

The CACNews

News of the California Association of Criminalists • Fall Quarter 2015



greg
LASKOWSKI



CAC President

**... a representative
of the CACLD
approached the
board expressing
an interest in the
two organizations
continuing to
hold contiguous
meetings whenever
possible.**

Reflections on Another Excellent Meeting

Greetings! As I pen, or rather word process this message to you, the Thanksgiving holiday will be upon us. It is getting close to December, and here in California we will soon begin to see the changes in weather. No longer will it be shorts weather for golf or tennis, at least where I live.

Only a month ago, we were hosting the joint meeting of the NWAFS and CAC at the Double Tree Hotel in Rohnert Park. I honestly feel that we had a successful meeting, and the boards of directors of both organizations did an outstanding job, especially if you consider that most of the host committee members had to plan the meeting from remote locations. Go to Meetings made it possible for us to communicate with one another and get things done. Over a 170 people attended the joint meeting with about 23 vendors exhibiting. Workshops, for the most part, were well attended. We had many outstanding presentations in our technical program with speakers from both associations presenting. Of particular merit was a most heartening keynote address from a man falsely convicted of rape and his accuser. Also, there was a masterfully prepared address about the CAC Code of Ethics given by John Murdock. The wine and cheese reception in the restaurant/bar at the Graton Resort and Casino was well attended. The venue was very accommodating with numerous big screen TVs available which held everyone in rapt attention as the World Series was televised. Although there was a plethora of *Giants* fans, generally well behaved, one could hear the occasional root from the less than a handful of Kansas City *Royals* fans. Was it a coincidence that the *Royals'* uniforms bore such a likeness to *Dodger* uniforms? Oh well, in the end, congratulations to the SF *Giants* as they ended up winning the Series. The following evening we enjoyed a wonderful banquet and awards dinner in the foothills above Rohnert Park at the Paradise Ridge Vineyard. The food was sumptuous and the wine paired well with the evening's meal. The banquet was an opportunity for members from both associations to mingle and compare notes. One of the interesting developments to come out of our meeting is that a representative of the California Association of Crime Laboratory Directors approached the board expressing an interest in the two organizations continuing to hold contiguous meetings whenever possible. This is a win-win situation for everyone involved, including the vendors, who also favor such an arrangement.

This past couple of months has seemed like the holidays to me in that our past-president bestowed a number of items on me that I am sure were bestowed upon him, and onto the past-president before him, and so on and so on. The articles of which I speak were gifts given to the CAC from our friends across the pond, the Forensic Science Society, now known as the Chartered Society of Forensic Sciences. Over the years, as the CAC and CSFS held joint meetings, gifts were exchanged by each organization. These gifts, at least those given to the CAC, were handed over to the president on each occasion. I suppose that the predecessors before me gently smiled and dutifully assumed the care of these gifts, perhaps proudly displaying them in their homes or offices during their term of office. Then each May they graciously handed them off to their successor. So, in my home office, proudly stacked on my desk, are the items handed over to me by my predecessor. There was no note or description tag that explained these items though most of the items bear some inscription. Included are the following: a presidential gavel and plaque from 1970; a blue presidential ribbon from 1994; a CAC medallion, that may have been previous-

please turn to page 4

FIRST QUARTER 2015



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

The CACNews

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Analytical Pairing

Linda Phelps introduces us to "Trevor," a beagle trained in accelerant detection. They were at the fall meeting representing Fire K9.org. *More photos inside.*

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LASKOWSKI

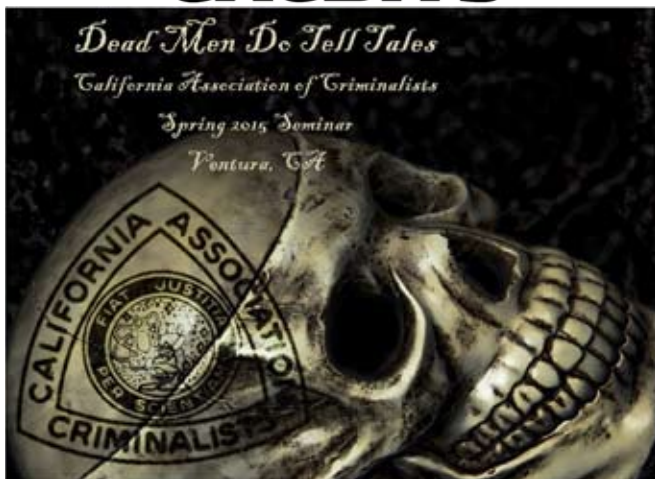
ly affixed to said ribbon now attached to the CAC livery collar bestowed upon each president; a ceremonial dagger with leather scabbard (I think it's really a letter opener) from 2006; also from 2006, a large silver plated bowl; a silver platter from 2011 (it seems this platter had some previous utilitarian purposes as I had scrub off some of what I suspect were petrified remnants of hors d'ouvers so that it would be suitable for photographing); and a cut glass sculpture celebrating ten years 1999 to 2009 presented to CAC in England in 2013. There is also an engraved metal stamp of the CAC logo with no markings. Late this summer, I decided to photograph these items not only for posterity but perhaps for insurance purposes. I forwarded these photographs to our illustrious *CACNews* editor to print them in this issue for you to enjoy. History or tradition will not be repeated by me as I think the proper home for these venerable gifts will be in the CAC archives on the campus of California State University at Los Angeles. There, they will be safe and secure for future generations of CAC and CFSS members to enjoy. What tales they may tell! Oh, the Coconut and the Livery Collar, those I will bestow them upon my successor in May.

As I close, I want to wish all of you a joyous and fulfilling holiday season. New Year's will soon be upon us bringing along with it some old challenges and, and I am sure, many new challenges. We of the CAC should embrace the future and what it holds. Thus, we are ready to face those challenges. God bless!

Guy







Next Seminar et seq.

Ventura Co. SO lab, Spring 2015; San Mateo Co. SO lab, Fall 2015; LAPD lab, Spring 2016. The Fall 2016 meeting will include the "North-South Swap" and will be hosted by Riverside DOJ lab, then SFPD, Spring 2017.



