MassHunter Unknowns and Qualitative Workflows for Forensic Data Analysis

Kirk Lokits – GCMS Applications Scientist - Agilent Technologies

The full day workshop is designed to introduce and train the audience in the workflows involved using Unknowns Analysis in the MassHunter software. The workshop begins with a 20-minute slide presentation explaining the deconvolution process, differences between deconvolution and peak integration, and some of the variables involved when using this powerful data analysis tool. Multiple exercises, using forensic data, will illustrate how to translate established workflows within MSD ChemStation Data Analysis to MassHunter Unknowns Analysis. The workshop will include how to generate an in-house library, how to link retention time and or retention indices to each library entry and apply these entries to increase your Library Match Score (LMS) confidence level. Examples of Unknowns Analysis reporting templates will be demonstrated from the workshop exercises. Qualitative Analysis software will also be introduced utilizing forensic data performing manual data analysis, background subtraction, and library searches. 16 laptops with MassHunter software and forensic data will be provided through this hands-on learning workshop. Additional students can be added, if the students provide their own laptops with MassHunter software already loaded. Forensic data can be loaded the day of the course.

Structural Elucidation – What is Identification?

Bob Ollis - Spectre Scientific

Previous workshops on structure elucidation have focused on the spectral interpretations of GC/MS, LC/MS, IR, and Raman systems, and interpretation of spectra for new and novel compounds. This workshop will include the platforms of X-Ray Fluorescence and X-Ray Diffraction. Rather than approach these techniques from solely a drug identification perspective, the use of these tools from the perspective of different disciplines in forensic science will ultimately stimulate the discussion of the entire concept of identification. Do we have "class" and "individual" characteristics in chemistry? How do we "identify" such complex materials such as polymers, distillate fractions, and food? Application to the field of drug identification, explosives, and other trace evidence disciplines are explored.

Risk-Based Thinking

TBD - ANAB

This ISO/IEC 17025 training course reviews specific requirements of ISO/IEC 17025 and ANAB that incorporate the word risk and those that foster a risk-based approach. Both ISO/IEC 17025:2017 and ANAB's AR3125 Forensic Accreditation Requirements have moved to less prescriptive, more performance-based requirements with an aspect of risk-based thinking to facilitate greater effectiveness and continuous improvement. Risk will be defined and several risk-based thinking approaches and tools for identifying, addressing, and monitoring risks will be presented. Participants will then apply these tools and their risk-based thinking knowledge and skills to several practical exercises.

Participants will

- Gain an understanding of ISO/IEC 17025:2017 requirements related to risk and fostering risk-based thinking
- Learn the definition of risk and common components for risk-based thinking
- Become familiar with various tools and resources available and acquire knowledge and skills to implement a risk-based thinking approach
- Learn how to identify and evaluate risks and opportunities in your management system

Half Day Workshops

Lean Six Sigma in Drug Chemistry: Standardizing a Non-Standard World

John C. Lofaro Jr., PhD, ABC-DA – Forensic Scientist – North Carolina State Crime Laboratory

This half-day workshop is aimed towards anyone who is interested in improving the productivity of their section. Lean Six Sigma (LSS) is a combination of Six Sigma (reducing variance) and Lean (reducing waste) principles to increase efficiency. Throughout the workshop we will explore the fundamental concepts of LSS and how they were implemented in the Drug Chemistry Section of the North Carolina State Crime Laboratory. Applying these principles requires measured observations, outside the box thinking, and standardization. These can be a challenge in any environment especially, in a section that is ever evolving not only in submissions but techniques. This workshop will use interactive portions to help explain LSS techniques and conclude with the steps that were taken to improve case throughput in the Drug Chemistry Section of the North Carolina State Crime Laboratory.

Gas Chromatography/Fourier Transform Infrared Spectrometry with Forensic Applications

Lewis Smith – Cape May County Forensic Laboratory

Since the advent of commercial Fourier Transform Infrared Spectrometry in the late 1960's, much progress has been made in both instrument sensitivity and data retrieval. The multiplex nature of interferometry combined with MCT cryrogenic detectors has vastly improved the signal-to-noise ratio of many older microscopic and reflective (ATR) sampling techniques. Modern fast scanning FTIR spectrometers have also made hyphenated techniques such as GC/IR/MS possible.

The most widely used confirmatory method of choice for most forensic labs is Mass Spectrometry. There are many compounds encountered in drug analysis which yield poor fragmentation patterns upon electron-impact. In addition, positional, chiral, and optical isomers cannot be unequivocally identified from their mass spectra alone. GC/FTIR using flow cell (light pipe) technology yields infrared vapor phase spectra that provide supplemental data with solutions to solve these problems.

An historical overview will be given covering the development of coupling gas chromatography with infrared techniques up to the latest GC/IRD technology. All vapor techniques will be covered including gas analysis and the use of heated static cells. Spectral comparisons between solid phase (condensed) and vapor phase will be made illustrating the importance of physical state vs molecular association.

In the case of Synthetic Cannabinoids, vapor phase allows for rotational isomers to move freely creating unique additional bands for identification. Vapor spectra are also free from the effects of polymorphism, intermolecular hydrogen bonding, and water clearing up the amino and carbonyl band stretching regions for a better resolved profile. These properties have made it possible to formulate a classification scheme for identifying all Synthetic Cannabinoids according to their Bridge Carbonyl Frequency.

