The CAC News

News of the California Association of Criminalists • Fourth Quarter 2012

The President's Desk

Got ABC?

As the fall quickly approaches, our organization is gearing up for the Fall Seminar. The seminar will be hosted by San Jose State University. I viewed the list of workshops and I'm very impressed with the program that Dr. Steven Lee and his students have put together. Just look at the broad range of workshop topics: fire debris, forensic anthropology, student training, explosives, DNA, ethics, evidence in international courts, management of human factors and a presentation of the Joint Prisoner of War/Missing in Action Accounting Command. This will be excellent training opportunity for our members, and I hope you take full advantage of the host committee's hard work.

In the last President's Desk, I challenged our managers to consider ways of building more trust within our laboratories. I also promised a challenge to "the rest of us," so here goes:

I just returned from the Impression and Pattern Evidence Symposium (IPES) hosted by NIJ and the FBI. There were interesting talks presented throughout the week. The one I found the most interesting was a panel discussion between a judge (Hon. Stephanie Domitrovich), defense attorney (Christine Funk) and prosecutor (Don Geary). Many topics were discussed and as to be expected, there were disagreements between the panel members. However, one area all three panel members quickly agreed: criminalists should be certified. I found it interesting that not just the defense but also the judge and prosecutor found the concept of certification to be useful for the justice system. After thinking about it, I realized of course they want us to be certified! Certification indicates that a criminalist has a minimum amount of knowledge, is continuing with professional development and the certification can be revoked due to unethical behavior. It is this three-part mechanism that provides some assurance of overall professional knowledge and conduct. The same type of system works well for other professions (such as lawyers and doctors). For example: would you go to a surgeon who is not board certified? Of course not! So why shouldn't our clients (the justice system) desire certified criminalists?

The topic of certification has caught the attention of the media as well. A few months ago, *Frontline* aired a special on "The Real CSI." One of the issues covered was the existence of "certification mills" and *Frontline* left the impression that there is no real certification of forensic scientists within our profession. Of course we know this is not true. There are excellent certification programs (e.g. IAI, AFTE and ABC) available to forensic scientists. It was disappointing that *Frontline* either failed to discover these programs, or ignored them in their final report. However, if *Frontline* had reported on the existence of the real certification programs, I suspect they would also have discovered that a large number of us are not certified.

Finally the desire for certification has made its way to legislators. Two pieces of federal regulation (S.3378 "Forensic Science and Standards Act" and S.132 "Criminal Justice and Forensic Science Reform Act") call for the standardization (and implementation) of certification. Based on recent seminars, media attention and legislation, I sense that certification will be required for us all. Why are we waiting for certification to be forced upon us by federal or state legislation? If we, as a profession, embrace certification, we can then point to a program that can be adopted by future legislation. On the other hand, if we continue to wait, then we are no longer in the driver's seat and will have to accept congress' version. The choice is yours, and I hope to see an American Board of Criminalistics sticker on your name badge at a future seminar.

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Todd Weller
CAC President

The CACNews

www.cacnews.org

FOURTH QUARTER 2012

On the cover...
Tana Langley catches the peak of action photo for this issue's cover. She and co-author Doug Ridolfi take us on a tour of the fireworks factory, too!

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Please direct editorial correspondence and requests for reprints to the editorial secretary.

Notice to Contributors: We publish material of interest to our readers and are pleased to receive manuscripts from potential authors. Meetings and course announcements, employment opportunities, etc. are also solicited. Advertisements are also accepted, although a fee is charged for their inclusion in *The CACNews*. Please contact the advertising editor for further information.

Submissions should be made in the form of Windows compatible files on CD or by e-mail. Alternatively, text files may be saved as plain ASCII files without formatting codes, e.g. bold, italic, etc. Graphics, sketches, photographs, etc. may also be placed into articles. Please contact the editorial secretary for details.

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

INSIDE

CAC*Bits*

CAC member Susan Brockbank describes examining evidence from a thirty-year old serial rape-murder case. From "Mysterious Confession," an episode of "LA Forensics" (truTV).

Correction

In the third quarter, 2012 issue of the *CACNews* we inadvertently misattributed the nice letter about Brian Wraxall to his ex-wife, Linda. In fact, the lovely sentiment was penned by the current Mrs. Wraxall, Joan. The *CACNews* regrets the error and offers its apologies to the Wraxall family.

—Greg Matheson

Call For Proposals

2013-14 McLaughlin Endowment Funding

The A. Reed and Virginia McLaughlin Endowment of the California Association of Criminalists is beginning its annual cycle of grant funding. During 2012-2013, grants for training, scholarships and research totaled over $22,000. Applications and requests are now being accepted for 2013-2014 funding.

—Nessa Rosenbaum
nrosenbaum@sbcsd.org

Paying Your Dues

The CAC treasurer reports "Dues must be RECEIVED by December 1, 2012. Any dues payment received after that date will require a $25 late fee. If your employer is paying your dues, contact the treasurer by the due date to avoid the late fee."

Slipped Mickey

When you have a fairly large block of time available, look at the interactive video, *Mouse Party*

learn.genetics.utah.edu/content/addiction/drugs/mouse.html

As I sit here enjoying the party and drinking my morning coffee, I wish they had included one more addictive substance: *Caffeine!* The basic website, *learn.genetics.utah.edu/* is worth perusing, too.

—Bob Blackledge

Regional Director South Report

San Diego County Sheriff's Department hosted the last study group meeting on June 20, 2012 at the Carlsbad Police Department. Richard Leglar spoke on "The Bomb House."

On November 18th, 2010, the sheriffs Communications Center received a call regarding a 49 year-old male who had suffered injuries from an explosive device located in unincorporated Escondido. Bomb technicians soon discovered a large quantity of homemade high explosives in the backyard—the largest such cache ever found in the United States. Improvised explosive devices, large amounts of chemicals and other high-explosive compounds were also located inside the residence.

Approximately 30-40 people in attendance for the luncheon. Study groups that met: Arson & Trace (joint), DNA, and Blood Alcohol.

Bob Blackledge resigned as Trace Study Group Chair, and we're looking for a new Trace Study Group Chair.

Next study group meeting will possibly be scheduled for sometime in the middle/end of September.

—Mey Tann

Regional Director North Report

A study group meeting was held May 31, 2012 at the California State University East Bay in Hayward, CA. Keith Inman and the Forensic Science Club organized the rooms, lunch speaker, meals, and directions. This is the first time this location has been used and there was a very positive response from the attendees and the study group chairs.

Cristian Orrego of the UC Berkeley Human Rights Center spoke during lunch about the role of forensic scientists in the investigation of human rights violations around the world. There were 45 lunch attendees.

The following study groups met: QA (13 attendees), Firearms (48 attendees), Drug (9 attendees), Arson/Trace (9 attendees), DNA Technical Leaders (~15 attendees), and DNA (~12 attendees).

This was the first time that the DNA Technical Leaders support group had met. Most of the attendees were either the

technical leader or a DNA supervisor in their laboratories. Jennifer Mihalovich shared the approach used in the Oakland Police Department laboratory in order to increase efficiency and throughput. The talk was well received and interest in continuing this study group was expressed by the attendees.

The Toxicology and Alcohol study groups did not meet during this period.

Tana Langley has stepped down as co-chair of the Arson Study group, as she is moving out of state. I queried Katherine Hutches about the need for a new co-chair. She feels that she can handle being the solo chair for the time being, as the Arson and Trace groups often plan joint meetings.

—Meghan Mannion-Gray

Instrumental App. Note

A recently published method for identifying the spermicide nonoxynol-9 by GCMS may be of interest to evidence analysts suspecting the use of a condom during a sexual assault. Ref: "Detection of the Spermicide Nonoxynol-9 Via GC-MS" Rabi A. Musah, Angela L. Vuong, Colin Henck, Jason R. E. Shepard, Department of Chemistry, University at Albany, SUNY, Albany, NY 12222, USA. *J. Am. Soc. Mass Spectrom*. (2012). Pub online Feb. 2012.

CAC Members in JFS

CAC President Todd Weller and members Robert Thompson and Fred Tulleners were among the authors of a recently published paper, "Confocal Microscopy Analysis of Breech Face Marks on Fired Cartridge Cases from 10 Consecutively Manufactured Pistol Slides." See the *Journal of Forensic Sciences*, Vol. 57, No. 4 (July 2012).

Maybe the Suspect was Irish?

Two little girls down the block were making chalk drawings. When I went for a walk later, I saw they had made chalk outlines of themselves, and had chalked in some crime scene tape which read "Caution - Caution - Caution" and "Caution - Crime SEAN" —CUTE!!

—Kristin Rogahn

FBI & Hair Comparison

In a recent press release, the FBI Laboratory reported that they still conduct microscopic hair comparisons. There is no reason to believe the FBI Laboratory employed "flawed" forensic techniques, they said.

"The validity of the science of microscopic hair comparison is not at issue; however, based on recent cases, the FBI and Department of Justice are committed to undertaking a review of historical cases that occurred prior to the regular use of mitochondrial DNA testing to ensure that FBI testimony at trial properly reflects the bounds of the underlying science.

"In 1996, the FBI implemented mitochondrial DNA (mtDNA) analysis to be used in conjunction with microscopic hair comparisons. Both the microscopic hair technique and mtDNA testing can contribute valuable information and, when combined, provide a stronger analysis."

The President's Desk *cont'd*

After reading this issue's editorial and the "Proceedings," I'm not sure if I'm in the generation they discussed. Maybe I'm sort-of in the transition.

