he was made an honorary Doctor of Laws by Edinburgh in 1796. He made the 5-month journey in Hungary and Slovakia which resulted in his *Travels in Hungary* (1797). Besides describing the caves at Aggtelek and Silica, and mentioning the Alsó-hegy shafts, this book contained a very early geological map, prepared by Townson from his own observations of rocks. Other books on geology (1798) and natural history (1799) followed. Then in 1807 he emigrated to Australia.

Key words: Townson, speleology, geology, history, biography, publications, Hungary, Slovakia, Baradla cave, helictite.

¹ Old Rectory, Shoscombe, BATH BA2 8NB, U. K.

INTRODUCTION

Robert Townson's book *Travels in Hungary...* (1797a) is well known in Central Europe for its account of his visits to caves in Hungary and Slovakia.

The extracts containing the descriptions of Baradla cave at Aggtelek, the Silica ice cave and the open shafts in the Alsó-hegy plateau have frequently been reprinted (e. g. in Dénes 1972; and Hadobás 1991; 1992) with topographical and speleological comment. For convenience, and to make Townson's text more widely accessible, they are reprinted here as Appendix I.

There has previously been little written on Townson's geological background, and much of the biographical information provided has been incorrect.

Indeed, Townson's life has hitherto remained something of a mystery. What has been published about him in Europe has been largely wrong and seriously incomplete. His place of birth, for example, is recorded in *The Dictionary of National Biography* (Carlyle 1899) as "probably... Yorkshire", with no year given. Britten & Boulger (1914; 1931), Desmond (1977) state that he was born in Shropshire, again with no year. Goodin (1967) has him born in 1763; Hadobás (1992) states "He died in 1799". None of these 'facts' is true.

This paper therefore concentrates on his life, work and travels. In so doing it adds 28 years to the life previously recorded in European biographical dictionaries, takes him to a successful new career in another continent, and provides a portrait.

A further intention is to provide a fuller picture of Townson himself - his interests, abilities and achievements - so as to throw more light on the man that travelled in Hungary, the quality of his observations there and the authority with which he wrote on geological matters.

BIRTH AND YOUTH, 1762-1782

The clue to new sources of information on Townson's life came to the present author when he was using the much revised second edition of *A Biographical Index of deceased British and Irish Botanists* (Britten & Boulger 1931). Here, unlike the entry in the first edition of 1893 (one of the sources of the erroneous entry in the *Dictionary of National Biography*), is the key phrase "d[ied] Australia". No date of birth was given and much of the other information was incorrect but that one simple statement led to the examination of Australian publications and other sources in Australia. In the course of this, I learned that my friend Dr Hugh Torrens, geologist and historian of science at the University of Keele, was already aware of Townson's Australian existence and had done extensive research in the course of preparing a revised entry for *The Dictionary of National Biography* (as yet unpublished). Much of the biographical information in this paper is derived from his published work.

Robert Townson was born, not in Yorkshire or in Shropshire, but in

Richmond near London. Vallance & Torrens (1984) have investigated parish registers of baptisms, an act of parliament and family divorce papers, and establish that:

Robert Townson was born between January and March 1762 at Spring Grove, Marshgate, Richmond, Surrey and baptised there on 4 April 1762. His parents were married well over four years later at Richmond on 23 December 1766. His father John (c. 1720-1773) was a London merchant and insurer; his mother Sarah Shewell (1731-1805) came from a family with... connections with London brewing and publishing companies.

Robert's father died when he was only ten years old. He served an apprenticeship in Manchester and then, from 1777, lived with his brother-in-law, the Rev. John Witts (1750-1816), at Cardington near Church Stretton in Shropshire.

UNIVERSITIES AND EUROPEAN TRAVEL, 1783-1795

From 1783 to 1787 Townson travelled on foot through France and Italy to Sicily, and on his return from there he attended lectures in Paris on chemistry and probably on mineralogy also.

In December 1789 he enrolled as a medical student at the University of Edinburgh, where he remained for two years without taking a medical degree. Later, however, on 11 April 1796, he was made an honorary Doctor of Laws (LL. D.) by that University (Jo Currie, pers. comm. 1994, quoting the Senate Minutes). This is likely to have been in recognition also of his achievements elsewhere in Europe by the university of what had then become his 'home' town. This LL. D. degree was printed after his name on the title pages of all his books. While at the University he joined the student Natural History Society, appearing on the membership list of 7 January 1790 and presenting two papers on local geology which will be referred to again later, along with his other publications. In 1791 he was elected a Fellow of the Royal Society of Edinburgh, an honour he also used on his title pages.

The influence on Townson of his friends and teachers at Edinburgh will be referred to at the end of this paper. In 1791 they recommended that he be appointed as naturalist to accompany a new Lieutenant-Governor to Canada. This did not happen so he travelled in Europe again, via Uppsala (Sweden) and Copenhagen (Denmark) to Göttingen (Germany). There he enrolled as a student in the Department of Natural History on 19 December 1791 (Selle 1937, and Ulrich Hunger, pers. comm. 1994). Although *The Dictionary of National Biography* (Carlyle 1899, Desmond 1977) credit him with becoming a Doctor of Medicine there in 1795, and the *Australian Dictionary of Biography* (Goodin 1967) states that he was made a Doctor of Civil Law (DCL) there in the same year, Hunger (pers. comm. 1994) says that there is no evidence for either degree; furthermore the absence of any leaving certificate suggests that

he did not take any degree there at all. It is significant that neither MD nor DCL degrees are printed on the title pages of his books.

During his three and a half years at Göttingen University, Townson spent the winter of 1792-93 in Vienna, where he studied the respiration of amphibia. A paper written there on that subject, and another completed later in Göttingen, where later published. Leaving Vienna on 5 May 1793, he set off on his Hungarian travels, returning in the middle of October. The Hungarian tour, his geological observations there, and the resulting book, are considered separately.

WRITING, 1795-1806

In May 1795 Townson returned home from Göttingen to Edinburgh. He worked there on his Hungarian book and attempted, unsuccessfully, to get himself appointed by the East India Company to study the physical geography, mineralogy and natural history of India (Townson 1797a, p. vi; 1799, p. 150). It was at this time, as already mentioned, that his honorary LL. D. was awarded by the University of Edinburgh. His *Travels in Hungary...* was published in 1797 and two other books, also discussed later, in 1798 and 1799. After this he started preparing a "County History of Yorkshire", but it was never published.

AUSTRALIA, 1807-1827

When his mother died in May 1805 Townson decided to emigrate to Australia. His elder brother John (1760-1835) had served in New South Wales as a military officer from 1790 (Austin 1967) and returned there as a settler in 1806. Robert followed him, arriving in July 1807. As a naturalist and scholar, and known to the influential Sir Joseph Banks who had accompanied Captain Cook's expedition round the world in 1768-71, he was promised grants of land and also given a sum of money to buy books and laboratory equipment for use in the still young colony (where the first settlers had landed only 18 years before). Strangely, the then Governor of New South Wales (William Bligh, who had been on Cook's third voyage and is known as victim of the Bounty mutiny at Tahiti in 1789) seemed opposed to Townson. The promised grants of land were not made and his scientific work was hindered (Goodin 1967). Thus alienated, he joined other influential and dissatisfied settlers in forcing the deposition of Governor Bligh. Bligh's replacement, Lachlan Macquarie was governor from 1808 to 1821 and his name is remembered in the Macquarie River and Macquarie Island. The grants of land were at last made in 1810, and Townson established a farm at Varroville, near Sydney, as described later.

