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Inter/Micro 2008

Gary J. Laughlin
McCrone Research Institute*

The first Microscopy Symposium on Electron and Light Microscopy was developed by Walter C. McCrone (light microscopist in chemistry) and Charles Tufts (electron microscopist in physics) and was held June 10-12, 1948 at the Stevens Hotel, now the Hilton Chicago. These meetings continued to grow with inversely proportional titles including "MICROSCOPY SYMPOSIUM" then "MICRO" and now, thanks to Lucy McCrone who came up with the name: "INTER/MICRO" (only after the RMS reclaimed the "Micro" name for their meetings in the 1960s).

You will be interested to know that the Inter/Micro symposia are believed to be the very first meetings to gather top people in light and electron microscopy together to discuss very small particles including the range of ultrafine particles that are commonly referred to today as "Nanoparticles."

You will also be interested, I'm sure, that Dr. McCrone's reaction and personal satisfaction to these symposia came from having the world's best microscopists come to Chicago to further *his* education! Thank you for helping us celebrate our 60th Anniversary and for your support of Inter/Micro so that we can all continue to further *our* education.

Monday, July 7th

Adar, Fran – HORIBA Jobin Yvon Inc., *The Shift in Paradigm: Smart Microscopy with Raman Spectroscopy*

Brown, Rich – MVA Scientific Consultants, *High Dynamic Range (HDR) Imaging with Reflected Light Microscopy*

Sparenga, Sebastian – McCrone Research Institute, *Mistaken Identity of the Hay Clinker*

Reffner, John – Trace Consulting, *Microscopy - the Foundation of Microspectroscopy*

Smith , Ken – Thermo Fisher Scientific, *FTIR Microscopy without Liquid Nitrogen*

Ravines, Patrick – George Eastman House International Museum of Photography & Film, *Confocal White Light Microscopy Applied to the Study of Photographic Surfaces*

Chernoff, Donald A. – Advanced Surface Microscopy, Inc., *Atomic Force Microscopy of Pharmaceutical and Biological Materials*

Griesser, Ulrich – University of Innsbruck, *Hot Stage Microscopy: The Aesthetic Side in Polymorphism Research*

Havics, Tony – pH2, LLC, *Ocular Deviations and Microscopy*

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Rich Brown of MVA Scientific Consultants speaks at the 2008 Inter/Micro in Chicago.

Hinsch, Jan – Leica Microsystems, *A One-Hour Crash Course in Microscopy*

Bales, Hazel – Microtrace Scientific, *Planar Section of Multilayer Paint Chips*

Muir, Kim – The Art Institute of Chicago, *Understanding the Evolution of Pablo Picasso's 'The Old Guitarist' through Cross-Section Analysis*

King, Meggan – McCrone Research Institute, *Archaeology and the Light Microscope*

Smith, Ken – Thermo Fisher Scientific, *Smart Raman Spectroscopy for QA/QC and Microscopy Applications*

Palenik, Chris – Microtrace Scientific, *Microanalytical Characterization of Architectural Paint Pigments*

Brown, Rich – MVA Scientific Consultants, *Particle Shape/Morphology; Limitations of Automated Systems*

Monday Evening

2008 'EVENING WITH BRIAN'
& 60th Anniversary Cruise
on Lake Michigan, Shoreline Sightseeing Boat Cruise
7:00 p.m. - 9:00 p.m.

Inter/Micro – The First Sixty Years

TUESDAY, JULY 8TH

Environmental and Industrial Microscopy

Brinsko, Kelly B. – McCrone Research Institute, *Optical Characterization of New Eco-Friendly Fibers*

Potter-Jankauskas, Sharon – Cherokee Consulting, *Women at Inter/Micro: A 60-Year History*

Lalonde, André – University of Ottawa, *The Importance of Polarizing Microscopy in the Undergraduate Geology Program at the University of Ottawa, Ontario, Canada*

Bormett, Richard W. – Renishaw Inc., *Improved Characterization and Identification of Cement Component Mineral Phases with Combined Raman-SEM Microscopy*

Howard, Phillip – NASA, *International Space Station EVA Wipe: An Extraordinary Sample from a Far-out Place*

Ford, Brian J. – Gonville & Caius College, Cambridge University, *Ingenious Living Cells*

Weaver, Robert – Par Pharmaceutical, Inc., *Pharmaceutical Problem Solving with Light Microscopy*

Bunker, K. L. – RJ Lee Group, Inc., *Complementary TEM and FESEM Characterization of Amphibole Particles in Mixed Mineral Dust from Libby, Montana, U.S.A.*

Havics, Tony – pH2, LLC, *A Stochastic Look at Asbestos Dimensions and Asbestos Structure Types in Settled Dust and Air Samples by TEM Analysis*

Ken Smith (left) of Thermo Fisher Scientific and Rich Brown share the podium.

Chatfield, Eric – Chatfield Technical Consulting Limited, *How Failure to Characterize Airborne Particles Caused EPA to Misinterpret the Source of Asbestos and the Effectiveness of Asbestos Abatement*

Charbonneau, James E. – Grocery Manufacturers Association, *Investigation of Foreign Substances in Food*

Rantanen, Walter – Integrated Paper Services, Inc., *Microscopy of Paper Mill Residues*

Boltin, Randy – MVA Scientific Consultants, *Analysis of Black Particles*

Nelson, Linda A. – United Space Alliance, LLC, *Investigation of Post-Flight Solid Rocket Booster Foreign Material*

Howard, Phillip – NASA, *Space Shuttle Engine Cut-off Sensor Contamination – Failure to Launch*

Wayne, Larry – Forensic Analytical Laboratories, Inc., *Manufacturing Errors in Compact Discs*

WEDNESDAY, JULY 9TH

Chemical and Forensic Microscopy

Tulleners, Frederic – University of California, Davis, *Micro-Marked Firing Pins: Character Durability and Micro Mark Legibility*

Greenman, Sylvia – *Constructing a Gunshot Residue Library*

Clarke, Theodore – *Reflected Light COL (Circular Oblique Illumination), an Almost Forgotten Technique*

Beckert, Jason – Microtrace Scientific, *Keeping it Together: A Brief Look at Paper Towel Wet-Strength Agents*

Bowen, Andrew – Stoney Forensic, *Optical Characterization of Silver Sulfadiazine*

Hill, Whitney B. – MVA Scientific Consultants, *Forensic Applications of the TEM*

Wilson, Bill – Microtrace Scientific, *After School Activity: Murder in Middle America*

Dulaney, Tanya – San Diego Police Department Crime Laboratory, *Validation of Nuclear Fast Red Staining of Hair Roots to Predict Nuclear DNA Testing Suitability*

2008 Inter/Micro attendees gathered at the Knickerbocker Hotel in Chicago for five days of workshops, exhibits and camaraderie .

