

## **Adolf Schmidl (1802 - 1863) the father of modern speleology?**

by

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The two men who have had the greatest influence on the development of speleology as a whole were A. Adolf Schmidl and E. A. Martel. Admittedly much good work had been done before their time in the form of difficult explorations, regional studies, explanations of speleothem formation, theories of speleogenesis etc., but no one had previously brought together more than a few aspects of the science now called speleology.

Schmidl, and later Martel, made a conscious effort to bring the various branches of cave study together, both in research and in publication, and it is significant that all the words used to denote the subject as a whole were introduced in their time. The earliest word for this purpose in any language was Höhlenkunde, meaning cave study. It was introduced by Schmidl (1826, p. 564) in a paper read to a learned society in Vienna on 5 December 1850, and subsequently the word Höhlenforschung was used for the exploration of caves. Both are still in current use in the German language. The now universally used «speleology», with its variants, is said to have been created by Emile Riviére, the prehistorian, about 1890 (Martel, 1931, p. 11). Its general adoption began when it was taken up by Martel.

A. Adolf Schmidl was born on 18 May 1802 at Königswart in Bohemia. He studied philosophy and law in Vienna from 1819 to 1825, where he later obtained his doctorate, and then he took up teaching. After a period as a school teacher in Vienna he became tutor in the family of Prince Ferdinand Lobkowitz. His inclinations at that time were already towards writing and in 1831 his first book appeared, a topographical study of the Schneeberg, to be followed by at least 27 other topographical books besides his cave publications. From 1844 to 1847 he edited the «Österreichischen Blätter für Literatur und Kunst» and then between 1847 and 1857 he was principal registrar of the new-

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ly founded Kaiserliche Akademie der Wissenschaften (Imperial Academy of Science) in Vienna. It was during this relatively short period that almost the whole of his cave work was done. His removal to Budapest in 1857 when he was appointed professor of geography and history at the polytechnic there seemed to bring it more or less to an end. He remained at Budapest until his death on 20 Novembre 1863 (Anon, 1858; Anon, 1861; Schmidt, 1863; Wurzbach 1869; S., 1890; Poggendorf, 1896; Meister, 1947; Rakovec et al. 1960, 1967. The little-known portrait reproduced here is from an obituary, (Schmidt, 1864).

Nearly all Schmidl's cave explorations took place in Slovenia, Austria and Hungary. In 1850 he set out with the avowed intention of «establishing the exact topography of the caves» of Slovenia (47, p. vi), exploring and recording meticulously and having accurate surveys made by his companion Ivan Rudolf. It is particularly significant that this was not done just in order to extend the tourist caves. His accounts of the several caves of the Postojna system, and of Predjamski jama, Škocjanska jama, Križna jama and other caves provided the first exact descriptions of them.

In Postojnska jama itself, his major achievement was the discovery of nearly half a kilometre more of the underground river Pivka. He reached its hidden course just downstream of the Velika Dvorana, not by the sump that Haquet had found open in 1774 but by another route which bypassed it. Even so, the exploration required very dry conditions for the two intermediate sumps to be passable. He pushed ahead for a distance of 570 m, the first part of which Haquet had already visited, and got as far as the Spodnji Tartar (47, p. 47, 148 & plate 2). On this occasion Schmidl was accompanied by his son Ferdinand. They set off, with a boat, on 30 August 1850 and continued all night. The danger was the rate at which the Pivka rises after a storm, sealing the sumps and blocking the way out. Such a storm did break over the area that afternoon and eight hours later (at 1 a.m. the next morning), the level was up by 3 m, effectively cutting off their return for a while.

Stopped in Postojnska jama, at least for the present, Schmidl turned to the Pivka's resurgence and investigated the Planina cave in 1852 (47 p. 127-151). According to Rudolf's plan (47, 2, plate 10) they explored a total distance of 6000 m there (475 m up to the junction, plus 2865 m in the south branch and 2660 m in the other). They used a specially made wooden canoe which could be taken to pieces for ease of carrying in small passages. In the western branch of the cave the canoe had to be unloaded and dragged through the shallow water no less than eleven times, as well as being dismantled altogether at one point. The south branch was generally easier to navigate, although there were rapids in one place; in another spot the boat had to be taken to pieces where the water disappeared beneath boulders, and reassembled beyond it.

