F8 An Interpretation of the 2016 President's Council of Advisors on Science and Technology (PCAST) Document in Terms of Forensic Metrology

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After attending this presentation, attendees will better understand how the scientific validity of forensic science methods can be quantitatively assessed by employing the core methods of metrology. In particular, attendees will gain a better understanding of how this may help in evaluating the probability of wrong decisions, when decisions are based on the results of scientific tests.

This presentation will impact the forensic science community by providing an interesting interpretation of the 2016 PCAST document in terms of forensic metrology. This presentation will broaden understanding of how the fundamental concepts of metrology can help with understanding the scientific validity of forensic science methods, and, most importantly, providing a quantitative assessment of their validity.

Recently, a growing discussion regarding the validity of forensic science methods and the way validity can be ensured has been seen. The most recent and interesting document is the PCAST Report, published in September 2016.[1]

On the other hand, ensuring scientific validity of the results obtained from experimental methods is the task of metrology. It is not by chance that forensic metrology has become a popular keyword of both the measurement science and justice.[2,3]

It can be shown that the PCAST Report can be read in a metrological perspective and that the ways scientific validity has been defined have a clear counterpart in the definitions of the contributions to uncertainty given by the International Vocabulary of Metrology (VIM).[4] In particular, the *foundational validity* can be assessed and quantified in terms of definitional uncertainty, while the *validity as applied* can be assessed and quantified in terms of instrumental uncertainty.

Forensic metrology methods enable the experts to evaluate the different contributions to uncertainty and thus provide a quantitative estimate of the validity of the obtained results. This means that a quantitative estimation of the remaining doubt about how well the measurement result represents the measure and can be provided to the trier of facts.

It is also possible to estimate which is the dominant contribution to uncertainty and focus the efforts to discuss and minimize this contribution. This presentation will consider two widely used forensic science methods: DNA profiling and Breath Alcohol Concentration (BAC) tests. This presentation will illustrate that the forensic practice focuses on the definitional uncertainty (in terms of wrong match probability) for DNA analysis, while the dominant contribution to uncertainty is the instrumental one, and focuses on the instrumental uncertainty in BAC tests, while, in this case, the dominant contribution to uncertainty is the definitional one.

Reference(s):

1. *Obama administration PCAST reports 2009 – 2017*. Washington, DC. Executive Office of the President, Presidents Council of Advisors on Science and Technology, 2017.
2. Vosk, Ted, and Ashley F. Emery. Forensic metrology: Scientific measurement and inference for lawyers, judges and criminalists. Boca Raton: CRC Press, Taylor & Francis Group, 2015.
3. Ferrero, Alessandro, and Veronica Scotti. Forensic metrology: A new application field for measurement experts across techniques and ethics. *IEEE Instrumentation & Measurement Magazine*. 16, no. 1 (2013): 14-17.
4. International vocabulary of metrology: Basic and general concepts and associated terms (VIM) = Vocabulaire international de métrologie: Concepts fondamentaux et généraux et termes associés (VIM). (Geneva: ISO, 2007).

Forensic Metrology, Scientific Validity, Measurement Uncertainty

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