Perhaps still affected by the treatment he had received from Bligh, Townson

seemed to lose almost all interest in scientific matters, and became discontented and unsociable. Many letters of this period are in the Mitchell Library in Sydney. He devoted himself almost exclusively to developing his farm, where he raised cattle and sheep, planted experimental crops and established a thriving vineyard (Anon. 1827; 1963: Leister, pers. comm. 1995). He was associated with the Philosophical Society in Sydney about 1820 (Finney 1993) but this was more a social club for those opposed to Governor Macquarie than a learned society.

When Macquarie left in 1821, Townson became a more normal member of the community. He was vice-president of the Agricultural Society of New South Wales (Goodin 1967) and worked on its committees, he supported the foundation of a Sydney Dispensary to provide free medical attention for the poor, gave dinners at his home, and in 1826 was appointed a magistrate.

He died at Varroville on 27 June 1827, aged 65, and was buried on 2 July at Parramatta.

PORTRAIT

An oil painting of Robert Townson in his later years (Fig. 1) was made by Augustus Earle (1793-1838), who a few years later was the artist in HMS *Beagle* during her South American voyage with Darwin. The picture is undated but must have been painted between 1825, when Earle arrived in Australia, and 1827 when Townson died. It was presented to the Australian Museum in 1873 and transferred to the Mitchell Library, in the National Library of New South Wales, in 1961. Although untitled, the recorded identity of the sitter is supported by the lettering on the spines of the books on the table by his right hand, all of which were written by him.

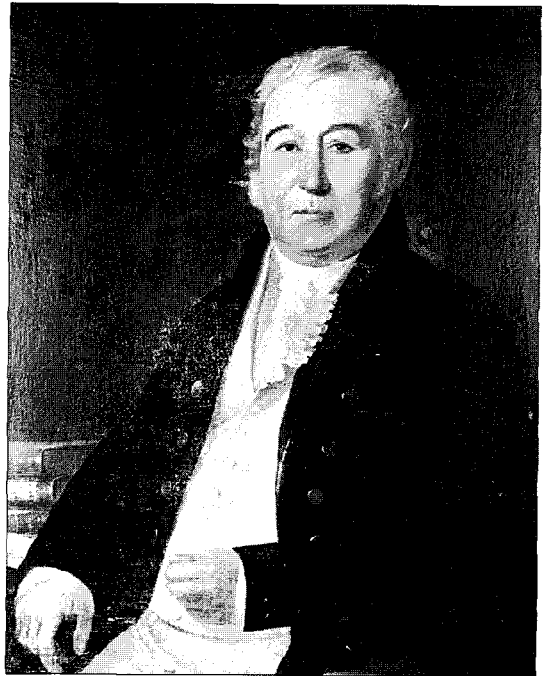


Fig. 1: Robert Townson between 1825 and 1827, a portrait by Augustus Earle. Oil painting 81,3 x 64,5 cm. Reproduced by permission of the Mitchell Library in Sydney.

VARROVILLE, HIS HOME IN AUSTRALIA

The delayed grants of land near Sydney were made by Governor Macquarie in 1810 (Anon. 1963), but there still was some further administrative delay after that. The area granted, on which Varroville was built and the farm created in the present-day district of Minto on the south-west outskirts of Sydney, was 1000 acres (404,7 hectares) and there was more land near Botany Bay. Macquarie visited the place in 1810 and remarked in his diary that Townson's land and some more nearby "are by far the finest soil and best pasturage I have yet seen in the Colony" (Anon. 1963). Townson named his property Varroville after the Roman agricultural writer Marcus Terrentius Varro.

Just what remains of Townson's house is not completely clear.

There is no documentary evidence to prove that he built the [present] house at Varroville, but the two owners after Dr. Townson were not long in occupation, and it is reasonable to assume that Townson, a wealthy man, erected a comfortable house for himself on his land (Anon. 1963, p. 25)

Recent information received from Campbelltown City Council (1995) is accompanied by a map (Fig. 2) in which one building is labelled "House, c.

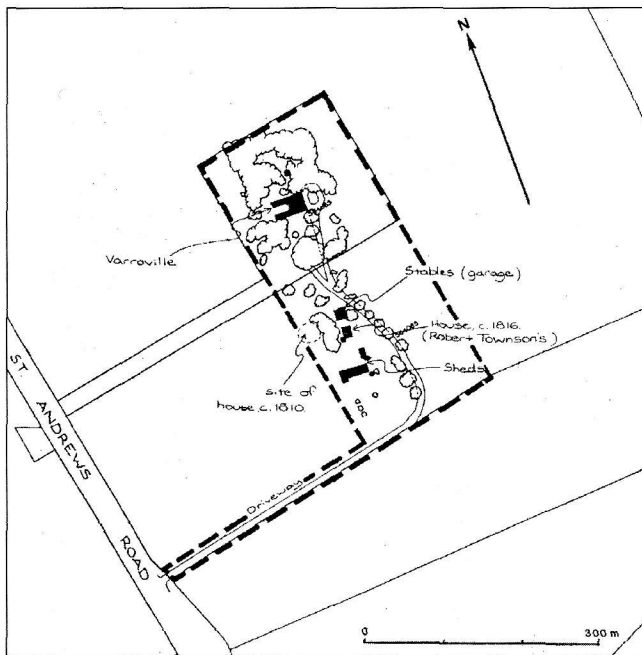


Fig. 2: The buildings at Varroville. A recent map supplied by the Campbelltown City Council.

1816 (Robert Townson's)" and there is also, nearby, "Approx. site of house, c. 1810". A wooden 'slab hut' of about 1810 does exist but whether it was already on the land when it was granted to Townson, or whether he had it built as temporary accommodation, is not known. The house of c. 1816 (Fig. 3) also survives and is still occupied. The main house, "Varroville" (Fig. 4), a little to the north, was formerly thought to have been built, or at least much modified, in 1859. Its main character, including the cast iron columns on



Fig. 3: The house of c. 1816-1820 at Varroville, which Townson probably occupied while the larger house was under construction. Photographed in 1950.



Fig. 4: Part of the south side of the main house at Varroville. The cast iron veranda columns on the right were added in 1859, but at least part of the house was built in the 1820s. Photograph by Ian Leister 17 Sept. 1995.

the east side (Fig. 4), are of that period. The present owners, Kenneth and Virginia Pearson-Smith, who bought the property from the National Trust, are both architects and they believe that the basic building is older.

The original wooden roof tiles exist under parts of the iron roof and that the practice of using these was discontinued in the 1830s. The two west wings, at least, therefore date from some time in the 1820s. Although the front section was probably modernised in 1859, Varroville was one of the houses in the area that was used for entertaining before that, so a sizeable house must have already existed (Ian Leister, pers. comm. 21 Sept. 1995).

So, to what extent the present house was known to Townson, and whether he lived in succession in the c. 1816 building and then the present building before its later modification, is uncertain. A plan of the present house, and drawings of its appearance from all four sides, are printed in Anon. (1963).

Later owners, after Townson's time, included Charles Sturt the explorer who in 1828 had been almost certainly the first person to explore the caves at Wellington, in New South Wales.

THE 1793 TRAVELS IN CENTRAL EUROPE

Townson's travels in Hungary and Slovakia during 1793 resulted not only in his classic descriptions of the Baradla and Silica caves, but also, and probably more importantly for the historian of geology, the very early geological map which accompanies the book and the observations on rocks which occur throughout. There are also accounts of towns and the people he met, travels over mountains, visits to mines and remarks on vine growing and wild plants.

His route, described below, is marked in red on his map. Where the spelling of place names differs between those on the map and in the text, the latter are used here. The equivalent modern names are given in brackets.