Poster Sessions at the Fall Meeting

(above) From ICITAP (Univ. of Sci. and Tech., Houari, Algeria) Abdallah dahmani presents, "Analysis of Synthetic Drugs by Differential Scanning Colorimetry: Case of Amphetamine Type Stimulants."

(below l-r) From CSU Sacramento, Reanna Rusnak, Diana Martinez and Shae van Ommen present, "Methods to Recover DNA from Bloodstains concealed by Paint."



Don Jones Retires

After 34 years Donald Jones is saying farewell to the Scientific Investigations Division of the San Bernardino Sheriff's Department. We hope to see more of him at the CAC seminars now that he has so much "free time."

Lab Retriever 2.2

The Scientific Collaboration, Innovation & Education Group (SCIEG) has released Lab Retriever 2.2. This is a major update with several added features, including the ability to run samples with 4 unknowns in the denominator. This algorithm also speeds up the program to the extent that all calculations are virtually instantaneous. Download Lab Retriever 2.2, as well as the updated manual and full release notes from www.scieg.org at no cost. This project is supported in part by the CAC's McLaughlin Endowment.



Membership Secretary Michelle Halsing wears her "retailer" hat when she operates the CAC merchandise table.

FEEDBACK ◀.....▶

Printing Press History

The gallery of presidential gifts [page 4] is impressive. Perhaps I can shed some light on the CAC logo "stamp." I believe that's actually a "letterpress block" which would be loaned to the print shop when reprinting CAC award certificates and other official documents featuring our logo. Having one of those blocks made up once and using it over and over would save a lot of set-up costs when printing on a press. It may not be a presidential gift, but it is an historically important artifact.

John Houde

greg
MATHESON



CAC Editorial Secretary

**Using your mind,
experiences and
talents to analyze
physical evidence
and to not allow
your mind to be
overshadowed
by the amazing
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The Problem with Blindly Using Technology

The October joint CAC/NWAFS seminar was exceptional. I might be biased because the boards of directors and various members of the CAC and the NWAFS were the hosts, but beyond that, the venue was good, the program and workshops were varied and of high quality and attendance was high. I had some concerns due to the lack of a local host agency, but thanks to the efforts of the CAC Seminar Planning Committee and all the other volunteers in our associations it came together.

One of the highlights for me was our keynote speakers. Jennifer Thompson and Ron Cotton. Their story is compelling and something every forensic scientist should hear. It puts into perspective our role in the criminal justice system and reinforces our duty as the gatekeepers of the physical evidence and to not be influenced or biased by anything except what the evidence tells us, or doesn't tell us. If you want to read more about their story, go to www.pickingcottonbook.com/home.html.

This issue's soapbox is a familiar one in my editorials but one that was highlighted for me by a personal experience at our seminar. The importance of thinking like a scientist. Using your mind, experiences and talents to analyze physical evidence and to not allow your mind to be overshadowed by the amazing and capable instruments and tools we use to do our jobs. The founders of our profession didn't have the technology we have at our fingertips today. They had a handful of chemical tests, rudimentary instrumentation, the power of observation, and an inquisitive mind. Of course, with our technology, our results can be more definitive, more precise and generally provide more information for the investigation and adjudication of crimes. However, it can be too easy to use technology as a crutch and fail to use our powers of observation and our inquisitive minds to fully develop information.

Now, on to my story/example where I used technology as a crutch that resulted in nothing catastrophic, but definitely annoying.

On Wednesday, October 22, 2014, our keynote speakers arrived at the seminar venue. They were special guests and several of the board members wanted to take them out to dinner. Thanks to Yelp, and a board member with knowledge of the local area, we chose a middle-of-the-road casual dining place called *Johnny Garlic's*. There were enough of us that we needed to go to the restaurant in two cars. I was the navigator in the car with our special guests.

GPS is a wonderful thing; it can take you to wherever you want to go. Just enter in the address and you are off to your destination. We agreed to meet at *Johnny Garlic's* in Santa Rosa so after entering the address into my iPhone we were on our way. It had been a long travel day for Jennifer Thompson and Ron Cotton and they were both very hungry. Luckily my phone told me our destination was only 20 minutes away (with traffic). Our plan was to get them in their seats at the table as quickly as possible to enjoy a relaxing dinner. The directions were precise and clear and the traffic lighter than expected. Before long my phone announced our destination was on our right. Unfortunately, the only thing to our right was an industrial building sporting signs for indoor batting cages. But this had to be the place, GPS took us right here. We checked the address, drove around the buildings and still no *Johnny Garlic's*.

The fault turned out to be mine, not my instruments and technology. The GPS worked flawlessly. The address given by Yelp was correct, unfortunately, the *Johnny Garlic's* at this location had closed though there was another one in Santa Rosa. I had relied blindly on technology. I made an assumption as to which place we were going and I failed to confirm the correct address with the driver of the other car. After getting the correct address and fifteen minutes of backtracking we joined the rest of our dinner party and had a lovely evening with our guests.

I understand this is a simplistic example but it would not have happened without the blind use of modern technology. Years ago I would have met with the driver of the other car, confirmed the address of where we were going, asked for directions from someone who had been there before or found the location on a map, or ultimately just followed the person who knew where they were going. But I had GPS and an address so the rest of the process didn't seem necessary.

In the laboratory, instrumental data should not be taken blindly. Controls and standards check the quality of the data, but it also takes the mind of the criminalist to understand what they are analyzing, what it means, and if it makes sense in the context of the evidence.

Have a great holiday season and a fantastic New Year.

A handwritten signature in dark ink, appearing to read 'Greg'.



A Hairy Question

Is it appropriate, for the purpose of entertainment, to share images of a hilariously hirsute autopsy subject with clerical staff?

