

Banska Stiavnica (Slovakia) & Ravenswood (Qld)



*“Dobry Den”
(that’s “Good day” in slovak)*

The significance of these lizards should emerge before the end

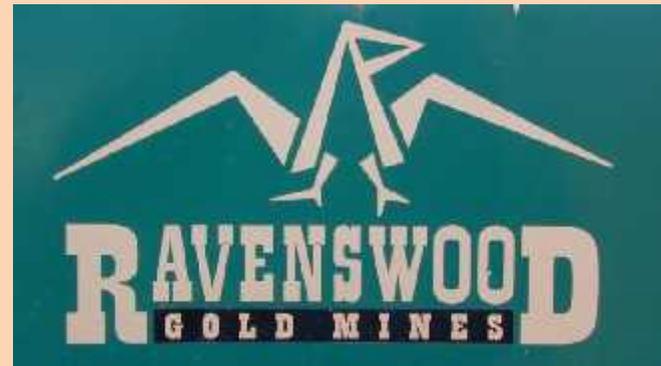
- From an Australian point of view, it seems all too easy, to lose our awareness of mining history of the time before European settlement in Australia.
- In an attempt to balance this awareness, I briefly compare 2 fascinating mining fields.



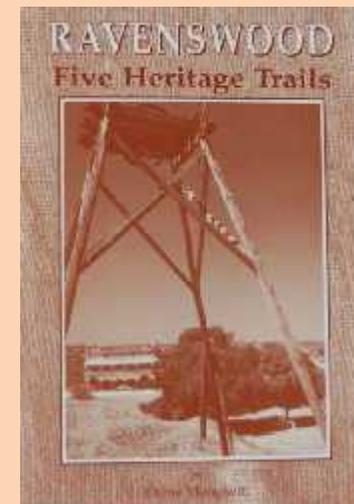
1788



Banska Stiavnica



- I shall also touch on how their mining histories are being communicated to the interested general public.
- Asking the question - How do we keep knowledge of history, alive in young people's minds?



This is where these 2 places are



Banska Stiavnica

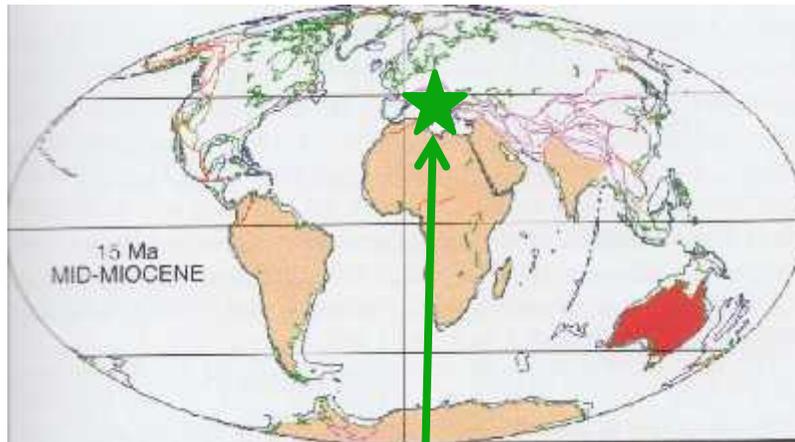
200 km E of Vienna in
Central Europe

Ravenswood
100 km S of
Townsville in NE
Australia.



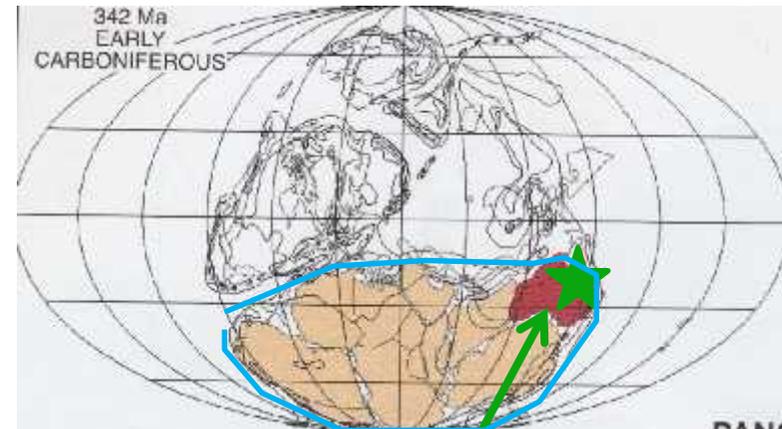
As an exploration geologist, I feel obliged to start with the geological context.

