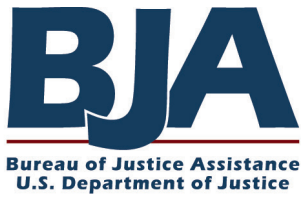
Smart Prosecution Practices:

Seven Recommendations to Integrate Science and Justice

Steven Jansen
Vice-President, COO
Association of Prosecuting Attorneys

Robert V. Wolf
Director, Communications
Center for Court Innovation

PROSECUTORS REPORT VI



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Association of Prosecuting Attorneys
1615 L St. NW, Suite 1100
Washington, DC 20036
www.APAInc.org

Bureau of Justice Assistance, Office of Justice Programs
United States Department of Justice
810 Seventh Street NW
Washington, DC 20531
http://www.ojp.usdoj.gov/BJA

INTRODUCTION

In 1910, four fingerprints left in wet paint on a railing linked Thomas Jennings to the murder of Clarence Hiller. The result: Jennings was executed, and the field of forensic science was born.[1]

The Federal Bureau of Investigation (FBI) opened its Criminological Laboratory in 1932, handling fewer than 1,000 cases its first year.[2] But by 2005, hundreds of crime labs across the United States. were handling about 2.7 million cases a year.[3]

Today, science is regularly used to identify perpetrators and convince juries of their guilt. Aided by increasingly precise DNA analysis, forensic evidence is also used to solve cases that had long ago turned cold and provide proof to support exonerations of the innocent in wrongful convictions.

The Association of Prosecuting Attorneys has published a framework for the "high performance" prosecutor that includes "integrating the progression of forensic science and technology into criminal investigations and trial courtrooms."[4] To achieve this worthy goal, however, prosecutors must overcome a number of challenges. They need time, despite busy caseloads, to stay informed about ever-changing forensic techniques. They also need funding to invest in new technology. Crime labs also face obstacles, including backlogs and the risk (as highlighted in some well-publicized cases) of poor or inconsistent work.[5]

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1 Jennings challenged the fingerprint impressions on appeal, but the Illinois Supreme Court concluded that fingerprints were a reliable form of identification. Jennifer L. Mnookin, Fingerprint Evidence in an Age of DNA Profiling, 67 Brooklyn Law Review 13 (Fall 2001) citing People v. Jennings, 96 N.E. 1077 (Ill. 1911).

2 Federal Bureau of Investigation, U.S. Department of Justice, University of Michigan Library (January 1, 1978), available at http://www.ncjrs.gov/App/publications/Abstract.aspx?id=78689; and Paul C. Giannelli et al, Reference Guide on Forensic Identification Expertise, Federal Judicial Center/National Academies Press, 2011, citing Anniversary Report, 40 Years of Distinguished Scientific Assistance to Law Enforcement, FBI Law Enforcement Bulletin, Nov. 1972.

3 Paul C. Giannelli et al, Reference Guide on Forensic Identification Expertise, Federal Judicial Center/National Academies Press, 2011, citing Matthew R. Durose, Crime Labs Received an Estimated 2.7 Million Cases in 2005, Bureau of Justice Statistics Bulletin (July 2008) NCJ 222181.

4 See Robert Hood and Steven Jansen, A Framework for High Performance Prosecutorial Services, Association of Prosecuting Attorneys & U.S. Bureau of Justice Assistance, available at http://www.apainc.org/files/DDF/APA%20High%20Performance%20%20Framework%20FINAL.pdf

5 See Maggie Clark, "Forensic Science Falls Short of Public Image (First of Two Parts)," Stateline, November 26, 2012, available at http://www.pewstates.org/projects/stateline/headlines/forensic-science-falls- short-of-public-image-first-of-two-parts-85899431908 (visited April 16, 2013), citing drug chemist's confession that she falsified samples at the state's Hinton Crime Lab in Boston and an investigation of 3,500 cases handled by the Houston crime lab that found that "analysts had fabricated test results, lost track of evidence and allowed a roof leak to contaminate DNA samples;" and Madeleine Baran, "Prosecutors, public defenders react to St. Paul crime lab report," Minnesota Public Radio, Feb. 15, 2013, available at http://minnesota.publicradio.org/display/web/2013/02/15/news/st-paul-crime-lab-report- reaction (visited April 16, 2013), citing reports of St. Paul's police crime lab by two independent consultants finding "errors in almost every area of the lab's work;" and Joseph Goldstein, "New York Examines Over 800 Rape Cases for Possible Mishandling of Evidence," New York Times, January 10, 2013, citing the Medical Examiner's Office's review of more than 800 rape cases "in which critical DNA evidence may have been mishandled or overlooked by a lab technician," including 26 confirmed cases "in which the technician failed to detect biological evidence when some actually existed."

