

# The CACNews

News of the California Association of Criminalists • Second Quarter 2007



# The President's Desk

## "The CAC Response. . ."

### California Commission on the Fair Administration of Justice

#### Focus Questions For Hearing On Forensic Science Issues

The Commission has met with Barry Fisher, Director of the Crime Laboratory for the Los Angeles County Sheriff Department, and Lance Gima, the Chief of the Bureau of Forensic Services for the California Department of Justice, to familiarize itself with the challenges currently facing forensic laboratories in California. The Commission has reviewed reports of a number of controversies surrounding the use of questionable scientific evidence, both in California and around the country. The Commissioners have read the 2004 recommendations of the American Bar Association Ad Hoc Innocence Committee regarding Forensic Evidence issues, as well as the 2004 Report to Congress by the National Institute of Justice regarding the Status and Needs of Forensic Science Service Providers. It is readily apparent that the issues we are addressing are not confined to California. Rather than issue tentative recommendations at this time, the Commission would like to focus the public hearing on the following questions, of particular relevance to California:

1. *What steps must be taken to reduce the current backlog of untested DNA samples taken from convicted felons pursuant to Proposition 69, enacted in 2004? The backlog will grow dramatically in 2009 when all those arrested for felonies will be required to provide DNA samples. There are currently approximately 225,000 untested samples, and the expansion of the program to felony arrests creates a potential for over 500,000 more samples per year being added. The California Department of Justice DNA Laboratory currently has approximately 34 unfilled vacancies for criminalists, and outsourcing to private laboratories is limited by the FBI requirement that only public laboratories may enter DNA data into CODIS, the national database.*

❖ CAC Response: CACLD has adequately addressed this issue. CAC agrees that it is a State/DOJ issue. Adequate salaries/compensation must be offered to attract and retain and increase qualified staff. We support the notion of having DNA trained technicians instead of fully trained DNA analysts work the backlog of database samples.

❖ The issue of outsourcing always raises some questions as to who has control of the process and what would be the impact on the laboratories accepting the backlog samples. This arrangement would have to be examined carefully to fully assess its effectiveness.

2. *Although California law provides for post-conviction DNA testing to be ordered by a Court, California Innocence Projects report mixed results in obtaining the cooperation of police and prosecutorial agencies in locating and identifying evidence which might be available for testing. What steps should be taken to encourage greater cooperation in the evaluation of post conviction claims of innocence?*

❖ CAC Response: We agree with CACLD that this is not a crime laboratory issue. In light of post-conviction results resulting in release of innocent people from jail, it seems that post-conviction cases should have the same priority as other cases. It goes back to the overall situation of crime labs being burdened to start with. The issue of adequate staffing is the first issue the state commission should deal with.

3. *Should statewide standards for the accreditation of forensic laboratories and the certification of criminalists be established? Should a state commission on forensic science be established in California, similar to the New York State Commission on Forensic Science? See: [www.criminaljustice.state.ny.us/forensic/aboutofs.htm](http://www.criminaljustice.state.ny.us/forensic/aboutofs.htm)*

❖ CAC Response: No. Accreditation standards have already been established by ASCLDLAB and most California public laboratories are ASCLDLAB accredited. These are national standards and the program is moving into international standards for all laboratories. In addition, there are technical working groups comprised of subject experts that have established technical guidelines for each discipline, including a strong set of guidelines created for DNA analysis. These DNA guidelines are used as the standards for required internal audits as well as by ASCLDLAB in the accreditation inspections.

❖ Certification of the individual criminalist is managed by the American Board of Criminalists. This individual certification requires not only fees to be paid but requires successful



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John Simms  
CAC President



**Editorial Secretary** Ron Nichols  
(925) 280-3623  
ronald.nichols@atf.gov

**Art Director** John Houde/Calico Press, LLC  
(206) 855-1903  
john@calicopress.com

**Technical** Jennifer Shen  
(619) 531-2655  
jshen@pd.sandiego.gov

**Webmaster** Mark Traughber  
(909) 557-1828  
m.traughber@hitdna.com

**Advertising** Vincent Deitchman  
(408) 918-2947  
vdeitchman@crimelab.sccgov.org

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The deadlines for submissions are: December 1, March 1, June 1 and August 15.

# The CACNews

www.cacnews.org



## On the cover...

Ed Jones (Ventura S.O.) sent us these photos of a tiny slide he made for the Microscopical Society of Southern California. The cover photomicrograph was taken with coaxial illumination, and includes the first "A" in the word. The image above is reproduced approximately actual size.

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**"The laws of chemistry are immutable."**

## Microcrystal Tests Pass *Daubert* Challenge

In a 2006 *Daubert* challenge (*U.S. v Edgar Diaz, Rickey Rollins, et al.*) to the use of microcrystal tests used to identify cocaine, U.S. District Court Judge William Alsup declared that, "The laws of chemistry are immutable. It is true that nowadays instrumentation is favored over chemical tests among scientists in the field and that the San Francisco Police Department Crime Lab is still relying on the state of the art as of the 1970s. But the science was good then. It is still good, the scientific principles being fixed. Despite the many hundreds of thousands of drug convictions in the criminal justice system in America, there has not been a single documented false-positive identification of marijuana or cocaine when the methods used by the SFPD Crime Lab are applied by trained, competent analysts."



**"The validity of microcrystalline tests to confirm the presence of cocaine is not reasonably in question."**

The case arose from an appeal of a 1970's era cocaine and marijuana case analyzed by the San Francisco Police Dept. crime laboratory where cobalt thiocyanate (color test) and two crystal tests were used to identify cocaine, without any other instrumentation.

Judge Alsup further stated, "The validity of microcrystalline tests to confirm the presence of cocaine is not reasonably in question. It is clear from the peer-reviewed literature and other evidence that these tests are highly sensitive and have been accepted for decades. [SFPD Criminalist Debbie] Madden testified that the microcrystalline testing procedures used by the SFPD Crime Lab were the same tests she was taught when she was a criminalistics student at the University of California at Berkeley thirty years earlier. Additionally, [SFPD Lab Manager James] Mudge testified that other forensic laboratories in California continue to employ microcrystalline tests to identify cocaine, including laboratories in Alameda, Oakland, Santa Clara, and San Bernardino. Even defense-expert [James] Norris testified that during the years he was a forensic analyst, he never questioned the validity of the microcrystalline tests. This order finds that the cobalt thiocyanate, gold chloride, and platinum chloride tests are generally-accepted procedures in the forensic science community that may be used to confirm the presence of cocaine.



## LA Forensics

CAC member (and Nominating Committee chair) Susan Brockbank was featured on a recent episode of *LA Forensics*. The episode, titled "Super Print," aired Feb. 27 on Court TV.

## Inter/Micro 2007

The 2007 InterMicro meeting is scheduled for July 9-13, 2007 in Chicago, IL. The meeting is sponsored each year by the McCrone Research Institute. These week-long meetings offer presentations on all aspects of microscopy, methods and materials. Most of our attendees feel that Inter/Micro is the best conference they attend each year due to the quality of the content in the multidisciplinary technical papers, the experts in all areas of microscopy that regularly attend, and the personal atmosphere of the entire meeting. We hope that you agree and we hope to see you in Chicago this July!

Visit [www.mcricri.org](http://www.mcricri.org) for more information and registration links.

## NEAFS Meeting Planned



The Northeastern Association of Forensic Scientists (NEAFS) will be holding their 33rd Annual meeting from October 31- November 3, 2007 at the Sagamore resort in Bolton Landing, NY. Meeting program information can be found at [www.neafs.org](http://www.neafs.org).

The contact for information on the meeting program is: Adrian S. Krawczeniuk, President-Elect, P.O. Box 100, Old Greenwich, CT 06870  
[Adrian.S.Krawczeniuk@usdoj.gov](mailto:Adrian.S.Krawczeniuk@usdoj.gov), 212-620-4923.

*CACBits continues on page 15*

# Southern Section Report



On November 30, 2006, the Southern Regional Study Group Luncheon was held at the Oceanside Police Department.

The Forensic Alcohol study group discussed the following items:

- DMV hearings with representatives from the DMV-San Diego present
- Discovery practices at the different laboratories and counties,
- Title 17 and DHS developments,
- ASCLD-LAB/ISO guidelines on requirements for breath calibration and laboratory documentation
- What defense experts are saying

The Crime Scene Investigation study group observed a demonstration of the Foster & Freeman Crime Lite alternate light source for use at the crime scene, engaged in a discussion on the future direction and topics for the CSI group, and reviewed and discussed three SWGSTAIN documents that were in the review and commentary stage of development.

The Fire Debris Analysis study group met and exchanged standards of ignitable liquids, discussed oil sources, and training guidelines of the different represented laboratories.

The Trace Study Group discussed the following items:

- TWGFEX (Nov 06) abstracts
- Classes listed in the SWAFS being held at the Western Forensic Law Enforcement Center-Colorado State University
- Papers given at InterMicro/2006 on individualizing minerals and the use of microscopy in forensic biology.
- SCANNING will be held in Monterey this year with a

one-day workshop on SEM in forensic science.

- FBI classes for 2007
- The Trace Evidence Quality Assurance Guidelines in the January 2000 issue of Forensic Communications.

The Controlled Substances study group discussed the direction of the study group, suggested speakers, and ideas for future sessions. Some of the results of the meeting were examination of medical marijuana matrices, extraction techniques, safety issues, the ABC exam, seminar presentations, microcrystal tests, and back-to-basics sessions on instrumental theory and applications.

The DNA section had three presentations:

Jeanne Putinier – Orange County Sheriff-Coroner Department – Anomalous migration of a vWA allele and the problems it presented in a court case, Cindy Carroll – Los Angeles Sheriff's Department Crime Lab – An interesting "touch" DNA case, and Adam Dutra – San Diego Police Department Crime Lab – Unusual results at a DNA loci on the X and Y chromosomes.

Additional topics were open for discussion including:

- Which labs are using Avant 3130? How do you like them? What did you do to validate if you upgraded from the 3100?
- Expert systems: anyone using them? How are you using them and do you find them helpful?
- Has anyone identified any new inhibitors? How are labs overcoming inhibition?
- Y-quantitation and Y-STRs: Which labs are using them and under what circumstances?
- Sample batching: Which labs use batching systems and how are they organized? Do you find batching to be helpful?

The next study group session should be in a more central location and I hope to see you there!

Wayne Moorehead  
Regional Director, South



## Queueing up at the AAFS

At the San Antonio meeting of the American Academy of Forensic Sciences, author E.J. Wagner faces the first wave of signature seekers following her luncheon seminar, "Trials of the Expert Witness:

From Lycanthropy to Locard and the Legacy of Sherlock Holmes." Her book, "The Science of Sherlock Holmes" was reviewed in the 3rd Quarter issue of the CACNews.