From Vienna he crossed the border into Hungary and passed through Oedinburgh (Sopron), Komorn (Komárom) and St. Andrée (Szentendre) to Bude and Pest (Budapest). After a spell there he travelled east to Gyongyes (Gyöngyös) and through Debretzin (Debrecen) to Gross Wardein (Oradea in Transylvania). Turning back there, he passed through Debrecen and went on to Tokaj (Tokaj) before crossing the present-day frontier to Caschau (Košice) in Slovakia (which was then a part of Hungary). It was while he was at Košice that he was told of the caves and consequently visited those at Akteleg (Aggtelek) and Szilitze (the ice cave at Silica, now in Slovakia). He also saw, near Nadaska (Tornanádaska), the entrances of some of the deep shafts on Alsó-hegy (not named in the book or on the map). From Rosenau (Rožnava) he travelled north to Poprad and across the High Tatra to visit the Wieliczka salt mine and the nearby city of Krakow in Poland. Returning south again across the Tatra, he was unable to make his planned visit to the Demänova ice cave and went on south to the mining towns of Schemnitz (Banská Štiavnica)

and Kremnitz (Kremnica) which interested him particularly. On through Neitra (Nitra) to Presburg (Bratislava) and back to Vienna.

THE BOOK "TRAVELS IN HUNGARY" AND ITS GEOLOGICAL MAP

The resulting book, *Travels in Hungary...* (Fig. 5), is a substantial volume of xix + 506 pages, measuring about 27 cm by 21 cm. Besides the map, with the areas containing different rock types outlined in colours, there are 16 engravings, of hills, the entrance to the Silica ice cave, a section through the Wieliczka salt mine, minerals, insects and plants. The text provides not only a general account of his travels, including the visits to mines and an alum works, but throughout he is constantly describing rocks, soils, "pseudo-volcanic craters", etc.

The cave descriptions (see Appendix I) show no particular geological insights. He remarks that they are "like all that I have seen, in a primitive or unstratified compact lime-stone... I think they arise from the rock, whatever that might be, giving way which supports them." On another page he writes that the individual chambers in the Baradla cave "have been formed by the falling in of the rock"; so probably he means no more than that caves are enlarged by roof breakdown.

When going into the Silica ice cave (Fig. 6), he is concerned to counter the common view, held by Bel (1739) and others, that ice caves are colder in summer than in winter and that it is therefore in summer that the ice is formed. Townson pointed out that the apparent cold of such caves in summer was due to the contrast with the warm air outside. When he visited the Silica cave on 16 July the air temperature inside was 0° C and,

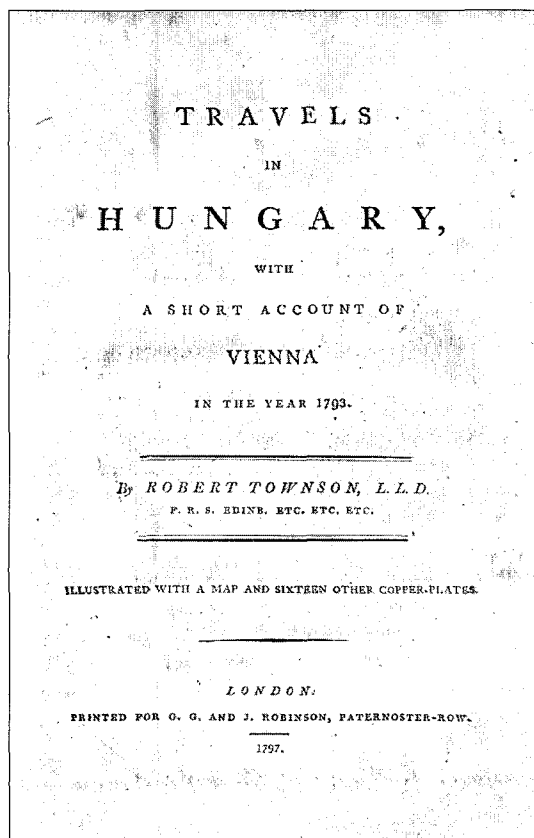


Fig. 5: The title page of the book describing Townson's tour in Hungary and Slovakia.

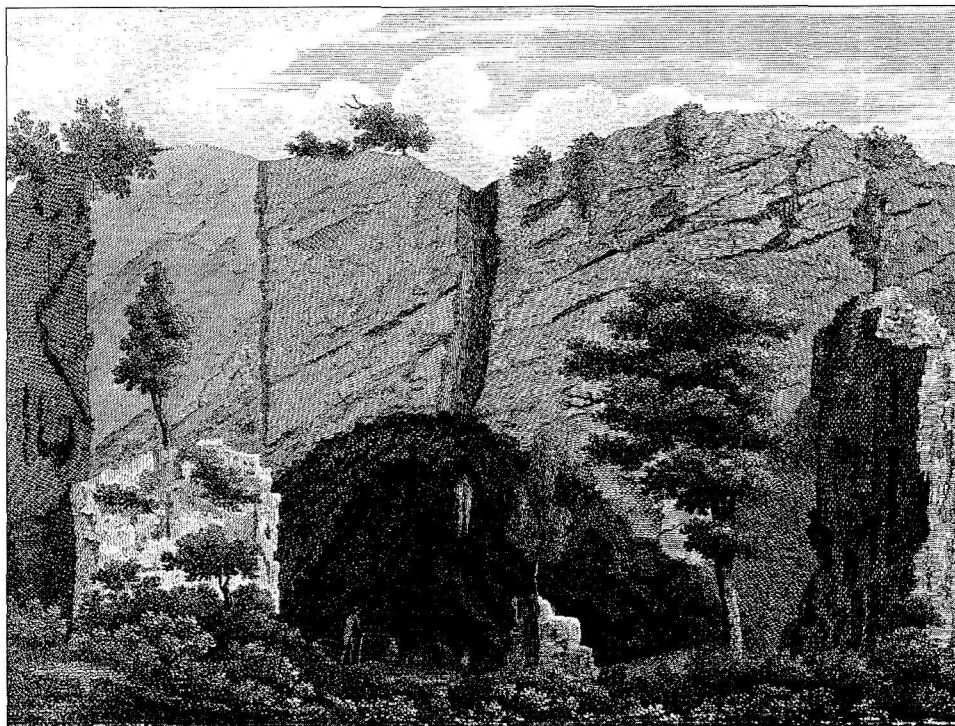


Fig. 6: The entrance of the Silica ice cave, opp. p. 319 of Townson's book of 1797.

although there were large masses of ice, they were wet and dripping as they very slowly melted. He believed that the ice is definitely formed in winter, though there is some delay before the low outside temperatures have an effect in the cave. Thus ice formation does not commence immediately with the beginning of winter, and the same slow reaction of the cave to external temperatures allows the ice to persist into the following summer. He held this common-sense and largely correct view fifty years before the theory of summer freezing was finally overcome. His idea had been put forward a century and a quarter earlier by Steno (1669) in 1671, but only in unpublished letters which Townson could not have seen.

