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SOCIETÀ SPELEOLOGICA ITALIANA

3RD INTERNATIONAL SYMPOSIUM ON UNDERGROUND QUARRIES

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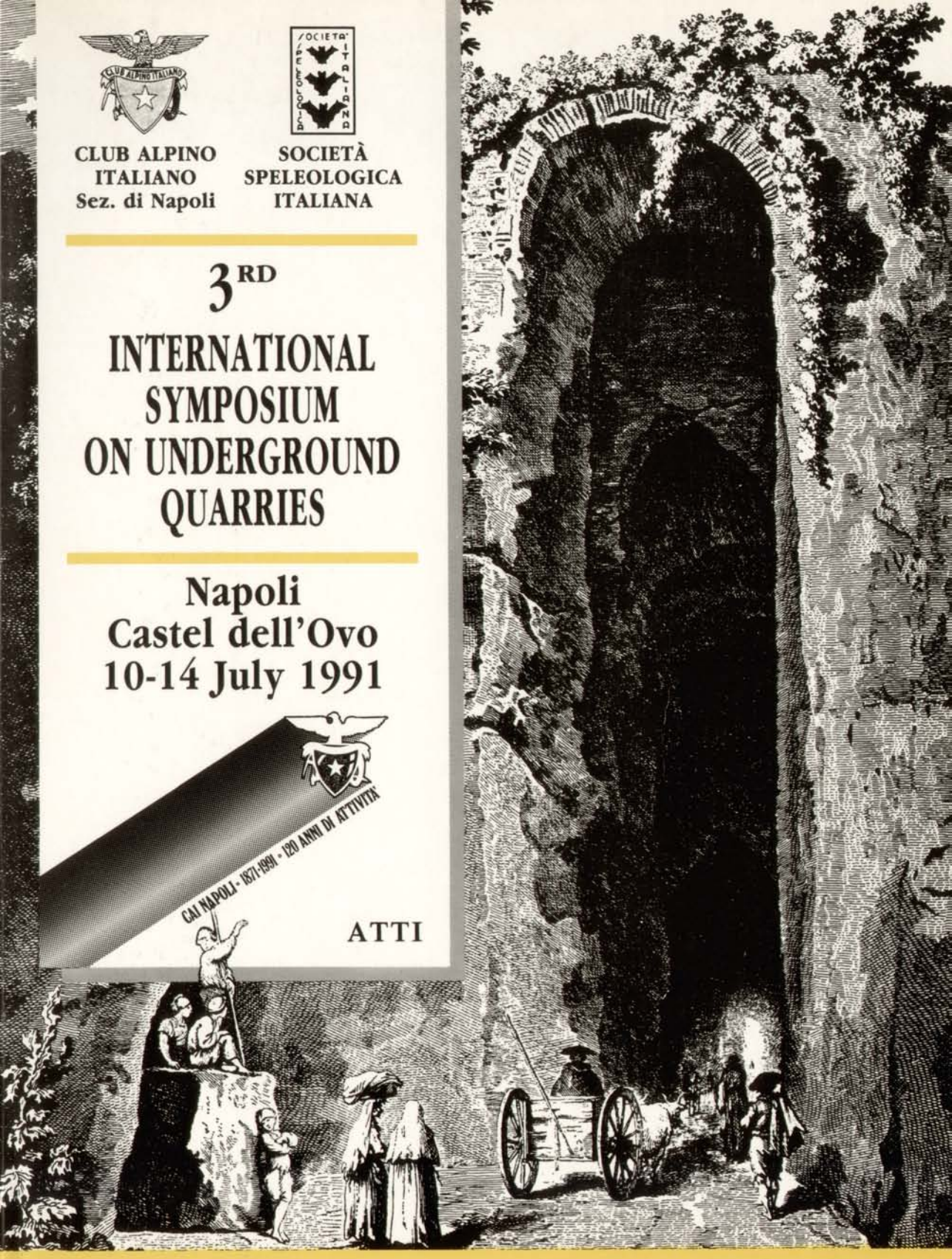

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A T T I

a cura di R. Paone e C. Piciocchi

Napoli - Castel dell'Ovo - 10/14 July 1991

KOLOWRAT GALLERY: AN UNIQUE UNDERGROUND LIMESTONE MINE NEAR LORETA, WEST BOHEMIA

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Riassunto

La galleria di Kolowrat fu trovata nel 1889. Essa rappresenta un tipo insolito di miniera di calcare per la produzione di calce. Ne venivano estratte pietre calcaree del Gruppo Misto (Moldanubico, Proterozoico). Lo sfruttamento della miniera può essere suddiviso in tre periodi: 1) estrazione delle pietre calcaree in piccole cavità; 2) scavo di condotti poco profondi; 3) estrazioni sotterranee. Le estrazioni terminarono, secondo varie fonti, nel 1910 o nel 1921/1922.