I do think that the phenomenon that is being discussed is deeper than just a digital, cell-phone, Wikipedia issue. It goes to how the "flower child's" generation raised their kids. We've gone to a society where "everyone is special." Where we celebrate graduations from each grade, and we reward mediocrity and end up ostracizing those who excel. Rather than rewarding and recognizing hard work, we reward completion of a task. Thus the newer generations have learned to shoot for the minimum because extra effort is not rewarded (and often peer pressure will prevent punish those who are over-achievers).

I think the way we have set up our laboratories has not helped this. We have seen a shift towards specialization, even within a discipline (serologists vs DNA), and batch work. While this may produce more casework, there is less ownership of "your case" in these assembly line type of analyses. Rather than rewarding complex analysis and thoughtful casework, management is more concerned about the number of cases completed and how fast they get done. Sometimes I feel less of a scientist and more a factory line worker punching out widgets.

The Editor's Desk

CAC / CACLD & Generations

The Fall 2012 CAC Seminar will be the first to be collocated with a California Association of Crime Laboratory Director's semi-annual meeting. One of my desires over the last several years has been to bring the CAC and the CACLD closer together. The CAC is the only US regional forensic science organization focused on one state and the CACLD is one of a very few regional supervision and management associations focused on a single state. Both organizations deal with the same law enforcement agencies, the same courts and the same state laws and regulations. Many of the organizations issues overlap and they have similar goals. The major difference lies in their everyday focus. The CAC's primary focus is casework/technical based and the CACLD's primary focus is supervision and management based.

With so much in common I have never understood the attitude by many of both associations members that the two groups were totally unique and did not need to interact or consider the other group a strategic partner in the delivery of forensic science services in California. I have seen many criminalists get promoted to a supervision and/or management position, join the CACLD, and then let their CAC membership lapse. The rationale was always there was no need to stay a member of the CAC because they just focus on technical stuff and my new focus is supervision and management. What they failed to grasp is that yes, their new focus is supervision and management, but they are leading people doing technical work and need to stay abreast of what the technical staff in their lab are doing and where the field is technically heading. A promotion shouldn't change your focus it should make it more broad.

The CACLD has considered having a joint meeting with the CAC for quite some time, but could never get past the mechanics of getting people to the meetings. It is hard enough in these times of fiscal shortages to send staff to meetings, but to send both technical staff and administrative staff away at the same time was operationally difficult or impossible. The last president of the CACLD, Wes Grose, had an idea that will be tested at the CAC/CACLD fall meeting. CACLD will be meeting on Monday afternoon and all day Tuesday. This overlaps with the CAC workshops which few to no supervisors or managers regularly attend. The regular CAC meeting goes from Wednesday to Friday afternoon, allowing CACLD members to extend their stay, if practical, and interact with the people doing the casework in both their laboratory and other California laboratories. It is usually easier to get to know someone outside of the workplace which results in improved work based communication.

To help stimulate interaction between the members of the two associations and to give ambitious CAC members the opportunity to see what happens at a CACLD meeting, the CACLD is offering non-CACLD members the opportunity to attend the meeting sessions on Monday afternoon and all day Tuesday free of charge. Unfortunately, meals cannot be included in the offer. As a smaller organization the CACLD is not as financially well situated as the CAC.

This is how professional organizations and strategic partners work together toward the common good.

Proceedings of Dinner - Bridging the Generations

Elsewhere in this issue is a variation of the typical Proceedings of Lunch—the excellent regularly occurring submission by Norah Rudin and Keith Inman. I found it timely in that it touched on something I was going to write about in a future editorial —the differences between generations of forensic scientists—and touches on issues regularly discussed at CACLD meetings—how to understand and get the most

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Greg Matheson
CAC Editorial Secretary

from different generations of people all working in the same laboratory.

There has been a lot of discussion and research into how each new generation thinks, communicates and interacts with their peers. Though not a scientific paper on the subject, this issue's Proceedings of Lunch (Dinner) lays out the thoughts of several veterans of our profession. Veterans with extensive technical skills and abilities, years with a variety of experiences, and years of dealing with the transitions of science and generational differences. To qualify as veterans they are all older than most CAC members. I too fit right into that group, not with the same technical experience as them, but with as many years in the field and a broad range of experience dealing with multiple new generations of criminalist, so I understand their thoughts and statements.

As an aside, keep in mind that every one of the veterans involved in this issue's Proceedings came from a generation whose motto was "never trust anyone over 30," a time characterized by the "counterculture" and social revolution. It was a time with a huge "generation gap" where the vocal young didn't trust the "old" and the "old" thought the new generation was lost. The movement away from the conservative fifties continued and eventually resulted in revolutionary ways of thinking and real change in the cultural fabric of American life. No longer content to be images of the generation ahead of them, young people wanted change. The changes affected education, values, lifestyles, laws, and entertainment. I'm not sure what relationship this has on the discussion—I just found it interesting.

At this point I am going to test some of their assertions. This isn't meant to be a "them versus us" situation. But rather, for you, the current generation, to share with and educate the veterans about what you think about the way your generation approaches communication, work and passion about your profession. I have had the great opportunity to meet many forensic scientists which, regardless of generational differences, share the same passion and desire to make forensic science a career and not just a job and who work toward ensuring the work product is not just good, but exceptional. But differences still exist and need to be understood. This can only happen through two way communication.

- *Are you passionate enough about your profession to have read their article and my ramblings to know this test exists?*
- *Are there any of you in the age groups they discuss willing to step up and respond to their thoughts and assertions? To take the time to share your opinions and comments by sending them to me for consideration? editor@cacnews.org*
- *What is your response when they comment about:*

  Their perception of the way this generation seeks, gets and consumes information.

  What motivates, if anything, the current generation to care about professional excellence? Pride? Money? Peer pressure? Ego?

  New generation perceptions about previous generations value and contributions to the field? Are you interested in what "they" have to say?

  Does the way the message is passed to the new generation matter? If so, what is the best way?

  Do you care or learn from other's successes and failures? Has the way this information is shared change the ability to learn from others?

I am hoping that their article inspires many of you to respond to their thoughts and comments. I look forward to hearing from you. editor@cacnews.org

Enjoy life, enjoy your profession, constantly learn, improve and make the world a better place.

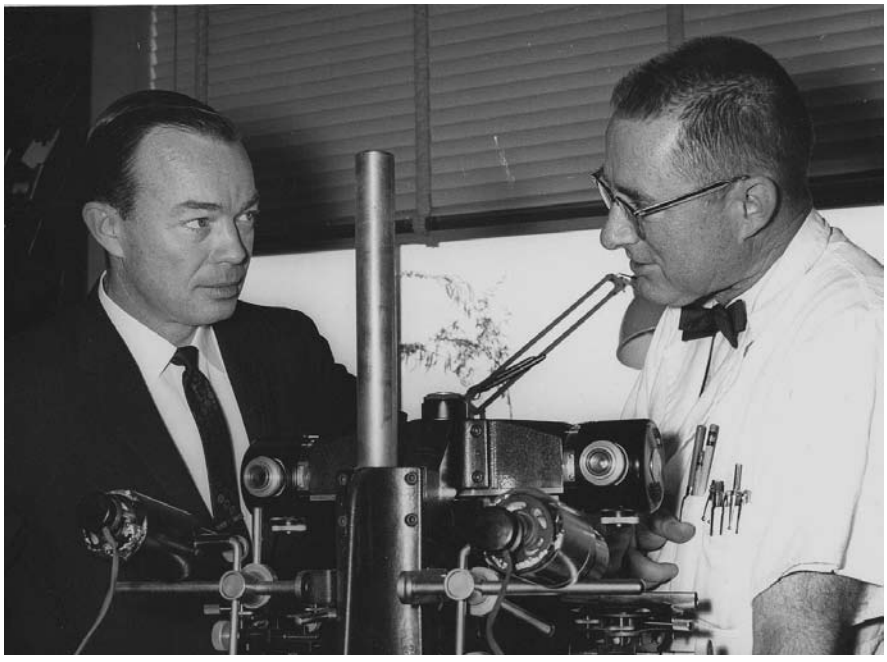

Photo courtesy Walter Houde.

Early Years

San Mateo Undersheriff Eugene Stewart (l) discusses the lab's comparison microscope with CAC Founding Member Don Harding (1917-2005) in the early 1960's.

The Proceedings of Lunch

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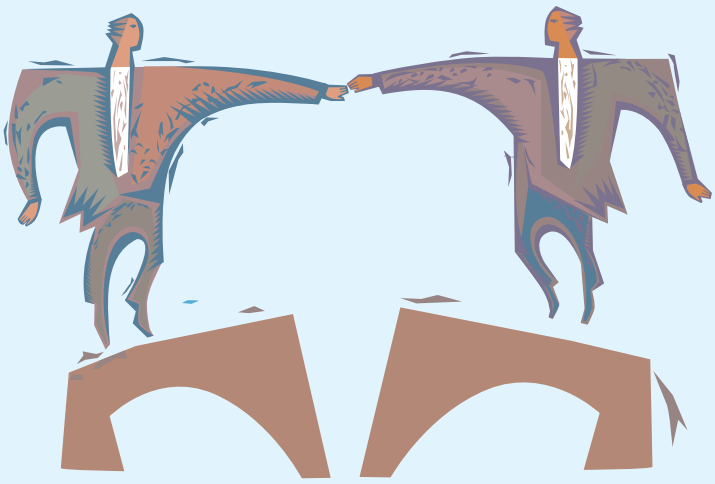
"The Proceedings of Dinner:"
Bridging the Generations

The Dinner

What's better than lunching with a colleague or two and shooting the forensic breeze? Sharing dinner and drinks with a six-pack (of colleagues) at a CAC meeting.