They also broke new ground in other caves of the same system, between Planina and Postojna. Schmidl's records of the water temperature, taken at many points primarily in connection with studies on the blind amphibian *Proteus anguinus*, also aided his deductions regarding the interconnection of the various caves. In the Črna jama they followed in Nagel's footsteps and then found about 250 m of new passage in its north-east corner. The next open pit to the north of Črna jama is the 65 m deep Pivka jama and, in August 1852, Schmidl and Rudolf were the first to explore it. They found and surveyed 950 m then and added some relatively minor extensions in the autumn of the following year (47, p. 106-113, 301-306).

Schmidl's equally significant though much less lengthy discoveries in Skočjanska jama took place in the spring of 1851. It is in this cave that the river Reka (or Timavo) sinks. Its underground course of some 35 km passes behind Trieste and had already attracted attention as a possible source of water supply for that city. He spent six weeks investigating the hydrology of the whole system. In Skočjanska jama itself he and Rudolf, together with Domenico Battelini a Trieste fireman, succeeded in reaching the sixth cascade, some 400 m from the entrance. This was not in fact very much further than Svetina had got by boat in 1840, but their method of approach provided the key to the successful expeditions of the 1880s and 1890s. They realized that it was impossible to follow the bed of the stream itself very far and came to the conclusion that they could only progress if they could find a ledge along one of the walls. This became possible when Schmidl discovered what is now called the Schmidlova jama, on the west side of the doline at Skočjan. It was an earlier channel of the river, at a higher level, and gave access to ledges some 80 m up on the wall of the present river cave (34).

Closer to Trieste itself the underground river had been reached in 1841 by Lindner in the Grotta di Trebiciano. It is not clear whether or not Schmidl descended Trebiciano himself, but at any rate he used data on the water level there. By tabulating this level, together with that at the sink and the rising, he obtained the gradients for the underground river, which seemed reasonable, and he also recorded the water temperature and the speed of flow (the linear velocity, not the volumetric flow) to aid in assessing its suitability as a water supply.

After 1854 he made only one small but important discovery in Slovenia. As late as 1856 in Postojna he connected the two halves of the Male jame passage, which had formerly consisted of two cul-de-sacs. What he did was to unblock a 15 m long collapsed section of passage after the survey had indicated the connection (Martel, 1849, p. 439; 55).

In 1855 Schmidl turned his attention to Austria. In particular he explored the



Fig. 1 - Adolf Schmidt

Geldloch in August and published a plan (54) which showed very little more than Strein had reached in 1592. He did not reach the shafts which are now known to attain a depth of 432 m, for the passage leading in that direction was

thought to be «inaccessible even on all fours». His published account is very detailed and pays particular attention to temperatures and to barometric pressures as a means of determining altitudes in the cave. It was in the same paper that he drew attention for the first time to Strein's 16th century exploration of the cave, and printed Strein's manuscript in its entirety.

In August of the following year he made a thorough investigation of the Aggtelek Cave in Hungary which, with its length of 8.667 km, remained the longest cave in Europe until 1893 when new discoveries at Postojna brought the latter to 10 km (49, p. 597-608). Once again he included tables of temperature readings and also a note on cave fauna.

The value of Schmidl's work is greatly enhanced by the surveys made by his colleague Ivan Rudolf who probably accompanied him on most of his explorations. Rudolf was born near Idrija in 1821 and became an engineer, first at the mercury mines there and then at Rabelj. His name is commemorated in the Rudolf Chamber at Skocjanska jama and Rudolf's Passage in Planina. The published surveys (47, 2, plates 2, 7, 10) show 5850 m in Postojnska jama, 6000 m in Planina, 493 m Crna jama (which he miscalls Magdalena-Grotte as Nagel and others has done before), and also 1080 m in Predjamski jama. The Postojna plan was also printed again at a smaller scale, superimposed in colour on a relief map of the ground above so as to relate the cave to the surface topography (47, 2, plate 1). Many of the other caves in the district must have been surveyed by Rudolf, or at least measured, for Schmidl (47/, p. 203) gave a table of length for eleven caves in all. The total passage length amounted to 19,110 m. These figures were for the caves as they were known at the end of 1852, and several of them were enlarged later by their subsequent discoveries. Schmidl's concern with underground hydrology as a useful product of cave exploring has already been mentioned in the case of the Timavo water sinking at Skocjanska jama. He was interested too in the origin of the two streams which merge underground in the Planina cave, though here he was only partly correct. A proportion of the underground water from the Čerknica lake and the river Rak flows direct to the eastern source of the Unica (the river which rises principally at Planina) without appearing in the Planina cave at all. Schmidl (47, p. 153) was the first person to appreciate this and it probably influenced him in his incorrect belief that none of the Planina water comes from Čerknica. In fact most of the water from there does flow, via the Rakov Skocjan polje, to join the Postojna water inside the Planina cave, whence they emerge together as the western source of the Unica. The actual junction of these two streams underground had been known since 1748 or before but their origins remained in dispute for many years. Father Anton Urbas (1849) supposed correctly in 1848 that the south branch was fed from Čerknica and the west one from Postojna. Schmidl (47), on the other hand, considered that it was the