**10 million years ago
between the African &
European Plates**



Banská Štiavnica

**320 million years ago on
Eastern margin of Gondwanaland**



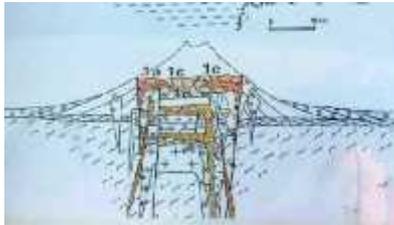
Gondwanaland

Ravenswood

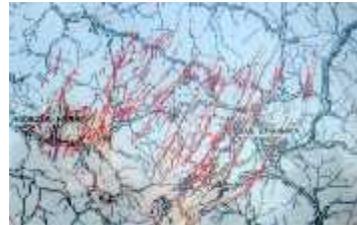
*Images from: Billion year Earth History
Veivers 2001*

Banska Stiavnica & Ravenswood

2 Comparable Mineralised Systems



Interp X-Section

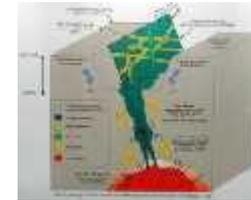


Map of veins



The ore

Banska Stiavnica



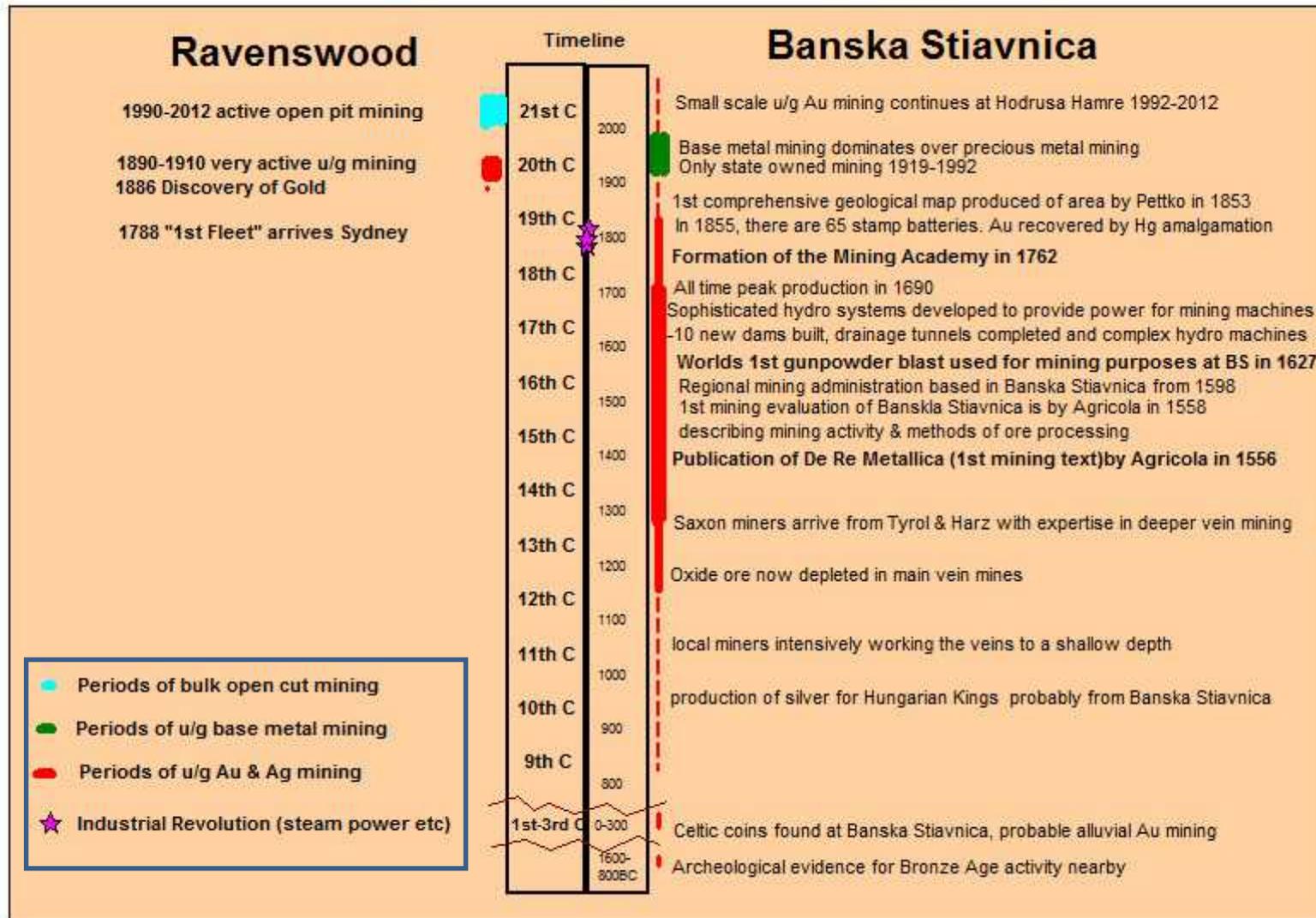
Interp model

Ravenswood

Despite the age difference these 2 mineralised systems are broadly comparable in style.

- Both interpreted to be closely **associated with localised igneous/volcanic systems.**
- Both developed **base & precious metal vein systems** extending over several square kms.
- Both systems are naturally **endowed with several million ounces of gold with silver**

2 very different Mining Timelines



The mining history of these 2 fields is very different due in large part to the spread of mining technology across the globe reaching remote Australia in relatively recent time.

The industrial revolution of the late 18th C with the harnessing of energy using steam engines divides the principle mining periods of these 2 fields.