Scenario

Your normal course of duties occasionally brings you to the lab's front office. During one such foray, you find some of the clerical staff are loudly exclaiming and laughing while gathered around another criminalist. Looking more closely, you discover that he is showing them hardcopies of autopsy photos—evidence from a former cold case that is going to trial. Their laughter is directed at the autopsy subject's thick coat of body hair. The criminalist admits that the reason for showing the photos to clerical staff was solely to entertain them. Is the criminalist violating any ethical concepts?

Discussion

One possibly violated ethical concept might be confidentiality. Nearly half of 37 forensic science ethics documents that were reviewed were found to say something about maintaining confidentiality. If the clerical workers have no professional reason to view the autopsy photos, then confidentiality may have been violated. But, confidentiality is predicated on delineating which groups are and are not privy to certain information. The lab would need policies in place that clearly indicate that clerical staff should not have been viewing the autopsy photos before one could state that confidentiality was violated. Without such policies, it could be argued that clerical workers, in the normal course of their duties, may have access to autopsy photos and confidentiality was, in fact, maintained.

Another potentially violated concept: maintain evidence integrity. Unnecessary handling could lead to the photos becoming accidentally compromised. This concept was found in twelve of the 37 reviewed documents, although not in the CAC's. Examples are: ASCLD/LAB *Guiding Principles*, 11; Soc. of Foren. Toxicologists (SOFT) G Comp 3; and Int'l Assoc. for Ident. (IAI), 2.04: "Give utmost care to the treatment of any samples or items of potential evidentiary value to avoid tampering, adulteration, loss or unnecessary consumption."

Am. Board of Criminalistics (ABC), Rule 3: "Treat any object or item of potential evidential value with the care and control necessary to ensure its integrity."

But, let's consider a version of the scenario in which neither of these concepts apply. Assume that the viewers of the photos are authorized and have a professional reason to view them, and they do so in a manner that best ensures their integrity. Are there any concepts that might discourage holding the autopsy subject up to ridicule for a physical trait displayed on the autopsy table?

Perhaps, although finding someone guilty of violating these principles would be a judgment call. Some of the clauses that might apply are those that address professionalism, acting with integrity, and not violating the public trust.

Professionalism (explicitly mentioned in eleven documents, but not in CAC's or ASCLD/LAB's). The argument could be made that using autopsy photos for entertainment lacks professionalism. Some examples are: Mid-Atlantic Assoc. of Foren. Sci. (MAAFS), 1.1.3; Midwestern Assoc. of Foren. Sci. (MAFS),

p3: "In all professional actions, it is the responsibility of all members to conduct themselves in a manner that is above reproach, even if particular situations are not covered by this Code."

Society of Forensic Toxicologists (SOFT), §C: "I agree to conduct myself in a professional manner..." §6: "Refrain from exercising professional...conduct adverse to the best interests and objectives of the Society."

Acting with integrity. Four documents state this explicitly (not the CAC's or ASCLD/LAB's). An example is taken from the document of the CAC's sister organization: Foren. Sci. Soc. (FSS), 2: "...conduct themselves honourably in the practice of their profession...have special regard at all times...to the maintenance of the highest standards of...integrity."

Not violating the public trust. Six documents state this explicitly (not the CAC's or ASCLD/LAB's). Examples are: ABC, Rule 15: "Carry out the duties of the profession in such a manner so as to inspire the confidence of the public." FSS, 2: "...have special regard at all times to the public interest..." Int'l Assoc. for Ident. (IAI), 1.08: "Conducts oneself personally and professionally...in a manner that does not violate public trust."

In Closing

I would not want to leave anyone with the impression that case information should best be made available only on a need-to-know basis. The morning-after impromptu hallway meetings, where the details of last night's scene are divulged to any passer-by who cares to listen, offers a unique educational opportunity. Such exposure can help provide lab employees with a grounding in forensic science that can better help them to fulfil their duties. Sharing case questions and findings with co-workers, regardless of whether they are working the same case, can bolster the quality of analyses. Ready communication between sections, including clerical, can improve overall case management. The underlying principles are education and improved functioning of the lab.

But, in this scenario, the underlying principle was entertainment. It could be argued that this, too, is valuable in that it can promote camaraderie, thus improving the day-to-day functioning of the lab.

What do you think? Is it appropriate, for the purpose of entertainment, to share images of a hilariously hirsute autopsy subject with clerical staff? Lend your thoughts to the CAC Ethics Forum at www.ethicsforum.cacnews.org.

[Editor's Note: I am strongly against utilizing crime scene evidence, of any type, for entertainment purposes. I feel that though it may not violate specific articles in codes of ethics, it is unprofessional and is inappropriate. As a retired laboratory manager, I would also like to add that although the conduct described in this column's ethical scenario may not explicitly violate professional codes of ethics, the conduct has a high probability of violating your governmental agency's rules of conduct. By showing autopsy photos in a group setting to non-technical staff that would not normally view photos of this type as part of their job, the criminalist could arguably be creating a hostile work environment. There may be clerical staff who are present who would be both offended and sickened by viewing such photos, but didn't feel comfortable saying so in a group of peers. By initiating such activity, the criminalist could be setting himself or herself up for being the subject in a personnel complaint investigation. Evidence should stay with the appropriate parties and all employees should be sensitive to others.]

Wood Hardness via the Lowly Steel BB

Lucien C. Haag

Abstract

Wood hardness has traditionally been measured by a method developed by the Austrian scientist, Gabriel Janka. His method and the wood hardness scale which bears his name is of primary value to companies and individuals associated with furniture manufacture, wood flooring, and certain musical instruments. But his method is not particularly useful or useable by forensic scientists with a need to evaluate the hardness of various types and forms of wood encountered in casework.

The method described here defines wood hardness on the basis of the impact velocity necessary to embed a standard 5.3-gr, 0.173-inch steel BB flush with the surface of the wood sample.