It is the map, with "Petrography... added by the Author" (Fig. 7), which makes the book of wider significance than just a regional description. On the map are distinguished 13 kinds of rock types, including 'granit', volcanic tufa, stratified and unstratified sandstone, 'shistus', saline limestone, unstratified compact limestone, stratified limestone, and calcareous tufa. It appears to be the first such map published in England. The somewhat similar "Mineralogical

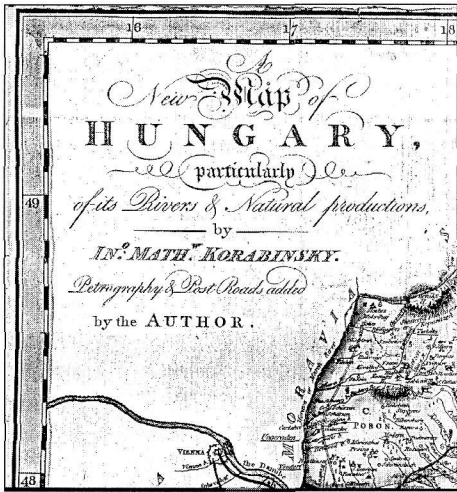


Fig. 7: The title block of the map in Townson's 1797 book.

map, of the western counties of England" was published later in the same year (Maton 1797) with the different rocks distinguished by cross-hatching instead of colour. In fact, Maton's whole book is rather similar to Townson's in that the text includes many geological observations made in the course of his journeys in south-west England in 1794 and 1796. Vallance & Torrens (1984) point out that an earlier German example of such a map occurs in a book by Charpentier (1778), which Townson had seen in Göttingen.

The arrangement of rock types in the key does not show any particular stratigraphic order, but some indications of this are given in the text where certain rock types are described as occurring between two others. Presciently he wrote:

When mineralogy and physical geography shall be more cultivated, which one day they certainly will, these maps will become common, and their union will give an easy and visible representation of the coating of our globe, that is, of its rocks and strata and their relative situations. (Townson 1797, p. xii)

He went on to say that this would be of practical use when particular minerals were recognized as occurring in certain strata.

The basic map from which Townson prepared his modified version and then added to it the geological information, was published by Johann Matthias Korabinsky in 1791. This original Korabinsky map showed the location of more caves than the one produced by Townson (Plihal 1992), who had presumably decided to simplify his in places so that it was able to receive his additional information without becoming overcrowded. His intention was evidently to produce a good 'petrographic' map from his observations throughout the tour, rather than a location map for the places he had visited. Thus, although the map in the 1797 book does have a cave symbol at "Szilitze", there is neither symbol nor name at Aggtelek.

The influence of Townson's *Travels in Hungary...*, which in English appeared only in a single edition, was greatly extended by its translation into French and Dutch. Editions in French were published in Paris in 1799 (*Voyage en Hongrie*, 3 vols.) and 1803, and at Leipzig in 1800; Dutch editions (*Reize in Hongarijen*) were issued in 1800 and 1801 at Den Haag (Darvas 1964). It was

the French language editions which made the book known in Hungary where little English was then spoken (Hadobás 1992).

The description of the Baradla cave at Aggtelek, only, was translated into Hungarian and included in Almasi Balogh's (1820) study of the cave. It may have been from this that Imre Vass (1831a; b), who wrote an entire book about the cave, learned about Townson's visit.

Contemporary reviews of *Travels in Hungary...* do not add to our knowledge of the book. Certainly, as was their purpose, they made it known to potential readers. They assess it from the point of view of the general reader, and not that of a geologist, speleologist or historian of science. The lengthy review by Thomas Beddoes (1797) in *The Monthly Review* is mainly descriptive of the journey, with many quotations; and a single-paragraph review elsewhere (Anon. 1798) laments that although the book covers "ground untrodden by any of our late tourists", its author has "unclassical taste" and was presumably considered at fault for examining rocks rather than the classical architecture of the Grand Tour.

TOWNSON'S OTHER PUBLICATIONS

All Townson's publications, both before and after his *Travels in Hungary...*, reflect his interest in natural history and especially mineralogy and the wider subject of geology.

His lectures to the student Natural History Society at Edinburgh in 1790 were not printed until 1799, so his earliest publication was a botanical paper read to the Linnean Society in London in 1792 and printed in their *Transactions* two years later (Townson 1794). It was reprinted in his book of 1799, but otherwise his interest in botany diminished with time, though there was a botanical appendix of 18 pages in the *Travels...*, as well as a slightly longer one on entomology. These publications justified his inclusion in the book, *A Biographical Index of deceased British and Irish Botanists* (Britten & Boulger 1931), which led to the writing of the present paper.

Townson's papers on the physiology of amphibia, already mentioned as being written at Vienna and at Göttingen in 1793 and 1795 respectively, were published separately in Göttingen (Townson 1794, 1795). An English reviewer (Anon. 1796) comments that "These tracts contain, in a small bulk, a very interesting series of curious and accurate observations". Both were reprinted, in English, in Townson's book of 1799.

An extract from his 1797 *Travels in Hungary*, describing a method of bread-making at Debrecen, was published separately as a short paper in the same year (Townson 1797b).

The *Philosophy of Mineralogy* (Townson 1798) (Fig. 8) is a book of 233 pages overall and covers some aspects of what would now be called geology, as well as mineralogy. The 1790s were a particularly interesting time for anyone

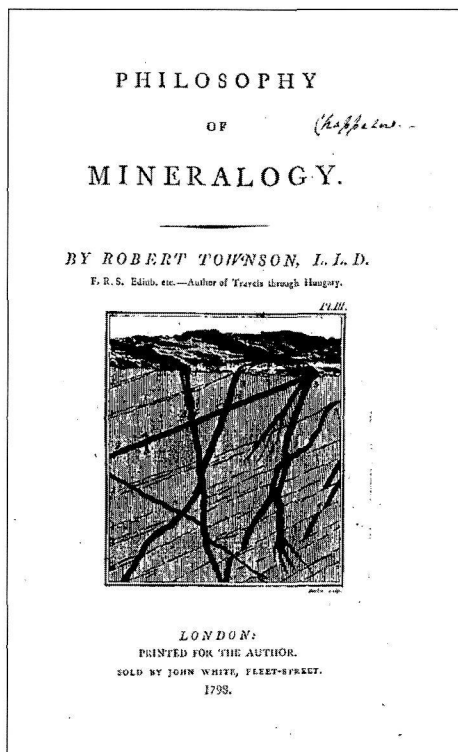


Fig. 8: Townson's 1798 book on mineralogy and geology.

On page 26 of the same book he speaks of carbonic acid "being a constituent of limestones... and acidulous waters". He does not comment on its role in the formation of speleothems. In his Hungarian travels (1797) he was more concerned with description than explanation, and *The Philosophy of Mineralogy* is an outline of the subject rather than a treatise. A reviewer (Anon. 1799a) criticised it for just this, but its author explains (p. ix) that this was because there was insufficient support for the larger work, to be called "Elements of Mineralogy", that he had announced the year before (Townson 1797a, between pages 494 and 495). Stalactites are mentioned in *The Philosophy*... but only as examples of minerals of a particular colour (p. 122) and of one of the shapes in which minerals occur (p. 140).

Tracts and Observations in Natural History (Townson 1799) (Fig. 9) is a collection of papers of various lengths. The first two parts of his "Physiological Observations on the Amphibia", already published in Latin in 1794 and 1795,

to study and write about these subjects. There were two conflicting schools of thought about how rocks had originally been formed. The Neptunists accepted Werner's belief, published in 1787, that all rocks had been formed by deposition from the primaeval ocean. The Plutonists, on the other hand, followed Hutton (1795) in thinking that the earliest rocks were the result of volcanic action, and that only later were fragments eroded from these laid down as sedimentary rocks in the sea. Townson was mainly a Neptunist, though with some reservations.

The 1790s were also a period in which oxygen was being recognized and phlogiston rejected, and the significance of carbonic acid in dissolving limestone was being realised. Townson himself (1798, p. 114) wrote:

Chemistry of late years has made a most rapid progress, and every branch of human knowledge within its reach has been advanced by it. Mineralogy should be the first to speak its eulogium... Chemistry has done much for mineralogy: it has raised it from a frivolous amusement to a sublime science...