Introduction

Loreta is situated approx.5 km to SSW from the regional capital of Klatovy in the West Bohemia. The site is located at the foot of the rounded hill (538 m a.s.l.). The entrance to the old underground mine is situated at the wall of small quarry. The ancient portal dated 1889 opens system of subsurface galleries, shafts and adits driven in three levels. The upper one is represented by funnel-shaped chambers (chutes) with original length estimated to about 100m. Recently, nearly all of them are collapsed. The middle level is the most extensive with 600 m of galleries. The largest chambers are 10m wide and high. The lower level is somewhat shorter (about 400 m long) and substantially narrower, except of one chamber (Bosák, Sýkora and Tůma 1983; Bosák 1986).

The old minings were founded in the lens of pure crystalline limestones (marbles) surrounded by cordierite migmatites and biotite pearl gneisses (Varied Group, Moldanubicum, ?Proterozoic). The shape of mine galleries reflects the sigmoidal curvature of the lens, which is 500m long and about 15m thick. Limestones are highly fractured and, in places, intensively karstified (Bosák, Sýkora and Tůma 1983). Surface sink-holes are up to 6m deep with diameter of max. 15 m. Cave sizes vary from fine tubes and anastomoses up to tunnel-shaped cave passages 55 m long with diameter of 2 to 2.5 m. The natural and underground cavities represent one of the most important places for the bat hibernation in the West Bohemia region (Bosák et al. in press).

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Archivalia

Archive information on the deposit and history of its exploitation are scarce. Some notes on the mining were published by Sommer (1839). All archivalia from the former demesne of Counts of Kolowrat, who realized the mining and after the World War I of the Týnec Agricultural Enterprises, which continued the exploitation, disappeared after the World War II.

Some old sold-day books dated to 1854 to 1922 dicovered Hofmann (1981). They illustrate finances of the estate and also of the lime factory and limestone mine, together with financial demands of mining, lime production, construction of lime factory etc. The profit of lime production had decreasing tendence with conjunctural hights and lows, some years reaching 80% of all income, sometimes falling only to 8-9%. The high rate of the pure profit at the beginning of lime production was connected to high quality of limestone, character of the deposit (thickness, geological setting etc.), low or zero costs of fuel (firewood came from the estate) and other circumstances (Hofmann 1981).

Quarrying

Surface mining in quarries can be dated back to the end of the 18th Century (Sommer 1839). Limestones were mined in small and narrow quarries following the shape of the limestone body. Quarries were founded either on natural rock outcrops on hill slopes or in karst depressions, which rests are visible in some places even in the present time. Surface reserves were exhausted in a very short time. Therefore, the estate owners decided to start underground exploitation.

Underground mining

Underground mining started by the sinking of shallow shafts from bottoms of pre-existing quarries. Small adits in two levels were excavated from shafts in the direction of the deposit. The waste was accumulated along shafts on the surface prolonging their depths. This type of exploitation was used in 1882 to 1909. Data of Hofmann (1981) indicate, that the underground mining started even shortly before 1872, when the price of 16m of rope is noted in sold-day books.

After shallow parts were exhausted, small galleries and shafts collapsed. The surface level above them sunk. Irregular close depressions originated by this way. The largest is 330 m long, 10 m wide and 5 to 15 m deep (Tůma and Bosák 1981).

Because of the high effectiveness of the mining, estate owners wanted to exploit also deeper parts of the deposit. Therefore, horizontal gallery was excavated in 1888 to 1889 on the eastern slope of the hill. After 70 m of mining in gneisses, the adit entered limestone lens. Mining continued to the year 1910, according to Hofmann (1981) the ex-

ploitation finished even in 1921/1922, when stopped for the nonprofitableness. The last mining experiments are dated to 1939-1940.

The largest underground chambers can be aligned to the period, most probably. According to local inhabitants, some works were carried out even at the end of the World War II. Large collapses at the end of some passages are probably of this time.

Exploitation techniques

The exploitation technique at the end of the mining was relatively simple. The inclined shaft (access adit) leads after 70m into blind vertical shafts 15 m deep. One was equipped by hand winch with lift. The second is encircled by the spiral gallery. Both shafts connect the middle and lower levels of the mine. The transport of limestone mined was realized by hand trucks from the lower to the middle level using hand lift and by access adit to the surface. Probably, hand trucks were transported back to the lower level by hand using descending spiral gallery. Several funnel-shaped chutes connect the upper and middle levels of the mine. Mined material was transported again by hand trucks to the surface. Today, the upper level is collapsed except of small relicts.

The limestone was mined in the whole thickness of the lens. This is reflected also in gallery profiles. In large exploitation chambers, columns were left for the roof stability. Owing to the endeavour to exploit the maximum volume of the limestone, the roof between mine levels is only 1 to 4 m thick. Mining in hard limestones was carried out by blasting material. In relatively soft gneisses, hand work using chisel was applied. Traces of chisel can be observed on gallery walls even in the present time. At some places in the mine, karst cavities were opened. They were filled with the waste. Two attempts of the chamber style of mining were carried out in the western end of the middle level. The second entrance to the mine was opened by this way in the bottom of relatively large sinkhole.