Just such an event occurred at the recent meeting in Bakersfield where the two of us (Keith and Norah) had the pleasure of dining with old friends and colleagues Dan Gregonis, Raymond Davis, John Houde, and Wayne Moorehead. Most of us have known each other for decades – that is a long time to watch a profession grow and change. And no one in this group is particularly reticent to speak his or her mind. Even before the drinks are served, the bitch session—uhhn—the collegial discussion, had begun. Perhaps it is truly a turning point in our profession, or perhaps just a group of aging professionals reminiscing about a past viewed through the soft-focus lens of time, and complaining about the present viewed through the cynicism of experience—but the conversation inevitably turned towards our observations of differences between the generations.



"I know you've heard it a thousand times before. But it's true—hard work pays off. If you want to be good, you have to practice, practice, practice. If you don't love something, then don't do it."
—Ray Bradbury: The Uncensored Biography by Gene Beley

"You're afraid of making mistakes. Don't be. Mistakes can be profited by. Man, when I was young I shoved my ignorance in people's faces. They beat me with sticks. By the time I was forty my blunt instrument had been honed to a fine cutting point for me. If you hide your ignorance, no one will hit you and you'll never learn."
—Ray Bradbury, Fahrenheit 451

The Crims of Generation Y, AKA the Millennials, Generation Next, the Net Generation, the Echo Boomers

One of our laments has to do with the way that we perceive this generation seeks, gets, and consumes their information. Keith suggests that this new generation of criminalists sees "us" as a no more valuable or useful resource than *Wikipedia*. Or perhaps they see us only as an earth-bound rather than cloud-based *Wikipedia*. He feels that a *Gen Y* analyst is more likely to seek information on the Internet than from a veteran colleague. Dan interprets this as a lack of respect of the ***quality*** of our knowledge and experience, and subsequently a failure to appreciate and learn from the accumulated wisdom of a previous generation. Dan continues with the observation that many of this current generation not only decline to learn from our mistakes, they often fail to acknowledge, and learn from their own mistakes. Hence they lose the opportunity to gain understanding and insight that could be applied to their next case or testimony.

John relates that when he was involved in music instruction at the junior-college level, he noticed a relative disinterest among some students in putting in the serious practice time necessary to do an outstanding job during a performance. While he acknowledged that many legitimate reasons might limit practice time, at least a few students gave him the distinct impression that they were not bothered by a poor performance. For him (and many of our generation), the fear of making a fool of oneself on stage was a powerful motivator to practice harder; he wondered if perhaps, for his students, a poor performance would not provoke the embarrassment, and yes, shame, that it would for many of us. If so, no amount of cajoling and threats, bargaining and demanding, would induce the student to put in more practice time if he was not self-motivated. John offers a direct analogy to forensic science: the musician is the criminalist and the performance is the testimony. If you don't care how you perform in the witness box, why should the jury?

John continues by wondering what might convince the performer—musician or criminalist—to care more? Apathy about one's performance is a luxury that cannot be afforded

by people who need to perform well in order to eat. His college ensemble would continue whether the performance was weak or strong, but a professional musician or criminalist cannot expect success in her career if she carries such a dismal attitude. He suggests that money, as repugnant an idea as that is to him, can be a powerful motivator. That works better for a private practitioner, who may lose clients, than for a criminalist in a public lab where even a corrective action rarely results in any substantive loss. If not money, then what? How can we motivate the current generation to excel in their endeavors when pride in accomplishment is no longer a powerful motivating factor?

John's parable leads Norah to suggest that pride is the other side of shame; having pride in (but not arrogance about) our endeavors leads us to do the very best job we can. This segues into a group discussion of "pride" and "shame," to us notions that clearly guide our actions to seek the former and avoid the latter. How can we instill these goals in those for whom poor performance has little consequence? He suggests that peer pressure was, and may still be, a powerful motivating factor; if the motivation does not come from within, perhaps it can be encouraged by external cues. He also wonders if succumbing (or not) to peer pressure is inherent to human beings, or something that is a learned cultural behavior? Is it generational? Is it reinforced or weakened through the anonymity of social media? He also notes that this is *CACNews*, not *Psychology Today*, so perhaps we should move on to discuss ways in which we might influence the future direction of our profession.

At this point the light bulb goes on over John's head – wait, are we having a Proceedings…… ??????? We agree that yes, this discussion is the very essence of a Proceedings – in this case, of dinner. We agree to turn our discussion into a formal column, and all of us gray-hairs desperately try to recall the main threads and pithy comments generated over the last couple of hours. We ask everyone to memorialize their recollections and send them in as e-mails. We already have another column planned for Q3, and it is clear that this will take time. So we plan this column for the Q4, 2012 issue of the *CACNews*.

The continuation

As summaries, replies, and further commentary begin to flood our e-mail, we realize that this is a bigger conversation than dinner, and even a Proceedings. Apparently we all harbor a lot of pent-up frustration over these issues, and are relieved to find a like-minded group with whom to share a discussion. Norah sets up a *Google* group to solve the "reply-all" problem, and the discussion continues to expand.

While we realize that we are all sounding like old-timers, we also believe that we have something important to say, some wisdom to pass on to the next generation. Dan offers the adage that you can have 10 years of experience or 1 year of experience 10 times; in other words, some people learn from their mistakes and build on that accumulated knowledge, while some never learn from their mistakes, and hence are doomed to repeat them in perpetuity. This leads him to wonder whether different generations learn in different ways. He relates a story about informing a group of trainees that they would have to repeat an exercise because it was performed in a way that could have led to unreliable results, hence compromised the ultimate conclusions. HIS supervisor suggested that Dan's straightforward delivery might have been interpreted as scolding by this young group, and possibly caused them to simply shut down and stop listening after the first sentence or two. The supervisor offered the observation that, for the current generation, a softer approach might yield better results. The lesson is that perhaps *Gen Y-ers* ARE willing, even eager, to listen to our criticisms and corrections, just not in the way that we might like to hear them ourselves. Perhaps a little adjustment is in order on our part, something that is more difficult for those of us who have become quite set in our ways.

Harkening back to his original observation during dinner, Keith offers that one sidelight to teaching in the CSU system is that all faculty are required to have expertise in both their subject matter, and how people learn. A significant body of knowledge exists in psychology, education, and human development on the brain and learning; and one fascinating finding is that the Internet is changing our brains. Keith does not suggest that this is the only explanation for the difference in generational communication patterns, but it is clear that how the brain of a *digerati* functions is different from those whose lives do not revolve around the constant connection to both social and informational sources via phones, tablets, and computers. He opines that this affects not only what people value, but how those values are expressed. He suggests that those who we might consider as a sage, or a keeper of generational wisdom, are now considered by the digital generation as merely "*Wikipedia* with a degree."

Therefore, "we" ask why "they" are not interested in what we have to say, or how we practice our profession. It may not be a lack of interest, but rather, how that interest is pursued and expressed. The constantly digitally-connected individual cannot focus for more than a few minutes on text (the kind with whole words and full sentences) or issues, but are constantly scanning the environment for information. They can't help it; their brain looks at the world as a constant *Google* search, checking out this source (clicking) for the top nugget, moving onto the next, and again moving on to the next. This is, of course, the very essence of the *World Wide Web.* Rarely is there a pause for integration; their world is continuously dynamic. If we wanted merely to keep them engaged in, for example, courtroom testimony, we would expose them to 8 hours of rotating content, from *My Cousin Vinny* clips, to witness stand malaprops. So our challenge, it seems to us, is first to get their attention, second to keep it, and *then* to teach them.

There is also the difference, Keith thinks, between the I'm - gonna - beat - your - argument - to- smithereens approach taken in serious research and academic circles (in the belief that constant and heavy criticism will burnish a thesis to its critical core) and the I-have-a-job-just-tell-me-what-to-do attitude. The challenge is to encourage a life-long love of discovery, which only comes when we are sufficiently self-critical to know that we don't know, that we can always do better, and that seeking is more fun than finding. Some individuals of both the generation previous to us, and of ours, espouse the approach of personal ego destruction. Keith rejected that long ago as inefficient to true learning. But mere collaborative exploration (as the opposite of excoriation), without sufficient critical skepticism and deep questioning, leads to feel-good superficial explanations, which is equally debilitating to learning. The digitally-connected individual has broad

continues on next page

knowledge that feels like real wisdom; however a breadth of knowledge does not equate to a depth of understanding.

Finally, Keith cautions that we must at least ask ourselves whether we have anything worthwhile to pass on; perhaps we're ignored because we are irrelevant. Why do we think we're right? We must present ourselves and our colleagues some evidence to support the contention that we should not be ignored.