Palenik, Skip – Microtrace Scientific, *A Practical Technique for the Recognition of Modern Sculpture Proffered as Ancient Art*

Isphording, Wayne C. – Tierra Petrographics, *Heavy Mineral Evidence in Forensic Investigations*

Hopen, Thom – Bureau of Alcohol, Tobacco, Firearms, and Explosives, *Lake Huron Sand Study*

Palenik, Mark E. - Microtrace Scientific, *Gas Chromatography with Mass Spectrometry (GC/MS) as a Technique for Determining the Presence of Lubricants in a Case of Sexual Assault*

Ford, Brian J. – Gonville & Caius College, Cambridge University, *World's Worst Microscopy*

Laughlin, Gary J. – McCrone Research Institute, *NIJ Forensic Microscopy Training Program*

De Forest, Peter – Jon Jay College of Criminal Justice, *The Approach of the Investigative Microscopist to Physical Evidence Casework*

Moorehead, Wayne – *Examination of Emanating Fibrous Structures in Morgellon's Disease From A Single Patient*

Diazcuk, Peter – John Jay College of Criminal Justice, *Analysis of Crystals Resulting from Different Catalysts used in the Manufacture of Triacetone Triperoxide*

Chris Palenik of Microtrace, LLC explains how Raman microspectroscopy is used to analyze architectural paint pigments.

INTER/MICRO 2008 BANQUET
AND
SMSI AUCTION

SMSI 2008 Èmile Chamot Award Recipient
Bill C. Mikuska,
Microchem Consulting, LLC

SMSI 2008 August Köhler Award Recipient
Dr. Peter De Forest,
John Jay College of Criminal Justice

2008 INTER/MICRO WORKSHOP I

THURSDAY, JULY 10TH, 2008

Microscopical Thinking and Trace Evidence Workshop

8:00 a.m. – 5:00 p.m.

Dr. Peter R. De Forest,
John Jay College of Criminal Justice, New York, NY

With assistance from:
Peter Diaczuk, John Jay College of Criminal Justice
& Wayne Moorehead

This workshop is designed to provide the participants with a broad perspective concerning the role of microscopy and that of a generalized microscopical, or trace evidence, approach to the problems of physical evidence assessment and interpretation in complex cases. It is expected that those participating in the workshop will possess a basic theoretical understanding of polarized light microscopy, as well as a modicum of practical experience with the use of the polarized light microscope.

The one-day workshop will have three interwoven components: short lectures, hands-on laboratory exercises, and presentations of illustrative case examples. The lecture portions of the workshop will present several aspects of microscopical theory and trace evidence concepts and philosophy. Two very different meanings of the adjective trace will be discussed. Most of the day will be spent on laboratory exercises and case examples. These exercises and case examples will be selected to illustrate the advantages of applying microscopical thinking and problem solving to dealing with complex cases. The point will be made that trace evidence approaches have an extraordinarily wide applicability in criminalistics. Furthermore, the applications of this approach to casework transcend the dimensional constraints of the microscopic domain, because this process is not limited only to material transfers.

2008 INTER/MICRO WORKSHOP II

FRIDAY, JULY 11TH, 2008

Workshop in Fluorescence Microscopy

8:00 a.m. – 5:00 p.m.
Dr. Steven E. Ruzin,
University of California, Berkeley, CA

McCrone Research Institute's Kelly Brinsko and Kevin Brady of Tredegar Film Products talk micro-shop.

This one-day workshop is an introduction to fluorescence microscopy, with an emphasis on identification of organisms in environmental samples using fluorescence. There will be lectures and demonstrations designed to introduce the participant to the mechanics and optics of fluorescence microscopes. In addition, participants will become familiar with the theory of fluorescence in microscopy and the practice of probing unknown samples with fluorescent molecules.

Students will gain hands-on experience using a number of common probes on provided samples as well as the participants' environmental samples of choice. Emphasis will be on choosing the appropriate fluorescent probe, sample preparation, and fluorescence image interpretation. While the workshop will be mainly concerned with identification of biological samples, non-biological samples will also be used and interpreted using fluorescence microscopy.

Jan Hinsch of Leica Microsystems gives his audience a "One-Hour Crash Course in Microscopy."

ABSTRACTS

MONDAY, JULY 7TH

Techniques & Instrumentation

The Shift in Paradigm: Smart Microscopy with Raman Spectroscopy, Fran Adar, HORIBA Jobin Yvon Inc.

The requirements of a microscopist for the Raman microscope are different from those of a spectroscopist. For example, bright and dark field imaging, binocular with a high quality digital camera, fluorescence imaging, color and density filters and polarized light imaging are essential tools for the microscopist.

Conventionally, a Raman microscope is based on a Raman spectrometer, which is then coupled with a microscope, most often a light microscope. The microscope enhances the performance of the spectrometer, but its own functionalities can be limited. Recently, HORIBA Jobin Yvon reversed this approach and developed a new Raman microscope (XploRA) that is based on a microscope. A compact Raman spectrometer is coupled to a light microscope to ensure that the full functionality of the microscope is maintained. An added advantage of this approach is that almost all upright microscopes are compatible. Spectroscopic functionalities are also maintained without compromise including true confocality and rapid Raman scanning.

Examples will be provided to demonstrate the spectroscopical and microscopical performances of the new Raman microscope including various pharmaceutical, mineralogy, polymer and nano-materials applications.

High Dynamic Range (HDR) Imaging with Reflected Light Microscopy, Rich Brown, MVA Scientific Consultants

Some of the most disappointing images I have taken as a microscopist involve reflected light and the stereomicroscope. Usually, I have a variety of particles with variable colors, transparency, shape, size, luster and focal depths all in the same field of view. While there are many ways to overcome each problem using diffuse light (different backgrounds, exposures and patience) I usually opt for getting a decent amount of light and a series of exposures; when in doubt, bracket.

Exposure bracketing in photomicrography is not new. Exposure bracketing is how photomicrography is performed and in every exposure there are dark particles that look good, white particles that look good but rarely (at least in my images) is there an exposure where all the different range of colors in the field of view look good!

Digital imaging offers hope for the frustrated! Using high dynamic range (HDR) imaging techniques and software, all of my bracketed images can be combined into a single image that represents the entire range of exposures taken. Examples of the images produced, software that is available and some basic considerations will be enough to get you started and experimenting with this new digital photography technique.

Inter/Micro attendees mingle and exchange ideas during a coffee break at the Knickerbocker Hotel in Chicago.

Mistaken Identity of the Hay Clinker, Sebastian Sparenga, McCrone Research Institute

Spontaneous ignition can and does occur. Occasionally, the material left behind resembles an incendiary device residue. In particular, when this occurs in haystacks, the residue is referred to as a hay clinker. The objectives of this presentation are to discuss the formation of hay clinkers and to present the characterization of a recently obtained clinker sample.