The value and usefulness of this proposed technique is twofold. The first is to provide a means of comparing and verifying that any test specimens of wood selected for terminal ballistic testing are equivalent to the evidence wood. Such equivalency would be critical if bullet penetration depth or velocity loss as a consequence of projectile perforation were important in a case. The second situation involves bullet deflection tests by a specific species of tree branches collected in another state for which Janka hardness values were not known. This species does not grow in the author's home state of Arizona, nor could a Janka hardness value be found for it. It was therefore deemed desirable to find a suitable local substitute of equal or slightly greater hardness for some additional deflection tests. The technique described here allows for an informed selection of a local tree as well as a means of verifying the comparability of evidence wood and test samples.

Keywords: BBs, Daisy 880 Powerline®, Janka Hardness Test, penetration, terminal ballistics, wood hardness

Introduction

The Janka Hardness Test for wood was developed in 1906 by the Austrian wood researcher, Gabriel Janka (1864 – 1932). In that year he wrote a 40 page book entitled, *Die Harte Des Holzes* (translation: The Hardness of Woods).

The Janka Hardness Test provides a measure of the hardness of wood, lumber or timber. The higher the number on the Janka scale, the harder the wood. This, in turn, provides some idea of the durability of a particular wood species; how easy or difficult it will be to crush under loads, dent, ding, mar or scratch. This is of importance if one is using solid wood for certain applications such as interior flooring, exterior decking, stair treads, tabletops, desktops, kitch-

en and workbench countertops. Wood hardness also plays a role in a variety of musical instruments and the tone they produce. It is also a very good indicator of how easy or difficult a particular wood species will be to nail, screw, sand, saw, plane, carve, polish and work in general. One might also extrapolate this to the ability of bullets to penetrate wood and any relationship between penetration depth and impact velocity.¹

The results of the original test were given in metric units of force required to embed an 11.28 millimeter (0.444 inch) steel ball into the wood to half its diameter (0.222 inches). This seemingly odd procedure was chosen so that the result would leave an indentation with a cross sectional area of exactly 100 square millimeters (approximately 9/64 square inches). In 1927 the American Society for Testing and Materials (ASTM) standardized the test requiring the results to be given in pounds of force to accomplish the same end result.

The hardness of wood frequently varies with the direction of the wood grain. Testing can be done on the tangential or the radial surface of a piece of wood typically with different results. Side hardness occurs when the force is applied perpendicular to the grain. All Janka hardness values listed on the Internet and most other sources are of side hardness.

The standard sample as indicated in ASTM D 143² is to have a 12% moisture content, be clear (no knots), a solid block of wood having the dimensions of 2" x 2" x 6" long and the

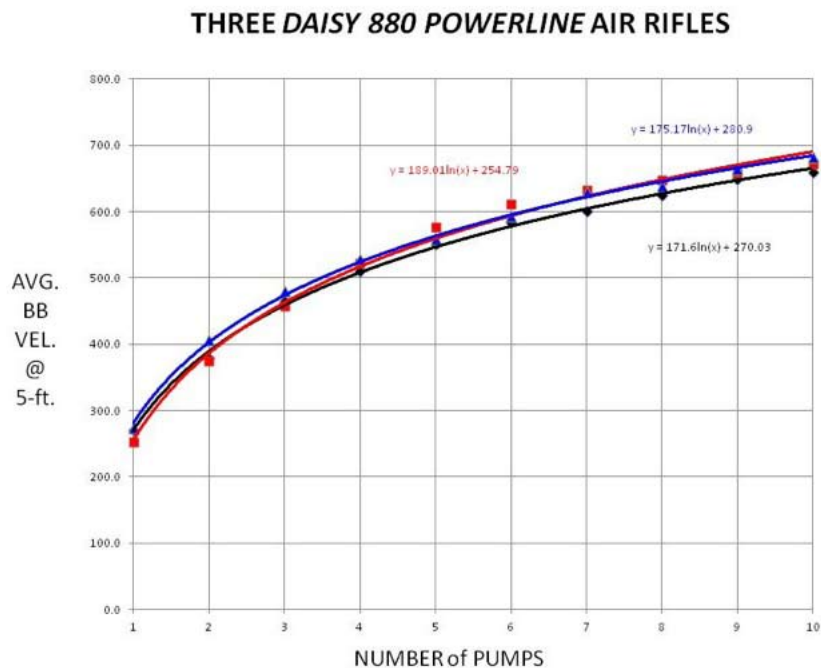


Figure 1

3 Daisy 880 Powerline Air Rifles, Zn-Plated 0.173" Diameter Daisy BBs (Avg. 5.25gr). Calibrated CED Chronograph At 5-ft. Each Data Point = 5 Shot Average



Figure 2a
Initial Testing by Wyatt Haag



Figure 2b
Data Collection. Shots into pine and Douglas fir.



Figure 3
Final Setup at FSSI.

rate of loading set at 1/4" per minute. A more accessible, and enlightening publication is one available on the Internet from the U.S. Department of Agriculture entitled *Janka Hardness Using Nonstandard Specimens*.³ A reading of this thirteen-page document should convince most any forensic scientist of the impracticability of either obtaining actual Janka hardness values on evidence items, or being able to use published Janka hardness values in any valid or meaningful way. This publication cites two references which indicate a predictable relationship between the Janka hardness value and the specific gravity, yet there are a number of wood species which have the same Janka hardness values, but all with different densities (which would include specific gravities) of the particular wood. [See Douglas Fir and Alligator Juniper in Table 1] If the latter is correct, then there is no reliable means to convert Janka hardness values to wood density or vice versa. Common sense should also alert us that the density (and specific gravity) of any target material is certain to affect projectile penetration and/or the amount of velocity loss during the perforation of such common things as a tree, a tree branch, wooden siding, wall studs or fence boards.

There is a final word of caution—the same species of tree can have a different hardness depending on where it has grown consequently relying on published hardness values for a particular wood encountered in casework is ill advised.