Bill Wagner

# The Editor's Desk

## Letting Go of the Rope

### Have you ever heard something...

...that you're not quite sure where or how it fits but you just cannot get it out of your mind. It's kind of like a subtle torture – it won't go away, yet the answer is not easily forthcoming. Since I do not like to be tortured alone, let me share something I recently heard – "Sentimentalism is living in the past focused on ourselves." (Attributed to Fred Franks, Sr.)

### A little clarification please...

A friend read the last editorial I wrote and was confused a bit by the "plank in the eye" statement. Basically, the only thing I was trying to get across was we should deal with our own faults rather than looking at another's.

### It's not so much...

...that I am an avid fan of the Giants, I just do not like the Dodgers that much! I grew up in Buffalo, NY and without a hometown team to root for I was drawn to the Cincinnati Reds. They were close to home and my boyhood hero was Johnny Bench. The most intense rival of the Reds were the Dodgers. So, when I moved to San Francisco I was able to transition to becoming a Giants fan not so much because I really liked the Giants, but because I really do not like the Dodgers!

### Live everyday as though it were your last...

Considering this is supposed to be my last offering as Editorial Secretary the "live everyday as though it were your last" thought was triggered. It was first triggered by John Houde when I was talking with him about these last four years, especially writing this editorial. So I decided to take a slightly different perspective – write every day as if it were the last thing I would ever write.

When you think of that phrase, "live everyday as though it were your last," what do you think of? Many people think of all the things they would never have dared try that they now want to try. "Let's go skydiving!" Some Hollywood movies portray this attitude too. It's all self-focused. "What do I want to accomplish before I die?" However, when someone else dies, what is your first thought? Is it those things that you wish you had said to that person and didn't? Is it those times you wish you had spent together but didn't? Notice the difference here between the two situations? In the first one, where you have 24 hours, it's all about you. In the second one, it's more about the other person. The first one is more self-focused, the second more other centered. Let's explore that.

Let me highlight some things from my last editorial which dealt with morale. Poor morale is running rampant in many laboratories. While we can point the finger at others for the blame, we are not so inclined to look at ourselves. If we did we examine ourselves, we would discover we can foster poor

morale through our own selfishness and pride.

The primary element here is selfishness. At our very human core, I believe that we are all selfish. It may not become obvious until that "live everyday as if it were your last" becomes a reality, but it is there. My wife believes that as humans we are incapable of having a 100% pure motive. I used to argue this, but now am inclined to agree. Selfishness is natural and our culture feeds into that. You need look no further than the commercials on your television screen for that evidence.

How does this tie into morale? Well, morale has to do with relationships and the bottom line is that selfishness destroys relationships. A friend (the other Fred Franks) recently said, "We put more time into building relationships than maintaining them." Let's think about that for a second. Whether it be in the workplace or at home, does this ring true of our lives? Think about that girl you were trying to get to fall in love with you? Remember all the things you did to try to impress her – talk with her, make time for her, dress well? Now that she did fall in love with you and you got married, are these still a priority? How about that guy? Remember all the interest you showed in the most mundane things that, while they held no interest for you, were important to him? Is that interest still there? Is it still a priority? How about the wonderful masks we donned to impress that potential employer (or highly sought employee)? When those come down, are we still as committed to that relationship as we were in the beginning?

We combat selfishness with selflessness. Selflessness moves us from that "what have I left to accomplish" mentality to the "what good have I left unsaid" mentality. If that one person died today, what would you regret not having said or done? Why should that be any different than if you were the one with only 24 hours left? It shouldn't. My same friend shared that we can always make more money but we can't make more time. The first part is not always true – we will not have every day to make more money. But, what's going to last into future generations? Is it going to be your accomplishments or the time you invested into the lives of others who in turn invest that into yet more?



**Ron Nichols**

*CAC Editorial Secretary*



Pride is tied into selfishness. I am not saying that we should not take pride in what we do because we should. The line we cannot cross is when we become prideful. Early on in my career, I did. It manifested itself in criticism, always comparing, stubbornness and superficiality. I would criticize others when their way was not as good as mine. I would always compare not only people but situations – “If only we were like...” If you looked up stubborn in the dictionary you saw my picture. And, I was very superficial. I looked good on the outside but inside, because of my inward focus, I was hurting. I had needs but since I could trust no one else other than myself, I put on a mask of self-sufficiency to hold others at bay.

Look around you. There are people with needs all about you. If morale at work is bad, one of the primary reasons is that there are people who are hurting and in need, yet too afraid of exposure to share it. Let's go beyond work to our other relationships – our families and friends. I suspect that if any were like I, they have some very deep hurts and needs that are eating away at them yet they are too afraid to share for fear of rejection. In every definition of the word, this is prideful though we may not think that immediately. In my case, I just wanted people to think the best of me. Bottom line is – that's pride.

Pride destroys relationships. Our fear of rejection puts a wall up between us and others who could actually be of help in healing those hurts. On the other hand, when we are excessively critical or stubborn we put distance in between ourselves and others. I do not know of too many families in which there is not some internal squabble over unresolved hurts and lack of forgiveness. Friendships have been destroyed due to the same.

Jean and I liken this to a tug-of-rope scenario. The game continues so long as people continue to pull on the rope so we encourage one of them to simply “drop the rope.” How do we drop the rope? Humility is the key – the humility to say that no matter what was done I have done hurtful things in the past too (this is the plank in your eye bit). Who knows – the hurt that you experienced may not have been because the other person has a grudge against you but because that person was simply reacting out of a hurt from a long time ago. Maybe that person rejected you first because they were afraid of being rejected first. The bottom line is that we may never know why they are playing the tug-of-war game, but we know who can stop it – if pride does not get in the way.

Let's look back at the original question – what do you think of when you hear the phrase “live everyday as if it were your last”? My contention is that if we changed the phrase a bit – “**love** every day as if it were some else's last” then we would have a better sense of what really matters. How can this be accomplished if by our very nature we are selfish? By getting a new nature. A new nature on our own is not possible. Mine could only be transformed by a Savior – Jesus Christ. (John 3:16) It is only because of Him that my selfish and prideful nature can be transformed into one of less selfishness and more selflessness, less pride and more humility. Am I perfect? Far from – but I am going to aspire to “love every day as if it were someone else's last.”

It has been a privilege and honor to serve you. As always, my best to you and yours.

Row

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## Debate Q's: An Open Letter to CAC President John Simms

In response to your invitation to debate the contents of your last "President's Desk" column [*CACNews*, First Qtr, 2007], I would like to answer some of the questions that you've raised throughout the column.

I feel that the reason the ABC allowed "specialists" to take the specialists examination without passing the GKE was that a preponderance of specialists were not able to successfully pass the GKE examination. The specialists then whined loud and long enough that the ABC relented and allowed them to take the specialists exams without first passing the GKE. This is the complete opposite of the logic applied in the medical model, and is clearly wrong-headed. In the medical model, students must first obtain their MD degree as a general practitioner before moving onto specialization. Why? Because it's necessary and prudent to have a solid foundation in the general medical practices before attempting neuro-brain surgery, having just acquired a BS degree. Similarly, the GKE should be required before one is allowed to take a specialty exam. Unfortunately, now that the "horse is out of the barn", there's probably no going back. The ABC has made a dreadful mistake in watering down the testing process... plain and simple!

**Who in our profession is seeking practical general training? Only those who truly understand the value of it, and subsequently pursue and seek it out for their own professional growth and development (despite administrative roadblocks and discouragements).**

In my humble opinion, allocating 40% of the specialist exam to GKE questions is insufficient to demonstrate a breadth of general criminalistics knowledge.

Who in our profession is seeking practical general training? Only those who truly understand the value of it, and subsequently pursue and seek it out for their own professional growth and development (despite administrative roadblocks and discouragements). Laboratory management should be making efforts to provide their forensic scientists/criminalists with generalist training, as in the long run it will only provide better, more comprehensive, and thorough examinations. With such training and education, analysts learn how one examination (such as DNA), can be performed in conjunc-

tion with, rather than to the detriment of, another examination (such as blood stain pattern analysis).

The ABC has advanced our profession by taking the self-monitoring lead in professional oversight, avoiding the ignominy of some external governmental entity (that wouldn't have a clue) trying to provide leadership. Of course, certification is NOT a panacea; but it does demonstrate the minimum breadth of general knowledge that a professional forensic scientist should have to do the job competently. It also serves as a reflection of the level of professional commitment that the individual takes in his/her profession. I proudly state my ABC certification each and every time I qualify in court.

The CAC needs to make it emphatically clear to the ABC that we disagree with the direction that the ABC has taken in allowing specialists to take a specialty exam before passing the GKE, as anathema to the progress of the profession and its members. If they disagree with that stance, CAC should not provide support to ABC, inasmuch as ABC strayed from the original intention of certification in order to appease the specialists that were the "squeaky wheel that got the oil."

Mr Simms wonders whether providing formal orientation to all other laboratory units during the training process is sufficient to remedy this criminalistics "information gap." I would assert that such an orientation is merely a "band aid" approach, and cannot substitute for analytical experience, nor is it capable of adequately preparing an analyst for the wide panoply of problems presented by the physical evidence that results from a criminal event.

With regards to your final thought question: In my professional opinion, I do not believe that a criminalist can effectively do crime scene work without the benefit of generalist training. In the "real world", we are all aware that cases are, not surprisingly, multi-disciplinary in scope. Consider the following (not unusual) scenario: A subject drinks alcohol (23152 - blood alcohol) and does drugs (11350 - controlled substances) to summon up enough nerve to execute an armed robbery (211). This results in several shots fired (12025 - firearms examination) and a pistol whipping (resulting in blood spatter) to intimidate convenience store personnel. He subsequently encounters an off duty police officer (resulting in an officer-involved shooting and further firearms work) and while fleeing the scene, ends up crashing the getaway vehicle (11550 - toxicology). Without generalist training, the criminalist will most likely focus on his/her particular specialty (which may ultimately have NO forensic value in the overall scope of the case) to the detriment of vital, and possibly critical, forensic evidence in the case that has been overlooked due to ignorance, or worse, a total lack of awareness.

Thank you for providing such a thought provoking column and for entertaining my thoughts on the topic with your valuable time. I hope that it provides some indication of the CAC membership's feeling on the issue for your poll.

—Kenton S. Wong, D-ABC  
kwong@forensica.com



## President's Desk, *cont'd*

completion of tests as well. There is individual certification for latent print examiners as well under the International Association of Identification, or IAI.