Key challenges facing these miners

during the main periods of historic production

Banska Stiavnica

c1300-1700 (400 yrs)

Main challenge is :
Supply of energy for
mining, dewatering
& milling machines

*The gold recovery would
probably have been low*

*Industrial Revolution &
introduction of steam power
1760-1820*

Ravenswood

c1882-1912 (30 yrs)

Main challenges are :
Better recovery of gold
from the ore & excessive
Freight transportation

Experiments with

- Smelting
- Chlorination
- Cyanide

Successive stages in Banska Stiavnica story

1990-present : Contemporary mining & exploration
Grant of **World Heritage status by UNESCO (1993)**
Promotional work by **Geopark**

4

20thC : period of political upheavals. **State owned** mining companies, **base metal mining** was carried out at BS, using relatively modern mining technology

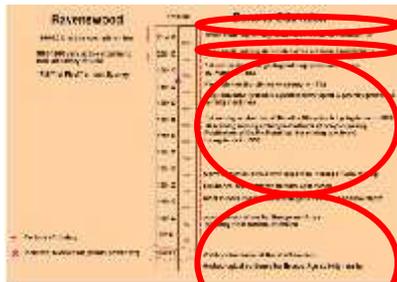
3

14-19thC : about **600yrs of rich mining & technological development** on the richest Au-Ag field in Europe. Starting with arrival of experienced **saxon miners from Tyrol & Harz**. Then the publication of **De Re Metallica**. Sophisticated **hydro-engineering systems** were developed for mining prior to the industrial revolution. Later as production declines and the industrial revolution rolls out, the **Mining Academy opens in Banska Stiavnica** & becomes a very significant centre of technological development & education.

2

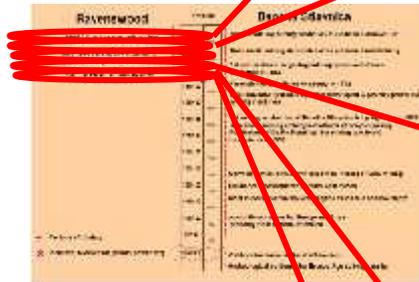
C300BC-1300AD : about **1000yrs of slow development** , possibly starting in Late Bronze-Age & progressing through to Hungarian mining enterprises extracting very rich oxidised ore

1



Successive stages in Ravenswood story

Covered in detail by Peter Bell – this conference



c1987-2012 : Mainly **open pit mining extracting bulk tonnage low grade ore & treating with CIP cyanide technology**. One high grade vein (Area 2) was mined underground.

5

Early 1980s : Reworking of old Ravenswood Mullock heaps (& tailings) using Heap Leach cyanide treatment at Totley over site of old village.

4

c1895-1917 : Under A L Wilson –Scottish mining engineer: Amalgamation of main mines & mills, significant investment funding from London, Installation of **1st successful cyanide plant in Ravenswood at Sandy Creek, heavy utilisation of Wilfley Tables. Flourishing industry**. Then heavy investment at Deeps Mine which produced very little ore.

3

c1882-1894 :Charters Towers Gold Field Boom brings railway closer **Silver rich Totley reefs at Ravenswood justify rail link into township (R King) Consolidation of main mines & Mabel Mill - Metallurgical experimentation attempting to improve gold recovery from mundic ores (smelting & chlorination, early cyanide tests) (H H Barton)**

2

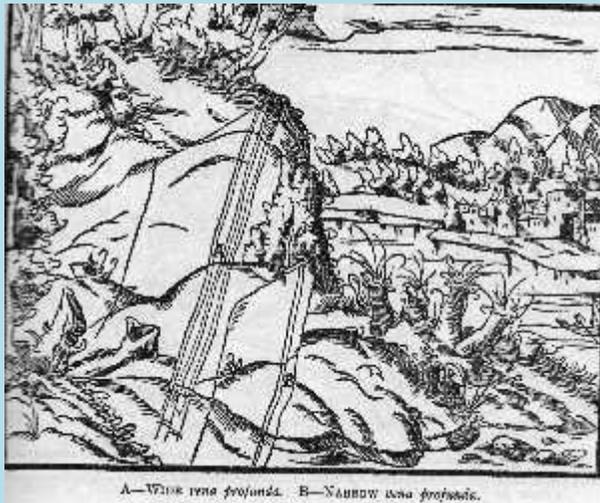
Early testing with cyanide (Macintyre)

c1868-1881 : Early alluvial & small scale reef mining on rich oxidised veins Encountering recovery problems with mundic ore below water table

1

Early & Medieval Mining - Banska Stiavnica as portrayed in De Re Metallica 1556

Stratum	Stratum
1. Stratum auriferum	1. Stratum auriferum
2. Stratum argenteum	2. Stratum argenteum
3. Stratum cupreum	3. Stratum cupreum
4. Stratum ferreum	4. Stratum ferreum
5. Stratum calcareum	5. Stratum calcareum
6. Stratum siliceum	6. Stratum siliceum
7. Stratum arenaceum	7. Stratum arenaceum
8. Stratum argillaceum	8. Stratum argillaceum
9. Stratum ligninum	9. Stratum ligninum
10. Stratum siccum	10. Stratum siccum
11. Stratum humidum	11. Stratum humidum
12. Stratum aquosum	12. Stratum aquosum
13. Stratum maris	13. Stratum maris