south branch which received the Pivka water, while the other one drained the Kaltenfeld plateau to the west.

Although Schmidl's exploration of caves and his accurate recording of them account to a large degree for his importance, he also had a wider interest in caves as an environment. His temperature measurements, of both water and air, have been noted already. The former were largely taken for use in cave fauna studies; the latter, together with the barometric readings he used primarily for altitudes, reveal his interest in cave meteorology.

In the Postojna cave he took hourly barometer and thermometer readings inside the cave over a 24 hour period in 1852, for comparison with simultaneous readings in the market place of Postojna. The temperature of the latter varied from 9.6° to 15.4°C, while inside it remained between 6.8° and 7.0° (47, p. 177). He tabulated readings of air and water temperature, humidity and barometric pressure in seven other caves in the district, comparing his own readings with those of previous workers. The Hungarian ice cave of Lednica near Szilutze attracted particular attention (49, p. 614-616).

The mechanisms of cave formation evidently did not interest Schmidl a lot but he did express an opinion on the origin of dolines. Although the majority of dolines are in fact caused by solution widening of joints in the limestone, there are in Slovenia some spectacular dolines caused predominantly by collapse into caves beneath. No doubt it was because of these impressive examples in the area he knew so well that Schmidl (47, p. 193) became convinced that all dolines were of similar origin. His writings had considerable influence and he has been credited as «the founder of the collapse theory» (Cvijić, 1960) although he was far from being the first to uphold it. In a later book (65, p. 29-32) he devoted some attention to speleogenesis itself.

The study of cave fauna was already a specialist subject in Schmidl's time. He undertook very little original research in it himself, though some of his water temperature measurements were made in connection with studies on *Proteus anguinus* (25, p. 231). What is significant, though, is that he regarded such studies as a proper part of speleology. Thus his major book on the caves of the Postojna district includes important sections by Schiner (1854) on cave fauna and by Pokorný (1854) on cave flora. Zippe (1854) contributed a section on geological and palaeontological aspects.

It is this breadth of his interests in cave studies, coupled with the extent of his discoveries and the technical difficulties he surmounted, that justify Schmidl's reputation as the father of modern speleology.

Schmidl's importance does not rest solely on his achievements, considerable as these were, but also on the influence he had on his successors. All his explorations were recorded in detail, with precise descriptions and accurate sur-



veying, and, as has been seen, associated scientific work was also included. Most of this material was published in scientific periodicals, accessible but not prominent. More influential was his separately published book *Die Grotten und Höhlen von Adelsberg, Lueg, Planina und Laas* (47). The closely written text, generally descriptive, gives full summaries of previous work and a separate volume of large format contains the plans and also eleven lithographs for which Schmidl was his own artist. Clearly it was intended at the time that this book would be the first volume of several, for apposite the main title page appears a series title *Zur Höhlenkunde des Karstes*. This intention was never realized, overtaken perhaps by Schmidl's new duties in Budapest after 1857.

Martel himself spoke very highly of this book. It «must be considered as the first of its type, and its author as the real originator of speleology or the scientific study of caves» (Martel, 1894, p. 435). Again, it is «selon moi, le point de départ réel de la Spéléologie» (Martel, 1905-06, p. 5).

Mention of Martel brings us to the inevitable comparison between the two men whose roles were somewhat similar. In any developing science, the later worker brings it more nearly to its present state but he builds on the foundations laid by his predecessors. The earlier man, on the other hand, starts from a more primitive state and might be expected to make more fundamental changes. Thus it is not easy to say which of the two is the more important.

