Think Tank on the Leading Edge of Forensic Science: Drones, Autonomous Vehicles, Big Data/Big Problems, National Security Globalization Into Protrusionism Privacy, Dirty Bombs, and Microbial Forensics

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W24 Think Tank on the Leading Edge of Forensic Science: Drones, Autonomous Vehicles, Big Data/Big Problems, National Security Globalization Into Protrusionism Privacy, Dirty Bombs, and Microbial Forensics

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After attending this presentation, attendees will understand how the rapid rate of change in society may impact several fields in forensic science.

This presentation will impact the forensic science community by demonstrating how the rate of change in society provides new challenges for forensic science. The development of designer drugs as well as the rapid development of methods to extract information from large amounts of data should be considered and perhaps prompt needed changes in laws. The issues with investigation of Chemical, Biological, Radiological, and Nuclear (CBRN) as well as driverless cars, drones, and the insights of cybercrimes and globalization with privacy issues will be discussed.

A wide variety of developments that will impact forensic science have been identified within the Think Tank Committee of the Forensic Sciences Foundation, Inc. The goal of this presentation is to describe how new developments may impact forensic scientists in their work. Practical examples will be presented on national security globalization into privacy issues, driverless cars, drones, microbial forensic, nuclear forensics, cybercrime, and big data. This presentation will impact the forensic science community by providing an overview of some of the new developments in forensic science and by opening a forum for the discussion of issues that arise regarding such developments.

Digital cameras were invented in 1975. As with all exponential technologies, the 10,000 pixels were a disappointment until digital became superior and went mainstream in a matter of years. This will now happen with artificial intelligence, health, autonomous cars, education, 3D printing, agriculture, jobs, and … yes, forensics.

The amount of data that is available from digital investigation, and from sensors, is rising each year and the question is whether a statistical analysis of this data can be presented in court. Biometric algorithms are improving and analyzing large amounts of video and images in combination with location data and other data available provide the possibility of making summaries of the data that can be presented in court. When applying these methods, users should also be aware of the limitations and error rates of the algorithms used. Additionally, the use of Bayesian conclusion scales is under discussion and national security globalization appears to yield privacy issues.

We see the developments of Unmanned Aerial Vehicles (UAVs) and drones and the forensic issues with finding digital traces as one of the topics. The driverless car is also performing in the real world. Will we skip level 3 autonomous vehicles (human intervention) and go directly to level 4?

Another important topic is the investigation within a CBRN crime scene and the interrogation of CBR agents presenting a variety of problems. Primary among those at the scene is an intense degree of political scrutiny and a high thermal burden. How do you accurately take high-value samples when you are in a Level A "spacesuit," how do you know where the samples are, and what should you prioritize in the 20 minutes of air you have at the scene? The European Commission Generic Integrated Forensic Toolbox (GIFT) is answering these questions and can share some of this data.

The Chemical Forensics International Technical Working Group (CFITWG) was created in 2017 to address science and capability gaps for the source attribution of weaponized chemicals by chemical means (e.g., impurity profiling and stable isotope ratios). Source attribution can tell how and where a weaponized chemical was made to help find perpetrators or facilitators of chemical attacks or detect the illicit proliferation of chemical precursors. This presentation will provide a brief overview of chemical forensics research and review how the CFITWG will strive to prevent and deter chemical attacks through collaborative efforts among members and partners.

The use of microbial communities in entomology is important. Current research focuses on the structure and function of antemortem and postmortem microbial communities using microbiomes as spatial and temporal evidence. In the past year, developments have advanced in understanding the relationships between decomposing remains, microbial communities, and the environment.

How do we manage multiple terabytes of data, containing millions of traces? How can a case investigator obtain meaningful information from all the data in the case, in a quick and simple manner, without compromising on forensic validation of the methods, the various data, and privacy protection? Additionally, the amount of data in the average case is needed by more than one team, dispersed through the town or country, and as such can no longer be worked on by a single investigator. Furthermore, knowledge dissemination concerning new methods discovered is difficult and ineffectual. At the Netherlands Forensic Institute, a big data digital analytics platform has been developed that is in use by the Dutch police force. This presentation will focus on the lessons learned about scaling the platform, the cases, and enhancing the platform with newer analytic methods. Finally, this workshop will close with research examples of deep learning and forensic multimedia investigation.

To keep pace, laboratories need to be innovative in their approach to monitoring the market for peer-reviewed literature and markets, building in-house libraries and databases, and investigating many other channels of intelligence in anticipation of possible new threats as well as helpful techniques.

Driverless Cars and Drones, National Security, Microbial Forensics