28th of June 2017

Meeting at Rammelsberg Mine, World Heritage Site in Goslar

Rammelsberg – in the middle the ore processing building, erected in seven floors. Source: Wikipedia, Norbert Kaiser Own work.

Presentation and tour by PhD Elisabeth Clausen, TUC

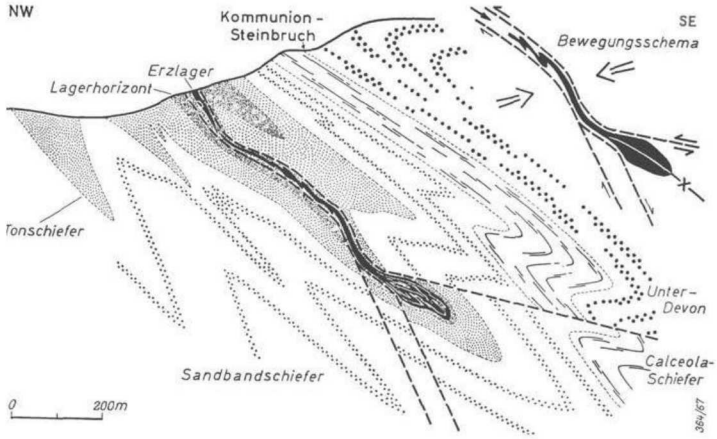
Originally, this guided tour by PhD Elisabeth Clausen has been developed for mining students in their first semester and it was adopted for our group. The general intention is to use an authentic place to illustrate principle technical issues of mining. We focused on the topics mine production and energy.

The ore deposit of the Rammelsberg was formed in the time period of the Devon (420 –360 Mio. a.).

On the sea floor, hydrothermal springs released ore-bearing material that settled to the sea floor after precipitation in the cold sea water. Two lense-shaped ore bodies formed, mainly made of fine grained Chalkopyrite, Sphalerite, Galena, Pyrite and Baryte. During the Carbon (360 – 290 Mio.a.), these ore lenses took part in the folding and rising of the mountain.[4]

[4] This type of ore development is called SEDEX : Sedimentary exhalative deposit. A summary of the Ore Genesis gives: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.923.1648&rep=rep1&type=pdf

Copper ore from the sedimentary exhalative deposit at Rammelsberg, Germany. Source: Wikipedia, Hannes Grobe - Own work



Source: W. Hannak, Die Rammelsberger Erzkörper, Göttingen,1978, Online: https://epic.awi.de/34604/1/Mineralogie-Geologie-Goettingen_1978.pdf

The so called old ore body has been exposed by erosion and was probably discovered during the Bronze Age, 3000 years ago. Since that time, mining took place at the Rammelsberg. The mining in historical times started in the 10th century and lasted for 1000 years. It has been estimated, that the ore bodies contained in total more than 26.6 Million tons of non-ferrous metals.[5] Rammelsberg provided silver-, lead- copper-, and zinc ores. In 1988, the mine was shut down because both ore

[5] Mueller AG (2007) The Rammelsberg shale-hosted Cu-Zn-Pb sulfide and barite deposit, Germany: Linking Sedex and Kuroko-type massive sulfides -- Slide presentation and explanatory notes. Society for Geology Applied to Mineral Deposits (SGA) website (http://www.e-sga.org): Mineral deposit archives.

bodies were completely mined out. Rumours about unknown, not yet discovered deposits have been going on for decades. Until today every exploration has been unsuccessful.

The Rammelsberg as an abandoned mine provides the opportunity for public and professional site visits for educational purposes, to analyse historical and future trends in the mining industry. Nowadays, the so called 'tailings' are in the focus of scientific interest, which are the residue of former ore processing operations.

During ore processing, the rock is crushed, grinded, sieved and lastly floatated, in order to separate the valuable ore grains from undesired waste rock. The residue is a very fine grained sludge, which is deposited in artificial ponds. This sludge is referred to as 'tailing'. The efficiency of the ore processing increased tremendously throughout the last century and the focus, which minerals are of interest widened throughout the centuries. As a consequence, old tailings still contain high amounts of valuable major and minor metals.

Nowadays, old tailings are presumed to bear the potential of serving as a new source from anthropogenic origin:

"Recently a German research project was initiated to exemplarily investigate and characterize the tailings of … the Rammelsberg … aiming at the development of an effective reprocessing route. The tailings contain as valuable metals Cu, Zn, Pb, Ba and to a lesser extent Co, Ga, Ag and In."[6]

Therefore, a visit to the Rammelsberg can be an incentive to learn about general and essential issues of a working mine (e.g. energy supply and machinery). Also, it serves as an entry point to grasp the concept of ore deposits of anthropogenic origin. Energy supply is an important topic when it comes to mineral extraction as mining activities are commonly highly resource consuming. In the case of the Rammelsberg, a system of several underground water wheels delivered the necessary mechanical energy for e.g. for water removal and ore hoist. Also the impact on the landscape can be shown by the deforestation in the Harz region in the middle ages. The impact of the mining needs is still evident today, as the former mixed forest has been replaced by planted conifers.

High amounts of water are also used in ore processing, especially in gold mining. Rivalry amongst resource water occurs often in semiarid mining areas, where farming and mining compete about the resource water, exemplary in Chile in South America.[7]

Another potential conflict represents the treatment of abandoned mines. The pumping of ground water, for example, can be an eternal requirement in populated areas with subsidences due to mining activities.

To cut a long story short: "If you can't grow it – and if you are, unavoidable in need of a mineral/a metal – mine it." And for a proper judgement of the necessity of on-going mining, the following

[6] https://www.researchgate.net/publication/318115504_Characterization_of_Tailings_of_the_Rammelsberg_Ore_Deposit_for_a_Potential_Reprocessing

[7] http://realworldmedia.tv/project/cry-of-the-andes/