



# We are all Forensic Scientists

Hosted by the McCrone Group

presented by

**Midwest Microscopy and Microanalysis Society (M<sup>3</sup>S)**

A local affiliate of the Microscopy Society of America and the Microanalysis Society

**Friday, September 16th**

**The McCrone Group**

**850 Pasquinelli Dr, Westmont, IL 60559**

**RSVP by Tuesday, September 12th**

**to:**

<https://forms.gle/SND65hhoY18PjWHBA>

**Please Note:** The McCrone Group (TMG) is open and operating with COVID-19 precautions implemented to protect the health and safety of our staff and those with whom we conduct business. Masks are not required at this time but if you would like to wear one, you are welcome to do so. If you are symptomatic or recently had COVID, please refrain from attending.

## **Onsite Registration Fees**

**Meeting Free for M<sup>3</sup>S members, \$20.00 for non-members, \$5.00 for students (Fee includes M<sup>3</sup>S membership for 2022)**

Brandt [bbrandt@jeol.com](mailto:bbrandt@jeol.com) (vendor liason) or [cem.akatay@honeywell.com](mailto:cem.akatay@honeywell.com) (MMMS secretary)

## **Program**

**8:15 - 9:15AM**

**Registration - Continental Breakfast will be served**

**9:15 - 9:30AM**

**Welcome and Opening Remarks**

**9:30 - 10:15AM**

**Forensic Microscopy: Problem Solving through Microanalysis**

**Christopher S. Palenik, Ph.D., Microtrace LLC**

The word "Forensic" has become a prefix that has been applied to every imaginable discipline. Analogously, microscopy has become a foundation to which nearly every imaginable analytical tool has been attached. Based solely upon the breadth of these two terms, their coupling would seem to be inevitable. The result, forensic microscopy, is a pairing with a purview that is broad enough to draw from any scientific discipline and any conceivable microanalytical tool. Thus, one of its strengths is the ability to scientifically address a vast array of questions spanning any industries or material. Through case examples, this talk will illustrate the elegant scientific solutions that the breadth of forensic microscopy may afford on topics of criminal activity, civil litigation, intellectual property, industrial contamination, and even art and antiquities. Conversely, this talk will also illustrate ways in which attempts to standardize and segregate the field into silos of specialty can backfire to destroy the very benefits that give this discipline its problem solving prowess.

Christopher Palenik, Ph.D. - <https://www.microtrace.com/about/scientists/christopher-s-palenik-ph-d/>

**10:15 - 11:00AM**

**Break - Visit with Vendors**

**11:00 - 11:45AM**

**Advances in Microanalysis Applied to Heritage Science**

**MAS Tour Speaker: Edward Vicenzi, Ph.D., Smithsonian Museum Conservation Institute**

Studying the origin and history of cultural artifacts can often be supported by analyzing their microscale textures and composition. The presentation will provide an overview of a selection of three projects where traditional scanning electron microscopy-based methods were augmented with less commonly made measurements using in situ  $\mu$ XRF, constant velocity stage scanning, and multi-voltage electron beam EDS to obtain information regarding: 1) the provenance of Mesoamerican obsidian mirrors, 2) the origin of Pre-Viking iron-age glass from a Swedish hillfort, and 3) nanoscale thin film coatings on 18<sup>th</sup> century metal-wrapped European textiles.

Edward Vicenzi, Ph.D. - [https://www.si.edu/mci/english/about\\_mci/staff/VicenziEP.html](https://www.si.edu/mci/english/about_mci/staff/VicenziEP.html)

**11:45 - 1:15PM**

**Lunch - Visit with Vendors**

**1:15 - 2:00PM Strange Bedfellows: Why is Forensic Science Inside Law Enforcement Organizations?**

**Max Houck, Ph.D., Florida International University**

Government uses science to make better decisions to serve and aid its citizens. Most governmental scientific endeavors have their own agency, like the U.S. Geological Survey or the National Forest Service, with their own remit and some level of control over their missions. Why then are forensic science organizations housed within law enforcement agencies? It is well-known that Edmund Locard created the first forensic laboratory in 1910 under the administration of the Lyon Police Department. But why there? Why not at a university, like at the University of Lyon where he trained and worked cases under Andre Lacassagne? Locard's decision, and his later successes, fixed the foundation for forensic organizations for decades. But what are the modern and organizational implications when non-scientists oversee and control scientific pursuits? Why has independence of forensic science been so difficult to pursue, let alone achieve? This presentation will discuss the history of forensic science provision and offer an opinion on the reasons for forensic science being subsumed under law enforcement agencies.

Max Houck, Ph.D. - <https://case.fiu.edu/about/directory/profiles/houck-max.htm>

**2:00 - 2:30PM Hair, There, and Everywhere...**

**Sandra Koch, Ph.D. The McCrone Group**

Having hair is a uniquely mammalian trait and microscopical analysis of the hairs that have been left behind can be informative for a wide range of applications or research questions. Microscopical analysis and comparisons can indicate the possible species a hair came from. Analysis of the context where the hair was found or how it was used can add to our understanding of past societies and modern interactions. Hair microstructure and the variation among mammalian hair forms have been studied and described in research by zoologists, anthropologists, archeologists, forensic scientists, museum conservationists, the cosmetic industry, textile scientists, and others in the biological sciences. This presentation will cover some of the range of research that is being done on hairs today. Hairs isolated from archaeological textile materials found in the southwest are being studied to better understand how people lived and interacted with animals in their environment in the past. Modern samples show up as contaminants in industrial products and as evidence in forensic casework. The training and reference collections necessary for characterizing such materials will be discussed as well as the limitations that should be included in reports and publications as there is still much to be learned about hair, even though it is such an obvious feature.

Sandra Koch, Ph.D. - <https://www.mccrone.com/staff/sandra-koch/>

**2:30 - 3:00PM Electron microscopy study of structural degradation in Li-ion battery cathodes**

**Jianguo Wen, Ph.D., Argonne National Laboratory, Center for Nanoscale Materials**

The performance failure of Li-ion battery is a heavily studied topic, which involves multiple scale structural degradation in cathode materials. Structural degradation could be caused by the significant changes in lattice expansion/contraction, phase transition, oxygen release, cation disordering, defect and crack formation, and surface reconstruction during electrochemical cycling. Using advanced S/TEM including 3D electron diffraction, we studied the origin of structural degradation in Li- and Mn-rich cathode materials. It was found that the structural degradation is mainly caused by the strain induced by the electrochemical inhomogeneity between LiTMO<sub>2</sub> and Li<sub>2</sub>MnO<sub>3</sub> nanoscale domains. By rational concentration gradient design, the formation of particle cracking can be effectively suppressed during electrochemical cycling.

[1] Liu, T., Yu, L., Lu, J. et al. "Rational design of mechanically robust Ni-rich cathode materials via concentration gradient strategy". Nat Commun 12, 6024 (2021).

[2] Liu, T., Liu, J., Li, L. et al. "Origin of structural degradation in Li-rich layered oxide cathode". Nature, 606(7913), 305-312 (2022).

Jianguo Wen, Ph.D. - <https://www.anl.gov/profile/jianguo-wen>