

2001 A CAVE ODYSSEY, FIVE MONTHS OF CAVES AND KARST

Part 1 – Hawaii to Slovakia

- Armstrong and Penney Osborne

From July to December 2001, Armstrong took study leave from the University of Sydney. During this time Armstrong and Penney attended the International Speleological Congress in Brasilia and spent four months in Europe working with colleagues on palaeokarst and non-meteoritic caves.

During the journey we both visited numerous show caves, tourist mines, conservation areas and museums etc. and saw much of interest relating to conservation and management. This brief report will share some of the particular points of interest to cave managers that we observed during our journey.

HAWAII

Hawaii was an obvious stop-over on the long journey to Brasilia, and an opportunity to visit Professor Keith Crook and Dr Ann Felton at the University of Hawaii. Hawaii had always been associated in our minds with volcanoes and lava caves, but Keith had promised real karst landforms, caves and amazingly palaeokarst.

Honolulu is partly built on karstified raised reef limestone. The only easily accessible cave in this karst is Moillili Lake Cave. The trip was most interesting. Keith's local contact, Chester Lau of the Board of Water Supply, set out his traffic cones and opened a manhole in the road. We entered the cave through a concrete pipe leading out of a large box culvert. The cave has a low flat ceiling and contains a wide shallow water-table lake. The ceiling of the cave is pierced by driven concrete piles, which support the buildings above. These extend through the total height of the cave and for an unknown distance below the water table.

Other small karst areas are found in raised reefs around the coast of Oahu. Dolines, karren and small caves are developed. We spent a day with Ann on the extremely hot limestone rock platforms next to the tropical sea, looking at caves and palaeokarst. There are no show caves in any of these limestones. Self-guided lava tubes in the volcanic flows are found on the Big Island (Hawaii) but that's another story.

BRAZIL

The reason for our visit to Brazil was to attend the International Speleological Congress. The Australian contingent was large, outnumbering both the Yanks and the French! The congress itself went like a flash; Armstrong gave 4 papers and was elected to the UIS (International Speleological Union) Bureau.

After the congress we went on the excursion to the "Tourist Caves and Historic Cities of Minas Gerais". We were fortunate to have quite a few friends on the trip, John and Mary Dunkley, Pavel Bella & Jozef Hlavac (Slovakia), and Andrej Kranjc and Stanka

Sebela (Slovenia). Minas Gerais was, and is, an important mining area in Brazil and contains many 18th century cities, the most interesting of which is Ouro Preto with its incredibly steep streets, baroque churches and old gold mines.

LANDSCAPE AND ROCKS

Like Australia, Brazil is a fragment of Gondwana so the geology and landscape is in places quite familiar. Around Brasilia there was red dust, dry plateaux and even termite mounds! The more arable parts of the country looked much like central western N.S.W.

The bedrock is Precambrian, like much of Western Australia. Many of the important ore deposits in Minas Gerais occur in banded iron formation, particularly the "black gold" after which the city of Ouro Preto is named. The cavernous limestones we visited were all Neoproterozoic in age, about as old as limestones get.

CAVES

We visited four cave localities, all of which can be recommended.

Cave of Our Lady of Lapa

This is not really a show cave, but a chapel built in the entrance of a horizontal cave. The cave is very interesting and also contains an unusual palaeokarst deposit.

Laphina Cave

Laphina Cave is a network cave developed in limestone (marble) with a horizontal cleavage. The show cave is "self-guided" with flagstone paths and bench seats made from slate at strategic places. The cave is a network of high fault and joint-guided rifts of varying widths, some up to 20 m+ high. The cave is very dry and quite dusty in places.

Maquine Cave

This is a very large dead-end cave with an entrance high on a hillside. The cave contains large stalagmite deposits and extensive rimstone dams, which are now inactive and have been extensively modified by condensation corrosion. The terminal chamber is enormous. There are ceiling pockets and pits in the ceiling, suggesting a phreatic origin, but there is no clear evidence as to exactly how this cave formed. A souvenir shop, paths and lighting are installed.

Rei do Mate Cave (Cave of the Forest King)

This cave is developed at the top of an isolated limestone hill. This cave is a series of large phreatic chambers, which have been modified by breakdown.