Raymond expands on the thought that perhaps we need to rethink how we are communicating the message. In his words, "the more we bitch, the less they listen." Over 21 years of courtroom classes, he has had ample opportunity to observe an ever-decreasing lack of engagement. Raymond echoes the thoughts of the group in proposing that, now that we have had the opportunity to vent among ourselves, we might want to rethink how we want to present our message. He is justifiably concerned that the monikers of pride and shame not only don't speak to the current generation, they come with baggage and a high probability of misunderstanding and alienation. It is a short street from legitimate pride in one's accomplishments to the more negative connotations of arrogance, conceit and vanity. Similarly, shame has thankfully disappeared from the landscape of parenting, perhaps because it can so easily turn from a motivator to an implement of abuse. Raymond proposes substituting the juxtaposition of "passionate" and "passive" to describe opposing approaches to professional life. He sees the distinction clearly in our colleagues, young and old alike. The passionate group pursues their career for the joy and fulfillment it brings, while the passive group tolerates it for the paycheck it brings. The passionate group lives to work while the passive group works to live. He has met too many young people who view work as something that takes an eight hour chunk out of their day. The passionate group finds joy in their work. For the luckiest among us, we have been able to live our passion every day, and even derive a paycheck from it.

Many of us contribute anecdotes with a common thread, that of sharing both our successes and our failures with our colleagues and, in the process, soliciting and providing feedback. Pre-computer, we spent down-time in the lunch room or around the proverbial water cooler, sharing both casework experience and courtroom experience in an informal way that enabled information transfer in an almost osmotic fashion. While none of us would suggest that technology has not greatly improved both the technical and administrative aspects of our profession, we can't help lament that a certain human quality may have been sacrificed in the process. True communication occurs through the non-verbal and visual cues provided by the communicator; neither methods or QA manuals, nor Twitter or Facebook (or their science equivalents) provide the rich, varied, immediate, and contextual cues that serve as the foundation for deeper meaning.

When Wayne attended mid-morning and mid-afternoon breaks at a previous employer, admittedly not all that frequently, he relates that the more youthful analysts' conversations that he overheard were rarely about casework, courtroom experiences, or other professional activities. He contrasts that to his overhearing other veteran colleagues or interacting with them, recollecting that they would frequently discuss casework issues, in particular mining another's expertise to assist with problem-solving. He continues with the observation that to share one's experience, to educate others, and to be educated by other's successes as well as their mistakes no longer seems important—there exists no tangible encouragement from managers for being better than adequate.

At this point in the discussion we remind ourselves to be careful of generalizations. Not all of our generation are shining lights (let the personal lists begin), and certainly some of the successive generation truly embody those traits that we admire; they are sharp, curious, and open to learning – they will carry our legacy into the future, and create their own. These are the people we old timers get excited about!

The plan

Raymond, while appreciating the opportunity to vent, begins to move us in a more productive direction by making some concrete suggestions based on our ongoing discussion. He wonders if some just starting out in this profession might feel intimidated by an older and more experienced colleague, perhaps precluding their engagement. They may actually wish to seek out learning opportunities, but perhaps believe that we are not interested, and thus remain isolated. Perhaps if we actively seek to change the paradigm, seek out our younger colleagues and engage them, make a point to offer praise when warranted, find a constructive way to critique if necessary, we will be more effective in the transfer of wisdom.

Raymond proposes codifying this relationship as a formal mentoring program and offers some organizational suggestions for how this might occur. He further commits, and ultimately commits the group, to facilitate a round-table discussion of these topics at the next CAC meeting. By the time you read this article, the details will have been solidified. We look forward to a spirited discussion.

The post-script

Norah, who was tasked with writing the first draft of the article, wonders, as the frequent readers of this column may have as well, why she has had relatively little to contribute to this topic. Quizzing the group, it emerges that the five gentlemen have been in this profession for as long as 4 decades (Raymond) to at least 34 years (Dan). Each of them pursued criminalistics with specific intention, an interest having been generated earlier in their youth. For those keeping track, here are the years each of them reports entering the profession of criminalistics: Raymond, 1972; Keith, 1974; Wayne, 1975; John, 1976 and Dan, 1978.

Norah entered the field only in 1990 (a mere babe in the woods), quite by accident, and with no specific prior intention except to collect a paycheck from the newly-minted DOJ DNA lab once her post-doc funds ran out. So, although she is not chronologically much younger than the guys, she is professionally a generational 'tweener, and has not yet accumulated quite the patina of the others. She notes that, but for Keith rescuing her from the DNA blinders by, yes, mentoring her in the general criminalistics, she doubts she would have chosen to continue in private practice.

So for this POL/POD, she is acting mostly as curator and a little bit as editor. Perhaps in another couple of decades she might have something wise to say.

The future

This group looks forward to more discussion about, both among themselves, and with others of all generations. They are willing to use technology as a communication tool when necessary, but much prefer dinner and drinks around a table with old friends.

The Intricate Micro-Art of Edwin L. Jones, Jr.

This slide is prepared from sand samples mostly collected by me. The template font "SANTA BARBARA COUNTY 2011" is 12 point Times New Roman type and the mounting media is ¾ inch Scotch brand double stick tape (Permanent). Each grain of sand is selected under a stereomicroscope and manipulated with fine forceps. Most of the sand samples are robust and are easily handled with forceps without damage. Some of the sand grains are fragile and are easily damaged by manipulation with forceps and/or trying to reposition them after they make contact with the sticky tape. The samples on this slide are from Santa Barbara County. They are arranged from south to north. Most of the popular costal sand beaches are included in this slide. The locations represented in this sample template are:

S— Rincon Park
A— Rincon Hill
N— Carpenteria City Beach, Carpenteria
T— Santa Claus Lane, Carpenteria
A— Loon Point

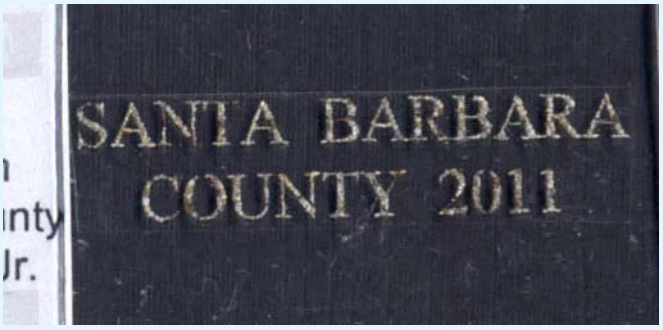
B— Lookout Park, Summerland
A— East Beach, Santa Barbara
R— Ledbetter Beach, Santa Barbara
B— Stearn's Wharf, Santa Barbara
A— Arroyo Burro Beach County Park
R— Isla Vista County Beach
A— Goleta County Beach

C— Ellwood Bluffs
O— Refugio State Beach
U— Corral Beach
N— Refugio State Beach
T— Arroyo Hondo Trestle
Y— San Onofre Beach

2— Gaviota State Beach
0— Jalama Beach
1— Ocean Beach Park, Vandenberg AFB
1— Main Street Beach, Guadalupe

Each digit takes a minimum of 4 hours to process the sand into the proper sizes, find interesting objects and arrange them on the slide. The objects on this slide include foraminifera, gastropods, ostracods, echinoid spines, euhedral mineral grains, colored sand grains, diatoms, sponge spicules and bryozoa.

Edwin L. Jones, Jr.



DNA Survey Results Released

We did statistics workshops at both CAC Bakersfield and also and a Northern California study group in May 2012. There were a lot of pieces to the workshop, but one little piece was this survey. We just thought it would be nice to provide the results as sort of a thank you to everyone who filled out the survey.

As part of a workshop on statistics for difficult DNA samples, we asked participants to answer some questions about both the statistics they currently use, and also about collection techniques. We would like to share with you the results of those surveys.

The total number of respondents was 40, representing both public and private laboratories from geographically diverse regions in California. In all cases, respondents could choose more than one answer, so the total percentages may exceed 100. Conversely, not everyone answered each question so in some instances; the total number of responses are listed at the end of each line.

The answers to the questions about collection techniques were fairly straightforward and so were easy to collate and categorize. Not surprisingly, the answers to the questions about statistics elicited a lot of prose qualification, so were much more difficult to collate and categorize. Short of reproducing each individual answer, we decided the best compromise was to make some executive decisions about categorization, just to give a general idea of the pattern of responses. We make no attempt at this time to interpret any of the data.

We hope you find the information from this informal survey useful, or at least interesting.

—Norah Rudin & Keith Inman

Sampling Methods

	Dry swab	Wet swab	Double swab (wet, then dry)	Scraping	Cutting	Other	# responses
Sampling methods with which respondent has had experience	28%	**95%**	51%	28%	41%	2.6%	39
Sampling methods that respondent believes collects the most DNA	2.6%	**68%**	21%	2.6%	13%	5.3%	38

Preferred collection fluid	Sterile water	Sterile saline	Sterile digest buffer	# responses
	95%	10%	10%	39

DNA Statistics

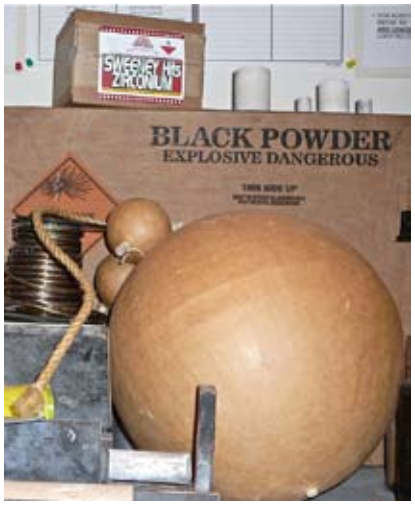
	Entire sample inconclusive	CPI or RMNE only if one or more reference samples included	CPI or RMNE regardless of whether any reference sample is included	LR for individual of interest	Other	# responses
LT partial profile w/ no overt evidence of more than one contributor	14%	30.4%	5%	8.1%	**62%**	37
LT profile w/ overt evidence of more than one contributor	11%	27%	19%	11%	**40%**	37
LT profile w/ 4 or more contributors	**82%**	2.6%	2.6%	5.3%	24%	38

(LT = low template DNA sample)

The Collision of Science and Art—

When Sparks Fly

By Tana Langley and Doug Ridolfi



The CAC's fire debris and trace evidence study groups visited an explosives manufacturing company on Dec. 13, 2011.