Some facts about the two men's work may be compared, however. Schmidl was actively involved with caves for some seven years; Martel's period of active exploration lasted for 26 years and he continued to study and write about them for a further 23. Schmidl's investigations were confined to fairly adjacent areas of central and south-east Europe, whereas Martel's while predominantly in France, ranged also into all parts of Europe as well as Russia and America. Schmidl's main published writings on caves amount to 3 books and several dozen papers, whilst Martel produced some 20 books and 780 papers, many of them translated and published abroad. The speleological societies set up in Austria from 1879 onwards may owe something to Schmidl's influence; Martel himself founded the Société de Spéléologie in 1895, which had a significantly international function.

This is not to say necessarily that Martel was of more importance than Schmidl in the history of speleology. Certainly his achievements were greater but that was largely the product of the very much longer period for which he was active, coupled with the fact that by then speleology already existed as a recognized and organized subject, at least in the German speaking parts of southern and central Europe. That it did so exist is undoubtedly due in some measure to the influence of Schmidl a generation before.

In any case Schmidl was without question the first person to treat speleology

as a single coherent whole - its originator as a science as well («Höhlenkunde») as a word.

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#### SUMMARY

A. Adolf Schmidl (1802-1863) was the first person to regard speleology as a single coherent subject. Besides making important new explorations, he studied karst hydrology and underground meteorology and was also closely concerned with the work of others on cave fauna and flora. His publications ensured that his achievements were known to his successors, but his influence was less widespread than that of Martel who nevertheless called him «the real originator of speleology».

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45. Knochen von *Ursus spelaeus* aus der Kreuzberghöhle bei Lass in Krain. *Jahrb. d. k.k. geol. Reichsanstalt*, Wien, 4 (4):843 (abstract).
46. Wegweiser in die Adelsberger Grotte und die benachbarten Höhlen des Karst. Wien, *W. Braumüller*, xvi, 88p.

## 1854

47. Die Grotte und Höhlen von Adelsberg, Lueg, Planina und Laas. Wien, *W. Braumüller*, 2 vols; 8vo, viii, 316, [1]p and obl. fol., 15 ff.  
[Zur Höhlenkunde des Karstes].  
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48. Guide du voyageur dans la Grotte d'Adelsberg et les cavernes voisines du Karst. Wien, *W. Braumüller*, xv + 80p. (translation of (46) by P.E. Obermayer).

## 1856

49. Die Baradla-Höhle bei Aggtelek und die Lednica-Eishöhle bei Szilitz in Gömörer Comitate Ungarns. *Sber. Akad. Wiss. Wien, Math.-naturwissen Classe*, 22 (2):579-621;  
also published separately, 1857, Wien, 45p\* (National Széchényi Library).
50. Der Mons Cetius des Ptolomäus. *Sber. Akad. Wiss. Wien, Phil.-hist. Classe*, 20 (2):338-352.

## 1857

51. Das Kaiserthum Oesterreich. Geografisch, statistisch, topografisch mit alphabetischen Ortslexikon. Nach den neuesten Daten und amtlichen Quellen. Wien, *L.C. Zamarski*, [viii], xxxviii, [ii], 641 p.  
[Der grosse österreichische Hausschatz]  
(main title page dated 1857, but issued in 7 parts, 1856-1857).
52. Aus den Mährischen Höhlen. *Abendblatt der Wiener Zeitung* (226), 3 Oct:[901]-902; (227), 5 Oct:[905].
53. A notice of the Baradla Cavern, near Agtelek, in Hungary. *Ann. Mag. nat. Hist.*, ser. 2, 20:79 (English summary of (49)).
54. Die Höhlen des Öischer. *Sber. Akad. Wiss. Wien, Math.-naturwissen Classe*, 24 (2):180-230.

## 1858

55. Wegweiser in die Adelsberger Grotte und die benachbarten Höhlen des Karsts. Wien, *C. Gerold*, 2nd. edn. [revised], xvi, 93p.
56. Geographie für Handels- und Gewerbeschulen. Budapest, *G. Heckenast*, 112 p.

57. Die Donau von Ulm bis Wien. \* (S., 1890).  
 58. Die österreichischen Höhlen. Eine geographische Skizze. Budapest, *G. Emich*, 27p. (there are two versions of the title page; in one (the earliest?) the author's name is printed as Schmiedl).