❖ Taking this step would only create another competing and perhaps conflicting set of accreditation standards resulting in confusion and ineffectiveness. The state should give consideration to requiring accreditation for ALL forensic laboratories and require certification for all criminalists before they can practice criminalistics in California. This could be done without the creation of a commission. Grant funding is already moving in this direction by requiring laboratories receiving grant funds to be accredited.

❖ The idea of creating another bureaucracy is frightening. In light of the laboratories' experience with the California Department of Health regulation of alcohol, this is the last thing we want. It took decades of frustration and anecdotal evidence of one horror story after another to finally remove the DOH from regulation of the program. Their role has been

This can be ordered by the judge if requested and of course it would all be at taxpayer's expense.

*6. Is the forensic delivery system in California supported at an adequate level to provide accurate and timely testing results?*

❖ CAC Response: Clearly the answer to this is NO specifically with regards to the issue of timely. Staffing issues do not affect the accuracy. There is a shortage of funding for adequate staff across all government jurisdictions. California has a combination of state, county, local, and private laboratories that are all faced with funding shortages. A dependable, permanent source of funding needs to be identified so that laboratories can adequately install staff levels, proper equipment and supplies that will provide for more timely analysis.

*7. Are California educational opportunities sufficient to supply future needs for fully trained forensic criminalists in California? Is adequate continuing education available to ensure that forensic science personnel are up-to-date in their fields of expertise?*

## **A new government agency to oversee forensic science will not provide any additional effectiveness in light of the funding shortcomings described above. Accreditation is being adequately managed.**

drastically reduced to the benefit of all public laboratory operations. There is nothing a state commission can do that ASCLDLAB is not already doing.

*4. Are California judges, prosecutors and defense lawyers adequately trained with regard to the use of forensic evidence in the criminal justice system?*

❖ CAC Response: Some are and some are not. In general, laboratories are more than willing to help the attorneys understand forensic evidence. The problem is at the time of trial, trial tactics overcome forensic education. The state bar can mandate forensic science training for attorneys. The training can also be provided by the California Criminalistics Institute.

❖ One of the most common trial tactics that we constantly struggle against is in dealing with DA requests to do everything on everything, particularly now for DNA evidence as our level of sensitivity increases. This is despite the educational process that can occur with the analyst and the attorneys on the case. This is a problem which promises to increase because the attorneys are anticipating the jury mindset due to all the forensic shows on television.

*5. Are California criminal defendants given sufficient access to experts in forensic evidence and testing in crime labs to assure the fairness of their trials?*

❖ CAC Response: CAC cannot address this other than to say that the defendants do have access to private laboratories just as they have access to attorneys if they are indigent.

❖ CAC Response: CACLD has responded very well to this question. There are plenty of education and training opportunities but often training and travel budgets are not adequate. Continuing education is extremely important for all analysts, and in particular, is required for DNA analysts.

OVERVIEW: the source of consternation in the delivery system of forensic science in California comes down to funding. There is insufficient funding to establish the staff levels needed to give the court system and detectives the turnaround times they demand. There is insufficient funding for regular, ongoing training. There is insufficient funding to buy either new or replacement equipment. Many of the on-going grants strictly prohibit the use of grant funds for equipment purchases.

A new government agency to oversee forensic science will not provide any additional effectiveness in light of the funding shortcomings described above. Accreditation is being adequately managed. There is not anything that a state commission could do that the accreditation body (ASCLDLAB) is not doing or could not do. The state legislature could look at making accreditation and certification required, and let it be handled through the certifying and accrediting bodies already managing these issues (ASCLDLAB, ABC, IAI). To create a new bureaucracy that would impose additional regulations on accreditation and certification when those programs are already being managed would divert critical funds that could be used for better purposes by the laboratories, and create unnecessary competing accreditation standards and confusion.





# Finding the Needle in the Haystack

By Kay Belschner and Charlene Marie

*"If searching for sperm can be likened to searching for a needle in a haystack, then this technique is the equivalent of burning the haystack"<sup>1</sup>*

## Part One: The Haystack

The successful analysis of the evidence taken in sexual assault cases usually involves the examination of mixtures. Particularly common are vaginal-seminal mixtures followed by oral-seminal mixtures. Less common, but still seen on a regular basis are rectal-seminal mixtures. Most seasoned forensic biologists start the staining of the medical-examiner collected vaginal smear slide, even while they inventory the rest of the sexual assault kit evidence. Often, the microscopic visualization of spermatozoa on this slide precludes the necessity of further searching. When no sperm are observed on this slide, extracts of other swabs are prepared. Stains on other items such as clothing and bedding may also be examined regardless of the results of the examination of the slide.



Whether the examination is of this slide or one prepared by the examiner from sample extracts of vaginal, oral and rectal swabs or other items such as clothing and bedding, the challenge is locating sperm on a slide inundated with nucleated epithelial cells originating from the victim. The use of phase contrast microscopy and histological stains, combined with training and experience, allow the examiner to better locate and differentiate spermatozoa from the myriad of other components found in these extracts. When the sample is overwhelmed with the presence of nucleated epithelial cells, searching for spermatozoa is made more difficult.

As a practical matter, if no sperm cells are seen but the presence of p30 is noted, or even if a very fast reaction for seminal acid phosphatase (SAP) is seen, it is likely, but not always the case, that the examiner will at least consider forwarding the sample for DNA processing and analysis. The real problem is for those cases, and we have all encountered them, where no seminal acid phosphatase or p30 is found, and nucleated epithelial cells dominate the microscopic effort. These cases are often ones where there is a longer time frame between the assault and the collection or where the amount of semen is low. Spermatozoa may be present and may go undetected. At that point the analysis of this sample is done and, if there is no other evidence, the report may be written "no semen found".

"Using Proteinase K (ProK) with sodium dodecyl sulphate (SDS), it is possible to digest all the cellular material apart from the spermatozoa, resulting in a quick and effective method of their isolation."<sup>2</sup>

The technique of Pro K / SDS digest is not new. In 1989, workers in the Metropolitan Police Forensic Science Laboratory evaluated the SDS/ProK technique on post-coital donor swabs and casework samples. They reported an increase in positive findings of sperm after the SDS/Pro K clean up was done.

Because we have a tool at our disposal that will allow us to do a better job with these difficult samples, it is incumbent

likened to searching for a needle in a haystack, then this technique is the equivalent of burning the haystack."<sup>3</sup>

Because the SDS/Pro K is more effective at revealing the presence of spermatozoa, the slide-searching task becomes much easier and more quickly accomplished.

Analysts at the CA Department of Justice, Bureau of Forensic Services Eureka and Santa Barbara Laboratories have done experiments to validate this extraction method. In PART II, The Needle, we report the findings of our validation of this clean up procedure. Ed Jones reports that of 1,000 samples evaluated using first only water and then using SDS/ProK; almost 7% of the sperm containing samples were missed using water extract alone.<sup>4</sup>

Two major concerns have been that screening examiners will somehow introduce material that has not been subjected to DNA-protocol quality control measures; or, that sample-limited evidence will be squandered. By applying this simple clean up procedure only in cases where sufficient material exists for both screening and DNA analysis, these concerns are rendered moot. The small amount of material used to screen the evidence will not be a part of the DNA evidence stream.

We know that we may be missing samples that could and should provide probative evidence. Until we are appropriately using every reliable tool at our disposal, we are not doing enough.

"My opinion (and you can quote me) is that, if there is a tool that can help the analyst find the evidence, and all of the usual concerns are addressed (contamination, validation, etc.); then, we should use the tool. We can't help the agencies/victims/criminal justice system unless we can first find the evidence, and secondly analyze the evidence. Both are important, but everything is contingent on finding the evidence in the first place."<sup>5</sup>

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**"My opinion (and you can quote me) is that, if there is a tool that can help the analyst find the evidence, and all of the usual concerns are addressed (contamination, validation, etc.); then, we should use the tool. We can't help the agencies/victims/criminal justice system unless we can first find the evidence, and secondly analyze the evidence. Both are important, but everything is contingent on finding the evidence in the first place."**

**—Kerstin Gleim**

on us all to take the time to validate this simple clean up procedure. Ed Jones reports in his chapter in the 2nd Edition of Volume 2 of Saferstein's Forensic Science Handbook:

"Treating a vaginal or oral sample with the proteolytic enzyme, Proteinase K (ProK) to selectively lyse the nucleated squamous epithelial cells, leaving the sperm heads intact, improves extraction efficiency and make the microscopic examination for sperm easier. . . If searching for sperm can be

---

*Kay Belschner, California Department of Justice, Bureau of Forensic Services, Eureka and Charlene Marie California Department of Justice, Bureau of Forensic Services, Santa Barbara.*

## **Part Two: The Needle**

In 1989, the Metropolitan Police Forensic Science Laboratory evaluated the extraction of sperm using sodium dodecyl sulphate (SDS) with Proteinase K (ProK). They tested 66 post-coital donor swabs and 58 casework samples. They found an almost 14% increase in positive samples using this extractant.

In 2000 Terry Spear of the California Criminalistics Institute, Department of Justice, Bureau of Forensic Services presented the results of a study conducted on swabs collected 24, 72, and 120 hours post-coital interval (PCI). The results of this study showed that sperm were more likely to be detected with this reagent in the swabs taken 72 and 120 hours PCI.



Independent experiments were performed at the CA Department of Justice Laboratories in Santa Barbara and Eureka to validate the use of the procedure to isolate spermatozoa from mixtures of sperm and other body fluids with a significant amount of cellular debris. The two laboratories tested the following samples:

<u>Santa Barbara Laboratory:</u>	<u>Eureka Laboratory:</u>
Semen-free vaginal swabs	Semen free vaginal swabs
Semen	Semen
Blood/semen mixtures	Saliva
Saliva/semen mixtures	Semen/vaginal fluid mixture
Feces/semen mixtures	Post-coital swabs
Post-coital swabs	
Control samples	

Additionally, the Eureka Laboratory tested 26 paired non-probative casework samples. These samples ranged from those that did not originally have any sperm detected to those that had numerous sperm present.

### Procedure:

The two laboratories used similar procedures. A cutting of the sample was initially extracted in water, saline, or stain extraction buffer (SEB). SEB was prepared with 1.21 g Tris, 3.72 g EDTA, and 5.84 g NaCl in 1 liter distilled water, pH 8.2. The sample was centrifuged, the supernatant removed and retained for other tests, and a portion of the pellet transferred to a microscope slide.

The original cutting and remaining pellet were then re-extracted with 2% sodium dodecyl sulphate (SDS) in SEB with 1% Proteinase K added. Extraction took place for approximately one hour at 56°C. The extract was centrifuged and the resulting pellet was transferred to a second microscope slide. The 1st and 2nd slides were stained with Christmas tree stain and examined for both sperm and epithelial cells

### Results:

- Sperm were not detected in any sample that did not contain semen (semen free vaginal swabs, saliva, and control samples).
- All samples except the neat semen had epithelial cells on the first slide that were eliminated on the second.
- The Eureka samples with semen had far more sperm on the second slide than the first.
- Sperm were detected in the saliva/semen mixture from Santa Barbara and the post-coital swab from Eureka only after the SDS/Pro K extraction (the second slide).

