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N.A.S. TO C.S.I: SHAPE UP!

Putting the "science" back in forensics won't be simple

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By Julius (Jay) Wachtel. Three years in the making, the National Academy of Sciences' anxiously-awaited "Strengthening Forensic Science in the U.S.: A Path Forward" is finally in, and it doesn't paint a pretty picture. Although it's clearly a product of compromise -- the National Institute of Justice reportedly opposed funding the study, then demanded a say in the conclusions -- the report has more than enough meat left on its bones to threaten the interests of labs and self-styled "experts" across the country.

At its most general, the study urges that forensic science live up to its name. Processes used to analyze evidence and make comparisons should be objective, set out in detail, reproducible by others and, as a topper, yield conclusions whose certainty can be accurately estimated, a requirement that places a big question mark next to virtually every identification technique short of DNA. Lamenting the ease with which junk science weasels its way into court, the report's authors advise establishing a "National Academy of Forensic Science" that would guide research, set standards and certify labs and examiners. To keep unholy influences at bay, they also urge that labs function as independent entities outside the control of both law enforcement and private interests.

It's a heady agenda that runs head-on into how forensic science is presently organized in the U.S. While many of the more ambitious objectives stand little chance of being implemented in the near term, the report's disparaging views on some popular forensic matching techniques will surely be welcomed by the defense bar.

Here is some of what Chapter Five, "Descriptions of Some Forensic Science Disciplines" has to say:

- Fingerprint identification. The Grand-daddy of all identification methods comes under criticism, although not for its validity. (That fingerprints are unique between individuals, an assumption based on decades of observation, has apparently gained support from biological science.) Instead, the issue is reliability: does fingerprint comparison yield identical results across examiners? (For a brief depiction of the process click here.)

  Crime scene fingerprints are often of poor quality, leading to subjective judgments that occasionally prove wrong. If the error is a false positive (saying that two prints match when they do not) such as what happened in the Brandon Mayfield case, and more recently at the LAPD crime lab, the consequences can be catastrophic. Meanwhile the identification community resists objectivizing its methods; for example, by using point systems based on minutiae, presumably because setting thresholds would yield fewer matches.

  When examiners testify that two prints were deposited by the same person they do so to an absolute certainty. Yet, as the report points out, no judgment can be that "certain." Indeed, it's the ability to quantify the probability of error that's the hallmark of a true science. Whether fingerprinting can be raised to that level remains to be seen.

- Shoe prints and tire tracks. Impressions from footwear and tires have "class" characteristics, meaning patterns created during manufacture, and "individual" characteristics, reflecting everyday wear and tear. It's the latter that are used to match a certain shoe or tire to a certain impression. Like fingerprints, the process is beset by subjectivity and lacks a numerical threshold for calling a match. Unlike fingerprints, it hasn't been demonstrated that shoe prints and tire tracks are indeed unique, nor that they can be reliably distinguished.

- Toolmarks and firearms. Again, class and individual characteristics are applicable. (For an example of firearms identification click here.) As in shoe prints and tire tracks, issues of subjectivity, "lack of a precisely defined process" and the absence of a threshold for calling a match present significant concerns. In 2008 a Michigan State Police audit revealed that Detroit police experts incorrectly matched guns to ammunition in at least three cases, including one that apparently caused a wrongful conviction. (Detroit PD's entire lab was shut down and its functions were shifted to the State.)

- Hairs and fibers. Matching hairs through their physical characteristics has been widely used in sex crimes. What the "experts" haven't been letting on, though, is the abysmal error rate, with two studies citing false positives of about twelve percent, clearly excessive by any standard. These and other shortcomings led the NAS to declare that, lacking nuclear DNA, there is "no scientific support for the use of hair comparisons."

  More hope is held out for comparing fibers, whose chemical composition can be analyzed with existing tools and protocols. However, since little is known about the effects of manufacturing and wear, reliably matching fibers to specific garments or carpets remains out of reach.

- Handwriting. There is some scientific support for the notion that individuals exhibit distinct handwriting characteristics and that these are relatively stable over time. Unfortunately, comparison techniques remain highly subjective, making their validity and reliability difficult to assess.

- Causes of fire. Many arson convictions have relied on expert testimony that pour patterns, charring, glass crazing, etc. were caused by accelerants. But the origin of some of these fires, including one that led to an execution, were later shown to have been accidental. (For a brief discussion click here.) According to the NAS, long-accepted indicia of arson are plagued by poor science and subjectivity. Even so, "despite the paucity of research, some arson investigators continue to make determination about whether or not a particular fire was [deliberately] set."

- Bite marks. Bite mark evidence is occasionally used in the investigation of violent crime. Although an odontological dissimilarity might help exclude a suspect, the report concludes that the method's scientific basis is "insufficient" for matching, and warns that its use has led to wrongful convictions.

- Blood spatter. During Phil Spector's first murder trial a defense expert testified that spatter could reach six feet, potentially placing Spector, whose clothes were flecked with blood, far from the gun (the barrel was in the victim's mouth when it discharged.) As might be expected, a prosecution witness said that droplets could travel no more than half that distance. (For a brief discussion of the case click here.) Had it been up to the NAS neither witness would have taken the stand. Criticizing the opinions of blood spatter "experts" as overly subjective and driven by advocacy, the report concludes that "the uncertainties associated with bloodstain pattern analysis are enormous."

What gets admitted into evidence is ultimately up to a judge. Federal practice, on which most State laws are modeled, is set out in Rule 702, Federal Rules of Criminal Procedure, "Testimony by Experts." Before admitting scientific evidence, judges must determine whether "(1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case."

In the era of C.S.I., with an entrenched forensic establishment that has elevated itself to a near-religion, not even an epidemic of wrongful conviction has managed to slow the choo-choo train of junk science. On the other hand, should defense lawyers take notice of the report, many of today's quasi-scientific forensic techniques will pass into the realm of voodoo, where they've always belonged.

Here's to their speedy demise.