A report by the National Academy of Sciences (NAS) in 2009 underscored additional challenges.[6] The report found that many long-used forensic techniques had yet to be scientifically validated, and that many forensic disciplines lacked uniform protocols or relied on protocols that were "vague and not enforced in any meaningful way."

Guided by the report's recommendations, more practitioners and crime labs have sought certification and accreditation, and more researchers are evaluating the claims of techniques used to solve crimes. In addition, a number of states have adopted uniform forensic science standards, and defense attorneys are promoting greater scientific rigor by raising more challenges to the admissibility of evidence. And in a key move, the U.S. Department of Justice and the National Institute of Standards and Technology in February 2013 announced the formation of a commission "to strengthen and enhance the practice of forensic science."[7]

What do these developments mean for prosecutors? "I think it [the National Academy of Sciences report] is still being absorbed by everyone, prosecutors especially. But I think prosecutors are asking a few more questions than they would have in the past [because of the report]," said Michael Moore, state's attorney of Beadle County, South Dakota, and co-chair of the Science and Technology Committee of the National District Attorneys Association.[8]

For prosecutors, the rewards of understanding more about science and better integrating it into their work are obvious: efficient and more accurate investigations based on more reliable information that is theoretically unbiased, which provides greater leverage during plea-bargain negotiations and more solid cases.

This report recommends actions prosecutors can take to harness science and new technologies more effectively and better understand the work of crime labs and forensic practitioners. Better knowledge of scientific principles and practices will strengthen prosecutors' ability to make their communities safe by strengthening investigations, identifying the guilty, exonerating the innocent, and presenting solid cases in court.

6 Committee on Identifying the Needs of the Forensic Science Community, National Research Council, "Strengthening Forensic Science in the United States: A Path Forward," National Academies Press, 2009, available at www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf, hereinafter referred to as the National Academies of Science report.

7 Press release, "Department of Justice and National Institute of Standards and Technology Announce Launch of National Commission on Forensic Science," Feb. 15, 2013, available at http://www.nist.gov/oles/doj-nist-forensic-science021513.cfm (visited Sept. 5, 2013).

8 Phone interview with Robert V. Wolf, Feb. 5, 2013.

RECOMMENDATIONS

1. **Use science to investigate, solve, and prosecute crimes while recognizing the strengths and limits of the technique(s) applied.**

Since it was introduced for the first time in 1987 as evidence in a U.S. court, DNA analysis has evolved from a novel (and sometimes contested) form of scientific evidence to become the gold standard against which other forensic disciplines are measured.[9] Forty-two percent of local prosecutors had used DNA evidence in a felony case at least once by 1994; 68 percent by 2001.[10]

What makes DNA so attractive is its precision: it does a better job of identifying an individual suspect than any other forensic evidence. It can do this not only because each individual (except for identical siblings) carries his or her own unique DNA, but because the science of extracting, analyzing, and matching DNA—as well as measuring the frequency of DNA variation among populations—has been extensively honed and tested by top scientists, medical researchers, and committees of experts.[11]

PRACTICE TIP

Conduct an office-wide review of the types of scientific evidence most frequently relied tupon and consider ways to improve how it is gathered, analyzed, and presented. Also consider if there are other kinds of scientific evidence that could prove helpful. For ideas, visit www.ForensicScienceSimplified.org, a website developed by the National Forensic Science Technology Center.

As DNA databases—both state and national—grow, the chance of matching a sample from a crime scene to a suspect also increases. By early 2013, the National DNA Index contained over 10 million offender profiles and the FBI-developed Combined DNA Index System—or CODIS—had produced over 200,300 hits in more than 192,400 investigations.[12]

Other forensic disciplines, including fingerprints, shoeprints, tire tracks, tool marks, ballistics, hair, fiber, bite marks, bloodstain patterns, and features of documents (such as the ink used or the presence of additions or deletions) have not been as rigorously tested or studied as DNA. For instance, no studies have been conducted of large populations to determine how many sources might share the same or similar fingerprints.[13]

Fortunately, new efforts to measure the accuracy of the latent print examination process are helping define and establish meaningful error rates. In 2011, a major experiment measured a false positive rate of about 0.1 percent and a false negative rate of about 7.5 percent.[14]

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9 Paul C. Giannelli, PART I: Forensic Science, Journal of Law, Medicine & Ethics, Summer, 34 J.L. Med. & Ethics 310, 2006.

10 Jeffrey M. Prottas and Alice A. Noble, "Use of Forensic DNA Evidence in Prosecutors' Offices," 35 J.L. Med. & Ethics 310, 2007.

11 The National Academies of Science report notes: "DNA analysis … has been subjected to more scrutiny than any other forensic science discipline, with rigorous experimentation and validation performed prior to its use in forensic investigations. As a result of these characteristics, the probative power of DNA is high."

12 See CODIS—NDIS Statistics at http://www.fbi.gov/about-us/lab/biometric-analysis/codis/ndis-statistics (viewed March 6, 2013).