MP Associates, Inc. started over 20 years ago doing special effects for the movie industry and for rock bands such as AC/DC, KISS, and The Rolling Stones. Now, the company primarily makes pyrotechnics for military training and for the commercial use of movies, resorts, and theme parks worldwide.

MP Associates is located on 300 acres that was previously a clay pit mine located in Ione, Calif. The site takes advantage of natural boundaries. The company utilizes the hills, vegetation, and small lakes to set off individual explosive manufacturing locations. The larger the amount of explosives handled or the more powerful the explosive, the more the building is isolated.

Co-owners Thaine Morris and David Pier provided the study groups with an informative tour of the manufacturing process and the safety measures necessary in the production and shipping of pyrotechnics. They also gave a brief history of the explosives industry. One interesting fact discussed was the evolution of billiard balls. At one time they were made of ivory. When ivory became too expensive, they were then made of nitrocellulose. But, if hit too hard nitrocellulose balls would explode. Eventually they came up with a safer substitute. The company's library on pyrotechnics is one of the largest in the world and includes books dating back to the 16th century.

Morris explained how some of Hollywood's special effects are done. To simulate a bullet strike to a wall, an explosive is placed in the wall where the bullet is intended to strike. The explosive needs to dislodge a piece of the wall without creating much smoke. The same type of explosive can be used to simulate bullet strikes on a person. A blood packet is placed underneath clothing and when detonated it blows a hole in the clothing and blood spurts out.

Scattered along the site are small wooden structures referred to as "birdhouses." These birdhouses are for storage of small amounts of completed pyrotechnic products as they are produced. These small storage containers are then emptied on a regular basis to avoid the accumulation of finished product in one area.

In the pre-mix section, articles are designed, tested, and then scaled up for any large-scale productions. To minimize risk, most mixing is done while the explosive material is moist with a solvent. Once mixed, the damp material is pressed into the desired shape (such as a star) and then allowed to dry.

Press stations were located in open concrete bunkers spaced at a distance from the other buildings. The more hazardous materials are pressed solely with a Carver press. A Carver press is remotely operated in two steps. First, the explosives pellet is pressed into a star shape. Then, the finished star is ejected into a Teflon holder. The pellet produced is roughly one inch in diameter and has a slightly raised lip at the top.

The R&D section will meet with the theme park's pyrotechnic display designers and get an idea of what they would like to see done. They then document their technology needed to make it happen.

Increasingly common requests include "Don't want all of those bad chemicals. Go greener", "Do want effects with less smoke", "Don't want effects in the entertainment industry that are too fast to be captured in photography."

The company is audited once a year. They also undergo inspections by DOT, ATF, OSHA, Homeland Security, EPA, the local sheriff's department, and The CA State Fire Marshal. The only group more regulated is the nuclear group.

Eight to ten percent of all products are tested for quality control. For some of the critical products, it is necessary to test up to fifty percent.

The testing of three star bursts were demonstrated for our group. Vertical and horizontal beams are to aid in documenting the height of the star burst.

Obtaining good consistency in all their products is one of the challenging aspects of pyrotechnic production. Clay is used in Carver press for quality control. The clay star can easily be measured and the rim can be inspected to ensure that it is made correctly and of proper density.

A 25 pound napalm bomb (vaporized naphthalene) is used by the military in their training to simulate an Improvised Explosive Devise (IED). This is also the size explosive used for an average Hollywood car bomb.

Explosives Labeling

DOT Classification

The United States Department of Transportation (DOT) regulates hazardous material transportation within the US.

1.1 Explosives with a mass explosion hazard. (nitroglycerin / dynamite)

1.2 Explosives with a blast/projection hazard.

1.3 Explosives with a minor blast hazard. (display fireworks)

1.4 Explosives with a major fire hazard. (consumer fireworks, ammunition)

1.5 Blasting agents.

1.6 Extremely insensitive explosives.

DOT sub-catagories are rated on a scale from 0 (extremely sensitive substance) to 6 (insensitive).

The majority of pyrotechnic shipping is one or two classifications:

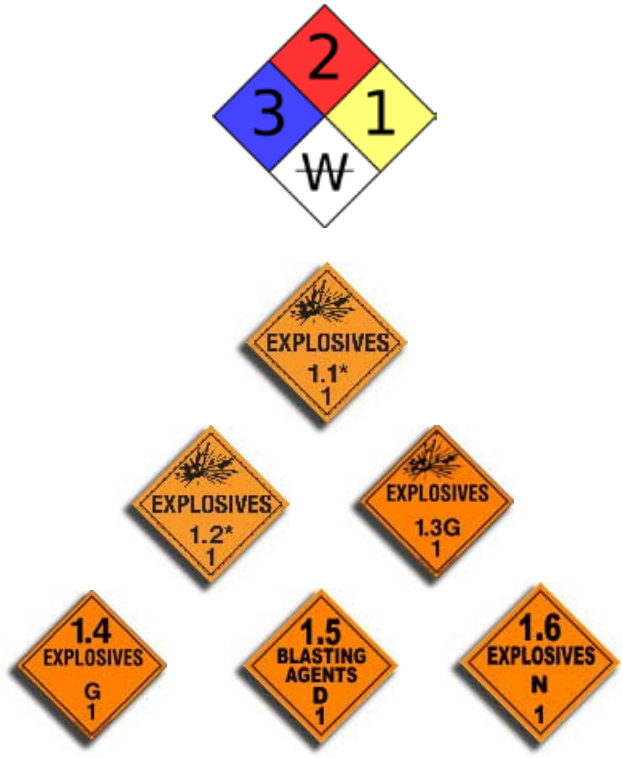
-1.4 for less hazardous but still potentially harmful pyrotechnics.

-1.3 for big aerial shells which could potentially take down an airplane

NFPA Classification

The four divisions are typically color-coded, with blue indicating level of health hazard, red indicating flammability, yellow (chemical) reactivity, and white containing special codes for unique hazards.

NFPA Sub-catagories (health, flammability and reactivity)are rated on a scale from 0 (no hazard; normal substance) to 4 (severe risk).



CRIME-SOLVING PLANTS

By Shirley Graham, PhD.*

Recently I was asked to provide text for a projected graphic display on the subject of forensic botany at the National Botanic Garden, Washington, D.C. Subsequently, the program directors asked me to expand on the display with a lecture entitled, "Crime- Solving Plants" for a public audience at the Garden. Bill Dahl, Executive Director of BSA, was directly involved in the original idea and later suggested that I submit the talk to the Plant Science Bulletin. The text follows below together with literature citations added to allow anyone interested in using the information to refer to some of the original studies and to see some of the illustrations that accompanied the presentation.

Early in January, 1935, a man named Arthur Koehler worked his way through crowds of people gathered outside the courthouse in Flemington, New Jersey. He was there to testify in one of the most important trials of the 20th century, the trial of Bruno Richard Hauptmann for the kidnapping of the young son of aviation hero Charles Lindbergh and his wife Anne. Dr. Koehler was an expert on wood anatomy and identification at the Forest Products Laboratory, United States Forest Service in Madison, Wisconsin and what was unique about the particular testimony he was about to give was that it dealt with the structure of wood, namely the wood of the ladder used by the kidnapper. Presenting that kind of evidence was highly unusual, there was little precedence for it, and it was not clear it would even be allowed. The use of scientific expert witnesses was an uncommon and limited practice at that time and botanical evidence had little standing in the criminal courts.

The defense argued strongly against allowing Dr. Koehler to testify, saying "there is no such animal known among men as an expert on wood; that it is not a science that has been recognized by the courts; that it is not in a class with handwriting experts, with fingerprint experts, or with ballistic experts... The witness probably may testify as an experienced carpenter or something like that, …. but when it comes to expessing an opinion as an expert or as a scientist, why that is quite different indeed. We say that the opinion of the jurors is just as good..." (Pope 1935). The judge responded, in what we can now consider to be an historical moment for forensic plant science, "I deam [sic] this witness to be qualified as an expert" (Trenchard 1935).

Koehler subsequently went on in the trial to demonstrate how the wood of the ladder, beyond any doubt, linked Hauptmann directly to the crime. The ladder was a unique design, homemade, and in 3 parts that could be disassembled to fit in a car. Koehler presented three kinds of information from his study of the ladder - 1) identification of the wood used, 2) physical marks left by tools on the wood, and 3) comparisons of the wood structure. He was able to determine that the wood used in the ladder was of four kinds: douglas fir (*Pseudotsuga menziesii* (Mirb.) Franco), 2 types of pine (*Pinus ponderosa* Dougl. ex Laws. and *Pinus echinata* Mill., or a close species, commonly called yellow pine) and birch (*Betula* sp., probably *B. alba* L.) used for the connecting dowels. In making the identifications he saw the characteristic presence in pine of very thin epithelial cells lining the resin canals, while in douglas fir he distinguished characteristic thick-walled cells lining the canals and faint spiral markings along the length of the tracheids (Fig. 1). The wood of the top left rail had clearly been used before. It had been sawn away from a bigger piece and there were nail holes present made by old-fashioned square-headed nails. Koehler alerted authorities to look for a missing board in any place connected with a future suspect. Remarkably, Koehler using scarcely visible planer markings was able to trace some of the pine back to its original mill source in McCormick, South Carolina and then forward to the National Lumber and Millwork Co. in the Bronx, NY just 10 blocks from Hauptmann's home. This was prior to Hauptmann's arrest after passing a bill from the ransom money. A week after the arrest, police realized that one of the floor boards in Hauptmann's attic had been partly cut away. Koehler was able to show in the trial that the attic board and the ladder rail had once been a single board by the exact match of annual rings (Fig. 2) and importantly, he demonstrated that patterns of annual rings are unique so that no other random board would have an absolutely identical pattern, just as today we demonstrate that portions of our DNA are unique to each individual. The wood anatomical evidence ultimately was one of the most incriminating and unshakable pieces of evidence that led to Hauptmann's conviction and eventual electrocution for the kidnapping (Graham, S. 1997).