Microscopy – the Foundation of Microspectroscopy, John Reffner, Trace Consulting

Microscopy is the art and science of creating, recording and interpreting magnified images: spectroscopy is the science of generating electro-magnetic radiation and interpreting its interaction with matter. Microspectroscopy joins these disciplines in a symbiotic-like relationship, each feeding on the other, creating new technologies with unique and powerful abilities. Microspectroscopy has many forms and it continues to transform as improved technologies emerge. Microspectroscopy is not new and its development was more evolutional than revolutional.

The first recorded use of microspectroscopy is traced to Henry Clifton Sorby. His microscopical work in metallurgy led him to invent a spectrum microscope with a new arrangement to get what he calls "direct vision" and this work pioneered yet another new branch of scientific study: "Microspectroscopy."

The development of a functional electron microprobe for x-ray microspectroscopy began in 1948 as the doctoral research of Raymond Castaing at the University of Paris. modified an electron microscope to produce an electron beam about one micrometer in diameter. Castaing obtained his initial results in 1949 using a dispersive x-ray spectrometer. The use of energy dispersive x-ray (EDX) detectors did not begin until 1968. Clearly, SEM-EDX microspectroscopy is widely used today.

In the same year Castaing published his work, the first papers on mid-infrared microspectroscopy were published. However, infrared microprobe analysis did not become a practical technology until 1978, when Vincent Coates developed the Nanometrics 20-IR and Robert Muggli demonstrated the first operational FT-IR microprobe.

Today, microspectroscopy is commonly used to extract chemical information from the magnified images produced by microscopes. The Microscopist now has tools for elemental or molecular analysis of microscopic domains. May the evolution continue!

FTIR Microscopy without Liquid Nitrogen, Ken Smith, Thermo Fisher Scientific

A new microscope platform has been designed that optimizes the throughput and infrared performance of a FTIR microscope to allow, for the first time, the use of a DTGS detector in a FTIR microscope. The iN10 MX FTIR microscope also has MCT and imaging array detectors which take advantage of the high throughput design of the microscope to allow rapid mapping and imaging of samples. The microscope is coupled with an enhanced software package, Picta, that

The conference brought together the top people in light and electron microscopy to learn more about the world of ultramicro/nanoparticles.

Hazel Bales of Microtrace Scientific fields a question about her talk on the planar sections of multilayer paint samples.

incorporates tools such as image analysis to automate the analysis of particles and inclusions, as well as streamlining the process of extracting data from mapping data.

Confocal White Light Microscopy Applied to the Study of Photographic Surfaces, Patrick Ravines, George Eastman House International Museum of Photography & Film

The Conservation Department at George Eastman House International Museum of Photography and Film has been testing tools from the field of optical metrology such as confocal white light microscopy to investigate photographs. Confocal white light microscopy is a non-perturbing (non-contact, non-destructive and non-invasive) technique that has proven to be useful and safe in the study of the surfaces of historic and fine art photographs.

Confocal white light microscopy provides quantitative data of the surface geometry; an array of (xyz) points in 3D space that reflects the topographical nature of the photograph surface. This technique is singularly well suited for the study of daguerreotypes, since the metallic surface structure and topography of silver, mercury and gold defines the image. Confocal microscopy makes it possible to quantitatively measure the surface and any changes in structure affected by deterioration mechanisms and/or evaluate restorative conservation treatments.

This presentation will discuss the concept of confocal microscopy, briefly cover the early history of photography and daguerreotypy (the first form of photography which began in 1839) and provide examples of the application of confocal microscopy to the examination and assessment of conservation treatments of daguerreotypes as well as other photographic media such as silver gelatin photographs, cyanotypes and platinotypes.

Atomic Force Microscopy of Pharmaceutical and Biological Materials, Donald A. Chernoff, Advanced Surface Microscopy, Inc.

We give four case studies showing how Atomic Force Microscopy (AFM) is used in the pharmaceutical industry and in medical research. We look at structures on length scales from 1 nm to many mm. Lactose is perfectly stable until you look closely. Molecules diffuse on particle surfaces over time in response to temperature and humidity, causing unanticipated physical changes in bulk materials. Polymer microspheres are not spherical at all. More importantly, the crystalline vs. amorphous form of tiny particles on the microsphere surface can affect flowability. Collagen is a monodisperse polymer, when first synthesized, but is cross-linked when incorporated into living tissue. When tissue is processed to make an injectable biomaterial, it is helpful to see and measure the now-complex molecular structure. In the hunt for the molecular basis of disease, clinical, cellular, and chemical studies are essential. AFM visualization of a key peptide-DNA complex completed the picture for psoriasis.

Dr. Peter De Forest (left) of the John Jay College of Criminal Justice accepts the SMSI 2008 August Köhler Award from SMSI President Wynn Hopkins.

Bill Mikuska of Microchem Consulting, LLC is the proud recipient of the SMSI 2008 Èmile Chamot Award.

Hot Stage Microscopy: the Aesthetic Side in Polymorphism Research, Ulrich Griesser**,** University of Innsbruck

Polymorphism, the ability of a compound to exist in multiple crystal forms, is nowadays recognized as an important issue in the pharmaceutical/chemical industry and presents a challenging playground in basic science to achieve a better understanding of supramolecular aggregation, molecular interactions, nucleation and crystal growth phenomena, etc.

Though most of the pioneering work in this research area was performed with the polarized light hot stage microscope (HSM), the use of this technique has been widely eclipsed by modern, high tech analytics. However, the role and strength of hot stage microscopy is, among others, its simplicity and the fact that the visual observation of a process can result in a much better understanding of the involved phenomenon than a peak on a chart. Therefore, HSM represents a very important complementary technique in complex solid-state characterization programs that can save a lot of time and money. Moreover, the operator is awarded with the fascinating and colorful images that originate from birefringent crystals in polarized light.

This presentation summarizes some of the benefits of HSM in the solid-state characterization of small organic molecules and inspects the "bright side" of polymorphism research.

Ocular Deviations and Microscopy, Tony Havics, pH2, LLC

The eye is a complex organ and can suffer from various deviations (retinopathies) that affect microscopical performance. These may be genetically inherited or induced from illness or adverse chemical or physical exposure and can include dyschromatopsia, contrast sensitivity loss, myopia (physically as well as mentally), etc.Information on the causation, effects, as well as the practical impact of these deviations will be presented, including what a "color blind" person sees when they look at an object?

A One-Hour Crash Course in Microscopy, Jan Hinsch, Leica Microsystems

The microscope is a deceivingly simple instrument. There can be no question what end to look into or where the specimen goes. And yet, after just one hour of training the foundations may be laid for taking the instrument to unexpected levels of performance and deriving equally unexpected levels of satisfaction from it. I will present some modest suggestions how that initial one hour might be spent, to turn a novice into a veritable member of the brotherhood of microscopists.