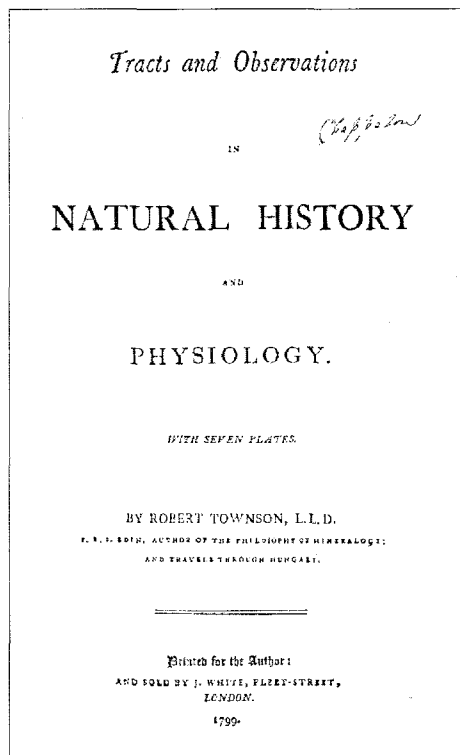


Fig. 9: Townson's 1799 book on natural history and geology, which includes his paper on flos ferri.

are printed here in English together with a third part, previously unpublished. "Memorandums on the rocks in the immediate vicinity of the City of Edinburgh" is based on the two papers he read to the student Natural History Society at Edinburgh in 1790. The Linnean Society paper on the growth of plants is also reprinted. Besides these, the book contains 21 original papers of which the most important is "A sketch of the Mineralogy of Shropshire". There is also the short "Remarks on the Flos-ferri", reprinted here as Appendix II, to make it available to karst researches. Flos ferri is normally a fine quill-like form of antihodite occurring in clusters, but Townson's description suggests that he is thinking of helictites. He is unable to explain their formation, though stalactites, he thinks, result from simple evaporation of water. A reviewer (Anon. 1799b) may have found most of the book too technical: the Shropshire mineralogy is appreciated, but the papers on amphibian respiration are considered too lengthy, and the rest is "unimportant matter".

After this, Townson planned to write a three-volume "County History of Yorkshire" (Anon. 1802). He worked at it until 1805, when it was seen that there was insufficient demand to cover the cost of publication (Vallance & Torrens 1984). By then, too, he was planning to emigrate. A few years later it was recorded as having been an "unsuccessful attempt" (Anon. 1809).

At the end of his mineralogy book Townson (1798, p. [220]) announced as 'preparing for the Press' a book to be called "Benevolence, considered as a source of happiness" but this too seems never to have appeared.

It has been stated (Vallance & Torrens 1984) that "The Poor Man's Moraliser", which reached a 3rd edition in 1799, was written by Robert Townson. The British Museum General Catalogue of Printed Books firmly attributes this to the Rev. Thomas Townson (1715-1792), but in view of the previous paragraph it might be questioned whether its identification of the "Dr. T." of the title page is correct.

CONCLUSION

This paper provides information, not hitherto published in the field of karst studies, describing Robert Townson's life after he apparently "disappeared" from European view in 1799. He emigrated to Australia, became a successful vine-grower and farmer, and died in 1827. By drawing heavily on a paper published by Vallance & Torrens in 1984, together with other sources, it has been possible to provide more information about his earlier life in Europe, and to resolve some of the anomalies in the standard biographies.

Throughout the whole of his life up to his emigration in 1807, it will have been seen that Townson's main and continuing interest was in natural history and especially in mineralogy and geology:

- a) 1789-91. The friends who influenced him when he was studying at the University of Edinburgh included Joseph Black (Professor of Chemistry), James Hutton (geologist), Alexander Monro (Professor of Anatomy), Daniel Rutherford (Professor of Botany) and John Walker (Professor of Natural History). Later he came to know Sir Joseph Banks, for 45 years President of the Royal Society.
- b) 1790. The two papers he presented as a student at Edinburgh were on local geology.
- c) 1791. He was recommended for a post as naturalist in Canada.
- d) 1791-95. He studied in the Department of Natural History at Göttingen.
- e) 1793. Geological observations were an important part of his travels in Hungary.
- f) 1795. The studies he proposed to carry out in India were to be on its mineralogy, geology and physical geography.
- g) 1797. Publication of *Travels in Hungary...* with its petrographic map.
- h) 1798. Publication of *The Philosophy of Mineralogy*.
- j) 1799. Publication of his "Mineralogy of Shropshire", for which much of the research had been done some ten years earlier, with a collection of other natural history papers including "Remarks on the Flos-ferri".
- k) 1802. Intention to publish on the geology of Yorkshire.

The 1790s were a particularly active time in the development of geology, both because advances in chemistry were making it possible to understand more about rocks and minerals and because the fundamentally opposed ideas of the Neptunists (including Townson) and the Vulcanists explained their origin in totally different ways.

So it was an exciting time to be a naturalist and geologist. Whether or not his geological background made Townson any better an observer or recorder of caves is open to question. His view that caves "arise from the rock... giving way..." certainly did not advance knowledge of speleogenesis. On the other hand, he measured temperatures deep inside the cave at Aggtelek "with a view

to a certain the medium temperature of this part of Hungary". And in the Silica ice cave his observations and temperature measurements enabled him to refute Bel's (1739) statement, sent to the Royal Society, that the ice formed there during the summer.

Nevertheless his purpose in the Travels in Hungary... was mainly to describe these caves and not to conjecture how they had been formed. It was in his observation of the different kinds of rock in the country he visited, showing them on his 'žpetrographic' map and occasionally noting their relative positions, that his geological experience was of benefit.

At least the caves were seen by someone who was familiar with geological phenomena, and it may be that this was why he visited several during a relatively short visit. The shafts on the Alsó-hegy plateau would have been unlikely to attract the attention of a more conventional tourist.

ACKNOWLEDGEMENTS

I am particularly grateful to Dr Hugh Torrens of the University of Keele, who has been working on Townson's life for many years, for sending me copies of his publications. Kenneth and Virginia Pearson-Smith, the owners of Townson's land at Varroville, Sydney, shared some of their historical knowledge and allowed photographs to be taken; they also sent me prints from some old photographs. Ian Leister of Canberra located more historical material and made contact with the Pearson-Smiths, visiting Varroville and photographing it.

Biographical information came from Miss Broughton archivist of the Shropshire Record Office, Mrs Jo Currie of Edinburgh University Library, Dr Ulrich Hunger archivist of the Georg August University in Göttingen, and the staff of the Mitchell Library in Sydney who also arranged for the portrait of Townson to be copied. Chris Howes, FRPS, made the copy photographs for publication. I thank them all.

REFERENCES

- Almási Balogh, P. A., 1820: Baradla utazás 1818-dik esztendőben.- Tudományos Gyűjtemény 1820 (1), 63-90, Pest (cited by Hadobas 1991).
- Anon. 1796: [Review of] Roberti Townson Observationes physiologicae, &c.- The Monthly Review [2nd ser.], 20, Appendix 494-495, London.
- Anon. 1798: Literary memoirs of living authors of Great Britain...- London, R. Faulder, 2 vols. (2 : 325).
- Anon. 1799a: [Review of] Philosophy of mineralogy. By Robert Townson.- The Monthly Review [2nd ser.], 30, 326-328, London.
- Anon. 1799b: [Review of] Tracts and observations in natural history and physiology... By Robert Townson.- The Monthly Review [2nd ser.], 30, 409-410, London.