From the foregoing it should be easy to see that no crime lab is likely to acquire the necessary equipment to carry out Janka hardness tests on finely prepared wood samples with a regulated moisture content whether they are evidence samples or potential comparison samples. Moreover, finding a Janka hardness value in the literature for an evidence wood does not help in insuring that a comparison sample selected for terminal ballistic testing is equivalent. Then there is the matter of no Janka hardness value for a particular evidence wood. Table 1 provides some examples. No hardness values have been found in an Internet search for the wood of most of the common trees in the author's home state of Arizona. The highly controlled conditions of the Janka test call for a moisture content of 12%. Criminalists presented with an evidence section of wood siding or a fence board in which a projectile is embedded are not going to have an easy way of measuring moisture content, nor for inducing or introducing a 12% moisture content even if their laboratory possessed a Janka Hardness Test apparatus. All of the foregoing required and resulted in a new approach for evaluating and comparing wood hardness in casework.

Why the lowly BB as a testing device?

Common steel BBs have a number of advantages for terminal ballistic testing. As spheres, they cannot yaw during the penetration process. Consequently, they follow straight paths in homogeneous media such as ballistic gelatin and ballistic soap, and have been promoted and used for many years for calibrating these soft tissue simulants.⁴ Since they are made of steel, they do not deform upon striking tissue simulants, glass, sheet metal or even the hardest wood. Their diameters, and therefore their weights, are well controlled and uniform. If one had any doubt, the diameters of these inexpensive projectiles could easily be measured, or their weights checked before use. Moreover, an inexpensive launching device is also readily available: any multi-pump air rifle designed to shoot BBs. The author's choice is a *Daisy 880 Powerline*®. Muzzle velocities as high as 800fps can be achieved with one of these

air rifles if they are pumped well beyond the manufacturer's suggested maximum of 10 pumps. Figure 1 shows some typical results for three of the author's Daisy 880 air rifles. Several previous articles by this writer describing the performance and ballistic behavior of common steel BBs may be of interest to some readers not otherwise familiar with them in a forensic context.^{5,6,7}

Procedure: Wood

Square or rectangular sections of a number of wood species were mounted against a support medium and orthogonal to the future flights of standard 5.3 gr steel BBs. The test setup is quite simple requiring a ballistic chronograph, a multi-pump 0.177-caliber air rifle, pen and paper and a shooter. This project was initiated by this writer's 11-year old grandson for his first serious ballistics experiment. Figure 2a and Figure 2b show Wyatt Haag's basic setup and data collection for multiple shots into sections of common pine (from Home Depot—species unknown) and Douglas Fir. Subsequent to these initial tests, this writer positioned a pair of calibrated ballistic chronographs immediately in front of each target sample of wood. [See Figure 3] As with Wyatt's tests, the velocity of the first shot was chosen to be sufficiently high so that it was likely to penetrate into the target beyond a depth that would leave it flush with the surface of the target. This was done to avoid having the BB rebound back towards the shooter; a situation that might occur if one started with a very low impact velocity and worked upward. If the "high velocity" shot does indeed bury the BB well into the target, the number of pumps is sequentially reduced until the embedded BB is perfectly flush with the impact side of the target. This is twice the penetration depth used by Janka with his 11.28mm steel sphere, but it was found to be easier to determine that a BB was flush with the target surface than only to the depth of half of its diameter (0.0865 inches). Moreover, depending on the nature and response of the particular wood, some BBs would fall out after penetrating to such a shallow depth. The impact velocity necessary to accomplish this (hereafter designated V_f for the impact velocity to embed a steel BB flush with the impact surface) becomes the measure of hardness by this method. If the wood is uniform, replicate tests should produce comparable results for V_f . Variations in hardness will be apparent if one finds substantial variation in the values for V_f , and in such situations an average value for V_f with a standard deviation for n tests should be reported. Figure 4 shows the initial results for a white pine board depicted in the previous figure. From a brief study of Figure 4 it can be seen that two pumps of the Daisy 880 produced an impact velocity of 386fps which resulted in the BB penetrating to a depth below the surface of this white pine board, and the impact velocity of 265fps from one pump left the BB raised above the surface of the board.

From an inspection of Figure 1 it should be apparent that large velocity differences occur with each pump at the low end (left side) of the plot. This creates a potential problem for soft woods such as that depicted in Figure 4. For this situation, a trial and error method for "fractional" pumps has been worked out. This requires a small wooden dowel rod of

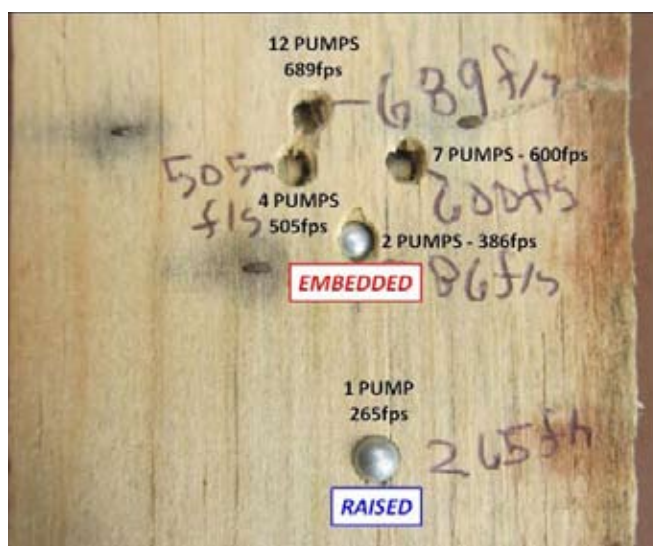


Figure 4

Initial results: White pine board.



Figure 5

Method for fractional pumps.

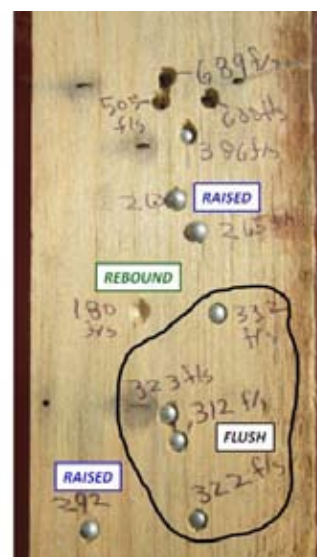


Figure 6

*Final results:
White pine board.*

*A specimen of this same white pine board was weighed and then dehydrated by repeated, short intervals in a microwave oven until no further weigh loss occurred. This allowed an estimate of its moisture content to be determined at 9%.

