Fundamental Principles of Forensic Science

PCAST

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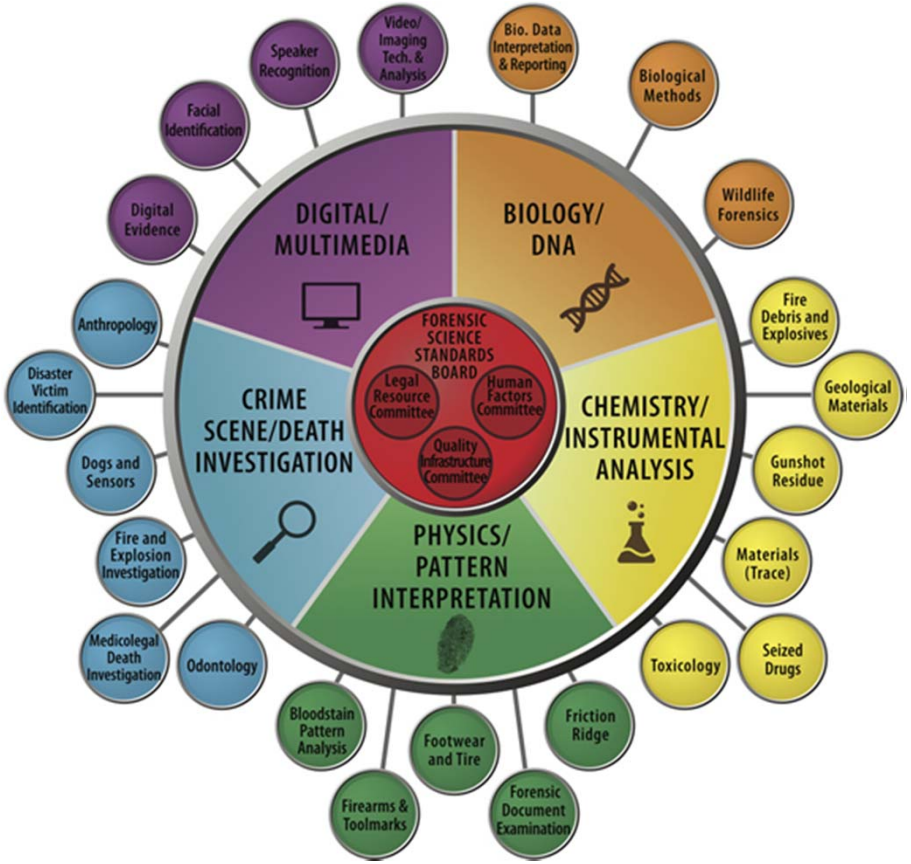
Norah Rudin, Ph.D.

Forensic DNA Consultant

Scientific Collaboration, Innovation & Education Group (SCIEG)

www.scieg.org

Response to NAS report
NCFS, FSSB, OSACS



Missing from the center are
Fundamental Principles of Forensic Science

Where are the Guiding Principles?

- NFSC, FSSB, OSACs mechanistic entities
- Each of the OSACs operating independently
- Absence of guiding scientific principles
  - And practices
- Consensus Paradigm would:
  - Unify the disciplines
  - Structure to articulate common problems and possible shared solutions
  - Contribute to legitimizing forensic science

Historical Context

- 1963 – Ontogeny of Criminalistics
  Paul Kirk
- 2001 – Principles and Practice of Criminalistics, The Profession of Forensic Science, *Inman & Rudin*
- More recently – Paradigm shift in our understanding of one of the fundamental principles of forensic science

"Individualization"

Forensic Science Paradigm

(simplified and updated)

Fundamental Principles

- Divisible matter
- Transfer (of matter)
- Identification (categorization)
- Probability of the evidence ~~Individualization~~
  (inference of source)
- Association (of people or objects)
- Reconstruction
  (ordering of events in time and space)

Action:

Direct formation of a committee at or above the level of the FSSB to implement and administer Guiding Principles and Practices of Forensic Science.

From DNA to pattern comparison

- DNA (fundamentally pattern comparison)
  - Academic foundation
  - Patterns easy to digitize
  - Stable and well characterized populations
- Prints
  - Stable populations (not yet well characterized)
  - Complex patterns more difficult to digitize
- Toolmarks and firearms
  - Population (not well characterized)
  - Patterns amenable to digitization
- Trace evidence (particles and fibers)
  - Amenable to physical and chemical characterization
  - Population unstable and difficult to characterize

DNA repeated early mistakes

- Technology exceeded our ability to interpret and weight evidence of complex profiles
  - And to understand significance in case context
  - DNA devolved to look much more like traditional forensic evidence
- Solution is not more technology that just produces more data
- Solution is statistical probabilistic approaches to help understand and weight the data
- DNA community is slowly starting to implement probabilistic genotyping
- Approach can be transferred to other disciplines

Software

Open Source

Free of Charge

Probabilistic Genotyping Software for DNA

- Importing our technology from New Zealand (ESR)
- Commercial, proprietary, expensive
- Paid for with Federal dollars through NIJ grants
- Model should be open source, free of charge
  - Example Osiris by NCBI for genetic analysis
- Such software exists, provided by smaller groups – can't support national needs

Action:

- Federally sponsored probabilistic genotyping program
- Model for future statistical software for other disciplines