- Anon. 1802: *The Monthly Magazine*, 14 (2), Sept., 162, London.
- Anon. 1809: [Review of] *The history of Cleveland...* by John Graves.- *The Gentleman's Magazine* 79 [2] Feb., 138-141, London (p. 138).
- Anon. 1827: Doctor Townson [obituary].- *The Sydney Gazette*, 2 July.
- Anon. 1963: *Historic buildings 3. Liverpool and Campbelltown.*- Cumberland County Council, 25-29.
- Austin, M., 1967: Townson, John (1760-1835). Pp. 536-537 in *Australian dictionary of biography 1788-1850 2*, Melbourne University Press.
- [Beddoes, T.], 1797: [Review of] *Travels in Hungary...* By Robert Townson.- *The Monthly Review*, [2nd ser.], 24, Sept., 1-9; Oct., 169-176, London (author identified by H. S. Torrens, pers. comm. 1995).
- Bel, M., 1739: *Dias antrorum mirabilis naturae, glacialis alterius, alterius halitus noxios eructantis.*- *Philosophical Transactions of the Royal Society*, 41 (i) no 452, 41-56, London.
- Britten, J. & Boulger, G. S., 1893: *A biographical index of British and Irish botanists.*- London, West & Newman, xv, 222 p. (p. 170).
- Britten, J. & Boulger, G. S., 1914: *Jonathan Stokes and his commentaries.*- *Journal of Botany* 1914, 317-323, London (p. 323).
- Britten, J. & Boulger, G. S., 1931: *A biographical index of deceased British and Irish botanists.*- 2nd edn. London, Taylor & Francis. xxii, 342 p. (p. 303).
- Campbelltown City Council. [1995?]. *Varroville*. Unpublished, 2 p.
- C[arlyle], E. I., 1899: Townson, Robert (fl. 1792-1799). P. 133 in *The dictionary of national biography* 57, London, Smith, Elder.
- Charpentier, J. F. W., 1778: *Mineralogische Geographie der chursächsischen Lande.*- Leipzig, xlv, xvi, 432 p. (cited by Vallance & Torrens 1984, p. 393).
- Darvas, I., 1964: *Adalékok az Aggteleki (Baradla) barlang bejárása és feltérképezése történetéhez, irodalmához és bibliográfiájához.*- *Karszt és Barlang*, 1964 pt. 1, 1-11, Budapest.
- Dénes, G., 1972: *Az első irodalmi adat a tornai-Alsó-hegy zombolyairól.*- *Karszt és Barlang*, 1970 pt. 1, 19-20, Budapest.
- Desmond, R., 1977: *Dictionary of British and Irish botanists and horticulturalists.*- London, Taylor & Francis, xxvi, 747 p. (p. 615).
- Finney, C., 1993: *Paradise revealed Natural history in nineteenth century Australia.*- Melbourne, Museum of Victoria (p. 18).
- Goodin, V. W. E., 1967: Townson, Robert (1763-1827). Pp. 537-538 in *Australian dictionary of biography 1788-1850 2*, Melbourne University Press.
- Hadobás, S., 1991: *The first detailed description of Baradla Cave in Robert Townson's book published in 1797.*- *The International Caver Magazine* (1), 32-35, Swindon.
- Hadobás, S., 1992: *Passages concerning caves from Robert Townson's Hungarian travelbook.*- *Proceedings of the ALCADI '92 International Confe-*

- rence on Speleo History, Budapest, 1992, Karszt és Barlang, 33-36, Budapest.
- Hutton, J., 1795: *Theory of the earth, with proofs and illustrations.*- Edinburgh, Cadell, Junior & Davies, 2 vols.
- Maton, W. G., 1797: *Observations relative chiefly to the natural history, picturesque scenery, and antiquities, of the western counties of England, made in the years 1794 and 1796.*- Salisbury, J. Easton, 2 vols.
- Plihal, K., 1992: *Caves of the Carpathian basin on old maps.*- Proceedings of the ALCADI '92 International Conference on Speleo History, Budapest, 1992, Karszt és Barlang, 95-98, Budapest.
- Selle, G. von, 1937: *Die Matrikel der Georg=August=Universität zu Göttingen 1734-1837.*- Hildesheim & Leipzig, A. Lax, [vi], 935, [vii], 176, [i] p. (p. 335) [Veröffentlichungen der historischen Kommission für Hannover, 9].
- Steno, N., 1969: *Geological papers.*- Ed. G. Scherz. Odense University Press, 370 p. (pp. 235-248).
- Townson, R., 1794: *Objections against the perceptivity of plants, so far as is evinced by their external motions...*- Transactions of the Linnean Society 2, 267-272, London. (also reprinted in Townson 1799, p. 137-146.)
- Townson, R., 1794, 1795: *Observationes physiologicae de amphibiis.*- Parts 1, 2. Göttingen, 68 p.
- Townson, R., 1797a: *Travels in Hungary, with a short account of Vienna in the year 1793.*- London, G. G. & J. Robinson, xviii, [i], 506 p.
- Townson, R., 1797b: *The method of making excellent bread without yeast; as practised at Debretzin in Hungary.*- A Journal of Natural Philosophy, Chemistry, and the arts, London, 1. Sept., 267-268.
- Townson, R., 1798: *Philosophy of mineralogy.*- London, for the author, sold by J. White, xiv, 219, [iv] p.
- Townson, R., 1799: *Tracts and observations in natural history and physiology.*- London, printed for the author and sold by J. White, ix, 232 p.
- Vallance, T. G. & Torrens, H. S., 1984: *The Anglo-Australian traveller Robert Townson and his map of Hungarian "petrography" (1797).* Contributions to the history of geological mapping.- Proceedings of the 10th INHIGEO Symposium 16-22 August 1982, Budapest, 391-398.
- Vass, I., 1831a: *Az Agteleki barlang...*- Pest, Landerer, [vi], 82 p.
- Vass, I., 1831b: *Neue Beschreibung der Aggteleker Höhle Gömörer Comitats in Ungarn...*- Pest, Landerer, 88 p.
- Werner, A. G., 1787: *Kurze Klassifikation und Beschreibung der verschiedenen Gebirgsarten.*- Dresden, 28 p.

ROBERT TOWNSON, POPOTNIK PO MADŽARSKEM LETA 1793 - NJEGOVO ŽIVLJENJE IN DELO

Povzetek

Robert Townson (rodil se je v bližini Londona leta 1762, umrl leta 1827 v Avstraliji) je študiral medicino, kemijo in naravoslovje na univerzah v Edinburgu, Parizu, Dunaju in Göttingenu. Čeprav ni dokončal študija na nobeni od univerz, so ga imenovali za častnega doktorja prava v Edinburgu leta 1796. Potoval je po Italiji in Skandinaviji, nato pa je odšel na petmesečno potovanje po Madžarski in Slovaški. Rezultat tega potovanja je leta 1797 objavljena knjiga *Travels in Hungary*. V tem delu opisuje jame pri Aggteleku, na Silicki planini ter brezno Alsó-hegy. Delu je dodana tudi geološka karta, sestavljena na podlagi Townsonovih lastnih opazovanj. Strani, ki vsebujejo njegove opise jam so ponatisnjene v dodatku. 1798 in 1799 je izdal še deli geološke in naravoslovne vsebine.