Planar Section of Multilayer Paint Chips, Hazel Bales, Microtrace Scientific

The microscopical and microanalytical characterization of pigments in forensic paint samples is generally based upon cross sections of paint layers. This is a proven practical and expedient method for typical forensic paint analysis. When examining pigments in paint layers, it is often helpful to have larger areas of any given layer to examine. This talk presents a means by which to prepare wide-area planar sections of a given paint layer of a multi-layer paint sample. To prepare such samples requires more care and time than free-hand sections, however, the end result is a preparation that provides an ample area to study for the characterization and analysis of pigments and extenders (fillers). This approach is particularly helpful when studying pigments that are present at lower levels, for example, tinting pigments.

Understanding the Evolution of Pablo Picasso's "The Old Guitarist" through Cross-Section Analysis, Kim Muir, The Art Institute of Chicago

Collaborative research by conservators, scientists and curators at The Art Institute of Chicago has shed new light on Pablo Picasso's "blue period" masterpiece

Gary J. Laughlin, director of the McCrone Research Institute, introduces Brian J. Ford at the 2008 "Evening with Brian" presentation.

"The Old Guitarist" (1903-04). Examination of the painting using a combination of techniques – including stereomicroscopy, x-radiography and infrared reflectography – revealed the presence of two distinct figural compositions below the surface. The information provided by these examination techniques, however, was limited and questions remained about the underlying images, their sequence of execution, their palette, and their degree of finish. In order to gain a better understanding of the hidden compositions, micro-samples were taken from key areas of the painting and prepared as cross sections. This paper focuses on the analysis of these samples using reflected light/ultraviolet fluorescence microscopy, scanning electron microscopy coupled with energy dispersive x-ray spectroscopy (SEM-EDS), and micro-Fourier Transform Infrared Spectroscopy (micro-FTIR). The results, evaluated in relation to the information gained from in-situ examination methods, provide important information about Picasso's working process and materials and contribute to a greater understanding of the artistic evolution of this iconic work.

Archaeology and the Light Microscope, Meggan King, McCrone Research Institute

The light microscope can be an invaluable tool in archaeological studies. The use of the polarized light microscope gives one the ability to determine a great deal of information about the chemical and mineralogical composition of materials. A small shard of pottery collected during the 2007 excavation season at the Byzantine city of Amorium, located in central west Turkey, was submitted to the McCrone Research Institute for analysis. This presentation will evaluate various microscopical techniques that were used to aid in the characterization of this piece.

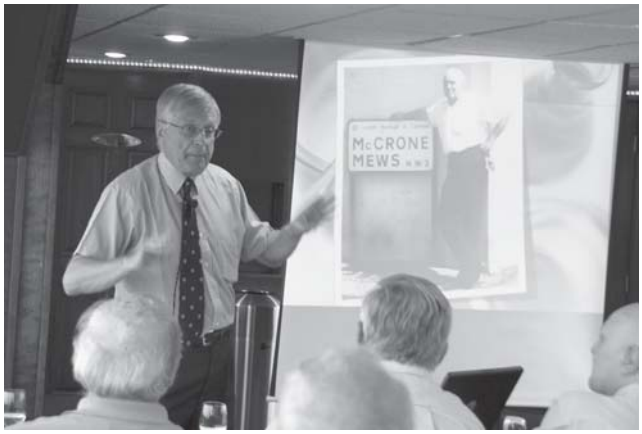
Smart Raman Spectroscopy for QA/QC and Microscopy Applications, Ken Smith, Thermo Fisher Scientific

Two new Raman systems have been developed from a single spectrometer platform that incorporates modular components including lasers, Rayleigh filters and gratings. When matched with automated alignment tools and a powerful software suite, these spectrometers provide easy to use Raman systems for both macro- and micro-Raman spectroscopy in the QA/QC or forensic laboratory.

Microanalytical Characterization of Architectural Paint Pigments, Chris Palenik, Microtrace, LLC

The characterization of submicrometer paint pigment in forensic investigations has traditionally been limited by a combination of sample size, pigment size, and pigment density. The development of Raman microspectroscopy as a viable analytical technique has opened a new avenue to characterize paint pigment. Raman microspectroscopy provides many benefits including a minimal analytical volume, ease of sample preparation, and characteristic spectra of many pigments. However, when used alone, it also has its own set of limitations that can include fluorescence, pigments that are not Raman active, and the inability to distinguish between samples with similar spectra but different binders or samples with the same pigments present in different ratios.

This presentation will demonstrate the ways in which Raman microspectroscopy can be used in concert with other microanalytical techniques to improve the evidentiary value of forensic paint evidence. Specifically, this talk will focus on our recent research into architectural paint pigment. Tinting pigments used to color architectural paints were collected from various paint suppliers. The basic tinting pigments used by various manufacturers have been identified and characterized using a variety of microanalytical methods including polarized light microscopy, Raman microspectroscopy, X-ray diffraction and energy dispersive X-ray spectroscopy. Using this analytical database, unknown paint samples were then characterized in an attempt to recognize and qualitatively identify the pigment(s) present in several architectural



Brian J. Ford of Cambridge University shares some fond memories of Dr. Walter C. McCrone during his "Evening with Brian" presentation.

paints. The advantages and limitations of pigment analysis with regard to their forensic significance will be discussed.

Particle Shape/Morphology; Limitations of Automated Systems, Rich Brown, MVA Scientific Consultants

Having been involved with automated particle analysis for the last 20 years, we have watched, struggled and contributed to the evolution of the automated particle analysis procedure. Showing some of the more sophisticated systems from Tracor, Noran, EDAX and now Thermo Noran will demonstrate how the evolution of the automated particle analysis system has survived many operating system changes and hardware "improvements". Today, particle analysis systems employed by scanning electron microscopes depend on the same basics as 20 years ago; particle dispersion techniques, contrast imaging techniques and collecting enough pixels to define a particle so that particle morphologies can be determined. Recounting the history of the past systems will bring back some fond memories of the many "features" that we have had to deal with and, a description of the new "features" available today, will help Inter/Micro attendees gain some insight as to the basics necessary to perform automated particle analysis using light and electron microscopy.

TUESDAY, JULY 8TH

Environmental & Industrial Microscopy

Optical Characterization of New Eco-Friendly Fibers, Kelly Brinsko, McCrone Research Institute

With the recent focus on environmentally friendly products, manufacturers have begun producing fibers to meet the growing demand of an earth-conscious public. Several of these natural polymers of bamboo, corn, milk, and soybeans are examined and characterized microscopically. Polarized light observations, including refractive index and birefringence, as well as hot-stage melting temperature are determined. The characterization also includes infrared micro-spectroscopy (FTIR), cross-sectional shape, and solubility.

Women at Inter/Micro: A 60 Year History, Sharon Potter-Jankauskas, Cherokee Consulting

Highlighted are four of the most influential women speakers of Inter/Micro. women who have made significant talks in each of the six decades will also be. The wide range of topics presented is covered and finally a comprehensive handout listing women speakers and their talks will be reviewed.