13 Jennifer L. Mnookin, The Courts, the NAS, and the Future of Forensic Science, Brooklyn Law Review, 2010.

14 Expert Working Group on Human Factors in Latent Print Analysis, "Latent Print Examination and Human Factors: Improving the Practice through a Systems Approach," U.S. Department of Commerce, National Institute of Standards and Technology, 2012, available at http://www.crime-scene- investigator.net/LatentPrintExaminationHumanFactors.pdf (visited Sept. 23, 2013), citing Ulery, B., A. Hicklin, J. Buscaglia, et al, "Accuracy and Reliability of Forensic Latent Fingerprint Decisions," Proceedings of the NAS, 2011.

If prosecutors are able to distinguish between reliable science and claims based on unreliable or unsound science, they will be far less likely to bring charges against the wrong person. As former Assistant U.S. Attorney Geoffrey S. Mearns writes:

> If faulty forensic science produces inaccurate results during an investigation, then law enforcement agents have wasted time and money. If flawed forensic science results or expert testimony have led to an unfounded criminal charge or a wrongful conviction, then a person has been unjustly convicted—and the real perpetrator remains free to hurt other innocent people.[15]

2. Familiarize yourself with scientific concepts

PRACTICE TIP

Ask around the office to see if anyone has a scientific background or previous scientific training.

Prosecutors should be familiar with the *scientific method*, which is "the process by which scientists, collectively and over time, endeavor to construct an accurate (that is, reliable, consistent and non-arbitrary) representation of the world," according to Frank L.H. Wolfs, a professor of physics at the University of Rochester.[16]

The following four steps are adapted from Wolf's description of the scientific method:

1. Observation and description of a phenomenon or group of phenomena.
2. Formulation of a hypothesis to explain the phenomena.
3. Use of the hypothesis to predict the existence of other phenomena, or to predict quantitatively the results of new observations.
4. Collect empirical data through controlled laboratory experiments or systematic field observations to verify or falsify the predictions.

In addition, prosecutors should be familiar with the statistical terms associated with forensic evidence, including error rate, random-match probability, population frequency, mean, and standard deviation. Random-match probability in cases with DNA evidence, for example, "can help jurors and judges decide how much weight to attach to other evidence in the case," said Edward J. Imwinkelried, a professor at University of California, Davis School of Law and member of the committee that authored the NAS report.[17]

The Supreme Court, in its seminal 1993 case on the admissibility of expert testimony, *Daubert v. Merrell Dow Pharmaceuticals,*[18] listed four questions that can help judges determine whether a particular theory or technique has been submitted to the rigors of scientific methodology. First, has the theory or technique been tested? Second, has it been subjected to peer review or publication? Third, have the technique's error rates been determined? And fourth, do standards exist for controlling the technique's operation?

Joe S. Cecil, the project director of the Program on Scientific and Technical Evidence at the Federal Judicial Center, said that the more an attorney knows about science, the better he or she can make effective arguments during *Daubert* admissibility hearings and question expert witnesses. "Attorneys need to know how to ask questions to probe whether scientific opinion [that they're trying to elicit from experts] is based on a rigorous scientific methodology," he said.[19]

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15 Geoffrey S. Mearns, The NAS Report: In Pursuit of Justice, 38 Fordham Urb. L.J. 429.

16 Wolfs, F. 1996. Introduction to the scientific method. Physics Laboratory Experiments, Appendix E, Department of Physics and Astronomy, University of Rochester, available at http://teacher.nsrl.rochester.edu/phy_labs/appendixe/appendixe.html.

17 Correspondence with Robert V. Wolf, Sept. 14, 2013.

18 509 U.S. 579 (1993).

19 Phone interview with Robert V. Wolf, Feb. 5, 2013.

Prosecutors can build their knowledge of science by:

- *Reviewing the National Academy of Sciences report*
  The report offers an overview of forensic disciplines and key scientific concepts. The report also raises concerns about the state of forensic science; prosecutors should familiarize themselves with those concerns because there is a chance the critique may be repeated by a defender.

- *Seeking training and continuing education*
  Seek opportunities to learn more about science. Training is often available at conferences, local universities and even through local forensic labs. The Maricopa County Medical Examiner has hosted Forensic Science Advanced Academies for prosecutors and defense attorneys.[20] The National Computer Forensics Institute in Hoover, Alabama, provides cyber-related courses using the Secret Service electronic crimes training model. Its mandate is to provide state and local law enforcement officers, prosecutors and judges with free, comprehensive education on cybercrime trends, investigative methods, and prosecutorial challenges. Training participants receive computer equipment, hardware, software, manuals, and tools necessary to conduct electronic-crimes investigations and forensic examinations.[21]

- *Accessing relevant guides or web sites*
  Guides to forensics include the Reference Manual on Scientific Evidence, published by the Federal Judicial Center and the National Academies of Science and written by leading experts for a judicial audience.

