S1 Innovative Science — How Advances in Technology Transform Forensic Science

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After attending this presentation, attendees will better understand some best practices for technology adoption and implementation that have improved efficiency, quality, accuracy, reliability, and operational excellence in forensic sciences and beyond. Furthermore, the Interdisciplinary Symposium will help attendees understand the benefits and risks of emerging technologies to enable consideration and implementation.

This presentation will impact the forensic science community by highlighting how technology and its adoption can advance teaching and learning experiences, improve operational and legal standards, and embrace scientific innovation.

Whether at the scene of a death or a crime, in the forensic laboratory, or in the courtroom, technologies are used every day by practitioners to impart evidentiary proof and thereby solve cases. Forensic science has always been held to a high standard in order to uphold justice and for this to continue, forensic science must evolve and innovate.

As science progresses, answering a research question utilizing evidence-based science and technology typically leads to more questions. In fact, scientific knowledge begets new technologies, which beget new observations and scientific knowledge, which begets the next technological advancement. Keeping up with these advances in a forensic environment requires change, both operationally and culturally. Understanding, embracing, communicating, and when necessary, enforcing these changes requires the involvement of all stakeholders — the government, the criminal justice system, medical and forensic communities, and the public.

The 2016 American Academy of Forensic Sciences Interdisciplinary Symposium program will help forensic scientists keep pace with technology-enabled opportunities by highlighting advances in forensic science that have improved efficiency, quality, accuracy, reliability, and operational excellence. From forensic science disciplines including pattern comparison and forensic medicine to newer ones such as digital and multimedia sciences and next generation sequencing, innovation in science and technology is all about understanding what the technology brings to the science and how the science can harness new knowledge and information to improve impact and confidence.

This Interdisciplinary Symposium program will include prominent speakers who support technology adoption in academia, the government and private sectors, management, and the legal system. This program will continue with innovative and emerging technology "stars" among us and "integrators" of technology who will share how they have experienced and continue to transform their practice based on the latest technology.

Nancy Rodriguez, PhD

Keynote Presentation

As the federal government's lead agency for forensic science research and development, as well as the administration of programs to facilitate technical assistance, the National Institute of Justice (NIJ) has a prominent role in directing efforts to address the needs of the forensic science community. Using various sources such as the Report issued by the National Academy of Sciences (NAS) in 2009 — Strengthening Forensic Science in the United States: A Path Forward — NIJ has made an unprecedented investment to help strengthen forensic science in the United States. The NIJ remains committed to a strategy that couples rigorous research and development with technical assistance to serve the forensic science community. This approach provides the forensic science field with evidence-based research to create long-term success and ultimately improve public safety.

Kenneth G. Furton, PhD

Historically, higher education has been focused on disseminating knowledge and creating new knowledge, but increasingly, universities are becoming hubs for innovation and entrepreneurship and helping to drive the economic development of the communities they serve. This trend can be transformative for forensic science as the translational research occurring in major academic forensic programs is spurring advances in many fields of forensic science that will impact the courtroom as well as the corporate boardroom. This presentation will highlight how academic forensic scientists have and will transform the field of forensic science in a variety of areas with a focus on detection science where trace detection of evidence and odors left from removed evidence is having a major impact on forensic science.

Jed S. Rakoff, JD

In the Anglo-American legal system, change tends to be incremental, with judges attempting to fit new situations and advances into the framework of previously developed legal principles; however, when it comes to technological advances, judges who rarely have much technological training or knowledge often find this difficult to do. This presentation will examine some of the difficulties judges have faced in dealing with technological advances in the forensic sciences and will suggest ways some of the problems of translating these advances into useable legal form might be better approached.

John M. Collins, Jr., MA

When forensic science professionals think of technology, their attention understandably gravitates toward innovations that relate directly to casework and the testing of evidence. But technology is not only about scientific practice. Managerial technology and innovations dealing with the administration of forensic science organizations are equally important. In this session, attendees will be introduced to the concept of administrative technologies and the way innovation can improve how forensic science organizations are managed. By examining some best-in-class practices from both inside and outside the forensic sciences, attendees will come to appreciate how technology can be leveraged in forensic science, not just for the testing of evidence, but in the management of people, customers, and organizational cultures.

Richard A. Guerrieri, MS

Forensic DNA analysis through Capillary Electrophoresis (CE) -based typing of Short Tandem Repeats (STR) is a well-established and successful technology with widespread technical acceptance. The emergence of Next Generation Sequencing (NGS) introduces opportunities for enhanced discrimination within mixtures and human remains, as well as identity, physical appearance, and ancestry relationships. NGS also introduces levels of change which are disruptive to present forensic laboratory approaches and will require modifications of established quality assurance practices and the development of new measures. NGS experiences in this area will be shared and implementation strategies for consideration by the forensic DNA community will also be discussed.

Kurt B. Nolte, MD

Advanced radiologic imaging modalities such as Computed Tomography (CT) scanners are transforming the practice of forensic pathology. CT allows for the rapid acquisition of a full volume of morphologic data that can be reconstructed in multiple planes as well as 3D perspectives. These images are detailed and can cover the full body. Research performed at the New Mexico Office of the Medical Investigator (OMI) has demonstrated that while both CT and autopsy have limitations in recognizing disease and injuries, they can be complementary in achieving the fullest diagnostic data set. This research has also demonstrated that in certain decedent cohorts, CT can supplant autopsy by developing an adequate diagnostic data set for accurately determining the cause of death. The OMI CT scanner is used daily by forensic pathologists to triage cases and to supplement and supplant autopsy.

Christina G. Hayes, BS

In the world of chemistry, there is a vast array of instrumentation that is available for use, yet in forensic drug chemistry, generally only a few instruments are utilized. By exploring the new technology available and comparing it to the standard instrumentation used with specific groups of drugs, it is possible to expand the drug chemists' repertoire for drug analysis.

Amanda R. Hale, MA

Digital imaging innovation is integral to advancing methods in forensic anthropology. The application of imaging techniques such as Computed Tomography (CT), 3D laser scanning, and digitization has already increased accuracy when performing putative identifications, ancestry estimation, and juvenile aging. In addition, digital imaging has increased database reference material used for both research and application. In combination with advanced statistical techniques, these provide a powerful new avenue for developing more precise methods in skeletal biology.

Zeno J. Gerdts, PhD

The development of digital and multimedia sciences is rapid due to the growth of data and the wide range of devices where digital evidence can be found; smartphones and most electronic devices now have digital storage that communicates with networks. Several sources state that 90% of the digital data has been produced during the last two years. Due to these rapid developments of big data, new techniques can be used and validation is crucial. Several developments in facial and image recognition based on deep learning algorithms have seen good progress and can be used in practice to assist forensic casework. New techniques on weak signal analysis will cause more possibilities for predictive methods. Also, if data is not accessible due to encryption, techniques for analyzing data streams can also help in cyber forensics cases.

Interdisciplinary, Technology, Innovation

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