Haag, cont'd.

approximate 0.13-inch diameter and .177-caliber felt cleaning “pellets.” These are shown in Figure 5. The felt cleaning “pellet” is inserted a selected distance down the barrel from the muzzle end (thus the marks on the wooden dowel rod visible in Figure 5) followed by a BB (muzzle elevated). The number of pumps just in excess of that which left the embedded BB raised above the wood surface are introduced into the air rifle, keeping the muzzle pointed up so as not to lose the BB. With the target ever so slightly higher than the shooting position, the muzzle is slowly lowered and the shot fired. Alternate seating depths or an additional pump of the air rifle may be needed to refine the impact velocity to achieve V_f . Figure 6 shows the final results for the white pine board using “fractional” pumps. This figure also shows that the method is capable of generating consistent, reproducible results for V_f .

The matter of moisture content was deemed of interest in this study since it is effectively unknowable in an evidence or reference specimen and could therefore be raised as a complicating factor in the comparison tests proposed here.

To evaluate this parameter, a section of the previously shot white pine board was cut off and immersed in water for 24 hours. This produced an 80% weight gain and a 2% increase in the thickness of the white pine board. The water-saturated board was allowed to drip dry for 30 minutes in a 40% relative humidity, 70°F environment then shot multiple times using the same setup and equipment as shown in Figure 3. The effect of water saturation of this wood was to lower the impact velocity necessary to embed a steel BB flush with the impact surface. V_f went from the “dry” average of 322fps to approximately 290fps as a result of this extreme situation.

TABLE 1
ARIZONA WOODS (TREES)

Common Name	Scientific Name	Janka Hardness(lbf)	Density(g/cc)
Douglas Fir	<i>Pseudotsuga menziesii</i>	660	0.45-0.53
Ponderosa Pine	<i>Pinus ponderosa</i>	460	0.31-0.45
Quaking Aspen	<i>Populus tremuloides</i>	350	0.40
Alligator Juniper	<i>Juniperus deppeana</i>	1160	0.47-0.53
Utah Juniper	<i>Juniperus osteosperma</i>	---	---
Hackberry	<i>Celtis pallida</i>	---	---
Mesquite, common	<i>Prosopis velutina</i>	---	---
Desert Ironwood	<i>Olneya tesota</i>	---	1.20
Catclaw	<i>Acacia greggii</i>	---	---
Blue Palo Verde	<i>Cercidium floridum</i>	---	---
Foothill Palo Verde	<i>Cercidium microphyllum</i>	---	---

TABLE 2
BOARDS

Common Name	BB “Hardness”(V _f)
Pine* (Wyatt Haag)	420fps**
Douglas Fir (Wyatt Haag)	430fps**
White Pine	322fps
Pine*	380fps
Birch	565fps
Poplar	590fps
Redwood	350fps

*Species unknown — construction material

**Uncalibrated chronograph

TABLE 3
1-INCH DIAMETER BRANCHES

Common Name	Scientific Name	BB “Hardness” (V _f)
Alligator Juniper	<i>Juniperus deppeana</i>	530fps
Utah Juniper	<i>Juniperus osteosperma</i>	610fps
Mesquite, common	<i>Prosopis velutina</i>	640fps
Foothill Palo Verde	<i>Cercidium microphyllum</i>	630fps
Southern Live Oak (TX)	<i>Quercus virginiana</i>	640fps
Emory Oak (AZ)	<i>Quercus emoryi</i>	600fps

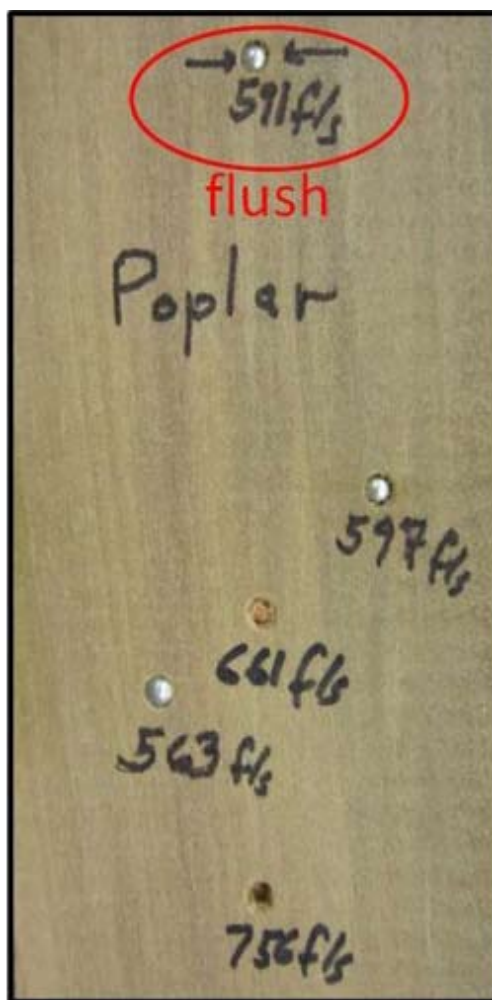


Figure 7
Standard steel
BBs into poplar.

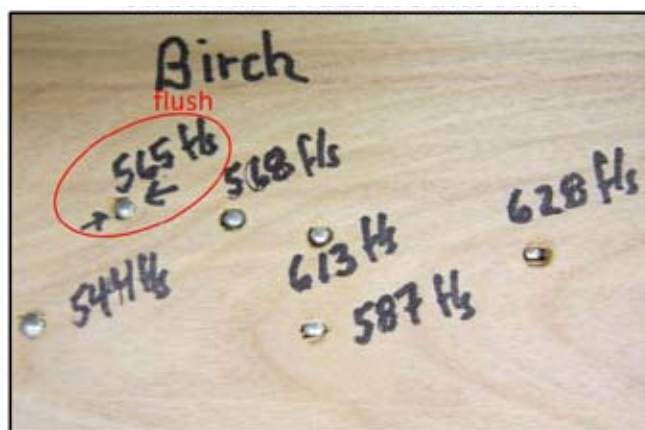


Figure 8
Standard steel BBs into birch.