1859

59. Die Donau von Wien bis zur Mündung. Leipzig, *Bruckhaus*, 137p. \* (Szinnyci, 1908, National Széchényi Library).

1860

60. Abriss einer Industrie- und Handelsgeographie. Budapest, *G. Heckenast*, 572p. + 2nd. edn. 1865.  
 61. Die Elemente der Geographie in 2 Lehrkursen für Unter-gymnasien und Unter-Realschulen. Budapest, *G. Heckenast*, 112 p.

1861

62. Die Wasserversorgung Triests aus der unterirdischen Recca. *Wiener Zeitung* (166), 19 July:2630.

1863

63. Die Abaligether Höhle, *Sber. Akad. Wiss. Wien, Math-naturwissen Classe*, 48 (4):346-360.  
 64. Die österreichischen Höhlen. *Öst. Revue*, [1] (4):[273]-290; (5):[270]-290.  
 65. Das Bihar-Gebirge an der Grenze von Ungarn und Siebenbürgen. Wien, *Forster & Martellus*, xv, [i], 442 p. (containing much on the karst and caves of what is now Romania).  
 66. Die Öfter Thermen. (Fragment). *Öst. Revue*, [1] (6):[283]-287. (left unfinished at his death).

## MANUSCRIPTS

1843

67. Autograph letter, signed and dated 1 Nov. at Wien, written to Dr. S. von Horvátz, appealing for material to publish in the forthcoming journal, *Blätter für Literatur und Kunst*, of which Schmidl was the editor.  
 [2] ff., 283 mm. *National Széchényi Library MSS*, Budapest. +

1844 - 1845

68. 11 autograph letters, signed, as follows:
- |               |      |        |         |
|---------------|------|--------|---------|
| 12.10 [1844?] |      | [1] ff | 220 mm. |
| 21.10 [1]844  | Wien | [3] ff | 235 mm. |
| 5.11 [1]844   | Wien | [2] ff | 235 mm. |
| 2.12 [1]844   | Wien | [2] ff | 235 mm. |
| 8.12 [1]844   | Wien | [2] ff | 235 mm. |
| 13.3 [1]845   |      | [1] ff | 236 mm. |
| 5.5 [1]845    |      | [2] ff | 235 mm. |
| 10.6 [1]845   | Wien | [2] ff | 235 mm. |
| 23.10 [1]845  |      | [1] ff | 219 mm. |
| [1845?]       |      | [1] ff | 234 mm. |
| [1845?]       |      | [2] ff | 235 mm. |

*Oesterreichischen Nationalbibliothek Autogr.* 273/32, 1-11, +

1848

69. Autograph application, dated 6 Sept., [3] ff., 333 mm. *Archiv der Universität Wien*. +

- 1850? - 1862
70. 4 autograph letters, signed, written to H. Laube, as follows:  
 27.12[1]1850[?] [2] ff 202 mm 164/38-1  
 7.11 [1]1858 Budapest [2] ff 252 mm 164/38-4  
 8.2.1859 [?] [2] ff 202 mm 164/38-2  
 28.10 [1]1862 Budapest [2] ff 241 mm 164/38-3  
*Österreichische Nationalbibliothek Autogr., 164/38, 1-4, 4*
- 1852
71. Autograph report to the [Adelsberger] Grotten Verwaltungs-Commission dated 17 Sept 1852. [4] ff, 340 mm. *Institut za Raziskovanje Krasa, Postojna; Archives of Postojnska jama, Schmidl folder.*
- 1852, 1854
72. 4 autograph letters, signed, written to the Adelsberger Grotten Verwaltungs-Commission, as follows:  
 [shortly before 12 July 1852] [2] ff 277 mm.  
 21.9 [1]1852 [2] ff 281 mm. enclosing [2] ff 231 mm  
 1 Nov 1852 [2] ff 288 mm.  
 20.7 [1]1854 [1] f 281 mm.  
*Institut za Raziskovanje Krasa, Postojna; Archives of Postojnska jama, Schmidl folder.*
- 1863
73. Autograph letter, signed, dated at Budapest 7 Mar., written to F.v. [on] Miklosich [2] ff., 290 mm.  
*Österreichische Nationalbibliothek Autogr. 138/26-1. 4*

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 \* (Bertalan & Schöviszky, 1973, p. 175).  
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