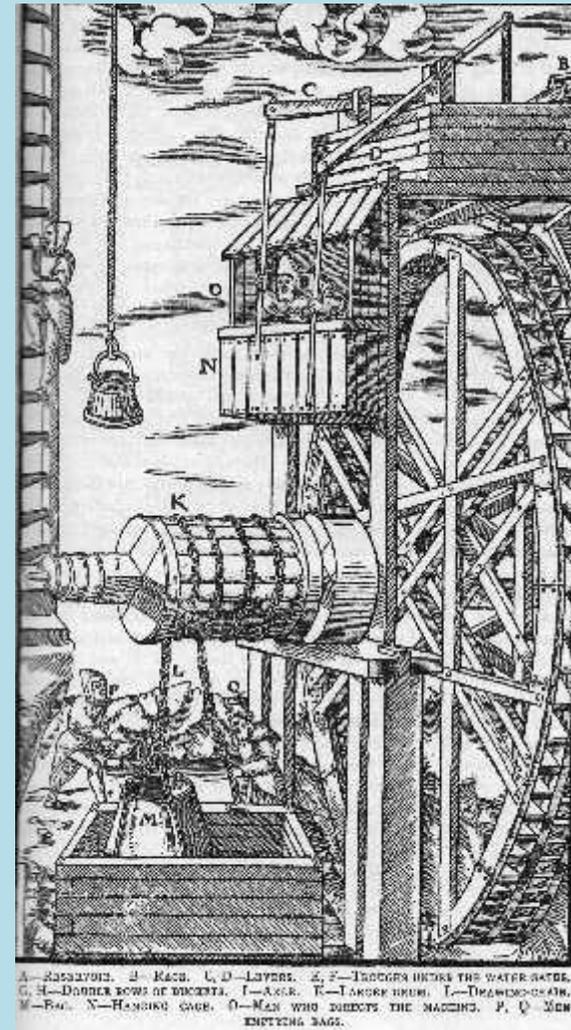
Veins in outcropping rock



Bronze age axe from nearby Sitno



Shafts & drives



Water powered dewatering Images from De Re Metallica Agricola 1556

Agricola is said to have surveyed Banska Stiavnica in 1558. These illustrations are likely to be typical of this site

Erhebung	Personen	Personen
1745	1000	1000
1750	1000	1000
1755	1000	1000
1760	1000	1000
1765	1000	1000
1770	1000	1000
1775	1000	1000
1780	1000	1000
1785	1000	1000
1790	1000	1000
1795	1000	1000
1800	1000	1000
1805	1000	1000
1810	1000	1000
1815	1000	1000
1820	1000	1000
1825	1000	1000
1830	1000	1000
1835	1000	1000
1840	1000	1000
1845	1000	1000
1850	1000	1000
1855	1000	1000
1860	1000	1000
1865	1000	1000
1870	1000	1000
1875	1000	1000
1880	1000	1000
1885	1000	1000
1890	1000	1000
1895	1000	1000
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1905	1000	1000
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2015	1000	1000
2020	1000	1000
2025	1000	1000
2030	1000	1000
2035	1000	1000
2040	1000	1000
2045	1000	1000
2050	1000	1000
2055	1000	1000
2060	1000	1000
2065	1000	1000
2070	1000	1000
2075	1000	1000
2080	1000	1000
2085	1000	1000
2090	1000	1000
2095	1000	1000
2100	1000	1000

Banska Stiavnica in 1745

showing a multitude of mine shafts, adits & mullock heaps



Banska Stiavnica:

hydro-engineering for mining

By the early 18thC this area had the largest water management system in the world with 50 reservoirs & many kms of tunnels & channels

Reservoirs	Number of Reservoirs
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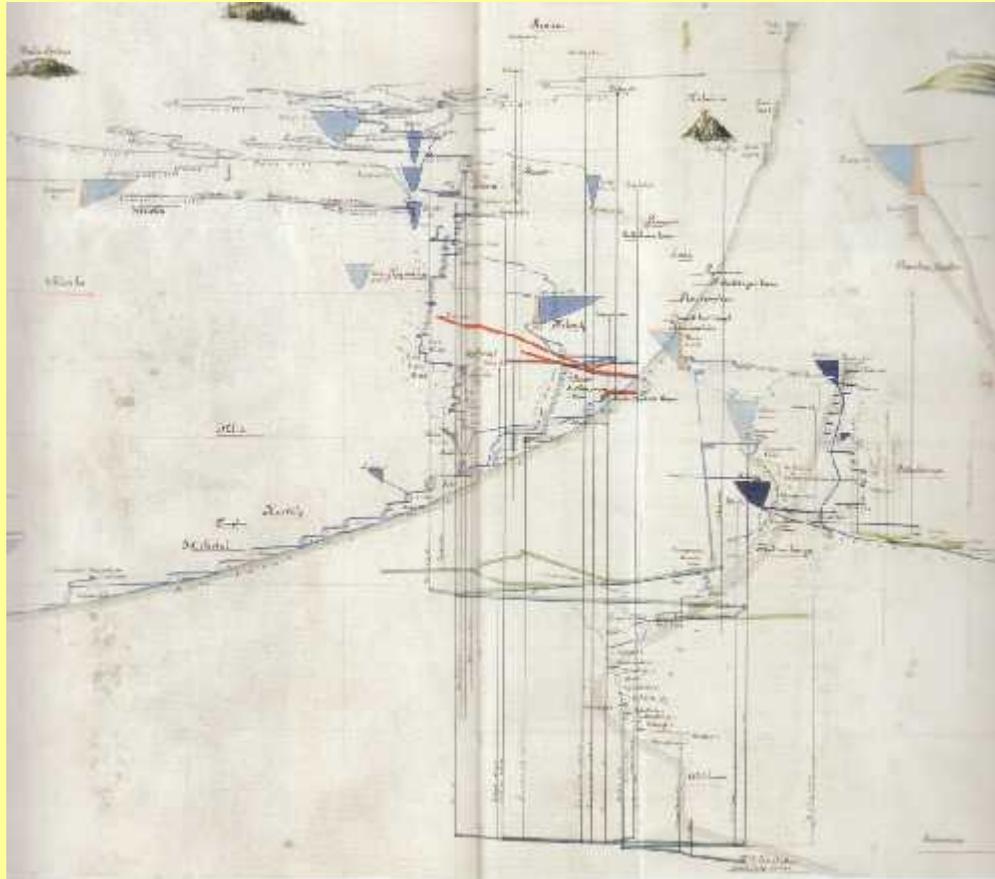