#### *Eureka Laboratory Paired Non-Probative Casework Samples:*

Twenty-six samples were used. In the original analysis, they ranged from no sperm to multiple sperm and a few cells to a very dense cell concentration. Two cuttings were taken of each sample. One cutting was tested using the Eureka Laboratory's standard method using Woolite as the extractant. The second cutting was tested using SDS and 1% Proteinase K in SEB with two washes at the end of the digestion.

In almost all cases, more sperm were seen with the SDS/Pro K extractant than in the original exam or paired Woolite sample. Exceptions were two cases with little sperm where the results were similar. In many cases, the amount of recovered sperm and ease of identification were remarkably better than with the Woolite procedure. In five cases, no sperm were

seen in the original casework or in the paired Woolite extract but were present after the SDS/Pro K digestion (a few in four cases; several in one case).

### Discussion:

In all the studies presented above, sperm could be detected in some samples only by using SDS/Pro K as an extractant as the following summary shows:

#### **1989 Metropolitan Police Laboratory**

13.6 % increase in positive donor samples (42 out of 66 increased to 51 out of 66)

13.8% increase in positive casework samples (30 out of 58 increased to 38 out of 58)

#### **BFS Study presented in 2000:**

23% donor swabs 120 hours PCI (3 out of 13)

#### **Eureka Paired Casework Samples:**

19% (5 out of 26)

#### **Santa Barbara/Eureka Test Samples:**

The semen/saliva mixture from Santa Barbara and post-coital test swab from Eureka. A percentage cannot be attached to these samples.

Several test samples, including neat semen stains, and paired casework samples used in the Eureka Laboratory showed a marked increase in the number of sperm recovered after extraction with SDS/Pro K. This indicates that not only does the use of SDS/Pro K clean up the extract by eliminating most or all of the cellular matter, but it may be a better extractant. The combination of an increase in numbers of sperm and elimination of the cells improved the ease of identification, decreasing the amount of time spent at the microscope searching a slide.

In summary, we believe that the use of the SDS/Pro K reagent should be considered for use by all forensic laboratories as a replacement for their current reagent. When used in this manner, no additional sample material is consumed, no material from this extract enters the DNA stream, and there is an increased likelihood of detected sperm in the evidence samples. A secondary advantage is that the time of the analyst performing the primary examination of the evidence is better utilized.

Contributors: Dianne Burns, Lara el Khazen, Meghan Kinney, Greg Avilez and Deborah Enns.

### Footnotes

- 1 Jones, E.L., Jr., "The Identification of Semen and Other Body Fluids", Forensic Science Handbook, Vol. II, Ch. 8, pg. 342, 2nd edition.
- 2 Chapman, RI, et al, *Journal of the Forensic Science Society* 1989; 29, 207-212.
- 3 Jones, E.L., Jr., "The Identification of Semen and Other Body Fluids", Forensic Science Handbook, Vol. II, Ch. 8, pg. 342, 2nd edition.
- 4 *Ibid.*
- 5 Kerstin Gleim, Pacific Coast Forensic Science Institute, Instructor, Microscopy of Sexual Assault Evid. *personal comm.*

# ACSR Conference: Crime Scene Continuing Education

Dianne Burns

DOJ - Santa Barbara Laboratory

Beautiful by day, deserted by dusk, downtown Tacoma, Washington, can be as exciting as hunkering down with your nightie clad Grandma and watching re-runs. No matter, because all the action was taking place at the Association of Crime Scene Reconstruction (ACSR, [www.acsr.org](http://www.acsr.org)) annual training conference



held at the Tacoma Sheraton, January 22-24. ACSR is a professional organization dedicated to crime scene education and training. Attendees included cops, detectives, CSI's, legal investigators, and criminalists.

Like most conferences these days, presentations took place inside one of those austere and windowless walnut paneled conference rooms. Eighty-three attendees listened thoughtfully to seven papers. Included were two papers on recognizing altered and staged crime scenes, a useful presentation on crime scene testimony strategies, and a provocative introduction to the new Fujifilm FinePix S3 Pro UV/IR camera, the first digital camera with onboard UV/IR capabilities that Fuji claims can capture such difficult to visualize evidence as bloodstains on dark clothing.

After supper the first night, a gathering of the Last Piece Society (LPS) took place inside the amply stocked hospitality

suite where the real fun began. The LPS is a "bring your own slides" get together. Head scratching unsolved cases were projected onto a heisted Sheraton king-size sheet tacked on the far wall. Presenters queried the audience for the last piece of the puzzle. Unlike pizza, where the first piece always tastes better than the last, each slice of the Last Piece Society just kept getting better.

The LPS offered handy crime scene tips, too. For example, next time try spreading out a hooded Tyvek coverall near those buried bones you are digging up. The Tyvek suit works as a human stencil. Place the recovered femur on the thigh, the skull where your head goes, and so on. As you fill in the pieces, you can easily see what bones have been recovered and what bones are still missing. The final product makes a graphic photo.

Workshops on the second day of the conference included collecting DNA at crime scenes, forensic anthropology, Taser incident reconstruction, and the proper use of forensic lighting. About twenty of us enjoyed the hands-on forensic lighting workshop where the new Fuji UV/IR digital cameras were available to play around with. My advice: wait a year or two for Fuji to work the bugs out and hopefully reduce the price (\$1800, body only) of this potentially useful new camera.

The final day of the conference was devoted to a dynamic presentation on the reconstruction of officer involved shootings by keynote speaker and deadly force expert, Dr. Bill Lewinski, who addressed the question, "Why do so many suspects get shot in the back by police?" The answer appears to be quite simple: a person can turn away and begin running more quickly than an officer can fire the first shot.

Treat yourself to next year's conference in Tulsa.

---

## Legislative Watch—"Crime Laboratory Review Task Force"

BILL NUMBER: AB 1079

INTRODUCED BILL TEXT

INTRODUCED BY

Assembly Member Richardson

FEBRUARY 23, 2007

An act to add Section 13519.10 to the Penal Code, relating to law enforcement, and declaring the urgency thereof, to take effect immediately.

### LEGISLATIVE COUNSEL'S DIGEST

AB 1079, as introduced, Richardson. Crime laboratories.

Existing law requires the Commission on Peace Officer Standards and Training, a state agency in the Department of Justice, to offer various training courses for peace officers in order to increase the effectiveness of law enforcement.

This bill would require the commission, by July 1, 2009, to establish a task force to conduct a review of California's crime

laboratory system. The task force would be required to review and make recommendations as to how best to configure, fund, and improve the delivery of state and local crime laboratory services in the future and to report its findings to the Department of Finance and specified legislative committees by July 1, 2009. The bill would also set forth related legislative findings.

This bill would declare that it is to take effect immediately as an urgency statute.

Vote: 2/3. Appropriation: no. Fiscal committee: yes.  
State-mandated local program: no.

THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT  
AS FOLLOWS:

SECTION 1. The Legislature finds and declares the following:

(a) There are significant questions regarding the structure, staffing, funding, and workload priorities of California's forensic analysis delivery system. There is also concern that existing law enforcement needs are not being met and that this situation will worsen if not addressed quickly.

(b) Forensic science is an increasingly vital element in the field of law enforcement. This highly specialized work covers at least 10 different specialties and is becoming more sophisticated as our scientific knowledge increases.

(c) Recruitment and retention levels of state criminalists are dwindling as demand for services increases. The state is experiencing a serious shortage of criminalists resulting in a significant backlog in unprocessed DNA samples. This problem will get dramatically worse in 2009 when state law dramatically increases the number of persons subject to DNA testing.

(d) There are no universal standards for certification for criminalists in California nor is there a mandatory requirement that all criminal laboratories meet minimum standards. California currently has 11 Department of Justice crime laboratories providing services to approximately 40 percent of California's law enforcement agencies. The remaining law enforcement agencies are served by at least 19 local criminal laboratories that fall under the command of a district attorney, sheriff, or police chief.

(e) The creation and growth of crime laboratories in California has evolved over decades without any statewide planning, review, or coordination to maximize the capabilities and effectiveness of these critical assets.

SEC. 2. Section 13519.10 is added to the Penal Code, to read:

13519.10. (a) The commission shall establish a task force to conduct a review of California's crime laboratory system.

(b) The task force shall be known as the "Crime Laboratory Review Task Force." The commission shall determine the composition of the task force, so long as the task force

is comprised of members from each of the following entities:

(1) The Commission on Peace Officer Standards and Training. This member shall serve as the chairperson of the task force.

(2) The California Association of Crime Laboratory Directors.

(3) The California Association of Criminalists.

(4) The International Association for Identification.

(5) The American Society of Crime Laboratory Directors.

(6) The California Highway Patrol.

(7) The Office of the Attorney General.

(8) The California State Sheriffs Association, from a department with a crime laboratory.

(9) The California District Attorneys Association, from an office with a crime laboratory.

(10) The California Police Chiefs Association, from a department with a crime laboratory.

(11) The California Peace Officers Association.

(12) The Office of the Assembly Speaker.

(13) The Office of the Senate pro Tempore.

(c) The task force shall review and make recommendations as to how best to configure, fund, and improve the delivery of state and local crime laboratory services in the future. The review and recommendations shall include, but are not limited to, addressing the following issues:

(1) With respect to organization and management of crime laboratory services, consideration of the following:

(A) If the existing mix of state and local crime laboratories is the most effective and efficient means to meet California future needs.

(B) Whether laboratories should be further consolidated. If consolidation occurs, who should have oversight of crime laboratories.

(C) If management responsibilities for some laboratories should be transferred.

(D) Whether all laboratories should provide similar services.

(E) How other states have addressed similar issues.

(2) With respect to staff and training, consideration of the following:

(A) How to address recruiting and retention problems of laboratory staff.

(B) Whether educational and training opportunities are adequate to supply the needs of fully trained forensic criminalists in the future.

(C) Whether continuing education is available to ensure that forensic science personnel are up-to-date in their fields of expertise.



(D) If crime laboratory personnel should be certified, and if so, the appropriate agency to assume this responsibility.

(E) The future educational role, if any, for the University of California or California State University systems.

(3) With respect to funding, consideration of the following:

(A) Whether the current method of funding laboratories is predictable, stable, and adequate to meet future growth demands and to provide accurate and timely testing results.

(B) The adequacy of salary structures to attract and retain competent analysts and examiners.