The Importance of Polarizing Microscopy in the Undergraduate Geology Program at the University of Ottawa, Ontario, Canada, André Lalonde, University of Ottawa

Recognizing the fundamental importance for students in an undergraduate geology program to properly identify minerals and rock textures in thin sec-

Brian J. Ford treats his audience to an "Evening with Brian" during the Inter/Micro 60th anniversary boat cruise on Lake Michigan.

tions, the Department of Earth Sciences at the University of Ottawa decided in 2005 to emphasize microscopy in its curriculum and to replace its fleet of ~40-year-old polarizing microscopes with 18 research-grade Olympus BX41 microscopes equipped for both transmitted and reflected light illumination. The instruments were installed in a dedicated room without windows, with available subdued lighting and with a dustless whiteboard. A BX51 microscope with a CCD camera connected to a ceiling-mounted projector is available to the instructor at the front of the class for live demonstrations in both orthoscopic and conoscopic imaging modes. Students have access to a microscope and stereomicroscope with CCD cameras for photomicrography. Students learn all the common methods of optical mineralogy including comparative refractometry, determination of birefringence, extinction, elongation, optic sign, the interpretation of uniaxial and biaxial interference figures and the measurement of 2V by several methods. This compulsory course, which is a prerequisite to most third and fourth-year courses in the geology program, includes a survey of most common transparent and opaque rock-forming minerals in standard and polished thin sections.

Improved Characterization and Identification of Cement Component Mineral Phases with Combined Raman-SEM Microscopy, Richard W. Bormett, Renishaw Inc., Leon Black, University of Leeds, Alan Brooker, Renishaw Inc.

An integrated Raman spectrometer and scanning electron microscope (SEM) has been used to investigate the composition of an ordinary portland cement (OPC) clinker nodule. With the combined analytical techniques of the combined microscopies, it has been possible to identify many of the phases present in the clinker. The addition of Raman spectroscopy to the SEM allowed the identification of the different phases according to their Raman spectra eliminating the need to infer identification according to the SEM determined morphology and elemental composition. The addition of Raman spectroscopy confirmed the presence of specific polymorphs of alite (monoclinic Ca_3SiO_5), belite (Ca_2SiO_4), tricalcium aluminate ($Ca_3Al_2O_6$), tetracalcium aluminate ferrite ($Ca_2(Al,Fe)O_5$), aphthitalite ($K_3Na(SO_4)_2$) and calcium langbeinite ($K_2Ca_2(SO_4)_3$). The Raman spectrum of the latter phase had not been previously reported in ordinary portland cement.

Dr. Peter and Carol De Forest (left) and McCrone Research Institute co-founder Lucy McCrone listens to Brian J. Ford's talk on the history of the Inter/Micro conference.

International Space Station EVA Wipe: An Extraordinary Sample from a Far-out Place, Phillip Howard, NASA

The Common Berthing Mechanism (CBM) of the International Space Station (ISS) serves as the docking port for the Space Shuttle to the ISS. Visual inspection of the earth facing CBM, while on orbit, confirmed the presence of visible contamination on the sealing surface that raised a concern of a potential leak. In preparations for expansion of the International Space Station (ISS), an extra-vehicular activity (EVA) was conducted to clean the (CBM) seal and return the contaminants to earth for identification. This presentation will cover some of the usual suspects found as well as contamination control in spacecraft environments.

Ingenious Living Cells, Brian J. Ford, Gonville & Caius College, Cambridge University

Several papers have now appeared in which Brian elaborates his view that single cells embody surprising levels of adaptive behavior that compares with what we see in more highly evolved life-forms. Current theories hold that when cells come together in a common purpose (as in bacterial biofilms) they can begin to show increased levels of adaptive response. Brian's theory is that single cells embody the essence of intelligence. Here we will see some examples of videomicrographs in which the behavior of single cells

reminds us of the activities of multicellular organisms (like insects ands birds).

Pharmaceutical Problem Solving with Light Microscopy, Rob Weaver, Par Pharmaceutical, Inc.

This talk will highlight some general and specific applications of light microscopy for characterizing physico-chemical properties and qualities relevant to the development of pharmaceutical products.

Complementary TEM and FESEM Characterization of Amphibole Particles in Mixed Mineral Dust from Libby, Montana, U.S.A., K. L. Bunker, RJ Lee Group, Inc.

This study involved the development and application of an analysis protocol using transmission electron microscopy (TEM) and field emission scanning electron microscopy (FESEM) for the particle-by-particle characterization (i.e., chemistry, crystallography, and morphology) of mixed mineral dust. This protocol was developed to aid in the differentiation between asbestos and non-asbestos amphibole particles that occur as accessory minerals around the former vermiculite mine located near Libby, Montana. Using microscopical methods to distinguish between asbestos and non-asbestos minerals is critical in regulatory settings. A standard TEM asbestos protocol was supplemented with FESEM by relocating and imaging each potential asbestos particle identified by TEM. Features key to distinguishing between asbestos and non-asbestos amphibole particles, such as overall particle shape and surface roughness, are readily apparent in the FESEM images, but cannot always be accurately observed in a standard TEM image alone. FESEM imaging also demonstrates that amphibole cleavage fragments and single crystals have dimensions and morphological features very different from true asbestos. The FESEM results have helped the geological and microscopical communities better understand the morphology of the minerals found in and around Libby and show that FESEM is a valuable complementary tool to TEM for characterizing the morphology and surface characteristics of particles suspected to be asbestos.

A Stochastic Look at Asbestos Dimensions and Asbestos Structure Types in Settled Dust and Air Samples by TEM Analysis, Tony Havics, pH2, LLC

Asbestos has been regulated based on the underlying presumption that fiber dimensions, length and width, are important in the toxicity of this mineral. Little has been published on fiber dimensions for air samples, let alone settled dust samples. In addition, categorization of structure type has also been lacking. In order to provide a more comprehensive assessment of potential health risk, these parameters should be considered. In this study we look at the varying terminology for structures as applied to different TEM analysis methods, and then proceed with stochastic data on lengths and widths of varying asbestos structures for both air and settled dust samples in typical samples.

How Failure to Characterize Airborne Particles Caused EPA to Misinterpret the Source of Asbestos and the Effectiveness of Asbestos Abatement, Eric Chatfield, Chatfield Technical Consulting Limited

During the years from 1980 to 1991, the Office of Toxic Substances of the EPA was investigating airborne asbestos in school buildings. A study was published in 1983, reporting that airborne chrysotile concentrations up to 644 n_g/m^3 had been observed in a group of U.S. schools. At that time, attempts were being made to relate the airborne chrysotile concentrations to the results of an algorithm that incorporated observations such as condition, accessibility, friability, activity and chrysotile content of the asbestos-containing material. It was concluded that the algorithm was not a valid predictor of airborne asbestos exposure. The asbestos-containing surfacing materials in these schools were removed, and a further air sampling study was undertaken immediately after the asbestos abatement

Brian J. Ford (left) joins Gary J. Laughlin, Jay Beckert, Kelly Brinsko, Shannon Sparenga, and Meggan King for a drink on the boat deck.

was completed. The results of this study showed substantially lower concentrations of airborne asbestos, and it was erroneously concluded that the removal of the surfacing materials had been an effective measure.

