Swiss Society of Mineralogy and Petrology

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A MAJOR BREAKTHROUGH IN SWITZERLAND – THE GOTTHARD BASE TUNNEL

On 15 October 2010, the last meter of rock separating the northern and southern parts of the eastern tube of the new Gotthard base tunnel disaggregated into dust. With a length of 57 km, it is currently the longest railroad tunnel in the world. It was built with a total deviation of only 1 cm vertically and 8 cm horizontally from the planned axis, and it traverses the Alps at an altitude of only 550 m above sea level. The tunnel was excavated using tunnel-boring machines and classical blasting in more schistose zones. Construction started in 1996, and to reduce the total construction time, excavation was carried out simultaneously in several sections. The tunnel will be fully operational in 2017.

Most rock types present at the surface are also found at tunnel level, almost 2.5 km below the surface, because the rock strata and foliations have a steep dip in this section of the Alps. The Gotthard region is famous for well-formed minerals occurring in Alpine-type fissures, and thus it was anticipated that mineralized cavities would be located in the new tunnel. For this reason, "mineral guards" were employed, whose duties were to collect, document and preserve mineralized clefts encountered during tunnel excavation. The best sample material is currently exhibited in museums in Seedorf (Mineralienmuseum Schloss A Pro), Sedrun (Dorfmuseum), and Lugano (Museo Cantonale di Storia Naturale).

Peter Amacher (front), one of the "mineral guards" preparing mineral specimens for transport. Beside him, a second person is extracting material from a cleft. Photo: Thomas Schüpbach

Analysis of fluid samples preserved in some clefts showed that the present-day fluid in the crystalline basement rocks has a high pH and is oversaturated with respect to zeolite minerals, indicating that zeolite growth in alpine clefts is happening today. One of the most interesting observations made is that the zeolite mineral stilbite crystallizes as stilbite-Ca and changes its mineral composition as it is being exhumed, becoming enriched in K and Na. This is the reverse of the cation exchange that occurs in your washing machine to soften water.

Edwin Gnos, Head of Earth Science Department,
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NEW EXHIBIT OF AN EXCEPTIONAL ALPINE QUARTZ FIND IN THE NATURAL HISTORY MUSEUM BERN

Quartz crystals that precipitated from hydrothermal fluids circulating in fissures during late Alpine deformation have been sought after in the Swiss Alps since the Neolithic. Until the 18th century, all finds were exported to Milan and other stone-cutting locations, where they served as raw material for the production of *objets d'art*, including pendants for the luxurious chandeliers in the courts of Europe.

Quartz crystals 28 to 35 cm in length. Photo: Peter Vollenweider

On May 13, 2011, the Natural History Museum in Bern opened a new permanent exhibit featuring one of the largest quartz crystal finds in the Swiss Alps. The find consists of 50 crystals with a total weight of 2 tons and was discovered in late 2005 by two Swiss crystal collectors. The slightly smoky quartz was discovered in a large fissure located in the Variscan, 300-million-year-old central Aar granite at Planggenstock, Canton of Uri, central Swiss Alps. The quartz crystals are distinguished by a combination of exceptional transparency, high surface luster and large size. Single quartz crystals reach 107 cm in length. The largest and most aesthetic group weighs 300 kg, but the complete find on display encompasses close to 50 quartz specimens and a number of pink fluorite octahedra. After an initial display in Flüelen, central Switzerland, the Natural History Museum in Bern decided to acquire the complete find for 4.5 million Swiss francs. The crystals are now on display in a darkened room, where all ambient light is directed to shine through the crystals, creating an awesome, contemplative atmosphere. The quartz crystal exhibition is accompanied by an impressive movie that describes the difficulties associated with recovering this find.

A smaller exhibit, located next to the main display of quartz megacrystals, shows the various roles that minerals play as constituents of the Earth and in everyday life. The origin of the Alpine quartz crystals is explained in a short movie. A suite of other minerals found in the same fissure, including chlorite, galena and secondary wulfenite, is also on display. These new exhibits are integrated into the preexisting displays of Swiss minerals. They follow the museum's tradition of documenting the most important mineral finds from Alpine fissures in Switzerland, with the earliest specimens being on display since 1721.

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