(4) With respect to performance standards and equipment, consideration of the following:

(A) Whether workload demands are being prioritized properly and whether there important workload issues not being addressed.

(B) If existing laboratories have the necessary capabilities, staffing, and equipment.

(C) If statewide standards should be developed for the accreditation of forensic laboratories, including minimum staffing levels, and if so, a determination regarding what entity should serve as the sanctioning body.

(d) The task force shall also seek input from specialized law enforcement disciplines, other state and local agencies, relevant advocacy groups, and the public. The final report shall also include a complete inventory of existing California crime laboratories. This inventory shall contain sufficient details on staffing, workload, budget, major instrumentation, and organizational placement within the controlling agency.

(e) The first meeting of the task force shall occur no later than 60 days after the effective date of this act.

(f) On or before July 1, 2009, the task force shall submit a final report of its findings to the Department of Finance, and to the budget and public safety committees of both houses.

SEC. 3. This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting the necessity are: Given the importance of combating crime in the state in the most efficient and expeditious manner possible, it is necessary that this act take effect immediately.

## CACBits, *cont'd*

### Anthony Longhetti Distinguished Member Award

CAC members in any category are eligible for this award, which is normally given every year, with nominations coming from the membership. The candidate must have contributed significantly to the Association in one or more of the following areas:

- Long term service to the association as a member of the Board of Directors or in committee(s).
- Sustained production of papers or technical notes in newsletters or at seminars.
- Organization of study groups, workshops, etc.
- Significant research and dissemination of the information to the forensic science community (i.e. journal or newsletter publications, seminar papers, workshops, study groups, etc.)
- Any other unusual or significant contributions to the improvement of the profession of criminalistics.

Nominations are due by July 1st to Mey Tann  
[mey.tann@doj.ca.gov](mailto:mey.tann@doj.ca.gov)

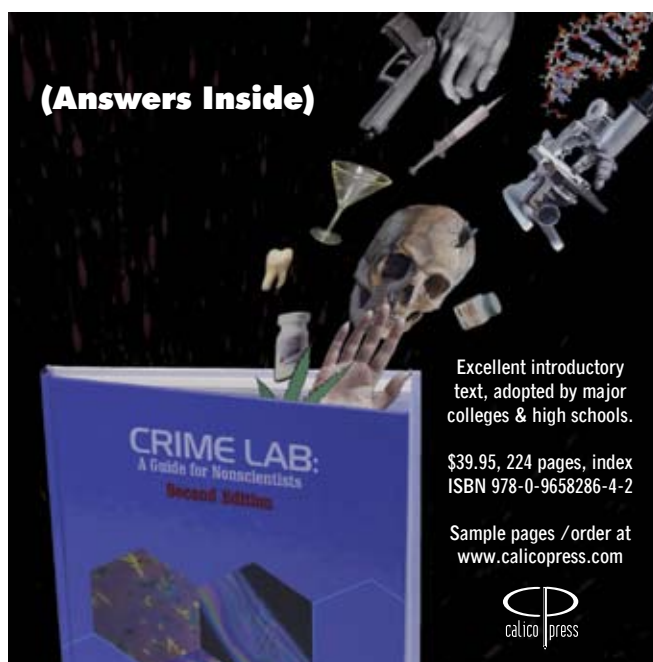
For more information, see the CAC website: [www.cac-news.org/archives.htm](http://www.cac-news.org/archives.htm)

### Forensic Statistics Classes Offered

Two summer workshops in statistical genetics for forensic scientists are offered this year:

June 18-20 in Seattle, Washington, and September 5-7 in Liege, Belgium. Details are posted at [www.biostat.washington.edu](http://www.biostat.washington.edu). To receive the brochures please email [sig07@u.washington.edu](mailto:sig07@u.washington.edu)

*Bruce S. Weir  
Professor and Chair, Department of Biostatistics  
University of Washington*




**(Answers Inside)**

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**Theorem 6.10: Bayes' Theorem.** If  $\{F_1, F_2, \dots, F_k\}$  is a partition of the sample space  $S$  and  $E$  is any event in  $S$  such that  $P(E) > 0$ ,

$$P(F_i|E) = \frac{P(F_i) \cdot P(E|F_i)}{P(F_1) \cdot P(E|F_1) + P(F_2) \cdot P(E|F_2) + \dots + P(F_k) \cdot P(E|F_k)}$$

for all  $i = 1, 2, 3, \dots, k$

**Proof:**

$$P(F_i|E) = \frac{n(F_i \cap E)}{n(E)}$$

$$P(F_i|E) = \frac{P(F_i \cap E)}{P(E)}$$

$$P(F_i|E) = \frac{P(F_i) \cdot P(E|F_i)}{P(E)}$$

$$\therefore P(F_i|E) = \frac{P(F_i) \cdot P(E|F_i)}{P(F_1) \cdot P(E|F_1) + P(F_2) \cdot P(E|F_2) + \dots + P(F_k) \cdot P(E|F_k)}$$

Suppose we want to find  $P(F_2|E)$  in the college student body. We can find  $P(F_2|E)$  directly from Table 6.1 by dividing 50 by 2900 by Definition 6.12  $P(F_2|E) = n(F_2 \cap E)/n(E)$ . Or we could use Theorem,

$$\begin{aligned} P(F_2|E) &= \frac{P(F_2) \cdot P(E|F_2)}{P(F_1) \cdot P(E|F_1) + P(F_2) \cdot P(E|F_2) + P(F_3) \cdot P(E|F_3) + \dots} \\ &= \frac{\left(\frac{1000}{2900} \cdot \frac{100}{1000}\right) + \left(\frac{800}{2900} \cdot \frac{50}{800}\right) + \left(\frac{600}{2900} \cdot \frac{40}{600}\right) + \dots}{\frac{800}{2900} \cdot \frac{50}{800}} \\ &= \frac{50}{2900} = \frac{5}{290} = \frac{5}{29} \end{aligned}$$

# Bayesian Condoms

Colin Aitken

University of Edinburgh

The 3rd Quarter issue of the *CACNews* contained an article by Mr. Chris Taylor on a condom wrappers link subject to sexual assault with a brief commentary including a 'quiz question for Bayesian bozos' by Bob Blackledge. I have been asked to respond to the question posed by Bob Blackledge as to 'what do Bayesian statistics have to say about the likelihood that an empty condom packet found at the scene of a sexual assault and found to be a fracture match with one end of condom packets in the possession of a suspect did or did not originally come from the same box?'

Some background to the Bayesian approach to the evaluation of evidence is required before an answer can be given to the question. The approach requires that the evidence be compared under two propositions, often referred to as the prosecution proposition and the defence proposition. Here the two propositions could be, first, that the empty packet found at the scene of the assault did originally come from the same box (this would be the prosecution proposition), and second, that the empty packet found at the scene of the assault did not originally come from the same box (this would be the defence proposition). The evidence is the fracture match of the empty packet found at the scene with the end of packet found in the possession of the suspect. In general, the Bayesian is interested in the relative values of two probabilities, the probability

of the evidence if the prosecution proposition is true and the probability of the evidence if the defence proposition is true. For this particular case, this is a comparison of the probability of the match if the two packets come from the same box and the probability of the match if the two packets did not come from the same box. If the ratio of the former probability to the latter is greater than one, the evidence is said to support the prosecution proposition. If the ratio of the former probability to the latter is less than one, the evidence is said to support the defence proposition. If the probabilities are roughly equal then the evidence is not particularly relevant for the comparison of the two propositions. The ratio is known as the likelihood ratio. It is the factor that converts, by multiplication, the prior odds in favour of the prosecution proposition relative to the defence proposition into the posterior odds in favour of the prosecution proposition. The likelihood ratio does not make a statement about the probability of the truth of either proposition, only about the probability of the evidence. In this case, the likelihood ratio is the ratio of the probability of the match if the condom at the crime scene came from the suspect's box and the probability of the match if the condom at the crime scene did not come from the suspect's box.

Other factors have also to be considered, such as those described by Bob Blackledge that one condom could be the first or last of a series that was placed in one box and the other could be the first or last of a series that was placed in either the preceding or succeeding box on the assembly line. Consideration of the value of these factors is a matter for the jury.

In the example of the condoms, the evidence is the perforations on the edges of the two condom packets. If the two condom packets are adjacent in the same box, then the probability of a match will be high, possibly close to 1. If the two condom packets come from different matches, then some probabilistic model of the patterns is required. This is necessary in order to provide a numerical value for the probability of the evidence of a match if the condoms come from packets that were not in fact originally adjacent. The development of such a model requires a background data set with mathematical representations of the perforations.

In the very likely absence of such a model, it may be possible to conduct an experiment to determine what is known as the discriminating power of an evidential technique. The discriminating power provides a general measure of the effectiveness of a technique but does not provide a value in a particular case. An example of the use of discriminating power is in the comparison of hairs, described by Gaudette and Keeping (1974). A series of 366,630 pair-wise comparisons between hairs known to be from different individuals were made. Nine pairs of hairs were found to be indistinguishable. These results were used to provide an estimate of the probability that a hair taken at random from one individual, A say, would be indistinguishable from a hair taken at random from another individual, B say, namely  $9/366,630$  or  $1/40,737$ . This is a very low value and is indicative of a good evidential technique or one with high discriminating power. Gaudette and Keeping (1974) provided an estimate of the probability that hairs selected at random (in some sense) from two individu-

**The evidence is the fracture match of the empty packet found at the scene with the end of packet found in the possession of the suspect. In general, the Bayesian is interested in the relative values of two probabilities, the probability of the evidence if the prosecution proposition is true and the probability of the evidence if the defence proposition is true.**



als are indistinguishable. This probability is an average probability (Aitken and Robertson, 1987). It can be used as a broad guideline to indicate the effectiveness of hair identification in general. However, the use of such a figure in a particular case could be very misleading. Also, it is of interest to consider the dissimilarity of hairs from the same source.

The corresponding experiment for condoms would be to make many pair-wise comparisons of the perforated edges of condom packets, known to have not once been connected, to look for similarities and to make many pair-wise comparisons of the perforated edges of condom packets, known to have once been connected, to look for dissimilarities. These experiments should be conducted under blind or double-blind conditions. The decision of what is a similarity and what is a dissimilarity is a subjective one made by the forensic examiners. The response to the examination of a particular pair of condoms is dichotomous. The perforated edges are either similar or they are dissimilar. The proportion of comparisons that are recorded as similar amongst all pair-wise comparisons of condom packets known to have not once been connected provides a measure of the discriminating power. The proportion of comparisons that are recorded as dissimilar amongst all pair-wise comparisons of condom packets known to have once been connected provides a measure of the probability of a false negative, the probability of deciding the condoms packets were not at one time connected when in fact they had been. It bears repetition that these probabilities, the discriminating power and the probability of a false negative, provide a gener-

al measure of the effectiveness of a technique (here the matching of perforations on separated condom packets). They do not provide a value of such evidence in a particular case.