Branches

The need to obtain some measure of hardness of tree branches came about during some practical testing related to the assassination of President Kennedy. One of the recurring hypotheses in that case has to do with Oswald's missed first shot. There was (and is today) a large Southern Live Oak tree below, and a little to the west of the 6th floor window of the Texas School Book Depository. This tree interrupted Oswald's view of the presidential limousine shortly after it turned onto Elm Street. It has been suggested that the bullet from the first shot struck one or more of the branches of this tree just as the President was about to disappear under it, and that this bullet was deflected to the extent that it not only missed the president but also the presidential limousine. This interesting idea was evaluated by this writer with the help of longtime AFTE member Lannie Emanuel who resides in the Dallas area.

Even though the specific gravity and density of the wood had greatly increased due to the absorption of water, the water had softened the wood and reduced its resistance to BB penetration. This affirms a previous statement that that hardness, density and/or specific gravity do not necessarily have a direct relationship to projectile penetration. Insofar as actual casework is concerned, information regarding the environment from which the evidence sample came and the conditions at the time of the incident, e.g., raining, hot and dry, etc., should be sought. Empirical testing with reference specimens of the same wood subjected to various degrees of humidity or dryness can always be carried out to address this parameter in the event it becomes an issue.

Figure 7 and Figure 8 provide examples for a series of shots into sections two harder woods (poplar and birch) in which the V_f values are considerably higher than for the pine samples. Table 2 lists the V_f results for the boards tested by this method.

Finally, a number of interesting calculations can be carried out by those with a penchant for math. For example, the kinetic energy (KE) and/or the energy density (KE/cross-sectional area) can be calculated from V_f , the weight of the BB and its area of presentation to the target. The cross-sectional area of a standard 0.173-inch diameter BB is 0.0235 in². The volume of displaced wood remains constant for all targets so long as the BB is embedded flush with the surface of the target and therefore need not be measured or calculated.



Figure 9a

He collected and shipped freshly cut Southern Live Oak branches of various thicknesses to this writer. These were quickly "consumed" after numerous projectile strikes, deflection measurements, and Doppler radar trackings of 6.5mm Carcano bullets fired from this writer's Model 91/38 Carcano

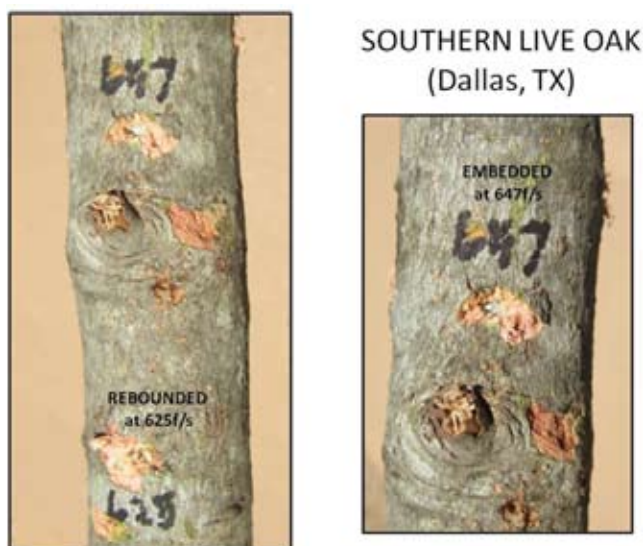


Figure 9b



Figure 9c

Figure 10
95 gr., .380
auto bullet in a
3/4 in. redwood
fence board.



rifle. The results of this testing will be presented in Part 4 of the author's series on the JFK assassination. A suitable local (Arizona) species of tree of comparable hardness was sought for some additional testing to obviate the need for another shipment of branches from Dallas. Comparisons between the Southern Live Oak branches and several local tree species via the BB method solved this problem.

Embedding BBs in branches present a little greater difficulty than flat pieces of wood in part due to their cylindrical shape. The difficulty with branches can be overcome by multiple shots with any off-center shots being discarded.

Any inference that one might draw from Janka Hardness values for the parent tree cannot, and should not be applied to branches of the same tree since there is no reason to believe, or data to support such a notion. This was a moot point in the testing related to the JFK assassination since no Janka Hardness value could be found for the Southern Live Oak (*Quercus virginiana*) or any of the common deciduous trees in the Sonoran Desert of Arizona. [See Table 1] Figure 9a provides two examples of some local branches selected for BB "hardness" tests. Figure 9b illustrates some test results into fresh Southern Live Oak branches and Figure 9c shows the results for Mesquite branches. Of the various species tested, Mesquite was found to be comparable in hardness to the Southern Live Oak based on the BB hardness tests. Table 3 summarizes the approximate BB "hardness" results for the species of branches tested.

Hypothetical Case Example

Consider a situation where an investigator submits a section of a Redwood fence in which a standard 95-gr .380Automatic bullet is embedded. [See Figure 10] He believes that this bullet's failure to perforate this relatively soft wood is the consequence of a long distance shot and would like some idea of the distance from which such a shot would have to have been fired in order to produce this minimal penetration in a 3/4 inch redwood board. The starting point in any effort to answer his question begins with a reasonable estimate of the bullet's impact velocity, and this can only be derived from some empirical testing with downloaded ammunition and specimens of 3/4 inch Redwood boards which possess the same hardness as the evidence board. In this hypothetical case, only a small section of the redwood fence board containing the embedded bullet was collected, and by the time the question of a long distance shooting was raised, the fence had been replaced with one of different construction. Simply obtaining some redwood boards of the same thickness from a lumber yard and shooting them with a series of download .380Automatic cartridges to find the impact velocity that produces the same amount of penetration leaves one open to challenge regarding the equivalency of the target boards. The BB hardness tests presented here offers a means of comparison and a degree of assurance that the evidence and target items are comparable insofar as their hardness and resistance to projectile penetration. Figure 11 illustrates multiple BB strikes to a sample of 3/4 inch Redwood fencing selected for terminal ballistic tests. If suitable for this purpose, the BB "hardness" test of the evidence section of fence should also produce a flush BB with an impact velocity of approximately 350fps.