The tourist path is made of raised metal decking. This cave is the best decorated we visited in Brazil and has excellent helictites. A smaller cave, above the main cave is an important palaeontological site and also has well-preserved cave paintings.

MINES

The tourist mines in Minas Gerais are historic, interesting and exciting but don't take along your friendly mines inspector or tell your insurance company too much!

Mine of Chiko Rei

This mine in the city of Ouro Preto was founded in 1702 by an emancipated slave and ceased production in 1888. It is a series of narrow adits through the banded iron formation. Most of the gold was extracted from quartz veins. The mine quite extensive and is lit and open for tourism.

Topaz Mine

Topaz is extracted by largely open-air workings in deeply weathered marble. The marble has largely turned to unstable clay and the topaz crystals remain. This was a truly Dickensian operation with lots of small boys and a few bosses, who each seem to have a small part of the field. The mine is located on the steep hillside below the Cave of Our Lady of Lapa, where it makes a prominent scar. The deeper and underground parts of the mine look quite dangerous. Poor quality stones are sold to tourists.

Passagem Gold Mine

Imagine a less-steep version of the Scenic Railway at Katoomba, plunging into the darkness, antique winding gear, brake, what brake? This is how you enter the Passagem Gold Mine. Once below you explore one level and visit the edge of the flooded levels now used by cave divers. In case you are concerned there is a well-tended shrine to Saint Barbara to protect you. This mine has great atmosphere, amazing old equipment and a well-stocked rock shop and display. Highly recommended.

POLAND

Our visit to Poland centred on the Krakow region. Some of the most important karst features in Poland are located near Krakow as are some internationally significant palaeokarst localities. Our hosts were Dr Michal Gradzinski of the Jagiellonian University, Krakow and Dr Andrzej Tyc of the University of Silesia.

Caves and Karst

There are some large outcrops of limestone and many very striking ancient atolls, which survive in the landscape as strange circular hills. Castles were built inside the hills, but only ruins remain as a result of the Swedish Wars. These hills, which feature many unroofed caves, are used for rock climbing, which is becoming increasingly popular among the young. Associated with the atolls are strange menhir-like limestone monoliths.

The caves are relatively small and not greatly decorated. From a scientific viewpoint, however they are extremely important as they were among the first caves to be interpreted as having a hydrothermal (rising hot water) origin.

INTERPRETATION

One of the outstanding features of the show caves of the Regional Park and National Park near Krakow is the close relationship between management and academic researchers. Both Drs Gradzinski and Tyc have produced high quality interpretive literature (Tyc has written both a standard and a children's version) and work closely with the management.

Krakow Castle

Krakow Castle, a World Heritage property, was the ancient home of the Polish kings. It is built on a limestone hill adjacent to the river. Under the castle is an interesting cave with a well that provided water during sieges. Appropriately for a cave formed by hot rising water, the cave was home in ancient times for the castle dragon!

Wieliczka Salt Mine

The Wieliczka Salt Mine is the epitome of tourist mines. Not only does the mine contain an amazing chapel carved out of the solid salt rock, it has also an extensive underground museum. This is a very large mine, and the tour is a little rushed, but it is well worth the effort. Remember to count the buttons on the miner's jackets. There should be 28 for Saint Barbara, the patron saint of workers with short life expectancy; miners, fire fighters and the artillery.

CZECH REPUBLIC

The Czech republic is an essential stop on karst pilgrimages to Europe. It has palaeokarst, hydrothermal caves and a long tradition of cave exploration and research. Our host Dr Pavel Bosak, Director of the Czech Geological Institute and Secretary General of the UIS exemplifies this tradition. Our time in the Czech Republic was to be short as we joined a field trip to Slovakia with Pavel and other colleagues from the Institute.

SANDSTONE LANDSCAPE CONSERVATION

There is increasing interest in Europe in the conservation of geological features in general. One particular aspect of this relates to sandstone landscapes. Our old friend Dr Vaclav Cilek from the Geological Institute took us to see some of the localities which will be included in a Central European Sandstone Landscape World Heritage Nomination being sponsored by the Czech Republic and Germany.

To Sydney-siders like us these landscapes were both interesting and very familiar. It's a sad reflection on Australia that there are no proposals to list our many significant sandstone landscapes on the World Heritage List, and that the Blue Mountains are listed for their trees and not their landforms!