Since that trial, what is termed forensic botany, or the use of plant remains to help solve crimes or other legal prob-

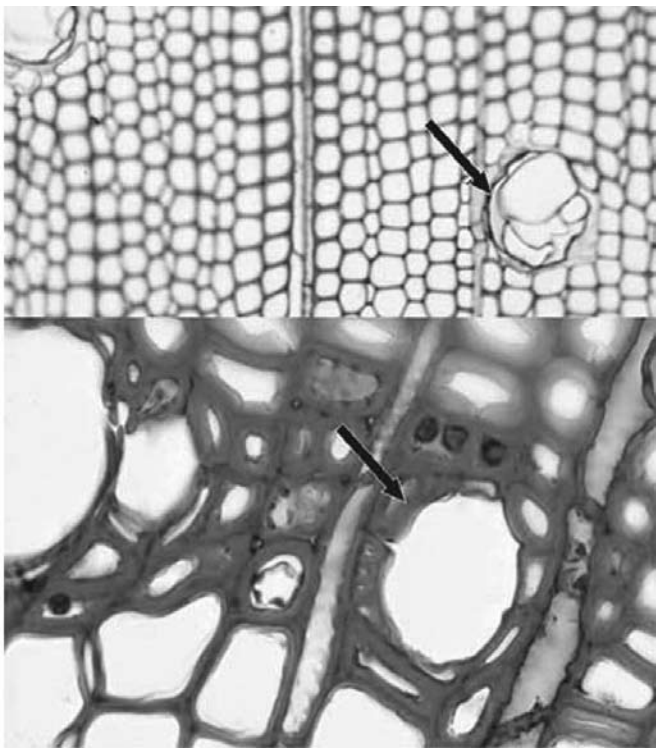


Figure 1. Cross-sections of gymnosperm wood. *Pinus echinata* Mill. (top) and *Pseudotsuga menziesii* (Mirb.) Franco (bottom)

* Missouri Botanical Garden, St. Louis, MO.

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Figure 2. Attic floor above Hauptmann's apartment. with the top left rail of the ladder (right) in place as a continuation of the floor board (left) from which it was fashioned; one nail corresponding to nail hole in the rail and floor joists visible on the rail. With permission of the USFS.

Seeds and fruits, like pollen, very often give away their identity by their specialized features

lems, has been widely accepted as valid scientific evidence by the courts. If the wildly popular televison crime shows like *CSI, Law and Order, Cold Case*, and many others reflect to some degree how real life detective work proceeds, then plants are now beginning to play an increasing role in solving crimes. In February this year in a TV episode of "*Bones*", one of the forensic anthropologists finds part of an ear bitten off the killer of a young woman. On the ear is ear wax within which pollen is embedded. As the story continues, the pollen is identified as a species of the grass genus *Eragrostis*, a species said to grow only in South Africa, and this leads the scientists to a suspect who has just come from there. I comment further on this story later, but the point here is that although this particular case is fiction, plants or parts of plants can provide significant supporting, sometimes, crucial evidence in solving crimes.

The reasons for this are several: 1) plant remains can be found almost everywhere; 2) they offer multiple sources of evidence, both macroscopic and microscopic, such as pieces of wood, (even as charcoal), seeds, fruits, leaves, twigs, plant hairs, microscopic air-borne pollen and spores, or in aquatic environments, algal cells; 3) their morphological diversity allows us to identify them and from the identification gather other useful information such as the season or geographical location in which a crime took place, whether a body has been moved following a murder; if a body is buried, how long it has been buried, and whether a suspect was present at the crime scene.

Pollen and spores, in particular, have all the useful characters just mentioned. Being widespread in nature in the air and on most surfaces, we breathe them into our lungs and they stick to our clothes. Pollen and spore exines are amazingly diverse, sometimes even to the species level, and their production is generally seasonally and often geographically restricted, thus their presence can point to a specific season, sometimes even a specific location, in which a crime was committed (Szibor, R. et al. 1998). There are many published examples of pollen morphology among related families or within families or genera that illustrate this diversity and consequently their usefulness as trace evidence (e.g. Nowicke and Skvarla 1977, Caryophyllales; Graham, A. and Barker 1981, Fabaceae, Caesalpinioideae; Patel et al. 1984, Myrtales; Bruce and Dettmann 1996; Fig. 3). In addition, they have other advantages. They are slow to decay; pollen can be retrieved from rocks millions of years old, a valuable asset for oil companies and archeologists. Because they are microscopic, they remain unseen, silent witnesses and even if they were visible, unlike fingerprints, they would be nearly impossible to eliminate from a crime scene.

A recent example from New Zealand illustrates how pollen as trace evidence was used to solve a crime (Mildenhall 1998). In Christchurch in 1997, a young woman was grabbed, pulled into an alleyway, and raped. Although shaken, she was able to describe the assailant and shortly after a man matching her description was arrested. The suspect admitted being in the area and noticing this woman, who seemed a little distressed, he said he stopped to ask her if she was OK. Now, he claimed, she must be putting his face on the face of the rapist, because he had not been in the alleyway. There was no DNA evidence, but the police noted dirt-stains on his clothes. These, he said, came from his yard where he was working on his car.

The alleyway where the crime occurred was lined along one side by a row of low flowering shrubs of wormwood, *Artemisia arborescens* L. a Mediterranean na-

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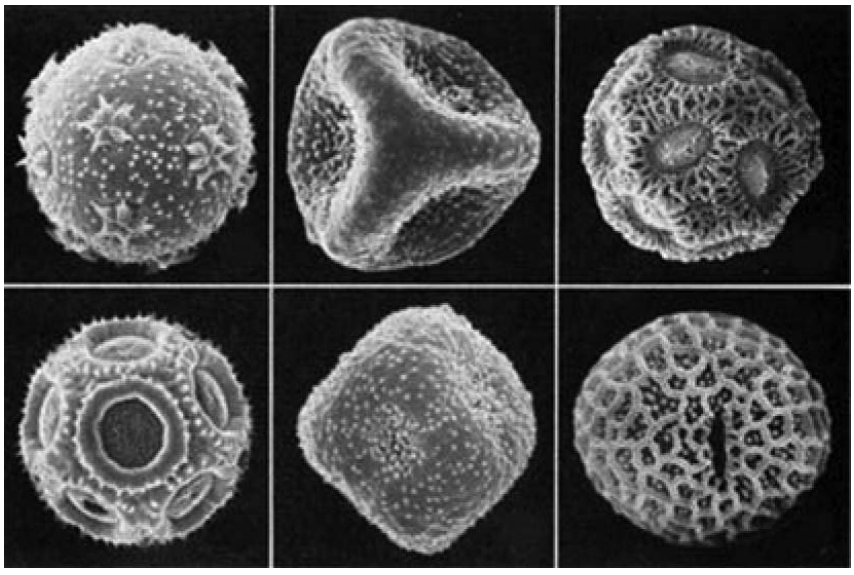

Figure 3. Diversity of pollen morphology in Centrospermae. From Nowicke and Skvarla 1977 with permission.

tive. The shrubs had been broken and flattened during the struggle that led up to the rape. The suspect's clothes with the dirt stains were sent for analysis together with a comparative sample of soil from the crime scene to the forensic palynology laboratory of the New Zealand Geological Survey. The soil sample was dominated, as might be expected by pollen of *Artemisia* (77%), much of it occurring in clumps, indicating the source was at the scene and had not merely blown in. The pollen of this genus has a distinctive, echinate (spiny), very thick-walled exine. There was a mix of mix of fresh pollen and somewhat older, darker colored grains, as well as an unusual large, thick-walled fungal spore in the soil sample, and other spore and pollen types in very low percentages. The same *Artemisia* pollen dominated the clothing sample (53%), again occurring mainly in clumps, in a mix of fresh and older grains, and the same thick-walled fungal spore type was abundant. The percentage of *Artemisia* was so high that the only explanation was that the clothing was in direct, forceful contact with an Artemisia plant. Investigators searched for wormwood near the suspect's home, and other places he visited but found none. The species is not common in New Zealand, being only occasionally planted in gardens. The forensic laboratory had processed over 1000 pollen samples from many localities in New Zealand and never found Artemisia in more than a trace amount, so the chances of finding large amounts were statistically 1 in 1000, but in actual fact, chances were certainly much lower. The fungal spores were also rare. This pollen and spore evidence was presented at the trial, the suspect was convicted, and was given an 8 year prison sentence. Similar comparative pollen evidence led to conviction of a murder suspect in northern Australia (Milne 2005), and in a civil case where pollen intake to a gasoline line was cited as the cause of a fatal plane crash, pollen provided important evidence negating the claim (Graham, A. 1997).