PRACTICE TIP

Ask a professor of statistics from a local college to conduct a class for staff on the principles of statistics that are relevant to forensic science.

There are also two multi-volume compendiums: David Faigman, et al, Modern Scientific Evidence: The Law and Science of Expert Testimony (2012-13 ed.), and Paul Giannelli, et al, Scientific Evidence (5th ed. 2012). Leading single- volume works are David Kaye, David Bernstein and Jennifer Mnookin, The New Wigmore: A Treatise on Evidence - Expert Evidence (2d ed. 2010) and Andre Moenssens, Carol Henderson & Sharon Portwood, Scientific Evidence in Civil and Criminal Cases (5th ed. 2007).

There is also an online resource, www.ForensicScienceSimplified.org, developed by the National Forensic Science Technology Center and funded by the Bureau of Justice Assistance.

- *Joining professional organizations or working groups*
  Most forensic disciplines have professional organizations that provide training, sponsor conferences, and are seeking to establish uniform guidelines and support research. There are also about 20 scientific working groups, seeking to strengthen forensic practices. For a list of working group web sites, visit: https://www.fiswg.org/about_swgs.

- *Visiting a crime lab*
  Prosecutors gain invaluable insight into forensic methods and protocols when they visit a crime lab. A visit, including a Q&A with staff, make them better prepared to understand lab results and defend them in court.

20 See http://www.forensicmag.com/news/arizona-forensic-academy-brings-prosecutors-and-defense- attorneys-together (visited April 4, 2013); and "The Arizona Forensic Science Academy: A Model Training Program" webinar, available at http://www.jmijustice.org/webinars/the-arizona-forensic-science- academy-a-model-training-program-for-prosecutors-and-criminal-defense-attorneys/view (visited April 4, 2013).

21 See http://www.justice.gov/usao/briefing_room/cc/forensics.html.

CSI EFFECT

The Hollywood portrayal of crime investigations, particularly the television show Crime Scene Investigation, have both praised and blamed for supposedly shaping public perceptions of forensic science. Many prosecutors believe that the predominant impact of the "CSI effect" is to raise expectations among jurors, making them unreasonably skeptical of forensic evidence when it does not conform to what they've seen on TV.

Researchers from the University of California (Cole and Rachel Dioso-Villa) report there are actually six different theories on the so-called CSI effect. They are:

- The Strong Prosecutor's Effect, described above, postulates that because of TV, jurors expect more and better forensic evidence, making them more inclined to acquit "in cases where forensic evidence is absent or insufficiently probative."
- The Weak Prosecutor's Effect postulates that Hollywood portrayals have changed prosecutors, making them more likely to question potential jurors about TV-watching habits and to request unnecessary forensic tests.
- The Defendant's Effect claims that TV programming, through "positive and heroic portrayals of state-employed forensic scientists," has enhanced jurors' faith in forensic witnesses' credibility.
- The Producer's Effect, advanced by CSI's producers, asserts that the show teaches science to the viewing public.
- The Educator's Effect claims that CSI-type shows are attracting young people into forensic careers.
- The Police Chief's Effect claims that TV has taught criminals strategies for avoiding detection.

Whether or not any of these effects are real remains to be seen. A different team of researchers (Shelton, Barak & Kim) surveyed jurors in Michigan in 2006 and 2009, finding that jurors indeed expected to see more scientific evidence in trials. However, the researchers found no evidence that crime shows were the primary reason for this. Rather, they credited a generalized "tech effect," which they described as "public awareness of and familiarity with the powers of modern technology," which "comes from a variety of sources, especially from mass media, including television with its expanded offerings." While "CSI-type programs are a part of that media environment, they do not play the significant role in forging jurors' expectations that many have attributed to them," the researchers found.

They also definitively declared that "the CSI effect is a myth," finding "no factual basis" for the claim that "watching CSI programs causes jurors to wrongfully acquit defendants." They also felt that the more general tech effect "cannot be singled out as the sole causative link to jury verdicts, either for convictions or acquittals. The process by which jurors deliberate on criminal allegations is far too complex and the impact of the media generally on those outcomes is far too diverse to lie at the foot of any one particular cause."

Sources:

– Simon A. Cole and Rachel Dioso-Villa, Should Judges Worry about the 'CSI Effect'?" 47 *Court Review* 20, 2011.

– Donald E. Shelton, Gregg Barak, & Young S. Kim, Studying Juror Expectations for Scientific Evidence: A New Model for Looking at the CSI Myth, 47 *Court Review* 8, 2011.