Further details of the Bayesian approach to the evaluation of evidence, including a commentary on discriminating power, are provided in Aitken and Taroni (2004).

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[Ed. Note: Bayesian statistics is means of dealing with the uncertainty encountered in the identification sciences. Considering we cannot examine every potential source of a tool mark, for example, Bayesian statistics is offered as a potential aid to evaluate the significance of a particular tool mark identification.]

## The CAC needs you.



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# Musings on “Cold Hits” and Statistics

Bob Blackledge  
bigpurple@cox.net

I confess I’m a big fan of the regular *CACNews* feature, *The Proceedings of Lunch* by Norah Rudin and Keith Inman. I find the format especially appealing. Have you ever wished you could be like a fly on the wall and unobtrusively listen in on the friendly discussions of some very smart people?

I always find Norah and Keith’s offerings very thought-provoking, and “A Frosty Debate: The Chilling Effect of a “Cold Hit” [1<sup>st</sup> Qtr. 2007 *CACNews*] was no exception. Back when I was a “working stiff” I would likely have just read the piece and thought about its implications during my daily commute to and from work. [Aside—I absolutely *never* listen to talk radio. Some of my most original ideas and insights have come during these solitary commutes.] But now that I’m an “ROF” I have lots of time on my hands and I decided to put my musings to paper.

The previous day in the December 2006 issue of *Smithsonian* I had read an article, “Living with Geese,” by Paul Theroux (his *Mosquito Coast* is one of my favorite books). The piece begins: “When I first began to raise geese in Hawaii, my more literate friends asked me, ‘Have you read the E. B. White piece?’ Theroux explained: “I had not read his essay ‘The Geese.’ I avoided it for several reasons. The first was that I wanted to discover the behavior of these birds, their traits and inclinations, on my own, at least in the beginning.”

I found Theroux’s reasoning interesting and perhaps it influenced me to not immediately look up and read the references at the end of Norah and Keith’s article. Another reason for my not first reading those references was that I didn’t want others to first define the conditions of any ensuing discussion/debate. Well before reaching the end of their article I was already wondering: “Is the wrong question being asked?” I have no formal training in statistics (the one exception being a graduate course in *Educational Statistics* that was force fed down my throat as though the professor’s intended ultimate product was *foie gras*!). However, throughout my forensic science career I have often wondered about the probability of a match and error rates. Early in my career there were very few extensive databases (Elmer Miller of the FBI Lab had a database on glass fragments) even if there had been there was no quick and easy way to search them. Yes, serologists used statistics (first ABO and Rhesus, then enzymes, and now DNA and mit-DNA), but that was about it.

So, let’s have at it. First, what are the questions that we really should be asking? [Since it’s my article I get to define the terms. If you don’t like them, write your own!] In no particular order, here are two questions that come to mind:

1. Should we use different probability statistics when a hit is obtained through conventional detective work (the individual was already a person of interest in the investigation) as opposed to a completely Cold Hit? [Notice that I am not restricting “hit” to just a DNA match. It may be fingerprints, toolmarks, paint chips, glass fragments, footwear impressions, cartridge case firing pin/breech face/extractor/ejec-

tor impressions, bullet striae, infrared spectra, mass spectra, stable isotope ratio mass spectra, laser ablation ICP/MS results, fracture matches of any kind, lip prints, palm prints, ear prints, fibers, various biometric features such as retinal and iris scans - - - in short, any measurements that may be applied to the question of commonality and that have (or may have in the future) a database (large or small) that can be searched.]

2. It seems to me that virtually all of the discussion so far has been about the “probability of a match.” Let’s be realistic. In real life, “ka-ka occurs.” Shouldn’t we also be asking the question: “What is the probability of an *erroneous* match?”

The question I choose to pursue in the remainder of this article is:

**Is the probability of an erroneous match the same or different if a “hit” is based on detective work (subject was already someone of interest in the investigation), or if it was the result of a “Cold Hit”?**

For convenience I’ll use DNA statistics for illustration, but bear in mind that what I really care about are all the other types of commonality comparisons. And I’ll use as examples the kind of DNA or mit-DNA cases where it is only possible to examine the stains using just a *few* loci. I mean really, does anyone give a rodent’s derriere whether the actual probability of a match is 10 Gazillion to 1 or merely 5 Gazillion to one?

**Example 1.** Okay, let’s say we have a hypothetical crime, and let’s say there are ten people of interest (victim, family members, close friends, suspects, etc.). We run our tests and get a perfect match with one of these individuals and the remaining nine are clearly eliminated. *Subsequent* to finding this match we enter our test results and they are searched against a database that contains 10<sup>9</sup> separate entries. The individual we have focused on is included in this database, but there are also 9 additional entries that contain the same match criteria. We have made no error, but what is the probability that just by chance we’ve focused on the wrong individual and the actual person who contributed the sample is one of the other nine entries? Since there are only 10 matching entries out of a total of 10<sup>9</sup>, the chances the sample was contributed by *someone else* in this database (everyone in the database has an equal chance of contributing the sample) are very small.

**Example 2.** Now, same crime and same evidence but this time the test results eliminate all 10 of our persons of interest. We search the same database and come up with 10 Cold Hits.

Assuming that one of these ten individuals in the database actually contributed the sample, if we develop no additional information on any of these 10, what is the chance that by *random selection* we will pick the correct individual? Just 1 out of 10. Is this different than the previous example? – you betcha!

But so far we've all been ignoring the elephant in the room. What about *error*?

**Example 3.** Same circumstances as the first example (10 persons of interest). We've run our tests and 10 loci are reported, but (gasp!!!) we screwed up and our findings on 1 of these 10 loci are in error. What are some possible outcomes? **Possible outcome 1** – False elimination. The sample actually was contributed by one of our ten persons of interest, but trusting our results we eliminate all ten. Definitely not good, but at least we haven't made a false identification. **Possible outcome 2** – Reanalysis. In comparing our results we notice that for 9 of our persons of interest it is slam-dunk easy that they did not contribute the sample. However, the tenth individual matches in 9 out of 10 of the loci. That non-matching locus was especially weak and difficult to read. We have enough remaining sample, so we run it again and this time we get a match with all 10 out of 10 loci. All's well that ends well. **Possible outcome 3** – Database search. Trusting our results, we initiate a search of the same database containing  $10^9$  entries. Ten entries (ten separate individuals) are found to fit our match criteria. Sure can't go to court on this alone, so our detectives start checking the background of these individuals (where were they; what were they doing; did they have motive; did they have opportunity; etc.). None of these 10 come up as viable suspects so: **3a** – the case remains unsolved, or **3b** – a light

bulb turns on above the head of one of the criminalists and she says – "You know, Jones (one of the original 10 persons of interest) matched in 9 out of the 10 loci. Maybe we should go back and run that one again?" **Possible outcome 4** – However, there isn't sufficient sample to repeat the test of the locus in question. In most discussions like this it's like a coin flip, that is, heads/tales or right/wrong. Life frequently isn't like that. Often we are faced with a question like: I really don't have confidence in the results/reliability of this test. I don't feel I can use it as a basis for *either* exclusion or inclusion. If I drop the results of this test (discount it) and just use 9 loci instead of 10 the statistics will not be as good, but I will have far more confidence that they are correct. However, (defense or prosecution) have discovery for all my notes and test results. If I discount that locus they will say that I am biased towards the (pick your side). "Oh, ka-ka! I'm in a lose-lose situation. I'm dammed if I do and dammed if I don't!" So gentle reader, what would you do?

**Example 4.** Same circumstances as Example 3 (we screwed up our test on one of the 10 loci), except clearly all 10 of our persons of interest are not included. Using today's vernacular, "it musta bin' some udder dude." So, we search the same database having  $10^9$  entries and we come up with 10 Cold Hits. The chance by random selection from these ten that we will select the actual donor of the sample is zero. Of course, we can't go to trial based on such weak statistics. Our detectives may spend a lot of wasted time (while muttering curses in regards to the lab geeks) while investigating the possible motives and opportunity of any of these 10, but it's highly unlikely that any of these 10 will become viable suspects.

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Meghan Mannion Gray [meghan.manniongray@doj.ca.gov](mailto:meghan.manniongray@doj.ca.gov) or  
Sheltri Hallford [sheltri.hallford@doj.ca.gov](mailto:sheltri.hallford@doj.ca.gov)



## An example that doesn't involve DNA

In the third quarter 2006 issue of the *CAC News* on page 30 was an item, "Condom Wrappers Link Suspect to Sexual Assault" written by Chris Taylor of the U.S. Army Criminal Investigation Laboratory in Atlanta. Immediately following Chris's article I had a commentary, "Quiz Question for Bayesian Bozos." In an article in the present issue, Dr. Colin Aitkin, Professor of Forensic Statistics, Mathematics Department, University of Edinburgh, responds to my question. [See related article this issue.] However, Dr. Aitkin only responds to the two opposing propositions: Prosecution Proposition: The condom packet from the crime scene and the condom packet found in the possession of the suspect were at one time contiguously connected. Defense Proposition: The condom packet from the crime scene and the condom packet found in the possession of the suspect were not at one time connected. In addition to these two propositions there are at least two additional pairs of propositions (prosecution and defense) that could also be considered. In an actual case you can be assured that the defense will vigorously advance their positions. Using the numbers I cited when first posing my question (they are from an actual rape/homicide case), let's take a non-Bayesian look at several possibilities.

**Example 5.** At the scene of a rape/homicide an empty condom packet is found. No identifiable prints are developed, but investigators upon executing a search of a suspect find an intact condom packet of the same brand and lot number. After comparison of the torn (perforated) edges of the two packets, a criminalist concludes that a fracture match exists between the torn edges and that the two packets were at one time contiguous.

Of course, unlike DNA, we do not have some huge database that we can search that would tell us the odds of, at random, from different, unrelated sources coming up with a condom packet from each source, where each is the same brand and lot number and one of the two sides from these packets form a perfect fracture match with the other. However, just for the sake of example let's assume that in some future *Big Brother* society that such a database exists. Perhaps not so far-fetched; does data exist today that could tell who purchased ephedrine-containing cold medicine (including brand, number of boxes and lot numbers)? From information provided by the condom manufacturer we know that 1417 x 144 separate condom packets were produced in that lot. That's a total of 204,048 separate condom packets in that lot. However, since this is a hypothetical example let's keep it easy and just say that there were  $2 \times 10^5$ . Let's also assume that some eager, breathless, dewy-eyed young intern has carried out the double-blind research suggested by Dr. Aitkin. She has found that the slippage in the condom packaging machine is cyclic. The cycle repeats itself after roughly every 100 condom packets. Doing the math, if you have a single condom packet and at random you select another packet from this lot, the odds that one of their two perforated edges will be a fracture match is  $2 \times 100$  divided by  $2 \times 10^5$  – or roughly 1 chance out of a thousand.