Approximately 4 years after the asbestos removal had been completed, another air sampling study was conducted in a sub-set of the same group of schools. In this study, entitled "Long-Term Effectiveness of Asbestos Removal", airborne chrysotile concentrations up to 1560 g/m^3 were observed, significantly higher than those found in the initial study prior to removal of the asbestos. The limitations of a purely statistical approach to the data and how detailed electron microscopy to determine the nature of the airborne particles at the outset would have provided a different outcome, will be discussed.

Investigation of Foreign Substances in Food, James E. Charbonneau, Grocery Manufacturers Association

As of January 1, 2008, the Food Products Association merged with the Grocery Manufacturers Association now known collectively as the Grocery Manufacturers Association or "GMA". The purpose of the organization is to investigate foreign substances in food that may lead to safety and quality problems for the food processor which can lead to interruptions in commercial production and consumer complaints. If a foreign substance or product tampering results in a recall, an entire business may be destroyed and this can have an effect on the credibility of the entire food industry. This talk will describe seven cases of foreign substances in food and their conclusions.

Microscopy of Paper Mill Residues, Walter Rantanen, Integrated Paper Services, Inc.

Paper mill residues consist of the sludge and dry solids produced at various mills. These residues can vary greatly depending on the feedstocks and processes in the mill. A number of different residues are examined and analyzed. The residues typically consist of fiber, fiber debris, fillers, coating pigment and other minor additives. From an analysis, the nature of the material that is generally considered waste can be evaluated for possible additional recovery and utilization, depending on its composition.

Analysis of Black Particles, Randy Boltin, MVA Scientific Consultants

In the age of anti-terrorism investigations, white powders have become the subject of much concern and are resulting in a great deal of analytical effort. On the other hand, black powders, with the possible exception of mold and soot, seem to be considered more of a nuisance and are largely the concern of property owners wanting to know whom to blame for those unsightly smudges on their countertops or cars. Unfortunately, it does not take a very large proportion of dark particle to give a dust deposit a black appearance. In practical terms, the average person exhibits more concern over black particles than white powders simply because it is more easily observed on the light colored surfaces that permeate everyday life.

The analysis of black particles present special challenges for the microscopist. The opaque nature of some black particle types does not lend itself well to the use of conventional transmitted light microscopy. However, a combination of reflected and transmitted illumination coupled with micromanipulation while observing physical properties, allows the light microscopist to quickly characterize a black particle and narrow the range of candidate particle types. Useful identifying chemical characteristics are also obtained by application of infrared spectroscopy, Raman spectroscopy and electron microscopy.

Investigation of Post-Flight Solid Rocket Booster Foreign Material, Linda A. Nelson, United Space Alliance LLC

After a recent shuttle mission, STS-120, and during post-recovery inspection of the Solid Rocket Boosters (SRBs), a large quantity of an unknown orange-yellow liquid and semi-solid mass was observed in a small cavity and a corresponding Teflon drain tube in the interior of one of the upper components of the SRB (Frustum); this cavity allows seawater to drain from the interior of the structure after removal from the Atlantic Ocean. The material was collected for identification and to determine the time frame of introduction. The scope of the analysis included microscopical observations using light microscopy and Scanning Electron Microscopy as well as elemental analysis via Energy Dispersive Spectroscopy.

The material was identified as Schinus terebinthifolius (Anacardiaceae) and Asteraceae/Compositae (genus and species unknown) and a few specimens of Vigna luteola (Fabaceae, legume family) pollen along with a variety of inorganic salts common to seawater. Inasmuch as these pollen forms are insect pollinated, the introduction of the pollen most prob-

ably occurred by insects (bees) through the outer drain hole into the tubing while the vehicle sat on the launch pad. This tubing was protected from the launch thermal environment and, therefore, the pollen did not undergo thermal maturation effects. The pollen became dislodged as the splashdown into the Atlantic Ocean forced seawater into the cavity and through the tubing, thereby blocking the outer drain hole.

Space Shuttle Engine Cut-off Sensor Contamination – Failure to Launch, Phillip Howard, NASA

The two launch scrubs of the Space Shuttle in December 2007 was traced to an electrical short in the liquid hydrogen engine cut off (ECO) sensor. Failure analysis using Time Domain Reflectometry (TDR), traced the electrical short to the External Tank (ET) feedline-to-tank interface external connector. One of the potential failure modes was the contamination of the connector with a common fluorinated grease. The NASA Kennedy Space Center Materials Science Laboratory was tasked with developing a sampling and detection method to exonerate a possible contamination of the internal connector. Certifying the internal connector's cleanliness would avert costly delays in launch schedule and the necessity for removal and replacement. The method developed applied scanning electron microscopy with a four quad backscatter detector (QBSD) to detect any fluorinated grease by atomic contrast. This method proved to have a limit of detection 1000 times lower than the visual cleanliness requirement currently used for flight. The sampling method was applied to certify cleanliness of external tanks 125 & 126 with the potential of being adopted by Marshall Space Flight Center for the certification of future ET ECO connectors at ET Michoud Assembly Facility (MAF) in New Orleans, Louisiana.

Manufacturing Errors in Compact Discs, Larry Wayne, Forensic Analytical Laboratories, Inc.

Due to the minute size of the readable data pits, glass-mastered compact disc (CD) manufacturing is performed in a clean environment. This does not, however, ensure that the discs will be totally free of flaws. Glass-mastered CD manufacturing uses laser-burned glass originals to produce metal stampers from which the physical CDs are produced. Errors in the production and use of the stampers can produce defects that are spread through an entire disc run. Examples are shown of several stamper defects. Further examples are shown of a finished disc containing the same flaws.

Inter/Micro attendees enjoy the cruise along Chicago's beautiful downtown skyline.

WEDNESDAY, JULY 9TH

Chemical and Forensic Microscopy

Micro-Marked Firing Pins: Character Durability and Micro Mark Legibility, Frederic Tulleners, University of California, Davis

The laser machining of microscopic encoding structures on specific firearm components has been proposed to assist in the identification of expended ammunition components found at crime scenes. This study involved the testing of firing pins by placing up to 8 alpha numeric digits on a firing pin with a diameter of 0.075 in. These micro-marked firing pins contained three different forms of encoding: alphanumeric, gear and radial bar codes. The durability of these micro characters and legibility of their impressions were observed by the testing of eleven semi-automatic pistols, two semi-automatic rifles and a pump action shotgun with different ammunition.