3. Take a fresh look at cold cases and preserve testable evidence for the long term

A national survey of prosecutors found that 65 percent of jurisdictions had analyzed DNA from old investigations and solved more than three-quarters of those re- opened cases.[22] In cases that are not readily solved, prosecutors have brought formal criminal charges with "John Doe" warrants—in essence, charging suspects identified solely by their DNA profile—in order to toll the statute of limitations.[23]

Advances in technology hold the promise that ever smaller and degraded biological samples will yield meaningful results. It is now possible to extract DNA from a single cell found on, say, the steering wheel of a stolen car, but to what extent and under what circumstances the analysis of such a small sample is reliable has yet to be determined.

One of the best things a prosecutor can do to promote justice (now and in the future) is to ensure that evidence that is potentially testable is preserved for the long term. This can be a challenge, a fact highlighted in 2012 by Superstorm Sandy, which caused flooding in New York Police Department evidence warehouses, potentially damaging thousands of pieces of evidence, including nearly 10,000 barrels containing DNA material.[24] The New Orleans Police Department faced similar difficulties after Hurricane Katrina.

Prosecutors should also encourage or help police and sheriff's departments that lack written policies regarding collection and preservation of biological evidence to create a formal Evidence Preservation Protocol.

PRESERVING EVIDENCE

In 2011, Texas adopted one of the nation's more rigorous evidence-retention laws. The new law expanded the definition of biological material to include "any item that contains blood, semen, hair, saliva, skin tissue, fingernail scrapings, bone, bodily fluids, or any other identifiable biological material" that could be used to incriminate or exonerate a suspect in a felony investigation. In unsolved felonies, the evidence must be preserved "for not less than 40 years or until the applicable statute of limitations has expired." When a defendant has been convicted, the evidence must be kept until the inmate dies, is executed, completes the sentence, or is released on parole, or completed a mandated term of community supervision.

The Austin Police Department has a 62,000-square-foot warehouse containing about 600,000 items, with about 60,000 new items every year, at a cost of $1.1 million a year, according to The Austin Chronicle.

Sources:
– The Austin Chronicle (see http://www.austinchronicle.com/news/2013-02-15/wheres-your-evidence/)
– Vernon's Texas Statutes of Codes Annotated C.C.P. Art 38.43 (see http://www.innocenceproject.org/docs/TX_CRIM_PRO_38_43_TX_preserve_eff_2001_amd_2011. pdf

22 Prottas and Noble, Ibid.

23 Veronica Valdivieso, DNA Warrants: A Panacea for Old, Cold Rape Cases?, 90 Geo. L.J. 1009, April, 2002

24 J. David Goodman, Flooding of 2 Police Warehouses Destroys Evidence Needed for Criminal Trials, New York Times, January 1, 2013, available at http://www.nytimes.com/2013/01/02/nyregion/hurricane- destroyed-evidence-held-by-new-york-police.html.

4. Use Reliable Experts

Remember that there is always a chance of error. To reduce the risk, use only those labs, units, and experts that have met standards set by an appropriate accrediting body.

PRACTICE TIP

Confirm that experts who testify in court are certified by an appropriate, nationally recognized organization.

Fortunately, the number of laboratories accredited by a professional forensic science organization has grown significantly—from 71 percent of 306 labs responding to a 2002 census to 83 percent of 397 labs responding to a 2009 census, according to the U.S. Bureau of Justice Statistics.[25]

5. Create a conviction integrity unit and forensic teams

A conviction integrity unit uses DNA and other evidence to uncover long-buried truths.

One of the first prosecutors to establish a conviction integrity unit is District Attorney Craig Watkins of Dallas County, Texas. His unit, created in 2007, investigates both "legitimate post-conviction claims of innocence" as well as old cases, both DNA and non-DNA related, "where evidence identifies different or additional perpetrators."[26] In Michigan, the Wayne County (Detroit) Prosecutor's Office established a conviction integrity unit in 2008 to focus on forensics and whether "all forensic evidence utilized by the Wayne County Prosecutor's Office was and is accurate and reliable."[27]

A six-member unit in Cook County (Chicago) was created to focus on physical evidence that was not fully examined and cases involving single eyewitnesses. "In my view, my job is not just about racking up convictions, it is about always seeking justice, even if that measure of justice means that we must acknowledge mistakes of the past," said Cook County State's Attorney Anita Alvarez, who created the unit in 2012.[28]

PRACTICE TIP

As a first step to explore creating a conviction integrity unit, research how other prosecutors describe their programs. For example:
Dallas County D.A.'s Office:
http://www.dallasda.co/webdev/division/conviction-integrity-unit/
Wayne County Prosecutor's Office:
http://www.co.wayne.mi.us/prosecutor/conviction_integrity.htm
New York County D.A.'s Office:
http://manhattanda.org/preventing-wrongful-convictions

Some offices have also created forensics or cold case teams. John T. Adams, the district attorney of Berks County, Pa., has designated seven of his 31 detectives as forensic specialists, each of whom belongs to a professional organization relating to a forensic specialty and is expected to stay up-to-date on developments in the field.