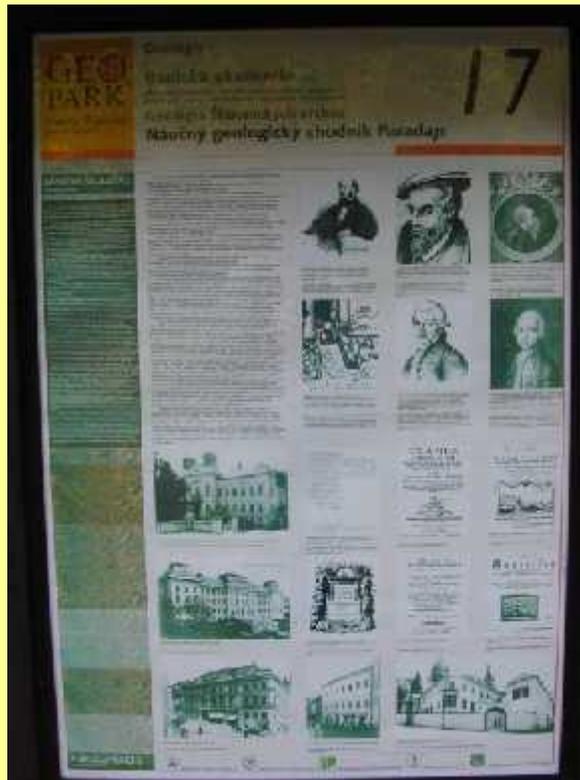
Chart showing the complex hydro engineering works across the mining areas

Technische	Handel	Handel
1762	1762	1762
1763	1763	1763
1764	1764	1764
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1795	1795	1795
1796	1796	1796
1797	1797	1797
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1799	1799	1799
1800	1800	1800

Banska Stiavnica

Mining Academy opens in 1762

1,000's geoscientists & technicians educated here



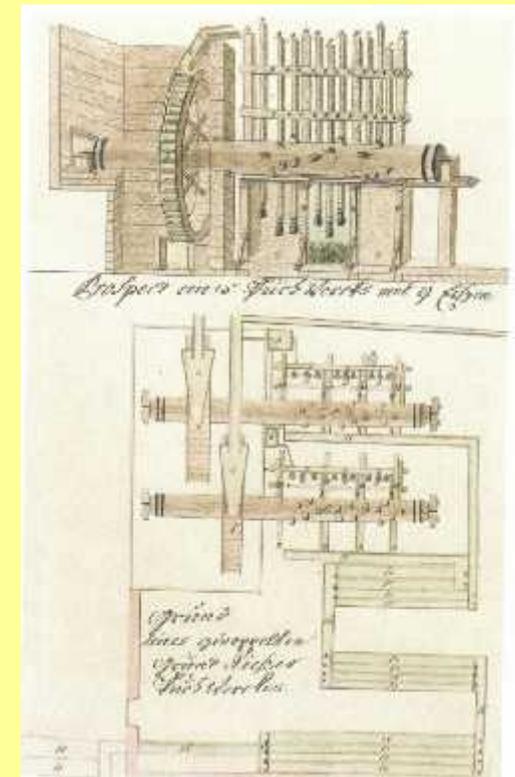
Geopark poster on Academy



Mining archives office



Models of ore processing machines
Early teaching aids
Now exhibits in museum



Drawing of water powered stamp 1764

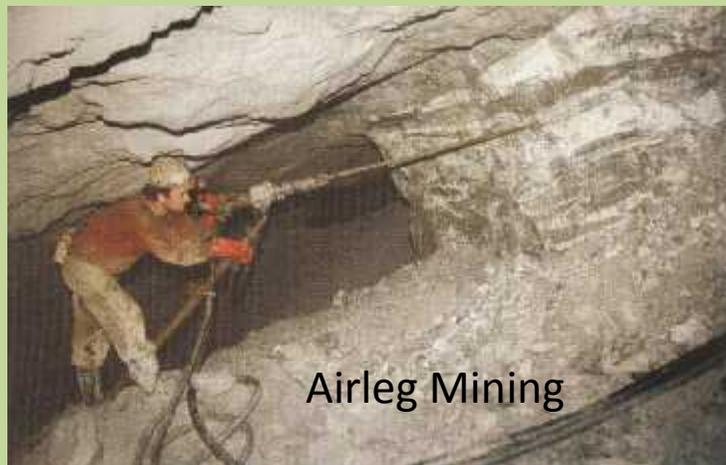
20thC base metal mining at Banská Štiavnica