The firing pins were evaluated before and after using the scanning electron microscope to document subsequent areas of firing pin encoding degradation. The micro serial impressed on the fired cartridge case primer was evaluated using a stereo microscope equipped with Schott ring light and a polarizer/analyzer. The legibility of the impressions produced by these micro-marked firing pins varied between firearms. Transfer rates were observed from zero to 100% for all encoding formats. Three major factors affected

the legibility of the impressed characters for each of the firearms tested: ammunition brand, firing pin drag, and multiple strikes of the firing pin within the same impression.

Constructing a Gunshot Residue Library, Sylvia J. Greenman

Many forensic analyses involving instrumentation offer a reference library with "fingerprint" spectra stating various degrees of certainty. Following this principle, the construction of a Gunshot Residue (GSR) reference library seeks to provide several benefits. Among these benefits are empirical data identifying idiosyncratic differences in the manufacturing of ammunition. Specifically, a GSR reference library can potentially identify variations between manufacturers or between different ammunitions from a single manufacturer. This distinction has the potential of establishing an association of an individual with a specific make or caliber of ammunition. This association of individual to ammunition can accordingly be broadened to provide a link between the individual and the specific caliber of weapon. The purpose of this project is to discover the idiosyncratic differences between different gunshot residues through the utilization of the scanning electron microscope (SEM) and catalogue the findings in a gunshot residue library.

Reflected Light COL (Circular Oblique Illumination): An Almost-Forgotten Technique, Theodore M. Clarke

I recently designed and made an epi-illuminator module for my LOMO Biolam microscope. Initially I wanted metallographic imaging capability comparable to that which I made for my first student microscope. This time, I decided to add the capability of inserting a stop for COL, referred to in a 1935 Kodak book as conical illumination. I was also aware from an article by J. S. Ploem's in the Journal of Microscopy that this type of illumination is used for reflection contrast microscopy (RCM) with a Leitz Orthoplan microscope adapted for RCM. Experiments with the new illuminator demonstrate that COL significantly improves contrast with metallographic specimens and that the contrast is unexpectedly good with the diatom Amphipleura pellucida well resolved, but accompanied by interference color bands.

Keeping it Together: A Brief Look at Paper Towel Wet-Strength Agents, Jason Beckert, Microtrace

This presentation will describe a recent forensic case involving the analysis of paper towels. During the course of the examination, a wet-strength agent was identified on both the known and questioned exhibits. Wet-strength agents are applied during the manufacture of paper towels to increase their resiliency, especially when moist. Once isolated, the polymer can be analyzed using infrared microspectroscopy. A survey of commonly available paper towels was conducted in order to determine the significance of this particular wet strength agent's presence.

Optical Characterization of Silver Sulfadiazine, Andrew Bowen, Stoney Forensic

A white stain observed on an item of evidence was analyzed by polarized light microscopy. The stain was observed to contain small crystals with very prominent dispersed extinction. Characterization of the crystals by polarized light microscopy did not enable them to be identified using available references. After additional instrumental analyses identified the material as silver sulfadiazine, no optical data for this substance could be located. Silver sulfadiazine is the active ingredient in topical antibiotic creams commonly prescribed for burn treatment, and is therefore a material whose optical properties should be available to the forensic community. To assist future investigators in identifying this material by polarized light microscopy, a standard was obtained and its optical properties for three wavelengths of light were determined using a spindle stage. The methods used and results obtained will be presented.

Forensic Applications of the TEM, Whitney B. Hill & James R. Millette, MVA Scientific Consultants

Transmission Electron Microscopy (TEM) is rarely used as an analytical tool in forensic science. However, it can be very useful in this field because of its ability to analyze the morphology of small particles, gather elemental composition information on very small particles (because of its beam concentration ability) and determine the internal structure of particles, crystalline and amorphous, via electron diffraction. Using TEM in forensic science trace evidence examinations can complement other instruments such as the Scanning Electron Microscope and Light Microscope by gathering morphological, elemental and internal structure information on very small particles that might be overlooked or not easily analyzed by other microscopical techniques. This presentation provides

information about characterizing and identifying various types of nanoparticles via TEM, which may be important to forensic analysis, and also the development of a database of known nanomaterials.

After School Activity: Murder in Middle America, Bill Wilson, Microtrace

A teenage boy was stalked and brutally killed after he returned home from school one Fall day in 1998. A suspect was arrested and charged with the crime. The police believed that the crime happened one way; we were brought in to reconstruct the case but drew different conclusions.

A protracted legal battle ensued regarding admissibility of key evidential items pertinent to the case. After four years, the issues were resolved and the case went to trial. Based on microscopical evidence and bloodstain pattern interpretation, the suspect was convicted. The presentation will address key elements of the crime and demonstrate with graphic photographs what the police missed and how the crime actually occurred.

Validation of Nuclear Fast Red Staining of Hair Roots to Predict Nuclear DNA Testing Suitability, Tanya DuLaney, San Diego Police Department Crime Laboratory, Marzena Mulawka, San Diego Police Department Crime Laboratory

The quantity of DNA present in the root of a hair based upon the root's uptake of the Nuclear Fast Red stain was predicted by scientists at the Department of Forensic Sciences at George Washington University. We investigated this method, and carried out validation studies using hairs in anagen and catagen/telogen stages of growth from twenty-two volunteers. The Trace Evidence section examined the hairs, and recorded their macroscopic characteristics. The hair roots were photographed in reflected light under low power magnification, in transmitted light, and using crossed polars.

The hair roots were stained with the Nuclear Fast Red stain, and the intensity of the staining was recorded and rated. The hair roots were photographed again in transmitted light. The DNA section carried out nuclear DNA extraction of the hair roots; the quantity of DNA was determined, and a profile was obtained when possible. We correlated the intensity of staining to our ability to obtain a full or partial DNA profile from each hair root. These results will be presented with accompanying photographs.

A Practical Technique for the Recognition of Modern Sculpture Proffered as Ancient Art, Skip Palenik, Microtrace

Ancient art, primarily in the form of stone sculpture, is highly collectable and authentic items command high prices at auctions of antiquities. As the prices paid for these objects continue to grow so does the temptation to produce modern works that are then artificially aged to give the impression of great antiquity and represented and sold at auction as authentic. Because the stones from which these pieces are carved are always themselves of great age (e.g. marble, granite, basalt), dating the stones is of no help in determining their authenticity.

Our work with one of the world's most respected dealers in ancient art has never provided us with the opportunity to scientifically examine a number ancient sculptures prior to and after sale. Using sound scientific techniques, of which have before been cited in the literature for this purpose, we have successfully exposed several of these "ancient" sculptures as modern fabrications. A basic tool for this purpose will be described and a very recent case will be discussed in detail.