An office lacking the resources to establish its own forensic team can consider collaborating with other offices. Michael Moore serves as a regional expert and resource for a number of state's attorneys' offices.

25 Matthew R. Durose, Kelly A. Walsh and Andrea M. Burch, Census of Publicly Funded Forensic Crime Laboratories, 2009, (Bureau of Justice Statistics, August 2012, NCJ 238252), available at http://www.bjs.gov/content/pub/pdf/cpffcl09.pdf (visited September 5, 2013).

26 See the Dallas County District Attorney's web site at http://www.dallasda.co/webdev/division/conviction-integrity-unit/ (visited March 7, 2013).

27 See the Wayne County Prosecutor's web site at http://www.waynecounty.com/prosecutor/405.htm (visited March 7, 2013).

28 Rummana Hussain, "Prosecutor Alvarez creates team to probe wrongful conviction claims," Chicago Sun-Times, Feb. 2, 2012, available at http://www.suntimes.com/news/politics/10396284-418/prosecutor-alvarez-creates-team-to-probe-wrongful-conviction-claims.html (visited April 19, 2013).

"In each prosecutor's office, there should be somebody who is your science and tech person," Moore said. "In South Dakota, because it's a small state, I'm that guy in my office and for a lot of offices. A lot of other offices will call me if they have a question."[29]

6. Be on the lookout for new technologies and better ways to apply old ones

Given the ever-changing nature of science and technology, prosecutors and investigators are regularly finding better ways to build cases. Video surveillance offers an example of how quickly a resource can mature. According to the Scientific Working Group on Imaging Technology, when Sterling Hall at the University of Wisconsin was bombed in 1970, there were no closed circuit TV's in the area. Fast forward 25 years, however:

> In 1995, investigators reviewed hundreds of video recordings related to the Oklahoma City bombing. Just six years later, in 2001, thousands of video recordings were examined by federal, state, and local agencies in relation to the terrorist attacks of 9/11. In 2005, the Metropolitan Police Service in the United Kingdom (New Scotland Yard) seized over 55,000 videotapes, hard drives, compact disks, digital video recorders, and other media in support of the investigation of the July bombings in London.[30]

The internet—particularly social media—is another technology that is helping prosecutors solve and win cases. Investigators analyzed hundreds of text messages from more than a dozen cellphones in a rape case involving teenagers in Steubenville, Ohio, resulting in two convictions to date.[31] In Boston, widespread use of surveillance video in public areas and crowd sourcing were used in the investigation of the 2013 marathon bombings that ultimately led to the death of one suspect and the capture of another.

A national survey of 600 law enforcement agencies found that 92 percent use social media, putting it to use for criminal investigations (77 percent), listening/monitoring (35.5 percent), and intelligence (62 percent).[32]

It is not just newer technologies that are useful, but older ones. Many observers believe that the full promise of DNA has not yet been realized.[33] For example, studies have found that law enforcement and prosecutors in the U.S. routinely use DNA evidence to investigate violent crimes and only rarely for property crimes.

At least five jurisdictions have experimented successfully with using DNA to solve property crimes.[34] A study of those five sites found that suspects identified by DNA had at least twice as many prior felony arrests and convictions as those identified by traditional investigation.

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29 Phone interview with Robert V. Wolf, Feb. 5, 2013.

30 See https://www.swgit.org/pdf/Section%207%20Best%20Practices%20for%20Forensic%20Video%20Analysis?docID=51, (visited March 25, 2013).

31 Richard A. Oppel Jr., "Ohio Teenagers Guilty in Rape That Social Media Brought to Light," The New York Times, March 17, 2013, http://www.nytimes.com/2013/03/18/us/teenagers-found-guilty-in-rape-in-steubenville-ohio.html?hpw&_r=0, (visited April 4, 2013).

32 2012 IACP Social Media Survey, available at http://www.iacpsocialmedia.org/Portals/1documents/2012SurveyResults.pdf.

33 Prottas and Noble, Ibid., noting that "There appears to be a consensus among practitioners and informed observers that the full promise of DNA within the criminal justice system has yet to be realized," citing N. P. Lovrich et al., National Forensic DNA Study Report: Final Report, National Institute of Justice, Office of Justice Programs, U.S. Department of Justice, 2003; and National Institute of Justice, Report to the Attorney General on Delays in Forensic DNA Analysis, National Institute of Justice, U.S. Department of Justice, 2003.