Okay, let's say we have a handle on the likelihood that two separate single condom packets from the same brand and lot number will have edges that together form a fracture match, but what about the question of whether they both originated from the same or different boxes of condoms? First, let's assume that these two condom packets were in fact at one

time contiguous (as they come off the assembly line they are like sheets of toilet paper). The odds on whether they were at one time connected and in the same box of several contiguously-connected condoms or at the factory had been separated and one was contiguously-connected to those condom packets packed in one box and the other was contiguously-connected to those condom packets packed in the next box depend on how many condom packets you have in a given box. For example, if in a box you have three separate contiguously-connected condom packets, then once they are separated you have a total of  $3 \times 2$  edges = 6. Of these six edges only the outermost two were at one time connected to condoms not in that box. Therefore the odds 2 out of 6 (1 out of 3) that if edges on two condom packets form a perfect fracture match they did **not** come from the same box. Notice that the odds get smaller as the number of condoms per box increases. For six per box it's 2 out of 12 (1 out of 6), for 9 it's 2 out of 18 (1 out of 9), and for 12 it's 2 out of 24 (1 out of 12). And if an overly optimistic bridegroom purchases a box containing a gross of condom packets (his bride purchased a gross of Excedrin® PM bottles) then the odds become 2 out of  $2 \times 144$  (1 out of 144)!

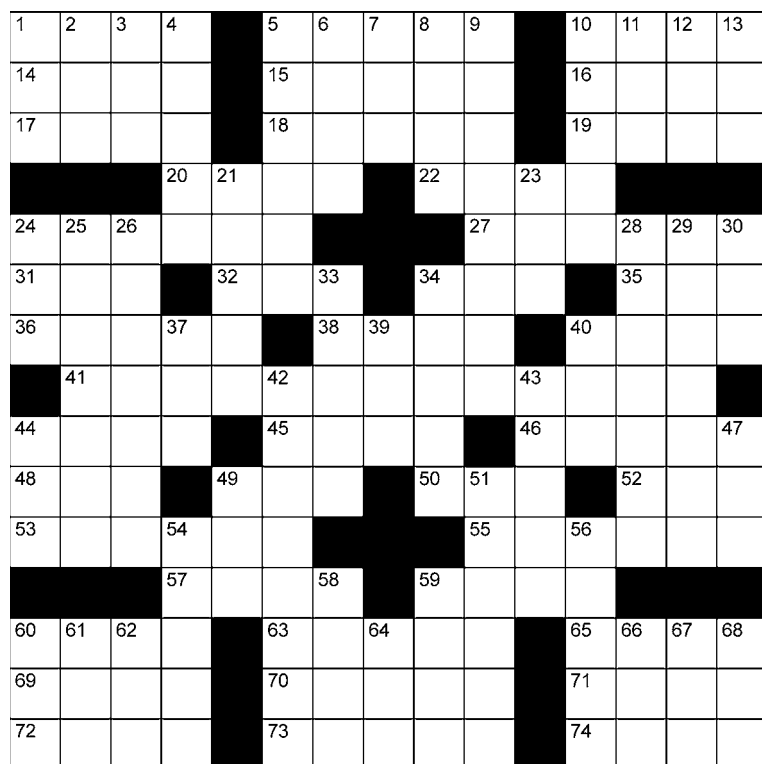
## Circumstances alter cases

Of course, the prosecution will claim that the condom packet found at the crime scene and the matching condom packet found in possession of the suspect establish an association between the suspect, victim, and crime scene. The defense will say that there is nothing to show that the condom packet found at the scene has any connection to the alleged assault and is from some prior sexual encounter. So what are the odds? Without unusual circumstances, pretty slim. But what if the suspect is a known "swordsmen" and the alleged crime scene was his car? What if the scene was a home where several sailors from the same ship were hosting a party? And what if this ship provides free condoms (all are the same brand and lot number) to its sailors as they depart on shore leave?

## Conclusions

By my reasoning, the probability of an error in a match is greatly affected by whether the matching individual became a person of interest due to detective work or was identified by a cold hit. The take home message? If a database search produces a "Cold Hit," you had better wait before puffing out your chest, calling a press conference, and announcing to all and sundry that "you've solved the case." Norah and Keith quote the executive summary of the NRC II committee (page 32): "If the only reason that the person becomes a suspect is that his DNA profile turned up in a database, the calculations must be modified." They go on to add: "Although such a calculation can be straightforward, it is best handled on a case-by-case basis." I would agree. Although the initial statistics on a cold hit should be viewed with caution, once a cold hit has identified a person of interest, subsequent investigation may produce information that greatly improves the hit probability/or **Not**. That is precisely why probabilities for Cold Hit cases are "best handled on a case-by-case basis." As databases based on other types of measurements become increasingly available it is imperative that criminalists (not just DNA mavens) realize that a **false inclusion** based on a Cold Hit is **far more likely** than for a hit based on someone who is already a person of interest in the investigation.

# RECREATIONS



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## "FORENSICALLY FLAVORED"

by John Houde

### ACROSS

- |    |   |    |                                  |
|----|---|----|----------------------------------|
| 1  | begin anew                                    | 41 | swapped, occasionally            |
| 5  | alternative power                             | 44 | a lab might collect this sample? |
| 10 | old apple scare                               | 45 | -mum preceder                    |
| 14 | often clicked                                 | 46 | finds a GC leak                  |
| 15 | double  | 48 | fps, for ex.                     |
| 16 | shoeprint source                              | 49 | chalk marks on gas cyls.?        |
| 17 | usable quantity                               | 50 | cut a signal, abbr.              |
| 18 | wrap up                                       | 52 | 1051 put another way             |
| 19 | DAM and DRUG, for two                         | 53 | in California, they're 451's     |
| 20 | big orgs. have lots                           | 55 | see 43 Down                      |
| 22 | forms a base?                                 | 57 | spoils                           |
| 24 | ____, the sample is easier to analyze (2 wds) | 59 | skin starter                     |
| 27 | where you'd stick your PIN                    | 60 | brainstorm                       |
| 31 | Walter McCrone, affectionately                | 63 | <i>chlorellas</i> , for example  |
| 32 | some older 'scopes (inits)                    | 65 | sit suddenly                     |
| 34 | chart recorder need                           | 69 | kind of aldehyde                 |
| 35 | judge   | 70 | -metric (analysis)               |
| 36 | mult. personality in physics?                 | 71 | too hasty                        |
| 38 | runner, abbr.                                 | 72 | lipids                           |
| 40 | cynical view of legal system?                 | 73 | tight bends in the tubing?       |
|    |   | 74 | obligated                        |

### DOWN

- 1 toss out
- 2 a type of terrorist
- 3 pre-Windows
- 4 a nanometer, formerly
- 5 low power 'scope
- 6 has complete mastery
- 7 large baggie?
- 8 proton donor
- 9 they sit for exams again
- 10 how much, exactly
- 11 "... reached a new \_\_\_\_"
- 12 H.S. math subj.
- 13 hi-
- 21 little leaf
- 23 \_\_\_\_-print card
- 24 chlor-
- 25 original member
- 26 Norton rival
- 28 they make nice cocaine xtals
- 29 sleeve
- 30 chromophore
- 33 organometallic?
- 34 Wiki-
- 37 its rate must be determined, abbr.
- 39 two make a qt.
- 40 electron \_\_\_\_
- 42 GRIM accessory
- 43 with 55 Across, a burg and a berg; one James and the other not-so-sure?
- 44 eggs
- 47 sets things off
- 49 six on the phone
- 51 main proposition
- 54 defense of 51 Down
- 56 starts a vise
- 58 high-end cameras
- 59 MRI's Dr. Stoney, for one
- 60 older gel technique, inits.
- 61 nuclear subject
- 62 can't do this in the lab
- 64 compressible phase
- 66 jurisprudence
- 67 sweet ending
- 68 terminal degree

## Know the Code



We seem to be settling into our new 'office' quite nicely, and the good folks at Astaria restaurant seem accustomed to the long lunches spent deliberating over both their tasty bites and our latest vexation. For some reason, a short-lived commercial, animated by an orange-haired clown, pops into our head. This silly drivel reminded us for awhile that we all needed to "Know the code."

The promise was that, if we knew the code, we could be in on some secret (like how to call home for less money). But now it brings to mind the code words that we use as analysts. The menu having been easily deciphered, we settled in to mull over the words we use to discuss our findings in our reports.

For we realize that all reports are written in code. You have the phrases memorized (or in auto-text):

*Fred cannot be excluded as the DNA donor*

*The likelihood of choosing a random unrelated person with the same type is ...*

*The reference and evidence hairs exhibit the same microscopic characteristics*

*One item of evidence is "consistent with..." another item of evidence.*

None of these are incorrect, insofar as they go. But there, indeed, is the problem. Do they go far enough? Do we say all that requires saying? Do we sacrifice narrative for (technical and scientific) precision, at the risk of misleading the reader? As analysts we cringe at the thought of imprecision, yet don't know how to adequately relay the fullness of our conclusions. Do we warn the reader of the boundaries of our test, of the implications of our results for the reconstruction of the crime, or of the myriad of other concerns that we have? This type of content in reports is rare; most analysts prefer to use a minimum of words, preferably those that leave some wiggle room when it comes time for testimony. We believe, however, that writing in this type of code leads to errors over which we have little or no control.

What error could this be? How could our reports, constructed so carefully, and after much argument and cogitation (and vetting by the ASCLD inspection team), be misconstrued? How, in short, could our reports possibly lead to error, especially when we have been so careful to seek and expunge errors through accreditation, certification, validation, and technical review?

The error about which we speak might be the wrong analytical result, but this is not a common occurrence, at least

in our experience. Most of the time, most analysts get the right nominal result; that is, the data are correct. Rather, we believe that an error occurs when...

*...someone misunderstands the scientific question or the scientific result/answer. The result of this error is that individuals make a decision about the case armed with some incorrect belief about the physical evidence.*

In our experience, most errors are the result of...

- Asking the wrong question
- Failing to understand the limitations of the evidence or the test
- Making inappropriate inferences

To the question, who makes these errors, we reply: Everyone! The detective, the analyst, the reviewer, the reader, every attorney representing any side, the judge, and the jury. No one is exempt from the types of errors outlined here.

What is the source of these errors? Perhaps the source is implicit in our humanity, nicely depicted by the seven deadly sins. These errors are an unavoidable element of the human condition.