Heavy Mineral Evidence in Forensic Investigations, Wayne C. Isphording, Tierra Petrographics

Soil typically consists of clay minerals plus quartz, feldspar, iron oxides, etc., that comprise the silt, sand, and gravel fractions. Often overlooked in forensic investigation, however, is the ubiquitous component, termed the "heavy mineral" phase, that usually makes up <1 percent of the sample. While weathered soils may consist solely of quartz, and possibly one or two clay mineral phases, the heavy mineral component of the same soil may possess a rich suite that includes ilmenite, leucoxene, rutile, kyanite, staurolite, tourmaline, etc. in quantities that may be diagnostic for identification. A further advantage of heavy minerals lies in the fact that, while two soils from a local area may be indistinguishable based on their major mineral content, they may be quite distinguishable by their heavy mineral suite. Even if composed of the same heavy minerals, ratios of certain species (e.g., Zircon + Tourmaline / Rutile, the classic AZTR Index), can often be used to distinguish samples from two sites.

Examples are presented where heavy mineral information from soil provided critical evidence in cases involving: (1) industrial sabotage, (2) the source of contaminants in the largest monetary settlement in the

Karl Laschet (left), Jay Beckert, Shannon Sparenga, Meggan King and Rory Dempsey enjoy the summer evening on the Lake Michigan cruise.

United States for a groundwater contamination suite, and (3) a case where heavy minerals conclusively identified a major steel producer as the source of potentially toxic contaminants on neighboring properties.

Lake Huron Sand Study, Thom Hopen, Bureau of Alcohol, Tobacco, Firearms, and Explosives, & Natasha Nell, Bureau of Alcohol, Tobacco, Firearms, and Explosives

This presentation will be the first installment on the study of 39 Lake Huron sand samples from 32 beaches and one inland sand pit. Ramseyer is working on a book titled "The Nature of Lake Huron's Beaches" that will include a chapter on the characterization of mineral grains from the different samples collected. Grain size distribution data is being obtained by weighing sieved fractions: coarse (> 500 μm), medium (500 μm to 250 μm), fine (250 μm to 125 μm), and very fine (< 125 μm). A density separation is being conducted on a second sieved fraction from 180 μm to 63 μm using bromoform (Density = 2.89 g/cc).

Once the light and heavy fractions are weighed, mineral grains from these fractions will be identified utilizing polarized light microscopy (PLM) and scanning electron microscopy coupled with energy dispersive spectroscopy (SEM-EDS). The data generated on the five samples examined will be presented in this ongoing study.

Gas Chromatography with Mass Spectrometry (GC/MS) as a Technique for Determining the Presence of Lubricants in a Case of Sexual Assault, Mark E. Palenik, Microtrace

We were asked by the defense in a case of alleged assault to examine a cylindrical plastic toothbrush case. A key item in the case for the defense was weather a lubricant was present on the toothbrush case. A variety of analytical techniques were used to test the sample for different classes of materials that could be classified as lubricants. This paper explores the feasibility of using GC/MS in detecting trace quantities of volatile/semi-volatile lubricants and the problems associated with it.

World's Worst Microscopy, Prof Brian J. Ford, Gonville & Caius College, Cambridge University

This is our unofficial award to people who get microscopy wrong, and there are a lot of them about. Each year since 2002, I have regaled us with some terrible examples of microscopy. Sometimes it is due to the media, other times due to scientists (who should know better). This year I will again show some new examples from all around the world. They show an exploding microscope (and other examples of dumbing down) that remind us how often our beloved microscope is misrepresented.

NIJ Forensic Microscopy Training Program, Gary J. Laughlin, McCrone Research Institute

The National Institute of Justice (NIJ) and McCrone Research Institute (McRI) are currently delivering a cooperative and federally sponsored and funded program that provides highly specialized microscopy training to forensic scientists working in United States crime laboratories. Criminalists and other trace analysts employed at state or local public crime labs are receiving week-long, hands-on forensic microscopy training through courses conducted by the McCrone Research Institute using its extensive facilities, experienced faculty, and qualified administrative staff; at no cost to the participant or their crime laboratory.

McRI has trained several thousand forensic scientists and has been educating forensic microscopists since it was founded in 1960 including courses sponsored by the Law Enforcement Assistance Administration (LEAA) on a similar mission to educate forensic scientists during the 1970's and 1980's. Beginning and advanced training in polarized light microscopy, hair & fiber microscopy, paint & polymer microscopy, and glass microscopy are offered now with plans for

Gary J. Laughlin (left), Bob Kuksuk, Rich Brown, and Thom Hopon relax aboard the boat.

the inclusion of training for additional forms of physical trace evidence in the future.

The Approach of the Investigative Microscopist to Physical Evidence Casework, Peter De Forest, John Jay College

This presentation will consist of a discussion of the important role of trace evidence, microscopy, and the microscopical approach in assessing, understanding, and appreciating the physical evidence record. Case examples will be selected to illustrate important concepts.

Examination of Emanating Fibrous Structures In Morgellon's Disease From A Single Patient, Wayne Moorehead

A prominent plastic surgeon in Orange County, California, described a patient afflicted with what he diagnosed as "Morgellon's Disease" and was interested in having someone examine the fibrous structures from the patient's lesions to identify them.

Background: Morgellon's Disease, an emerging syndrome, is characterized by lesions of the skin containing fibrous growths. The emanating fibers have been further described as cytoplasm-like single cells with smooth walls that reportedly do not appear to be of textile origin and have a high degree of autofluorescence. There is some controversy over whether the disease exists.

The patient of interest reported a biting and crawling sensation on or under their skin at or near the lesions with filamentous structures emanating from the lesions, all consistent with Morgellon's symptoms. According to the Morgellon's Research Foundation website, "the most striking feature and least understood" are the fiber-like structures that emanate from the lesions.

The physician privately collected samples from a number of lesions of the patient and submitted them for examination. Collectively, the fibers were observed to be of several different colors with one whole fiber typically consisting of one color.

While expecting some, as yet unknown, filamentous growth structures, the fibers were consistent with common natural and manufactured clothing fibers, or on rare occasion, animal (non-human) hair.

Analysis of Crystals Resulting from Different Catalysts used in the Manufacture of Triacetone Triperoxide, Peter Diazcuk, John Jay College

The use of improvised explosives for criminal, domestic, and international terrorism is an ever-increasing problem. Methods for homemade production of these non-military and non-industrial explosives often require little, or no, background in chemistry. The clandestine manufacture of triacetone triperoxide (TATP) is no exception. This rather exotic explosive is currently receiving considerable attention because of

Sixty years after the first conference, Chicago remains the home of the annual Inter/Micro symposium.

its ease of synthesis and procurement of starting materials.

The research presented here was spawned by earlier work detailing the optical properties of two identified TATP polymorphs (Hietpas et al., 2005; Speir et al., 2006), and a preliminary study (Miller et al., 2006) examining the crystal morphology of TATP using different acid catalysts. This presentation expounds upon the work by Miller by further detailing the potential link between crystal morphology and the specific acid catalyst used during synthesis. This link could be used as an investigative lead when attempting to determine provenance of a TATP sample submitted as evidence.