Returning to the use of plants in crime TV shows, and specifically the finding of *Eragrostis* grass pollen in ear wax that led to a suspect, the science of this story presents a bit of a problem. Although many plant groups have spectacular pollen morphology, not all pollen is remarkable structurally

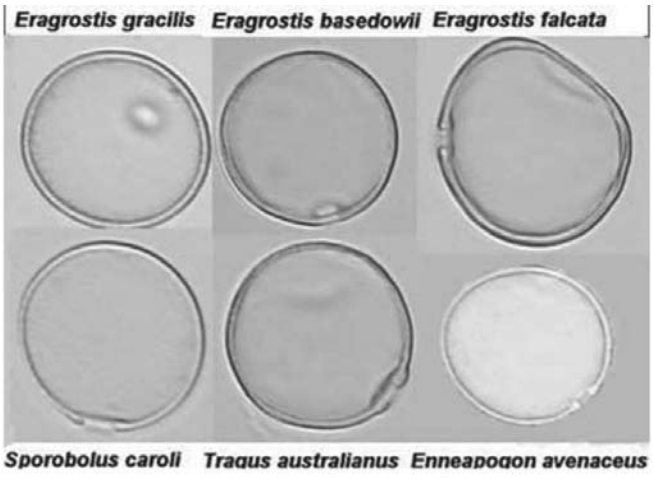

Figure 4. Pollen of the grass genera *Eragrostis*, *Sporobolus*, *Tragus*, and *Enneapogon* illustrating the absence in most grass pollen of useful characters for identification. With permission of The Newcastle Pollen Collection.

It is unfortunate that in this country, botanical trace evidence is still poorly integrated into crime scene analyses, in spite of its potential in many situations. In 1990, a survey of 30 of the largest forensic laboratories in the United States found that only two knew pollen could be used as a forensic tool

and sadly the pollen of grasses, one of the most common and widespread plant families in the world, is nearly as featureless as a ping-pong ball, so it would have been impossible to identify an *Eragrostis* plant to genus or species and pinpoint the geographical source based on pollen (Fig. 4). An interesting exception in the pollen of grasses is cultivated corn which has extremely large pollen, ca. 100µm in diameter, compared with a more average pollen diameter of ca. 35µm.

Seeds and fruits, like pollen, very often give away their identity by their specialized features, especially if they are provided with hooks or barbs. These structures have evolved to aid in dispersing progeny away from competition with the parent plant and are very effective in their role, as anyone who has walked through a field in summer or fall has experienced. In 1997 in Ohio, I was called by the sheriff's department of Champaign Co. near Columbus, Ohio to identify some seeds (actually single-seeded fruits) associated with the murder of two children. The children were found buried in an area at the shady wooded margin of a local cemetery not long after they were reported missing by the stepfather. He soon became a suspect. I identified the seeds as from *Geum canadense* Jacq. (or possibly *Geum aleppicum* Jacq. with very similar fruits), commonly known as avens, in the Rosaceae and from *Galium aparine* L., bedstraw, in the Rubiaceae, species of shaded to partly sunny places in dry to moist somewhat disturbed woodlands (Fig. 5). The seeds had been removed from a blanket and the stepfather's clothing recovered at his house. He claimed the seeds came from his small farmyard, but neither plant occurred in his open weedy yard, nor would they have been expected there. Both species were found at the gravesite. The seed evidence linked the suspect to a wooded area such as that of the gravesite and was part of the evidence introduced at the trial (*State of Ohio vs. Kevin Neal*, 2000). He was convicted of the two murders and is now serving two life sentences. Similar investigations employing seed evidence from crime scenes have been reported by Lipscomb and Diggs (1998) and in a case investigated by David Hall, summarized at www.nwf.org/wildlife/ wildlifecrime.cfm.

Botanical trace evidence is also obtained from plant cells found in gastric contents. Many of the common foods we eat contain seeds or other plant parts with specialized cells having thick walls of cellulose and lignin. Because these materials do not digest or digest only slowly they can be present in partially digested stomach contents or excreted in feces, and are often

Figure 5. Hooked seeds transported from a burial site on a murderer's clothing. *Galium aparine* L. (left) and *Geum canadense* Jacq. or *Geum aleppicum* Jacq. (right). Photo by S. Graham.

able to be identified in degraded form (Bock, J. H. et al. 1988). It is sometimes possible to determine components of a victim's last meal which, in turn, can provide clues to the setting or timing of death. In a particularly tragic case in London in 2001, partially digested plant material even gave a clue to the victim's homeland and suggested a reason for his death.

The case began in September, 2001, when the torso, minus limbs and head, of a young boy 4-7 years in age was found in the Thames River. There was little to use for identification based on standard techniques and there were no corresponding missing child reports. Scotland Yard suspected from the condition of the body, which had been deliberately drained of blood, that they might be dealing with a ritual killing – a human sacrifice. They turned to forensic scientists, including a palynologist and a plant anatomist to look for whatever evidence might give them a lead in the case. DNA suggested the child was West African in origin and the contents of the digestive tract revealed alder (*Alnus*) pollen, a tree native to northern Europe, and was an indication that the child had been in England in the days prior to his death.

Of greatest interest was the presence in the stomach and intestines of an unusual assortment of small mineral pieces, clay pellets embedded with minute gold particles, and the remains of some type of bean seed. The anatomy of seeds in some plant families, including the legumes (Fabaceae), the mustards (Brassicaceae), and the tomato-potato family (Solanaceae), is quite distinctive and can even be species-specific in some taxa. By comparing seed coat anatomy from the stomach contents of the boy, the seeds were closely matched by a plant anatomist at the Royal Botanical Gardens in Kew to a highly poisonous legume from West Africa, the Calabar bean (*Physostigma venenosum* Balf.). Anatomical recognition of legume seeds is possible because the outermost cells of the seed coat consist of a diagnostic palisade layer in which the cells are typically narrow, elongate, and very thick-walled. It is the heavy walls that make them resistant to quick dissolution. The next deeper layer also can be quite diverse and help in narrowing an identification. The presence of Calabar beans in this case, mixed with the other unusual items in the stomach, suggested the child had been given a toxic paralytic voodoo potion. This finding pointed, like the DNA, to areas of West Africa, like Nigeria, where witchcraft is known to be practised still, and it supported the idea that the child had been a human sacrifice.

Further investigations, using bone chemistry, narrowed the home of the boy to an area near Benin, Nigeria, where Calabar bean is native and where animal, and rarely human, sacrifice is performed. Thus far, no one has been arrested for the murder but as part of the investigation, a ring trafficking in people from Africa into Great Britain and Germany was uncovered and shut-down and 21 people involved were arrested, including the man who brought the child from Africa (*The Guardian* 2004; see also National Geographic Channel presentation, "The Witchcraft Murder", 13 Feb 2005). Today the fastest growing component of botanical evidence in forensics is molecular evidence. We are in early stages of this type of plant trace evidence. The first instance in which data from plant DNA was accepted as admissible evidence in a criminal case was in Arizona in 1992. In that case, *State of Arizona vs. Bogan*, a young woman was murdered and her body dumped in the desert. The suspect was taken into custody after his pager was found near the site. He claimed he had given the woman a ride and that she had stolen his wallet and pager from his truck. A member of the Maricopa Co. investigating team, Charles Norton, happened to notice that one of the palo verde trees (*Parkinsonia microphylla* Torr.) at the scene was freshly scraped, possibly by the murder's vehicle. On an impulse he picked some seed pods hanging from the tree; later, the same kind of pods were found loose in the open truck bed of Bogan's truck and Norton, knowing that DNA could identify human individuals, thought perhaps the pods could be linked by their DNA to the tree at the crime scene. Dr. Tim Helentjaris, a geneticist at the University of Arizona agreed to try. Using RAPDs (Randomly Amplified Polymorphic DNA) to produce profiles of visualized DNA fragments- a kind of 'fingerprint' of individuals being studied, he was able to match the DNA from the 2 seed pods found in the truck to the seed pods collected from the tree at the scene and only to that tree. This was because the palo verde trees had an exceptionally high degree of intraspecific genetic variation (Yoon 1993). The truck, if not the suspect, had definitely been at the site. The jurors agreed Helentjaris's findings were very influential in their decision to find Bogan guilty of first degree murder.

In recent plant DNA research, botanists at the Australian National University in Canberra, Australia have produced a prototype identification system for grasses based on DNA, a

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kind of molecular taxonomic key (Ward et al. 2004). Although grass pollen is not generally helpful in forensics, other parts of grasses like seeds and stem or leaf fragments can be a good source of DNA and because grasses are among the most likely plants to be encountered as trace evidence, a means of identification would be a valuable tool. In their study, using primers designed for the purpose, they sequenced parts of the mitochondrial genome that were representative of subfamily, tribe and genus ranks within a test set of 20 samples. These were then used to identify 25 unknown grass samples in a blind test. With more complete representation, the possibility of identification of many more kinds of grasses by molecular means seems to be within reach.

It is unfortunate that in this country, botanical trace evidence is still poorly integrated into crime scene analyses, in spite of its potential in many situations. In 1990, a survey of 30 of the largest forensic laboratories in the United States found that only two knew pollen could be used as a forensic tool (Bryant and Mildenhall 1990). This figure has not risen significantly in the past 16 years even though criminal investigations are becoming more sophisticated in treating other aspects of trace evidence (Bryant and Jones in press).