34 The five jurisdictions are Orange County, Calif., Los Angeles, Denver, Phoenix and Topeka, Kan.

In addition, the study found that property crime cases where DNA evidence is processed have more than twice as many suspects identified, twice as many suspects arrested, and more than twice as many cases accepted for prosecution compared with traditional investigation; DNA also proved to be far more effective than fingerprints, identifying a suspect five times more frequently.[35]

Denver's four-year experiment with using DNA to investigate property crimes produced prodigious results. Investigators were able to retrieve biological evidence from 400 of 6,500 burglaries. The 400 cases produced 340 DNA profiles and 199 hits in the CODIS database.[36]

The Denver District Attorney's office accepted 172 cases for prosecution—76 percent of which would never have been filed without DNA analysis, according to an in- house evaluation. Residential burglars convicted on the basis of conventional investigation received an average sentence of 1.4 years; burglars convicted in cases with DNA evidence received an average sentence of 13.9 years. The evaluators estimated that the return in police costs and prevented property loss for every dollar spent was $90.

"The bottom line is that it's cost effective. Your return on the dollar is high, especially in going after professional burglars," said Denver D.A. Mitch Morrissey.

To stay up-to-date with changes in the field, prosecutors should also check the annual supplements to the leading treatises on scientific evidence, which track the latest developments and breakthroughs.

Fortunately, new technology is not always expensive. Through partnerships and collaborations, which allow them to share resources among multiple agencies, and through grants, prosecutors can find creative ways to support investments in science.

A relatively inexpensive technology is audio-video equipment to record interrogations. Research in experimental psychology shows that recording interrogations reduces the incidence of false confessions, which can save prosecutors time and money— and most important of all avoid a false conviction. "Recording interrogations lessens the number of Miranda motions, lessens overall the challenges they face from defense attorneys on interrogations and brings them to a conclusion through pleas more quickly when you have the little recording... that's all a savings of resources, and by the way, you get a conviction out of it," said David Harris, associate dean for research at University of Pittsburgh School of Law and author of *Failed Evidence: Why Law Enforcement Resists Science*.[37]

35 John K. Roman, et al, "The DNA Field Experiment: Cost-Effectiveness Analysis of the Use of DNA in the Investigation of High-Volume Crimes," April 2008, Urban Institute, Justice Policy Center.

36 Simon Ashikhmin, et al, "Effectiveness and Cost Efficiency of DNA Evidence in Volume Crime Denver Colorado Site Summary," available at http://projects.nfstc.org/fse/pdfs/DNABurgrCostEfficiencyReserch1.pdf, (visited March 25, 2013).

37 Phone interview with Robert V. Wolf, Jan. 29, 2013.

PROFICIENCY TESTING

Proficiency testing is used to measure a technique or technician/examiner's ability to analyze or match evidence. According to the American Society of Crime Laboratory Directors/Laboratory Accreditation Board:

> Proficiency testing is an integral part of an effective quality assurance program. It is one of many measures used by laboratories to monitor performance and to identify areas where improvement may be needed. A proficiency testing program is a reliable method of verifying that the laboratory's technical procedures are valid and that the quality of work is being maintained.

There are several kinds of proficiency testing. Testing can be conducted internally or externally (usually by another lab), and it can be blind—with material submitted to an examiner for analysis as if it were a real case—or declared (in which case, the examiner is informed in advance that he or she is being tested). The American Society of Crime Laboratory Directors/Laboratory Accreditation Board recommends blind testing "as a more precise test of a worker's accuracy," according to the National Academy of Sciences.

Sources:
– Proficiency Testing and Review Program Description, ASCLD/LAB, Oct. 31, 2011, available at http://www.ascld-lab.org/wp-content/uploads/2013/04/AL-PD 1020_Proficiency_Testing__Review_Program_v1.0.pdf.
– Reference Manual on Scientific Evidence, Federal Judicial Center/National Research Council of the National Academies, Washington D.C.: Academies Press, 2011.
– Committee on Identifying the Needs of the Forensic Science Community, National Research Council, "Strengthening Forensic Science in the United States: A Path Forward," National Academies Press, 2009, available at www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf.

7. Use technology to engage communities

Prosecutors can also use technology to engage communities. District Attorney John T. Adams of Berks County, PA uses a service called crimemapping.com to inform the public about the location of crime.[38]

"We want the public to know what's going on. We could be having a rash of burglaries in a particular municipality, and ... you might not be aware of it. [Our use of the web site] is another effort to get the public aware of crime fighting. They can be the eyes and ears of the police," Adams said.[39]

By early 2013, about 1,000 people had subscribed to be notified by e-mail when a crime had occurred in their neighborhood, according to Lieutenant Todd Trupp, of the Berks County D.A.'s Office.[40] Adams pays for the online crime-mapping service with drug forfeiture funds.

38 http://www.crimemapping.com.
39 Phone interview with Robert V. Wolf, Jan 28, 2013.
40 Phone interview with Robert V. Wolf, Jan 28, 2013.