Ročník	Práca
1911	Práca na štátnom ťažárskom podniku v Banskej Štiavnici
1912	Práca na štátnom ťažárskom podniku v Banskej Štiavnici
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1919	Práca na štátnom ťažárskom podniku v Banskej Štiavnici
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Contemporary (21stC) mining at Banska Stiavnica

Roční výnos	Roční výnos
1. 1. 2010	1. 1. 2010
2. 1. 2010	2. 1. 2010
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100. 1. 2010	100. 1. 2010



Highlights of the Banska Stiavnica story include :

1. The amazing geological story of the hosting **Stratovolcano** which ultimately created the rich mineralisation. A story **so well communicated by the Geopark posters**, and the great work of geologist Jaroslav Lexa.
2. The close connections to the 1st published text book on mining & metallurgy with its 200 wood-cut illustrations- **De Re Metallica 1556**.
3. The great developments in **hydro-engineering** to provide energy with which to mine, dewater & mill.
4. The establishment of the highly esteemed **Mining Academy in Banska Stiavnica in 1762**, through which 1000's of geoscientists were trained, and where the origin of rocks was debated - **"Neptunist vs Plutonist"** theories – & many other "foundation stones" in the geosciences.
5. That small scale commercial gold mining continues today in the western part of the field, run by **Richard Kana, who is a wonderful & accomplished advocate of recording & communicating mining history**.

Communicating the Banska Stiavnica story

- A significant difficulty in communicating this amazing story, is the **limited use of the English language in Slovakia.**
- It is also only recently (1990) that Slovakia emerged from communist rule. Following this in **1993 UNESCO recognised the international significance of this site by bestowing World Heritage Status on the town.**
- Using the preserved civic buildings, technical teaching collections, literature archives, and mine infrastructure, **multiple mining related museums** have been established in the town.



Historic teaching aids on display in the museums



In 2000 an organisation known as **Geopark** was formed to create a **vast array of informative posters**. These are well illustrated **bi-lingual (including English)** educational posters communicating the story of Banska Stiavnica. They are displayed all around the townscape and on walking trails.



Salamander Festival



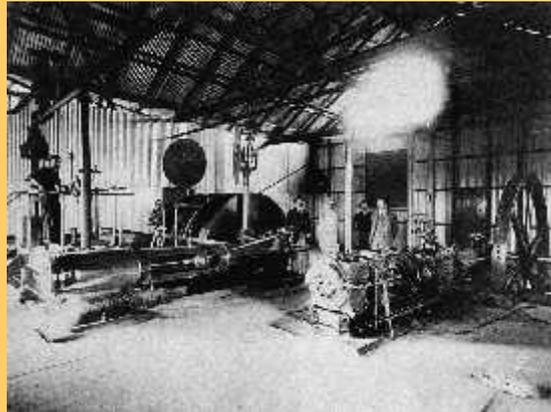
An annual 3 day festival of mining history & culture are held in September. This is known as the **Salamander Festival** , named after 2 folklore lizards which are part of the discovery story.

Mining at Ravenswood c1880-1912

Year	Particulars
1880	...
1881	...
1882	...
1883	...
1884	...
1885	...
1886	...
1887	...
1888	...
1889	...
1890	...
1891	...
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1905	...
1906	...
1907	...
1908	...
1909	...
1910	...
1911	...
1912	...



