Science and Forensics

- Within natural science, disciplines that are basic science, also called pure science, develop *information* to predict and perhaps explain—thus somehow understand—phenomena in the natural world.

We are Here

- **Applied science** is a discipline that applies existing scientific knowledge to develop more practical applications, such as technology or inventions.
- Examples include medical applications
- Engineering
- And of our interest-Forensics

Terms

- We all use terminology, but is our understanding justified?
- Science
- Art
- Theory
- Hypothesis
- Law
- Scientific Method

- Error
- Bias
- Uncertainty
- Accuracy

Bias

- It is acceptable to report in “favor of the defendant”
- Why not report in favor of the prosecution?
- Where is the bias?
- Critics of the Forensic Community of Bias
- Compare Bias of the Forensic Scientist and the Law Community

A statistic needs pertinence

- If I see a person I know on the street, I cant really say “I saw Jim”. All I should be able to say “I saw someone who looked like Jim, but it may not have been Jim, because anything is possible and I haven’t seen every person in the world, so it may not have been Jim, but he talked like Jim, but I really cant be sure. I mean, Jim can not be excluded but identification is not possible, I mean that there is a one in 1,000,000,000,000 chance it was not Jim, therefore there is a chance I was not talking to Jim, but this is really up to you to decide, I can not make a unique identification.”

DNA Gold Standard

- Statistics like those utilized for DNA can not be utilized for other fields. Such attempts are akin to using the same approach of uncertainty for the weight of cocaine and the GCMS identification of cocaine. A miss-match.

Uncertainty/Conclusions

- Then there is the anything is possible argument
- It may be remote, but how can you say that a print is unique since all humans have not been checked?
- The monkey and the typewriter ect.
- These ‘statistics’ are so remote, that there no reason to be seriously considered in a forensic/science setting

Steps for Scientific Method

- Scientific researchers propose hypotheses as explanations of phenomena
- Experiments to test Hypothesis
- Must be repeatable
- Proposes a Theory
- Proposes a Law

Theory

- “JUST A THEORY”- commonly phrased and misused
- A Theory is a very strong explanation of results. Results are repeated and the Theory explains why these observations have been occur
- A thread-fingerprints are unique

- Nowhere does it say to have theory that every item has to be tested
- The sentiment that fingerprints are not unique because every person not compared is a canard
- Same for Firearms etc.
- Back to anything is possible? Or do we mature?

Scientific Law

- A law in science is a generalized rule to explain a body of observations in the form of a verbal or mathematical statement. Scientific laws imply a cause and effect between the observed elements and must always apply under the same conditions.

  Scientific laws do not try to explain the 'why' the observed event happens, but only that the event actually occurs the same way over and over. It emphasizes a prediction based on observation.

On Being a Scientist

- Integrity
- Data Sharing
- Appreciation of how the future and present will be/is built on the past
- Reporting-(positive effect of accreditation)
- Correct statistical reporting
- (National Academy of Sciences)

Firearms

- Has Peer Review
- SOP
- Repeated Observations, consecutive Barrel Studies, Proficiency Tests, 100 years of Data, Training (how is this not a science, a law or theory?)
- Now for a Decision

McCluskey Case

- US District Court for the District of New Mexico
- Three day hearing
- Crux of the case was the acceptance of a firearm identification.

Defense

- No points of similarity on photographs
- Theory that firearms toolmarks are unique and reproducible not proven
- Used NAS report
- The position stated that Firearms is a Pseudo-science at best
- Since no error rate exists, it is not acceptable.

Adina Schwarz-Defense Expert

- Associate Professor John Jay
- Reviewed Literature-never did analysis
- Advocate for non-admission of ballistics

ART and Science

- The expression or application of human creative skill and imagination, typically in a visual form such as painting or sculpture
- Creative
- No peer review-anathema to a Art
- Rules?
- Conduct?

- Art does not have an SOP
- Art is produced by skill and imagination
- Art has no object. An artwork is its own object.

More on Art and Science

- Creative-so is science
- Possibilities
- Discovery-common to both art and science
- Justification of thought
- Searching (art) vs. understanding the universe (science)
- Feelings vs Facts

Major Differences with Art and Science

- Science is data driven
- Repeatability
- Rules in Science
- Ethics
- Peer Review
- Everything we do in Forensics is under the Umbrella of Science

Considerations

- Jettison the idea of “comfort”
- Replace with confidence
- Do you want to debate with your staff “I am not comfortable with this report”
- Or “I am not confident with the reports conclusions”, not complete, data does not support this conclusion etc. Are you an Artist or Scientist?

Back to the Firearm Case

- The court rejected the position that an identification was in exclusion of all other firearms

- However it did say that a “practical certainty”, not an absolute certainty is acceptable
- This was the acceptable standard
- One way to look at this is that since people are fallible, an absolute ID is not possible, but the practical certainty is acceptable.

Defense Rejected

- Defense analysis is biased
- Not peers in the field
- Error rate was determined not to exist
- Was not needed to determine if Firearms is a science and can be admitted.

Prints

- Long history
- AFIS hits
- Never had two people with the same print
- Theory partially based on embryology
- Do you really think that this has not been peer reviewed, that if embryologists questioned the basis of ridge detail it would not be published?

- The science for Prints is well established
- Data is evaluated, 1st, 2nd, 3rd level detail
- This alone precludes this from being an Art

Personal Notes

- Such forensic critics never offer data
- Just critique the work
- Without data there is no hypothesis
- No theory
- No Law
- But they talk a good game and must be confronted

SWGDRUG

- **Qualitative Analysis**
- The identification of seized drugs requires the combination of methods to form an analytical scheme (see PART III B - Methods of Analysis/Drug Identification).
- **2.1** Individual methods have limitations and, consequently, uncertainty. Uncertainty of qualitative methods is not typically expressed in numerical terms.
- **2.2** Understanding these limitations enables the laboratory or analyst to build an appropriate analytical scheme to correctly identify a drug or chemical.
- ***2.2.1 It is expected that, in the absence of unforeseen circumstances, an appropriate analytical scheme effectively results in no uncertainty in reported identifications.***

Bottom Line

- Forensic Applications as we use them are a science
- Not an Art
- Give ourselves more credit
- But be able to explain WHY we are scientists

More Bottom Line

- I feel that the individual Forensic Scientist should reacquaint herself with the concept of science and the scientific method
- Will future Forensic bodies support the contention that firearms and prints are a science. Will this be strongly supported.
- Time will tell.