SHOW CAVE MANAGEMENT

Two quite interesting and unusual show caves were visited in the Czech Republic, Chynovska Cave and Bozkov Dolomite Caves. Chynovska Cave is the best example we have seen of a cave formed by water *rising* under pressure up steeply dipping limestone. Bozkov Dolomite Caves are quite unusual containing opal and aragonite together and have a lower chamber, which is kept open to the public by pumping.

The management arrangements at these caves are quite interesting. Firstly, following local practice, the cave manager is an experienced caver. The manager is responsible for exploration, mapping, research, interpretation and publicity for the cave. Cave guides undertake research projects in association with museum, university and Geological Institute scientists.

New buildings “cave houses” have been provided for the administration. These feature staff rooms with individual desks for permanent guides, dark rooms and laboratories.

AUSTRIA

Our hosts in Austria were Hoff. Dr Robert Seeman of the Mineralogy and Petrology Department, Natural History Museum, Vienna and his wife Traude. Even with free accommodation and most main meals supplied by our kind hosts, we found that Vienna was still expensive for Australians.

Natural History Museum

The Natural History Museum is an imposing imperial structure with an impressive mineral collection set out in 19th Century glass cases. The aragonite masses retrieved from the Styrian iron mines will take the breath away from any cave mineral enthusiast.

The Natural History Museum has a whole Department dedicated to Caves and Karst as well as having cave mineral and cave biology research taking place in other departments. Robert Seeman's work includes studies of cave minerals (including aragonite) and cave sediments. The Museum undertakes large cave development and conservation projects in Greece and the Middle East, offering clients a “one stop” solution. They are presently engaged in a very large project in Oman.

Hermannsholle

Hermannsholle is the closest show cave to Vienna and was developed and is operated by a speleological society. There are two tours offered and it is well worth a visit. There is an outstanding volume (in German) covering all aspects of the caves history, exploration and science.

SLOVAKIA

There are a number of distinct karst regions in Slovakia and many caves. The country offers a great range of cave and karst types and is an essential

stop in any karst pilgrimage. In addition to show caves, our trip involved fieldwork in wild caves 500 m or more above the road level in the company of extremely fit local guides!

Part of our trip to Slovakia was with our Czech geological colleagues and part was with our Slovak colleague Dr Pavel Bella, geomorphologist and Deputy Director of the Slovak Show Caves Administration.

SHOW CAVES OF SLOVAKIA

There are twelve fully developed show caves and one partly developed semi-wild cave (Dead Bat Cave) in Slovakia.

On this trip the show caves we visited were:

Demanovska Cave (Demanovska Valley, Low Tartras)

This is a large, multi level stream cave. Only a small part is open to the public. A unique experience is the music, written while the composer sat in the cave, which features in the excellent sound and light presentation.

Armstrong made many trips off the path. The most interesting with Pavel Bella and Petro Lubomir of the Slovak Geological Survey. This was to install a strain gauge on an active fault within the cave. It was amazing to a myriad of fractured stalactites that had grown and then been crushed or torn apart in the fault rift.

Dead Bat Cave (Demanovska Valley, Low Tartras)

This is a fourteen level alpine rift/maze cave with an entrance located high in the landscape. It is a steep walk to this cave and the tour is hair-raising, despite the safety lines. Lighting is by a petrol generator in the cave house, where the guides live when on duty in the summer. There is no vehicle access; petrol and all supplies are carried up on the guide's backs!

Demanovska Ice Cave (Demanovska Valley, Low Tartras)

This cave has lots of small-scale ice features. The cave is an upper level of the Demanovska system.

Dobsinska Ice Cave (Slovak Paradise, Plateau Karst)

This recently World Heritage listed cave contains the world's largest lump of underground ice, which is growing! New wooden paths and steps have to be built at progressively higher levels because of the rising ice levels. It is claimed to be the first cave in the world to be electrically lit, in 1886.

Ochtinska Aragonite Cave

One of our favourite caves and an important research site for Armstrong. This cryptokarst cave was intersected by mining operations. It is World Heritage Listed, and has amazing aragonite helictites. An innovative climate-monitoring program is being

conducted in the cave, in order to protect the aragonite from damage by tourists lowering the extremely high humidity that naturally occurs in the cave.