1807 se je izselil v Avstralijo, kjer je nameraval nadaljevati z znanstvenim delom. Zaradi nesporazuma z guvernerjem države New South Wales je to opustil, nato pa se je preselil v bližino Sydneya, kjer je kmetoval in se ukvarjal z vinogradništvom. V prispevku je tudi reprodukcija njegovega portreta iz šestdesetih let in ocena njegovih knjig.

APPENDIX I

THE CAVE DESCRIPTIONS IN
TOWNSON (1797)

Saturday, July 14th, I left Csechau; but I again left the direct road to the Carpathian Alps, and struck off to the west. I was induced to this from hearing at Csechau, and not from the vulgar, but from learned doctors and professors, that at the distance of about a day's journey there were two great caverns; in one of which water froze during the summer, and ice thawed during the winter: whilst the other was so soft that one might wander about in it for a week without finding an end. Soon after leaving Csechau, I came to a quarry of the *Cervinus fissile* of Wallerius. At Csees, where I changed horses, the road began to draw nearer the hills, and the country became more pleasant: this is chiefly a corn country, Indian wheat was a good deal cultivated. Early in the evening I reached Nadekcs, the seat of Countess Giulais. The hills here, which are very high, are of unstratified compact limestone, without any petrifications, but

it is full of holes; some of these are so deep, and at the same time so round, that they look as if they had been formed by art. I passed the evening in a very dull manner; a rough gloomy priest was come here to be ready to perform divine service the next day; and though he ate copiously himself, he allowed none of the family to do so; and the Countess, and her niece, who was a very nice girl, and spoke very good French, who were all that far down to supper, fasted. I was a dreadful thorn in the side of this fellow, and vexed him grievously by eating a hearty supper, the whole of which he seemed to wish to possess.

Next morning I set out again for the caverns. I travelled at the foot of the same chain of hills; now and then some *Schiffus* made its appearance, but in general the lately mentioned limestone prevailed. About half way I changed my horses for oxen; but as they were only to draw me, or rather my baggage, over a high hill, where horses could have gone no faster, I did not suffer as in the last horned cattle expedition. About one o'clock I reached Aktoleg, and I took up my quarters with the Calvinist parish minister: he knew not a word of German, much less French or English, only the Hungarian and the Latin. Though this was Sunday, and the villagers were Calvinists, they were dancing and making merry.

I procured a guide, and the same evening I entered the cave; but it was chiefly with a view to ascertain the medium temperature of this part of Hungary. The thermometer in the shade, in the open

air, stood at 15 above 0 of Reaumur, but in the cave, a good way from the mouth, immersed in a running stream in different places, it stood at seven degrees; yet out of the water by the side of the rock it stood at seven and an half. Shall we suppose that all, or part of this water, came from melting snow, which, hid in some deep hole or cavern, had now only begun to thaw? this would render every experiment fallacious: or shall we suppose that the rock, however thick, was nevertheless affected by the heat of the atmosphere? As I left my thermometer an hour, it certainly, as it had but a small bulb, had time to take the true temperature of the medium which it was in. The water in the wells in the village was eight degrees. The above observations, though rendered less decisive by this difference, agree pretty well with those made by Mr. Haquet on the medicinal waters of Barfeld: he says, "at six o'clock in the morning, the water was ten degrees of Reaumur colder than the atmosphere, which was then 16 degrees." This brings the temperature of the waters to six degrees, which is a degree colder than that of this cavern; but Barfeld is about half a degree of latitude further north, and in a more elevated situation.

In the morning I returned to the cavern, to see how far I could penetrate into it, and to repeat my experiment with the thermometer, but by accident this was left behind. The report here is, that this cavern extends several miles under the hills, and that it would require several days to see the whole of it. The mouth of it is at

the bottom of a precipice about 150 feet high, at the west end of a compact unstratified limestone hill, which runs east and west. This entrance is about two yards broad, but so low that I was obliged to bend considerably to get in. I descended rapidly for a short distance, and then I found myself in an immense cave, with a very lofty vault; this has in different parts communication with other caves and passages, and these again with others. Some of these caverns are over one another; in some places I came to considerable streams of water; in one great cave my guide conducted me over a hill formed of great blocks of stone, which most probably had fallen down from the roof: in one place I had to get down a hole like the funnel of a chimney; then I was led into a cave where large stalactites, as thick as my body, hung pendent from the roof, and I was shown others where the sides were ornamented in the manner of the most curious Gothic workmanship. In some the stalactites were so thick and close together, that we were in danger of losing one another if we separated but a few yards. Here aged stalactites, overloaded with their own weight, had fallen down, and lay prostrate; and there an embryo stalactite was just shooting into existence. The most curious cavern was one apparently of modern date; the sides, and particularly the roof, seemed as if recently separated: and it was probably so, for I think most of these caverns have been formed by the falling in of the rock: very white and slender stalactites were only found here.

After I had wandered about for three or four hours in this awful gloom, and had reached the end of the caverns in one direction, I thought it time to come out, and I desired my guide to return. After we had returned, as we thought, some way, we found no passage further; yet the guide was sure he was right. I thought I recognised the same rocks we had just left, and which had prevented our proceeding further, but the guide was positive he was in a right direction. Luckily for us I had written my name on the soft clay of the bottom of the cave, which had been the extent of our journey; on seeing this the guide was as thunderstruck, and ran this way and that way, and knew not where he was, nor what to do. I desired him not to be frightened, but to go calmly to work to extricate us from this labyrinth. As the wood which we burnt instead of lamps was nearly exhausted, and as I never adverted either to one of the guides whom we had left above, who by being charged with wood could not get down the funnel-like hole, being so near; nor to the people of the village being acquainted with our being in the cavern, who no doubt would have taken every possible means of coming to our assistance had we stayed much longer than usual, I was a good deal alarmed for our safety, and there was good reason: had our torches gone out, we should never have been able to find our way out; nor, had any accident have happened to our guide, could we by ourselves, though we had had lights, have had any hopes of extricating ourselves. After wandering about till all our wood was nearly exhausted, we found a great flacatite from which, on account

of its remarkable whiteness, I had been induced to knock off a specimen as I came by: I recollected how I flied when I struck it: this at once set us right; and after walking a little further we made ourselves heard to the other guide, from whom we got fresh torches, and we then continued our route homewards without further difficulty.

So complete a labyrinth as these caverns are in some places, is not I am free to be' found but in similar caverns: large open passages proved *cul de sacs*, whilst our road was over and under, through and amongst grotto-work of the most intricate nature. I firmly believe, that though a man should have lights and food enough to last him a month, he would not be able to find his way out.

On the soil at the bottom of the cavern, my guides shewed me impressions which, they said, were from the wheels of a carriage. I thought immediately to have detected the error by measuring the distance of the marks of the two wheels at different distances: but I was mistaken; the marks were throughout parallel. Whether these were really the marks of a carriage I cannot say: I only observed them in the first part of the caverns. If the soil at the bottom at the mouth of the cave was taken away, I do not see any possibility, through the assistance of men, to get such a thing in thus far. It is known to have served as a hiding-place to the weak and unfortunate in time of war, and a sifter hiding-place there cannot be

I thought it probable that I was the first English traveller who had examined this immense cavern; but Mr. Korabinsky says *, "that it is of such astonishing dimensions in length, that two members of the Royal Society of London, who were sent some years ago into Hungary by the Society, to examine this and other curiosities, after remaining in it three days, could never get to the end of it, nor find an opening."