In great part, the failure to incorporate botanical evidence in investigations is due to lack of knowledge about plants by personnel who study crime scenes and so fail to collect it. The FBI's 2003 *Handbook of Forensic Services* (www.fbi.gov) mentions the usefulness of wood and cotton fibers and explains how these should be submitted for examination, but refers to no other kind of supporting plant evidence. Unless plant parts are conspicuously evident, samples of plant materials are not standardly taken, nor are specialists brought in to record critical observations of vegetation that could yield credible evidence.

The assessment of plant evidence requires well- trained specialists and frequently also access to extensive reference collections. Today, specialists in plant systematics, plant anatomy and morphology, and palynology are relatively few in number, and aging, and younger replacements are increasingly rare. The balance in plant science research has tipped so heavily toward molecular-based research that students interested in whole plant-based studies find fewer and fewer relevant botany courses available at universities, little research support at the graduate level, and few job opportunities. The value of botanical trace evidence in criminal and civil cases has been clearly demonstrated and is accepted by the courts. Justice can now only be more fully served when law enforcement agencies and other relevant groups recognize and take full advantage of its utility and open employment opportunities for botanically trained investigators. Academic institutions, for their part, must once more appreciate the value of providing well-rounded instruction in botany within their undergraduate biological programs.

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Ethical Dilemmas

Discussion Corner with Carolyn Gannett

Share your thoughts and dilemmas at
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Assisting a Detective

Justice may best be served…if laboratory managers were to forge agreements with investigators regarding fabrication of reports.

The Scenario:

A detective calls you. You have a long-standing good working relationship with her. She has a burglary suspect in interrogation. He's about to roll over, but he needs a little encouragement.

A. She would like you to come to the interview room with your lab coat on and verbally report to her in front of the suspect that the suspect's fingerprints were found inside the burgled residence. You've not yet examined the fingerprints that you collected at the scene. Would you comply with the investigator's request?

B. Let's say that you HAVE examined the prints and your report has been peer reviewed and filed. You found that all prints are either unusable or were deposited by residents. Would you be willing to verbally report to the investigator (lab coat on, in front of the suspect), "Fingerprints were found"? After all, that's a true statement.

C. What if you decline to offer verbal results of any kind, and the detective then asks you for an electronic blank report form? Would you give it to her?

Discussion

I know forensic science experts (yes, plural) who advocate helping an investigator in such ways. I know some (sadly again, plural) who have admitted to actually having done it. Arguments offered in support are along the lines of: anything I can do to help, I will do; or, it's the truth (as in version B), so it's all right; or, law enforcement has different rules than we do, and we work so closely alongside them that it really is not a problem to assist them within the context of their own rules.

Honesty

The law enforcement "rule" being referred to is, roughly speaking, that law enforcement can legally be dishonest when interrogating suspects. But how does this rule hold up when applied within the context of practicing forensic science?

Regarding situation A, to verbally report that the suspect's prints were found at the scene is not honest. Many forensic science ethics documents explicitly advocate honesty. Below are quotes from some of those documents. Perhaps the one that affects the most readers is from ASLCD/LAB's "Guiding Principles…" (acronyms are defined below):

ASCLD/LAB 4: Honestly communicate with all parties (the investigator, prosecutor, defense, and other expert witnesses) about all information relating to their analyses, when communications are permitted by law and agency practice.

For those individuals who are not bound by ASCLD/LAB's document, perhaps one or more of the following apply. All relate to honesty and can lend insight, regardless of whether a practitioner is bound by any of these documents.

ABFT 1: Conduct themselves with honesty…at all times.

ABFT 2: Perform all professional activities in Forensic Toxicology with honesty…and refrain from any knowing misrepresentation of…material facts.

ASCLD G, Disclosure and Discovery: When release of information is authorized by management, all employees must avoid misrepresentations and/or obstructions.

ASCLD G, Integrity: Laboratory managers must be honest and truthful with their peers, supervisors and subordinates. They must also be trustworthy and honest when representing their laboratories to outside organizations.

ENFSI 2.1; FSReg 2: Act with honesty….

IABPA 2, par. 1: In all aspects of professional activity, a member should be truthful…within legal constraints.

IAI 1.04: Truthfully communicates with all parties (i.e., the investigator, prosecutor, defense, and other expert witnesses) about information related to his/her analyses, when communications are permitted by law and agency practice.

SOFT C1: Perform professional activities with honesty….

SOFT C5: Render testimony in a truthful manner without…misrepresentation.

SOFT G, Professionalism 4: Honestly communicate with all parties (the investigator, prosecutor, defense, and other expert witnesses) about all information relating to their analyses, when communications are permitted by law and agency practice.

SWFS 4: Honestly communicate with all parties (the investigator, prosecutor, defense, and other expert witnesses) about all information relating to their analysis, when communications are permitted by law and agency practice.

TIAFT, General: All TIAFT members should treat their peers and colleagues with honesty….

Use of Tactics to Implant a False Impression

In person, in front of a suspect, in a lab coat: this is not the normal means of presenting forensic science results, even if a complete verbal report is made. Add to that withholding information (situation B), and the conduct quickly becomes even more questionable. Aside from possibly being a violation of policy in many labs, presenting results in this manner might also be a violation of some ethics documents, even if only the truth is stated. The manner of presentation uses tactics to plant a false impression. Several ethics documents directly address this.

AFTE III.F: The examiner will not by implication, knowingly or intentionally assist the contestants in a case through such tactics as will implant a false impression.

ASCLD/LAB 16; SOFT G, Clear Communications, 5; SWFS 17: Do not alter reports or other records, or withhold information from reports for strategic or tactical litigation advantage.

IABPA 2.1.4.2: A member shall not alter reports or other records or withhold information from reports for the purpose of gaining a strategic or tactical litigation advantage.

IAI 3.04: Does not falsify or alter reports or other records, or withhold relevant information from reports for strategic or tactical litigation advantage.

Note that the CAC and NWAFS documents' content is almost exactly the same as AFTE's, except the questionable conduct is limited to its effect on "the minds of the jury."

CAC III.H; NWAFS III.H: The criminalist will not by implication, knowingly or intentionally, assist the contestants in a case through such tactics as will implant a false impression in the minds of the jury.

As written, the CAC's document does not apply to situation B. The CAC (and NWAFS) may wish to consider adopting AFTE's wording in order to broaden application of the concept.

Fabricated Reports

Providing the investigator with a blank report form (situation C) could also be argued to be assisting with tactics to implant a false impression.

As an aside, it is easy to produce a realistic fabricated laboratory report, especially if a real one is in hand. It has happened that an analyst has been presented in court with a report sporting the analyst's signature and thought to be legitimate by the attorney. But, the document was actually created by an investigator for interrogation purposes. Had the creator of that document not happened to be present to inform the court that it was a fabrication, much time and effort might have been wasted by the justice system trying to sort out the facts surrounding the fabricated report.

Justice may best be served (a common concept in ethics documents—see quotes below) if laboratory managers were to forge agreements with investigators regarding fabrication of reports.

AFTE Intro, paragraph 2; CAC Preamble, paragraph 2; NWAFS Preamble, paragraph 2: ...serve the interests of justice to the best of his ability at all times.

ASCLD/LAB 5: Laboratory management will take appropriate action if there is potential for, or there has been, a miscarriage of justice due to circumstances that have come to light, incompetent practice or malpractice.

ASQDE IX.i: …thereby promoting justice….

ENFSI 2.3: Recognise that your overriding duty is to justice.

ENFSI 2.17: Take appropriate action if you have good grounds for believing there is a situation which could result in a miscarriage of justice.

FSReg 1: Your overriding duty is to the court and to the administration of justice.

IABPA Preamble: …members have a responsibility to… the justice system…

KBI 1.1: …constantly remain aware of the importance of our duties and how those duties affect the criminal justice system…

SCAFO: I dedicate myself to the efficient and scientific administration thereof in the interest of Justice…

SOFT G Prof 6: Take appropriate action if there is potential for, or there has been, a miscarriage of justice due to circumstances that have come to light, incompetent practice or malpractice.

Suspects typically do not know what a real report looks like. There is no need for investigators to create a fabricated report from a real one and risk having it misconstrued by elements of the justice system as a real report. And, there is certainly no reason to use the signature of a real analyst—any signature would do. Heck, NO signature would probably do—what difference would it make to a suspect?

Summary

These are the primary reasons why it might be unethical, according to some documents, to comply with the investigator's request. If you can think of other reasons, or if you believe that such actions should not be unethical, please feel free to share your thoughts on the ethics forum: www.ethicsforum.cacnews.org.

ACRONYMS

ABFT	American Board of Forensic Toxicology
AFTE	Association of Firearm and Tool Mark Examiners
ASCLD G	ASCLD (Guidelines for Forensic Laboratory Management Practices)
ASCLD/LAB	American Society of Crime Laboratory Directors / Laboratory Accreditation Board
ASQDE	American Society or Questioned Document Examiners
CAC	California Association of Criminalists
ENFSI	European Network of Forensic Science Institutes
FSReg	Office of the Regulator, Home Office, UK
IABPA	International Association of Bloodstain Pattern Analysts
IAI	International Association for Identification
KBI	Kansas Bureau of Investigation
NWAFS	Northwest Association of Forensic Scientists
SCAFO	Southern Calif. Assoc. of Fingerprint Officers
SOFT	Society of Forensic Toxicologist's
SWFS	Society for Wildlife Forensic Science
TIAFT	The International Assoc. of Forensic Toxicologists

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