Typical mullock heap



New machines at Deep Mine



Miners in the Deep Mine



Sunset underlie shaft



Duke mine workings



Diagram of main u/g workings

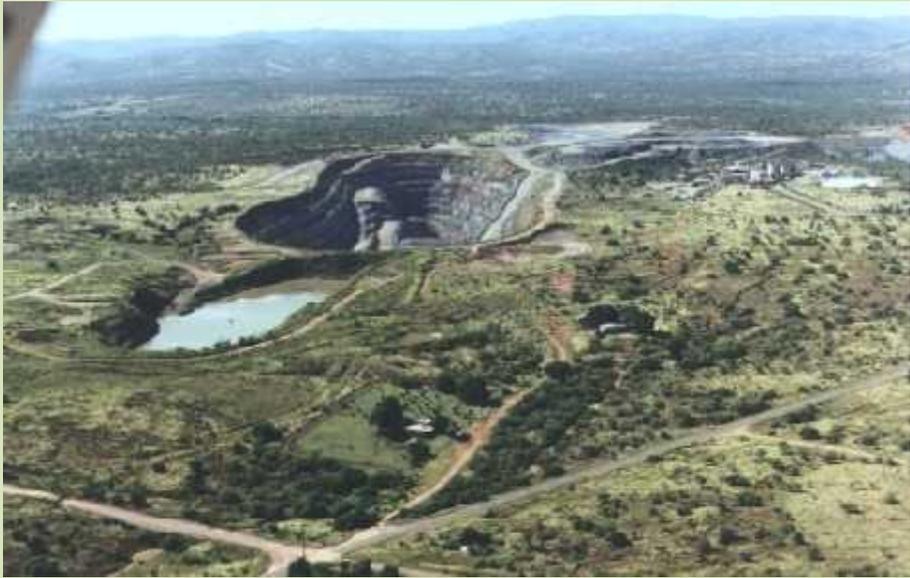
Contemporary Mining at Ravenswood

Stratigraphic Unit	Thickness (m)	Remarks
1.0	1.0	...
2.0	2.0	...
3.0	3.0	...
4.0	4.0	...
5.0	5.0	...
6.0	6.0	...
7.0	7.0	...
8.0	8.0	...
9.0	9.0	...
10.0	10.0	...
11.0	11.0	...
12.0	12.0	...
13.0	13.0	...
14.0	14.0	...
15.0	15.0	...
16.0	16.0	...
17.0	17.0	...
18.0	18.0	...
19.0	19.0	...
20.0	20.0	...
21.0	21.0	...
22.0	22.0	...
23.0	23.0	...
24.0	24.0	...
25.0	25.0	...
26.0	26.0	...
27.0	27.0	...
28.0	28.0	...
29.0	29.0	...
30.0	30.0	...
31.0	31.0	...
32.0	32.0	...
33.0	33.0	...
34.0	34.0	...
35.0	35.0	...
36.0	36.0	...
37.0	37.0	...
38.0	38.0	...
39.0	39.0	...
40.0	40.0	...
41.0	41.0	...
42.0	42.0	...
43.0	43.0	...
44.0	44.0	...
45.0	45.0	...
46.0	46.0	...
47.0	47.0	...
48.0	48.0	...
49.0	49.0	...
50.0	50.0	...



Beginning Nolans Pit

Nolans Pit completed



Highlights of the Ravenswood story include :

- The **Mabel mill site where earnest experimentation was done** to improve the metallurgical recovery of gold from the complex mundic ores. A variety of processes were tried, and ultimately success was achieved.



- Due to these metallurgical successes, the town flourished, and a number of very **elaborate hotels** were built in either timber or local brick. The wonderful brick buildings have been preserved well and are still hosting business today.