GC/IR identification of other drug classes such as Fentanyls, Opiodes, Amphetamines, Tryptamines and Cathinones will be covered with emphasis on isomer identification. Examples of derivatization will also be given for compounds that require this modification.

The perfect reproducibility of spectra from vapor phase GC/FTIR offers excellent search results. The availability of reference data and commercial search libraries will be discussed at the conclusion.

Developing a Deeper Understanding of How FIGG Works

Lisbeth Colon – Field Application Specialist – Qiagen

Over the past few years advancements in Forensic Investigative Genetic Genealogy (FIGG) have made headlines with successes associated with cases where traditional STR workflows have provided little insight. Examples are instances where perpetrators are not entered into the CODIS database system and missing persons cases. In the majority of those cases GEDmatch and its law enforcement only side GEDmatch Pro are often used as the database for FIGG kinship analysis. The parent company of GEDmatch and GEDmatch Pro, QIAGEN, would like to invite you to a workshop in order to answer your questions and leave you with a better understanding of the mechanisms by which long-range FIGG kinship analysis is done in our databases. This workshop will include everything from the basics of how FIGG profiles are generated, to more advanced topics such as how kinship analysis is calculated. At the end of this workshop you should not only have a better understanding of how current FIGG workflows operate, but also the ease in which it could be implemented in your laboratory.

Solving More Crime with New Technology

Ashley Korsakas – Senior DNA Analyst/Training Manager - DNA Labs International

This workshop will discuss the importance of utilizing new technologies and the impact that these technologies can have on evidence and cases. The following topics will be covered: fired casing collection and processing for DNA, STRmix, M-Vac, degraded bones and tissue analysis, hair shafts, serological testing, kinship, NGS-SNPs, and genealogy. The techniques will be discussed in detail including limitations and challenges as well as the advantages and successes, including court admissibility. In addition to explanations of the techniques, their application will be further explored using case studies. Case studies will highlight the importance of case reviews prior to testing that involve a collaborative effort across laboratories, law enforcement, attorneys, and other involved parties. This

presentation will also discuss the changes and advancements in forensic DNA analysis over the past few years that may allow evidence that has already been processed to get a second chance.

Thermo Rapid DNA

Presenter TBD – Thermo Fisher Scientific

Let's catch up on the latest Rapid DNA milestones and successes. Please join Thermo Fisher Scientific to discuss various Rapid DNA studies, programs and best practices. Learn more about how State CODIS laboratories and booking stations are using the RapidHIT ID System to generate and automate the upload and search of arrestee DNA against unsolved cases in the National DNA Database; how crime laboratories and law enforcement work together to form Rapid DNA investigative lead programs; and how laboratory and medical examiner/coroners are considering Rapid DNA for its speed, mobility and ease of operation for their disaster recovery and identification programs.

Do I really want to be a lab manager?

Larry Sullivan – Georgia Bureau of Investigation

Managing a laboratory is not easy. Many new managers can be lost or unsure how to handle people and situations that arise. The training of a new manager can be hit or miss, depending on how your organization handles things. In this presentation, Larry will share what he has learned in his 20 plus years in management. The presentation is designed to be fun and interactive. He will explore such questions as "What is life like behind the desk?", "What does a manager need to do to be effective?" The presentation is aimed toward new managers and those looking to go into management, however the topics and exercises will benefit all levels of employees.

TESTIMONY – Expert Witness Tips and Preparing for an Admissibility Hearing

Michelle Shepherd and Emily Schmidt – Georgia Bureau of Investigation

Whether you've testified hundreds of times or are still anxiously anticipating that first time you are deemed "qualified as an expert in _____", this workshop will provide informative tips for navigating the courtroom and confidently presenting and defending your findings. Come prepared to be an active participant as we better prepare to be an "Expert Witness" in forensics.

Ethics

Robin Bowen – West Virginia University

Ethics is an understudied, yet significant topic when it comes to the field of forensic science. Although people may think of ethics as a personal matter, it also includes professional and public issues. Proper ethical behavior is required by scientists making complex decisions about the interpretation of data, about which problems to pursue, and about when to conclude an experiment, all which help to improve the quality of forensic science.

While the workshop includes many "basics," the course relates those ideas to the forensic science profession. To understand forensic-specific ethics, it is important to look at the interactions between the cultures of science, law, research, and law enforcement.

 Upon completion of this course, the student will be able to:

- Demonstrate the relationship between science, technology, and society in ethics

- Examine the various types of conflicts and the problems they may create

- Analyze what ethical standards are in place for forensic scientists and related professions

- Evaluate how codes of ethics in science may contradict other professions

- Defend how and why unethical situations occur

- Analyze when and how to report misconduct and associated consequences

Attendees are given the opportunity to interact and discuss ethical situations that have taken place within the forensic science community. Attendees will be presented with scenarios and the ethical considerations involved with each. The attendees will provide insight from their work environments and represent the "real-world" of ethics in forensic science. Participants should be open to discuss and debate, while keeping an open-mind and a positive environment.