Bystrianska Cave (Low Tartras)

A maze cave developed in complexly folded limestone. The cave has a dedicated chamber for speleotherapy. Speleotherapy is highly regarded in central Europe for treating childhood asthma. Children spend many hours underground undertaking supervised exercise and rest periods in the clean atmosphere of the caves.

Gombasecka Cave (Slovak and Aggtelek Karst World Heritage Area)

This is a relatively small, well-decorated cave with excellent red speleothems.

Domica Cave (Slovak and Aggtelek Karst World Heritage Area)

This is the upstream (Slovak) part of the Domica-Baralda Cave System. It receives far fewer visitors than the Hungarian part, but don't let that put you off! It is large and well decorated. An outstanding feature is the extraordinary number of shields in the cave. The highlight of the tourist trip is a boat journey along an artificially flooded section of the main streamway.

For Australians the Slovak/Hungarian border near the caves is interesting. Unlike Slovakia, which requires no visa, Australians require an expensive visa for Hungary. The poor border guard had never dealt with Aussies before. Our trips over the border two days running created lots of unexpected and unfamiliar paperwork for him.

Vazeka Cave

A small cave with lots of cave bear bones. An excellent taped English commentary and very enthusiastic guides. A new Cave House is under construction.

Bellianska Cave (High Tartras)

This cave really aroused our attention. It has lots of large cupolas, similar to those in Jenolan! It is located a long walk up the mountainside, yet gets 130,000 visitors per year.

SLOVAK SHOW CAVE ADMINISTRATION (SSJ)

The Slovak Show Caves are managed by the Slovak Show Cave Administration (SSJ), based at Liptosky-

PHOTO CAPTIONS

- 1 Cave entrance Water Board style, Hawaii. Chester Lau is opening the entrance.
- 2 Pier and tree root, Moilili Cave, Hawaii.
- 3 Cave of Our Lady of Lapa, Brazil.
- 4 Strange limestone monoliths and castle wall, Podzamcze, near Krakow, Poland.

Mikulus. This is a highly professional (and very friendly) organisation with an impressive organisational structure.

Head office consists of the Director's Unit that looks after admin, personnel etc, the Cave Protection Department, the Technical and Services Department, the Economy Department and the Commercial and Promotion Department. Scientific staff includes Dr Pavel Bella, geomorphologist; Dr Jan Zelinka, climatologist; a hydrologist and a GIS analyst. The SSJ hosts and co-hosts regular international scientific meetings and produces the magazine *Aragonit*. Both Dr Bella and Dr Zelinka are regular contributors at international scientific and technical meetings.

INTERPRETATION

The interpretation of the Slovak Show Caves is good. The SSJ produces high-quality colour multilingual brochures for each cave and an excellent multicolour hardbound handbook, which is regularly revised. The web site is simple, but contains clear information for visitors and is worth a visit.

Visitors to the caves make long walks up steep paths with many hairpin bends to reach the caves entrances from the roads, which run along the floor so the valleys. The SSJ has placed both bench seats *and* excellent multi-lingual (Slovak, English, and German) interpretive signs at the bends. The signs have both text and diagrams. One sign always shows a map of the cave and the route of the tourist path through it.

WATER SUPPLY-SEWAGE ISSUES

Australian karst managers are frequently engaged by water supply and waste water issues. Spare a thought for your Slovak counterparts. Many of the cave entrances, and thus the tourist infrastructure, are located 500 m above the valley floor and water table. The only water supply is frequently from speleothem drips diverted into small tanks, while the waste disposal remains a great challenge.

Slovak Museum of Nature Protection and Speleology, Liptosky-Mikulus

Truly worth a visit, a museum with a focus on caves. The displays feature both science and exploration. Some of the home-made Soviet era caving equipment is really quite amazing. Caving and administrative politics also gets covered. The Slovak Karst Register is administered through the museum, with a part-time staff member employed as registrar.

- 5 Paleokarstologists in uniform? Pavel Bosak and Armstrong in Jewish Cave, Demanovska Valley, Slovakia.
- 6 Traude Seeman, Armstrong and Penney in Hermannsholle, Austria.
- 7 Sign on bend of path to Demanovska Cave, Slovakia. Note cave map and cross-section.
- 8 Pavel Bella, Petro Lubomir and Armstrong near Demanovska Cave, Slovakia.