After dining with the pastor, who seemed to possess but a small portion of the good things of this world, I set out for the other famous cavern near Szilitz. I travelled by a bye road through a pleasant, hilly, and woody country, chiefly with pasture land. There I saw again my favourite little animal the Earless Marmot, which I had not seen since I left the great plain. I reached Szilitz early in the evening, and as before, I asked hospitality of the Calvinist minister, who likewise only knew his own language, the Hungarian, and the Latin. He seemed to be in more easy circumstances than the last, and to be a considerable farmer: all this district is inhabited by Calvinists. As the cavern is a mile from the village, I deferred seeing it till the next morning, when my host, who had nothing of the four Calvinist about him, accompanied me.

The immense vaults, and the glittering flacatites arranged in

* Lexicon von Ungarn, page 6.

Gothic style, of the last cavern, are not to be fought for here. This is only famed for possessing the remarkable nature of being really colder in summer than in winter; so that when the north east in winter blows, and the whole country is defaced with ice and snow, then the ice within this cavern begins to thaw; but when the parching heat of the canicule reigns, then its dripping rocks begin to be adorned with pellucid icicles.

This is not the opinion of the vulgar alone, but, in this country, of the learned likewise; it has even reached our country, and found its way into our Philosophical Transactions. The celebrated Hungarian historian Matthew Bell sent the following account of it to the Royal Society, who have inserted it in the 41st volume: "Natura Antri Id habet prodigi, quod cum extus verum intus minus riget, tepido sit intus aere; frigido contra, immo glaciali, cum sunt feruissimum soles. Nimirum, simul diffugiens nivibus vero intus caput, interior antri concameratio, qua ex meridiano soli dorso objicit, aquam limpida et passim diffusantem exsudat: qua, interni frigoris vi, in pellucidam glaciem concretescens, striae efficit, ad ingentium dolorum molem crassas, ac pendulas, inque ramos abeuntes miris illius specibus." And further adds, "Glaciale istud specus ingenium, totum festivum est: quod ideo admirationis habet plurimum; augetur enim cum increfcente solis ardore. Primo, nimirum, vere, hibernus ille tepor cessare; mox, ubi id adolevit, intendi frigus occipit, tantis accessibus, ut quo magis aer incalcescit, eo antrum frigate ex-

quisitus. At ubi aetas inlit, jamque fervet canicula, in glacielem
brumam intus about omnia."

This account agrees perfectly with the information I received at
Cafchau, and with what I heard on the spot likewise. Yet I know I
shall have no difficulty to persuade Natural Philosophers of the pre-
sent day, that there is a fallacy in the observations, and that this has
arisen from depending too much on our feelings, and neglecting the
only proper gage of heat and cold, the thermometer.

This cavern is about a hundred feet broad, a hundred and fifty
deep or long, and twenty or thirty feet high at the mouth or entrance
which faces the north: the descent is pretty rapid, the last third part
of the bottom or floor was covered with ice; but this was so thin
that I could see the rock under it. From the roof at the further end,
which was here much lower than at the entrance, hung an immense
icicle, or rather a congeries of icicles; and in a corner to the right,
which was not only deprived of the influence of the sun, as the
whole cavern is, but likewise of light, there was a great mass of
ice. It was a fine forenoon when I visited this natural ice-house;
and the air was heated by a July sun: as soon as I approached the
mouth of the cave, I felt a chill, which increased the further I went
in, and which rendered my continuance there, to observe the state of
the thermometer, very disagreeable.

Ice I truly found here in abundance, and it was near midsummer,
but in a state of thaw: the bed of ice, which covered the floor of
the cavern, was thinly covered with water, and the icicles dropped:
every thing announced a thaw. I had no need to use my thermo-
meter: however, I placed it in the ice, and it fell to 0 of Reaumur; I
then wiped it and placed it in a niche in the rock, at the further part
of the cavern, a yard above the ice, and here it remained near an
hour: when I returned I found it at 0. Thinking it might not have
had time to take the real degree of heat of the medium in which it
was in; I tried this by breathing upon it till it rose one degree above 0; I
then left it for a quarter of an hour only, and when I returned I
found it again at 0. Every thing here, therefore, ice, water, and the
atmosphere in the neighbourhood of these, had the same tempera-
ture, and that was the temperature of melting ice, 0 of Reaumur.

When then is the ice which is found here, and in such quantities
that this cavern serves the few opulent nobility in the neighbourhood as
an ice-house, formed? Surely in winter, though not by the first frost,
not so soon as ice is formed in the open air. No doubt, from the little
communication this cavern has with the atmosphere, it will be but
little and slowly affected by its changes. Should, therefore, Mr. Bell,
or any of his friends, have come here to verify the common report
at the commencement of a severe frost, when the whole country was
covered with ice and snow, they might still have found here nothing
but water, or the ice of the preceding winter in a state of thaw, and

the cavern relatively warm: and likewise, should they have visited
it in a warm spring, which had succeeded to a severe winter, they
might have found nothing here but frost and ice; and even the fresh
melted snow, percolating through the roof of this cavern, might again
have been congealed to ice.—I observed frequently in Germany,
in the severe winter of 1794-5, on a sudden thaw, that the walls of
churches and other public buildings, on the outside were white, and
covered with a hoar frost, and their windows on the same side covered
with a rime. I certainly should not have said so much on this sub-
ject, were not the opinion I have been combating so very general.
This cavern is like all that I have seen, in a primitive or unstratified
compact lime-stone; and it is curious to observe, that the most fa-
mous in the world are of this kind of rock. I think they arise
from the rock, whatever that may be, giving way which supports
them.

APPENDIX II

TOWNSON'S PAPER ON FLOS FERRI, FROM HIS 1799 BOOK

Remarks on the Flos-ferri.

THE manner in which stalactites are formed, is, I believe, well understood. It is easy to conceive that by the gradual dissipation of a solvent the matter held in solution may be deposited, and assume all the various forms that the solution at one or different times had been in. Thus we can account for the form of any stalactite which has such a one as the dripping fluid can have existed in, either through its own natural gravitation or through the joint powers of gravitation and the attraction of some body in contact, but by no means of those forms in which we know a fluid body could not in any circumstances have been.

Reasoning thus, I am unable to account for the formation of that beautiful fossil the Flos-ferri, found in its greatest perfection in the iron mines of Eisenärtz in Styria, which not only differs from all other stalactites in its forms but in its texture. In regard to its form it is generally branched, but whether simple or branched the parts are by no means straight but curved, and in the same specimen curved in very different directions. Where the branches shoot out, that is at the *axillae*, it is

no thicker than in other parts, and frequently a simple undivided shoot, three inches long, is no thicker towards its base than towards its point. In the direction of its growth, the Flos-ferri differs not less from the common stalactites, whose long cylindrical forms are never found in a horizontal situation, and in which direction we know they never can be formed. Yet in the great mine of spatous iron ore of Styria, I have seen both the sides of a vertical fissure covered with the flos-ferri. The texture of this fossil likewise greatly differs from the common stalactites. It is not compact, nor is it composed of concentric cylindrical plates, but of obliquely divergent fibres.

These peculiarities lead me to think that it is formed in a different manner from common stalactites, and I offer these remarks to those who have an opportunity of observing this fossil in its birth-place, that they may investigate its formation.—It is not foreign to the present subject to mention that a few years ago I found on the side of a chalk rock on the turnpike road, somewhere between Portsmouth and Guildford, a fine white light body resembling very much in its structure, the *lyfseus aspera*; being in haste I put a small specimen between the as-skin leaves of my pocket book, which, when I went to examine, I found reduced to powder. It was insoluble in water, but soluble with effervescence in nitrous acid. It is probable that this singular production was of the nature of the flos-ferri, and might be denominated *Inolithus-byfsoides*, or *Stalactites-byfsoides*. But these remarks are only offered as hints to future observers.