And what causes us to err in this way? Here are a few highlights:

- Incomplete knowledge
- Faulty assumptions
- Failure to explicitly consider alternate hypotheses
- Failure to consider of the power of the test
- Failure to consider the limitations of the test
- Failure to consider the limitations of the evidence
- Unconscious or subconscious bias
- Looking for verification instead of refutation
- Failing to be scientifically skeptical
- Failing to understand inference and balance of probabilities
- Faulty logic
- Not writing enough in a report
- Reading too much into a report

To illustrate, we use here Keith's favorite dartboard, saliva and DNA typing. The question seems simple: is saliva present on this sample, and, if so, whose? However, when deconstructed, the answer rapidly increases in complexity and uncertainty.



The first problem is to decide what it is about saliva that demonstrates 'saliva-ness,' without ambiguity. In other words, what is unique about saliva? How do we detect it to the exclusion of all other fluids? All forensic biologists know the imperfect answer; we don't know just yet (in a validated, published, accredited way) what is unique about saliva, so we default to the next best thing: amylase.

We all know that amylase (read that as  $\alpha$ -amylase for the balance of this diatribe), is an imperfect indicator of the presence of saliva, and that fact is reflected in the code that we include in our reports. We know that amylase can be found, in addition to saliva, in urine, perspiration, semen, vaginal fluid, breast milk, and feces (thank you, Keith). In the old serology days, we tried to narrow this list by determining the genetic origin of any detected amylase, as we know that saliva, breast milk and perspiration contain AMY1, while the remaining fluids/tissues contain AMY2. Alas and alack, that analysis hasn't been performed (in our review of casework) since the advent of DNA typing, and is a terminally ill if not dead art. So we have developed a code to 'communicate' the un-specificity of our test:

*"The presence of amylase is considered "indicative of the presence of saliva"*

Some reports may state which other fluids contain amylase, but most don't. Even in those reports that provide this caveat, no evaluation or guidance is provided as to how likely it is that *this* sample in *this* case is saliva or one of the other candidate fluids. And lest you think that we are criticizing only an over-interpretation of elevated amylase levels, we are just as concerned that low levels, accompanied by this statement in a report,

*The levels of amylase are not characteristic (indicative) of the presence of saliva,*  
could also be caused by the presence of dilute saliva.

So to answer the questions posed by either the detective or an attorney, the flow of the analysis proceeds along the following lines:

- Analyze the sample for the presence of amylase (to determine whether saliva is present)
- Extract and type for DNA (to determine whose saliva is present)

The problem with this logic is that there exists no direct, inevitable connection between amylase and DNA. Amylase is a secreted enzyme, while DNA resides in the nucleus of a cell. While a normal spit sample will contain both amylase and nucleated cells from the same individual, one cannot logically infer that amylase and DNA found in a single stain/sample inevitably originates from the same source. Norah suggests than an illustrative and common example is a panty crotch where some foreign DNA has been detected. A common situation is the absence of detectable semen/sperm, and a "positive" amylase test. Of the list of physiological materials listed above, perspiration, urine, and feces, at the very least, could have potentially contributed to any detected amylase. Analysts for the most part, we believe, recognize this, and when testifying, utter the appropriate qualifying remarks. But the report is always written in code.

*Amylase indicative of the presence of saliva was detected. A single source DNA profile was detected from the stain. Fred cannot be eliminated as the source of the DNA.*

Even if the 'other fluids contain amylase' caveat is present in the report, the **reader** infers that, because both amylase and a DNA profile were found in the same stain, saliva from the defendant is present. And Norah reminds us that the report is frequently read and interpreted in the absence of the analyst.

The true meaning of the code is that these findings suggest the possibility that saliva is present, that other fluids might also be contributing to the amylase levels detected (for example, perspiration from a breast swab), and that, depending on the sample source, DNA from sources other than saliva (and not detected in this examination) might be contributing to the profile. Particularly in samples containing DNA from more than one individual, "saliva from Fred" is not the only inference. In addition to these considerations, there is typically no discussion in the report of other innocent explanations for the presence of saliva in the evidence sample.

Another source of error, and one we have discussed at length in previous POLs, is the specialization of the new generation of DNA-only analysts. Many of these young analysts lack training with respect to physiological origin testing beyond what is written in their laboratory's DNA manual and provided in a relatively short training course. They may not be aware of the (ancient) historical literature, and many may not even be aware that AMY1 occurs in physiological materials other than saliva (yes, we have documented evidence of this bit of fantasy).

From this scenario, the potential for error (on the part of the person making a decision about the case) exists in these areas:

- Reading too much into a report
- Faulty assumptions (DNA and amylase have the same biological source)
- Ignorance of the power of the test (other physiological materials contain  $\alpha$ -amylase)
- Faulty logic (if amylase is detected, saliva is present; any DNA detected is from saliva)

## What is the source of these errors?

Perhaps the source is implicit in our humanity, nicely depicted by the seven deadly sins. These errors are an unavoidable element of the human condition.



In turn, the root causes of these errors for the typical consumer within the criminal justice system include incomplete knowledge, a failure to consider alternate hypotheses, and failing to understand inference and the balance of probabilities.

Another example from a long-forgotten case illustrates the pitfalls of examining evidence with incomplete knowledge on the part of the analyst. The garage of a Hells Angel's house was burgled (hard to believe this made the police blotter, but OK), and detectives responding to the scene spotted a shoeprint on the garage door (the small human-size door on the side, not the pull-up one for their choppers). Aha, exclaim the detectives, the door was kicked in! A young teen was detained by the police, and his shoes and the print from the door were dispatched to the criminalist for comparison. Unusual traits were seen in the evidence print corresponding to similar traits in the reference shoes, allowing the criminalist to effect an individualization. Detectives confronted the young lad with the incriminating conclusion, but the teen insisted that he had been hired to guard the garage, and he wasn't responsible for the burglary. When detectives related this information to the criminalist (who up to this point had only seen the print and the shoe), she asked to see photos of the crime scene. She quickly discovered that the shoeprint was oriented the wrong way on the door for someone kicking it in; the heel was facing the top of the door, with the toe facing the ground. Someone leaning against the door, with their foot raised against it, would leave exactly such a print. Further examination of the door showed no damage that would accrue from kicking it in. The evidence supported the notion that the teen had indeed been lounging against the door, not breaking it in. Subsequent investigation revealed that the burglary was an inside job, demonstrating once again that there is no honor among thieves. Errors in this case included faulty assumptions on the part of the detectives, incomplete knowledge on the part of the analyst, and a failure to pose alternative hypotheses.

Other examples abound in our experience, and we are sure the reader has a few fables of her own. We assert, yet again, that the heart and soul of the forensic enterprise centers on a logical investigative framework, not the technical wizardry of the instrument or the analyst. We need to be scientists, asking relevant questions and proposing solutions to those questions, not technicians blindly following the cookbook SOP written (optimistically) to obviate the need for critical thought. How do we know which of these we are? Here's our checklist:

✓ **Scientists and technicians are not differentiated by their degrees.**

A scientist need not have the advanced degree, just the burning desire to get to the bottom of the pertinent case issue(s), patiently testing one hypothesis and item of evidence after another. Keith has been privileged to know many whom he considered to be "scientists" lacking the instantly-recognized credential, but who nevertheless embodied what it is to be an applied 'scientist.' These individuals pondered their cases, not letting go until the evidence had been examined and re-examined from many perspectives. Norah reminds us that spending many years Piled Higher and Deeper in the Ivory Tower does not automatically confer thoughtfulness or passion.

✓ **A technician can run a test, but a scientist knows when something has gone wrong, and what the reasonable outcomes are given the specific circumstances of the case.**

Technicians know where to find the protocol, where the checklist lives on the hard drive, where to locate the MSDS in the lab or the library, and how to prepare notes that will survive technical review. A scientist knows when a test result measures up to the rigors of scrutiny, what to accept, what to be suspicious of, where to look to determine whether something is amiss, and what other tests might support or refute her (tentative) conclusions.

✓ **A scientist can quote George Santayana**

"Skepticism is the chastity of the intellect, and it is shameful to surrender it too quickly or to the first comer: there is nobility in preserving it coolly and proudly through long youth, until at last, in the ripeness of instinct and discretion, it can be safely exchanged for fidelity and happiness."

—George Santayana  
*"Skepticism and Animal Faith, IX"*

Yes, you have seen this quote in a past column, yet it so eloquently captures the essence of the skeptical mind that is the hallmark of the scientist. Doubt and question immediately, trust nothing, test exhaustively, become fatigued with questions, and then think of more questions and long for more testing. Science is a profoundly intellectual process; results are the roughage for contemplation and conclusion. To abandon the scientific process at the conclusion of the testing phase is to leave the fruit over-ripening on the tree, unpicked.

Errors occur when skepticism is surrendered too quickly, to the tyranny of the deadline, or the next case, or the ignominy of ignorance.

Errors occur when we are certain that we have the right answer. Of course, once you have found something, to look further is a waste of time. When the answer matches someone's expectation, we stop seeking.

Errors occur when we are satisfied. Within the disaffected and the dissatisfied lurks a deep desire to know, and from these individuals, progress in knowledge and understanding is made. Let this be the attitude of the forensic scientist.



Gluttony

## All in the Wrist

A mechanic was removing a cylinder-head from the motor of a Harley motorcycle when he spotted a well-known cardiologist in his shop. The cardiologist was there waiting for the service manager to come take a look at his bike when the mechanic shouted across the garage "Hey Doc, want to take a look at this?"

The cardiologist, a bit surprised, walked over to where the mechanic was working on the motorcycle.

The mechanic straightened up, wiped his hands on a rag and asked, "So Doc, look at this engine. I open its heart, take the valves out, repair any damage, and then put them back in, and when I finish, it works just like new. So how come I make \$55,000 a year and you get the really big bucks (\$1,700,000) when you and I are doing basically the same work?" The cardiologist paused, smiled and leaned over, then whispered to the mechanic... "Try doing it with the engine running."

*Submitted by Raymond Davis*

### Answers to "Forensically Flavored"



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800 S. Victoria Ave.  
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angel.shaw@doj.ca.gov

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Orange County Sheriff-Coroner  
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Los Angeles, CA 90033  
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Bureau Alcohol, Tobacco & Firearms  
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(925) 280-3623  
Ronald.Nichols@atf.gov

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San Diego Police Dept. Crime Lab  
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San Diego, CA 92101  
(619) 531-2605  
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The poster features a central image of a magnifying glass resting on a beach. Inside the lens, numerous seashells are visible, many of which are replaced by various law enforcement and forensic logos, including the California Association of Criminalists (CAC) logo. The handle of the magnifying glass is black with the text 'California Association of Criminalists' in yellow. The background is a dark, textured surface, possibly a beach at night or a dark sand area.