THE BRIDGE

MATERIALS ANALYSIS eNEWSLETTER

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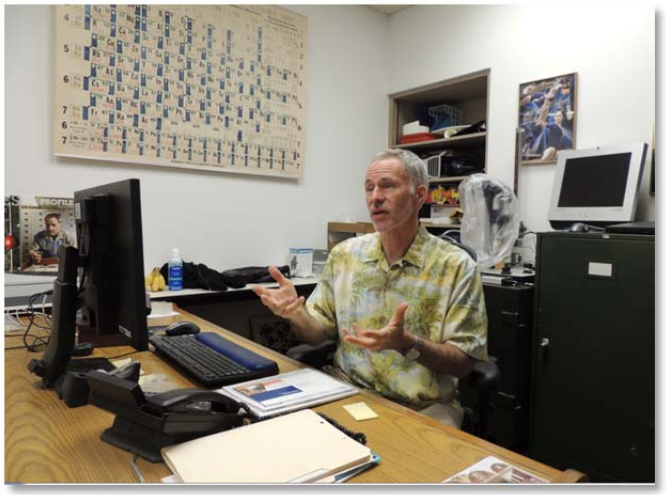
The R-AXIS RAPID II located at the Natural History Museum of Los Angeles County

The Natural History Museum of L.A. County, 900 Exposition Blvd., Los Angeles, CA 90007, Dr. Anthony R. Kampf, Curator Emeritus

The Natural History Museum of Los Angeles County opened on November 6, 1913 at Exposition Park in L.A. and has since grown to be the largest such museum in the western U.S. As Curator of Mineral Sciences for



Dr. Anthony R. Kampf

more than 34 years, Dr. Anthony R. Kampf was instrumental in building the museum's extensive collection of gems and minerals, its beautiful gem and mineral exhibition, as well as performing scientific research in descriptive mineralogy and structural crystallography. Since retiring in 2011, Dr. Kampf has continued his research as Curator Emeritus.

Dr. Kampf joined NHM in January 1977, after earning his Ph.D. in mineralogy and crystallography from the University of Chicago. The current mineral sciences lab at NHM developed around his knowledge of mineralogy, crystal chemistry and structural crystallography. He has analyzed countless unknown minerals and described 26 new minerals between 1975 and 2008. Interestingly enough, over 100 new minerals are still found by mineralogists every year around the world.

Dr. Anthony R. Kampf and his R-AXIS RAPID II

The R-AXIS RAPID II, one of Rigaku's curved imaging plate X-ray diffraction systems, was installed at NHM by Dr. Kampf in November 2007. He needed to replace obsolete powder and single-crystal XRD systems that were film-based. He chose the R-AXIS RAPID II because it can measure both powder and single-crystal data. When Dr. Kampf is faced with an unknown mineral phase, he first obtains an X-ray powder diffraction pattern and performs a search against a database of known minerals. If the X-ray powder pattern does not match a known mineral and occurs in crystals of sufficient size and quality, Dr. Kampf then pursues a single-crystal study and structure analysis. The dual-purpose functionality of the R-AXIS RAPID II (powder and single crystal) has proven ideal to Dr. Kampf's work, allowing him to quickly and easily switch between the two methods. In the 6 years since obtaining the R-AXIS RAPID II, Dr. Kampf has characterized more than 75 new minerals, three times the number that he had characterized in the previous 33 years!

From left to right, Collections Manager Alyssa Morgan, Associate Curator Eloïse Gaillou,and Dr. Anthony R. Kampf

One of his signature XRD studies with the R-AXIS RAPID II was his work on the new mineral krotite in 2011 (*American Mineralogist, Volume 96, pages 709–715, 2011*). This phase is considered one of the earliest formed in our solar system. Dr. Kampf told us that the new mineral krotite, $CaAl_2O_4$, was found as the main component of a tiny inclusion in a meteorite. "Inclusions like this one are usually studied in thin-sections mounted on glass microscope slides. The phases in inclusions like this are almost always too small to investigate by conventional XRD and so usually have to be studied using EBSD (electron backscatter diffraction). The krotite in this inclusion was large enough that I was able to use the RAPID II. I first mounted the entire microscope slide on the RAPID and recorded the powder diffraction pattern of the krotite using reflection mode. I then succeeded in extracting a 110 x 60 x 20 µm crystal fragment, from which I collected single-crystal structure data. I obtained an excellent structure refinement with R_1 = 1.6%. For me the charm of scientific mineralogy comes from making discoveries, each of which helps us to understand the world around us a little better. I was particularly happy to be a part of the team that worked on krotite because it adds to our understanding of how our solar system formed. The special feeling that comes from making a discovery is what has kept me involved in research even after retirement. In fact, the only reason that I retired was so that I could spend more time doing research and using the R-AXIS RAPID II, which has proven to be an essential and irreplaceable research tool."