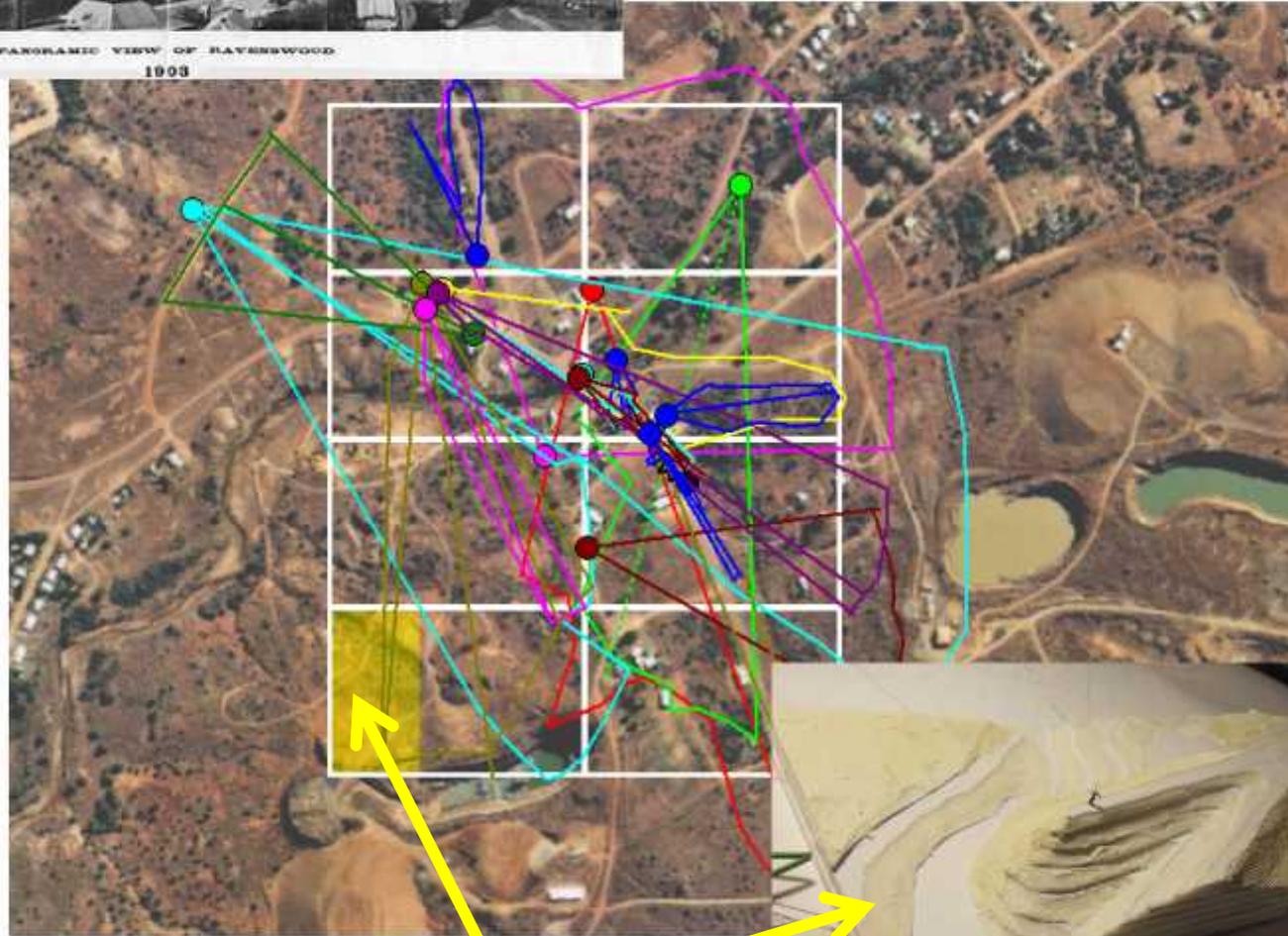
Communicating the Ravenswood story

- One **significant difficulty** in effectively communicating Ravenswood's story is its **relatively remote location**.
- The ability to keep the history of **Ravenswood alive has been greatly enhanced** by the modern gold mining company **Carpentaria Gold**-(Ravenswood Gold Mines). They have kept the small community economically viable and have contributed significantly to the restoration of several historic buildings. They also sponsored the production of the historic walking trail booklet by Diane Menghetti.
- The **Charters Towers Regional Council** is understood to be in the process of significantly upgrading the **walking trail signage** which provides fascinating historical information to visitors.
- There are **2 museum type displays** of historical artefacts and information about Ravenswood : -Courthouse museum, and Thorpe's Building.
- The **family & social histories** in this town is becoming quite well documented and this is of particular interest to people doing **genealogical research**.

A New Project : Historic Ravenswood Model 1:500



Using 20 coordinated panoramic photos



*Ravenswood village
airphoto base - 1999*

Area of draft model shown here



Creating buildings for the 1:500 model

New Ravenswood Hotel & Browns Hotel – developing models

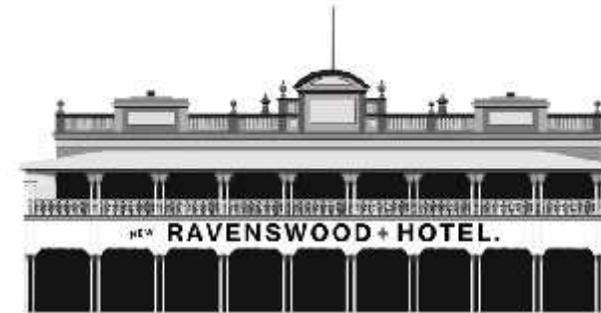
New Ravenswood Hotel



Damaged photo of Hotel in Ravenswood



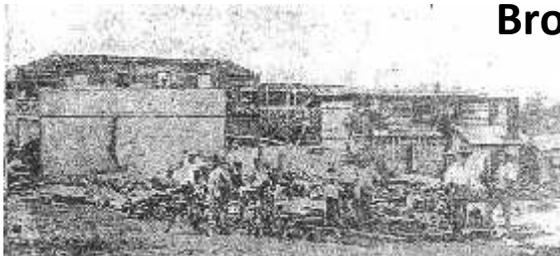
& after relocation to Winton



& with Photoshop work

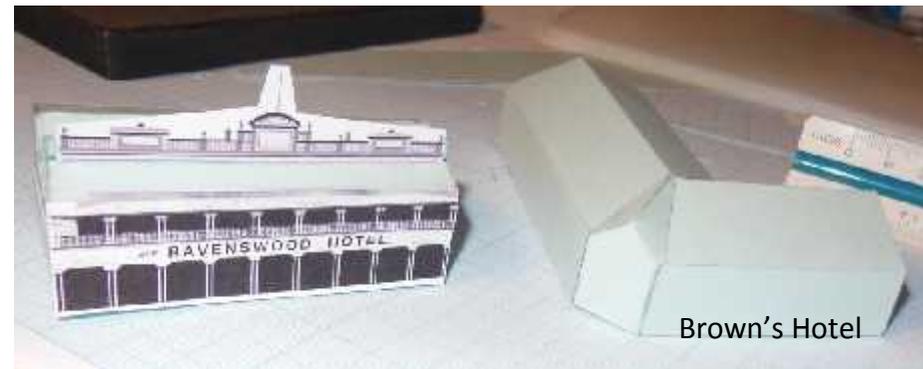


Brown's Hotel



rare insight into interior after Imperial Hotel fire

developing models of the buildings



Is the Mabel Mill Site important?

This wonderful site can tell a rich story of metallurgical heartache & success

The story involves multiple metallurgical processes; corporate collapse & success; chinese workers, environmental issues etc etc.



Displayed & communicated well, this site could be inspirational for young minds!

At risk of fading away in Ravenswood

The Great Extended Mine (Totley)- redeveloped by Percy Kean



A proud installation in 1946



Fading away in July 2014



Still standing in 2010



My 2 key points

For a mining site that seems relatively unknown to Australian Geoscientists Banska Stiavnica would seem to be a very important historic site and one well worth knowing more about.

Ravenswood is a much younger and shorter lived mining site, but still has high significance, particularly for it's efforts in metallurgical extraction of gold from complex sulphide ores.



I havn't forgotten the lizards



I hope this presentation has provided some **new information**, that just might inspire you to **visit Banska Stiavnica & to attend the Salamander Festival.**

Chris Green July2014
geocom7@bigpond.com

*Cheers
from Banska
Stiavnica*