Relicts of lines, hand trucks, timber support and complete hand lift with winch are preserved underground. The total length of the Kolowrat Gallery was approximately 1400 m. Only 110 m of them is accessible in the present time. The heigth distance between the upper and lower levels is 25 to 30 m. The upper level is situated about 20 m under the surface, i.e. below the bottom of old sunken depressions. Relicts of old adits from 1882 to 1909 occur between the surface and the upper mine level.

Conclusions

This type of mining and limestone exploitation to obtain raw material for lime production is an unique feature not only in West Bohemian region where numerous limestone lenses were quarried, but in the whole area of the Czech countries and also in the Slovakia. The underground mining was applied because mine owners (Counts of Kolowrat, later

the Týnec Agricultural Enterprises) wanted to be self-sufficient in the production of lime. We suppose, that this possibility was real. The local consumption of lime was low. Only 3 to 5 workers were employed in underground and in small lime factory, newly recontructed in 1888 to 1889 (Hofmann 1981).

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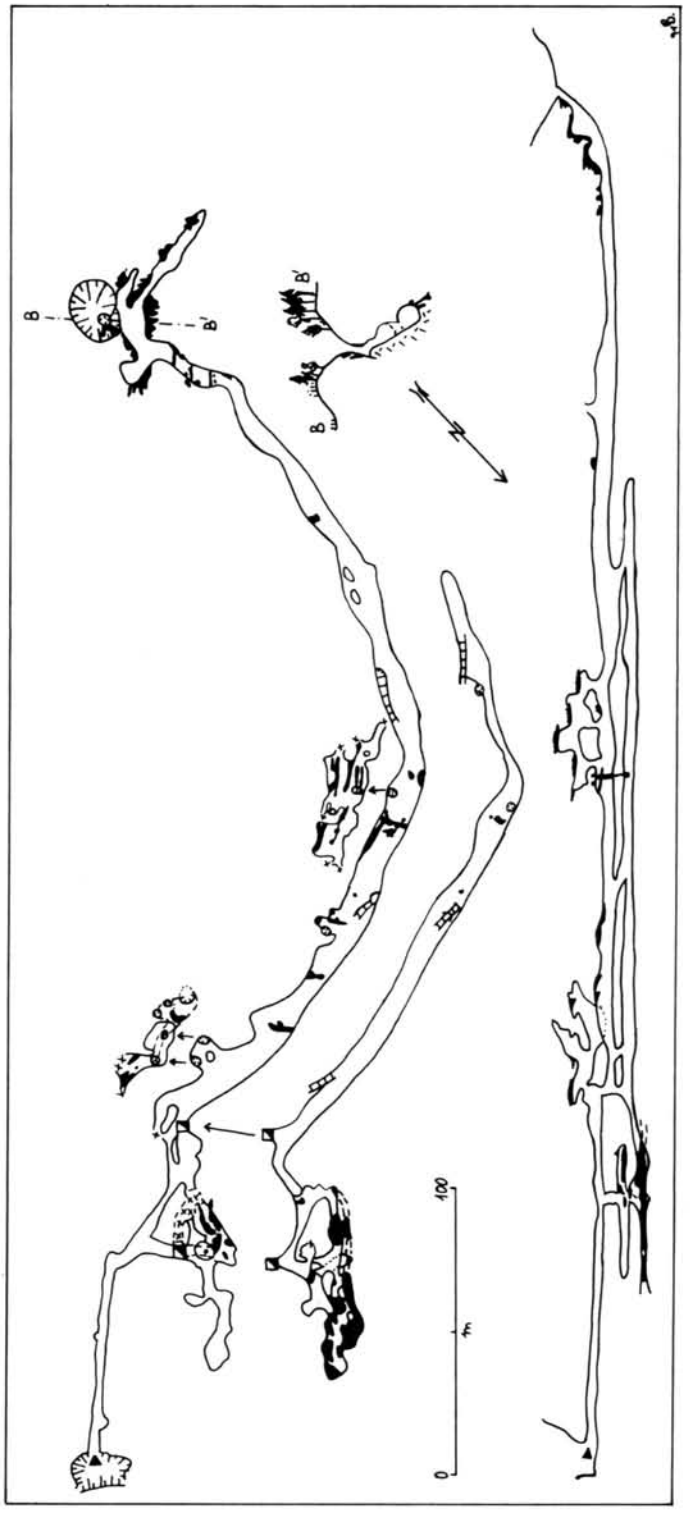

Simplified plan of all three levels and cross-section of the Kolowrat Gallery. In black - karst features. Crosses - collapses. Black arrow - entrance. Modified after Bosák, Sýrora and Tůma (1983).