CHALLENGES

While scientists continue to push the boundaries of knowledge, prosecutors face a number of challenges that can limit their capacity to implement new technologies. Those challenges include:

Crime lab backlogs

The nation's 411 publicly funded labs had a backlog of 1.2 million cases in 2009, with about three-quarters of the backlog involving requests related to forensic biology.[41] Backlogs make it harder for prosecutors to expand the application of science to more crimes. And the situation would be worse if police and prosecutors tried to expand their use of DNA. For instance, in 2006 DNA evidence was used primarily to investigate murder and rape cases, which numbered about 110,000 that year. If prosecutors had tried to collect and analyze DNA evidence from the 2 million burglaries that had occurred that year, or the millions of vehicle theft cases, labs as well as police investigators, prosecutors and public defenders would have required vastly more resources or been sorely overwhelmed.[42]

Fragmented databases

There are numerous databases for various types of evidence, but many are fragmented, making it difficult if not impossible to conduct a national search efficiently. For instance, automated fingerprint systems created by different vendors are incompatible; they use different baseline standards and lack a common interface.[43]

And even large countrywide databases, such as the National DNA Index, which contained over 10,142,600 offender profiles, 1,362,800 arrestee profiles, and 472,500 forensic profiles as of January 2013, are limited to specific kinds of searches. Since many states prohibit familial searches—which are used to identify close biological relatives—they must be conducted on a local level, in only those states that permit them.[44]

Lack of standardized forms and terminology

The National Academy of Sciences report criticized as inadequate the way many forensic laboratories report results, particularly when "they include no mention of methods or any discussion of measurement uncertainties."[45]

Prosecutors should consider asking labs for more detailed reports, ones that include at a minimum "'methods and materials,' 'procedures,' 'results,' 'conclusions,' and, as appropriate, sources and magnitudes of uncertainty in the procedures and conclusions (e.g., levels of confidence)," according to the National Academy of Sciences.

41 Matthew R. Durose, Kelly A. Walsh, Andrea M. Burch, Census of Publicly Funded Forensic Crime Laboratories, 2009, (Bureau of Justice Statistics, August 2012, NCJ 238252).

42 John K. Roman, Shannon Reid, Jay Reid, Aaron Chalfin, William Adams, Carly Knight, "The DNA Field Experiment: Cost-Effectiveness Analysis of the Use of DNA in the Investigation of High-Volume Crimes," April 2008, Urban Institute, Justice Policy Center.

43 The National Academies of Science report.

44 http://www.fbi.gov/about-us/lab/biometric-analysis/codis/codis-and-ndis-fact-sheet, visited April 1, 2013.

45 The National Academies of Science report.

Geoffrey S. Mearns, a former prosecutor who now serves as president of Northern Kentucky University and who sat on the committee that wrote the National Academy of Sciences report, said he typically encountered lab reports that contained as little as "name of the lab, and a statement that says, 'I tested such-and-such weight of a white powdery substance and determined it was cocaine.' That's not a fair disclosure of the testing techniques. There's going to be increasing pressure on prosecutors to disclose more," Mearns said. "Our suggestion was to have a uniform lab report for each discipline so all practitioners know what to complete, then you don't have to have a dispute with the judge over whether you've given enough information."[46]

CONCLUSION

Despite challenges that may limit prosecutors' capacity to integrate and implement new technology, it is important that they still strive to gain a better comprehension and appreciation of scientific principles and practices. A stronger understanding and appreciation of science and technology will assist prosecutors in ensuring more accurate and efficient investigations based on reliable, theoretically unbiased information and ultimately leading to more solid cases. As science and technology continue to evolve, prosecutors must stay abreast of these developments in order to best protect their communities and promote public safety.

46 Phone interview with Robert V. Wolf, Feb. 8, 2013.

RESOURCES

American Society of Crime Laboratory Directors / Laboratory Accreditation Board
The American Society of Crime Laboratory Directors/Laboratory Accreditation Board is a not-for-profit organization specializing in the accreditation of public and private crime laboratories.

http://www.ascld-lab.org/

Arizona Forensic Science Academy
The Academy is the first of its kind in the United States and has been hailed as a model for other states to follow. The Basic Academy offers instruction on topics that include DNA, toxicology, controlled substances, crime scene analysis, fingerprints, ballistics, digital evidence, and death investigations. The Advanced Academy offers more in-depth training in the areas of DNA, ballistics, and fingerprints.

https://www.azag.gov/azfsac/academy

National Forensic Science Technology Center
A resource for non-scientists, the website covers the core concepts, capabilities, and limitations of key forensic science disciplines.

www.ForensicScienceSimplified.org

Scientific Working Groups
Since the early 1990s, American and international forensic science laboratories and practitioners have collaborated in Scientific Working Groups (SWGs) to improve discipline practices and build consensus standards. For a list of working group web sites, visit:

https://www.fiswg.org/about_swgs

Strengthening Forensic Science in the United States: A Path Forward
This report published by the National Academies Press in 2009 provides an overview of the forensic sciences and recommendations for improvement.

www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf

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Association of Prosecuting Attorneys

1615 L Street, NW • Washington, DC 20036

202-861-2480 www.APAInc.org