Summary

The Janka method for determining wood hardness and published Janka values for wood hardness are of little to no



Figure 11

use to the forensic scientist presented with physical evidence consisting of some form of wood, yet the question of wood hardness stands to be important in those cases where wooden objects have been penetrated or perforated by projectiles. A simple and inexpensive means of testing and comparing the hardness of wood encountered in casework and reference specimens used in subsequent terminal ballistic testing has been presented. This stands to be useful where certain terminal or intermediate ballistic events involving wood or wood products have forensic significance. The results of any empirical testing on reference samples may be legitimately criticized and challenged if the proponent of ballistics tests is unable to show that the evidence sample and the reference samples are comparable in the relevant physical properties to include hardness and resistance to projectile penetration.

It is hoped that others interested in this subject will further evaluate this alternative method for assessing wood hardness and carry out similar experiments.

Acknowledgments

Special thanks are extended to Lannie Emanuel of Double Oak, Texas for his arboreal skills and willingness to supply the author with fresh, home-grown *Quercus virginiana* branches.

Thanks also go to grandson Wyatt Haag of Mountain Green, Utah for his careful documentation and testing in an initial evaluation of this procedure.

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Essay

Disturbing

Raymond J. Davis

A recent Federal criminal case in Boise, Idaho involved four business men charged with running a Ponzi scheme. The CEO, his two sons and the company attorney were charged with inflating the company's net worth taking millions from investors. The FBI's lead investigator was instrumental in bringing dozens charges against the four of them.

The trial was proceeding normally when some jurors noticed her continuing to glance down at her lap. Some jurors thought that she might have been using her cell phone. They brought their concerns to the bailiff who relayed those concerns to the trial judge. Sometime during her testimony, the judge asked her if she had been using her cell phone while testifying.

"No, sir, I was just turning it off," came her reply.

"You weren't using it to communicate with anyone?" the judge asked. (I'm not sure if this was asked outside the presence of the jury or not.)

"No, sir," was her reply.

Before she left the witness stand, the judge confiscated her cell phone. Later that evening she killed herself with her service pistol.

Telephone records indicated that she had sent four separate text messages while testifying. Only one dealt with the case at hand. That conversation concerned itself with the length of her testimony and how much longer she thought she'd be on the witness stand.

The judge informed the defense attorneys that the agent had lied under oath. The court was faced with a difficult decision: Inform the jurors or keep them in the dark until they reached a verdict. I'm sure the court was also concerned about a defense motion for a mistrial. The judge decided it was best not to inform the jurors until after they had reached a verdict.

After the verdict, the judge informed the jury of the agent's death.

It's clear from this tragic case that witnesses shouldn't lie or embellish their testimony. However, I recall several occasions early in my career when young district attorneys asked incredibly stupid questions that would torpedo their cases had I answered truthfully. Never having received any formal training in courtroom testimony, I was at a loss in how to deal with this vexing problem. I certainly didn't want to face the wrath of an irate deputy DA for sabotaging his case. I admit there were times when I provided carefully crafted answers that I now regret.

The message from this case and from my own experience is simply this. "Tell it like it is and let the chips fall where they may." If you have said or done something wrong, admit it. Period. Your career and your life are not worth any trial that you testify in.

I leave you with a quote from Robert Louis Stevenson. "It's better to be a fool than to be dead."

Raymond Davis is the author of *Parabellum*.



Joint Meeting in Rohnert Park— "Forensics Uncorked"

The Fall 2014 joint seminar between the Northwest Association of Forensic Scientists and the CAC will go down as perhaps the most successful non-laboratory hosted meeting in our history. The hard-working boards of both professional associations prepared a welcoming venue and a stimulating lineup of workshops, vendors and speakers.

(Left) CAC President-Elect Chris Coleman supervises his workshop in bullet trajectory while NWAFS President Kathy Kittell measures angles with John Murdock. *(bottom right)* Kathy is welcomed to the meeting by CAC President Greg Laskowski. *(below right)* Todd Weller, Michelle Halsing and Eric Halsing assume the registration table duties. *(below left)* The full CAC Board of Directors takes time out for a photo. *(clockwise from left)* Michele Halsing, Chris Coleman, Greg Matheson, Meghan Mannion-Gray, Eric Halsing, Kirsten Fraser, Alice Hilker, Mey Tann, Greg Laskowski.



W · O · R · K · S · H · O · P · S

DNA

Applications of UV, Visible & IR Lighting: Foster & Freeman

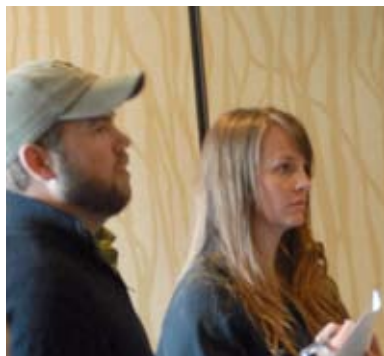


Lean Manufacturing & 6 Sigma Quality Improvement

Future Trends in Forensic DNA Technology: Thermo Fisher

quantitative samples
laboratory research
scientific
ethics Mexico members within extraction
after Model protein fingerprints found other
State twists data latent system
casings work regarding
days hair using kit finding
crime study law use present California all
tape one known profile used time
match based case MZ some lab different
each while identification PrepFiler high duct
hits years same Since science well recovery trial
residue three glass evidence results biological
CODIS human Working
quality number material allows two CAC
through presentation County scene
between analysis cases
Defendant compared Firearm
forensic

Bullet Path Reconstruction



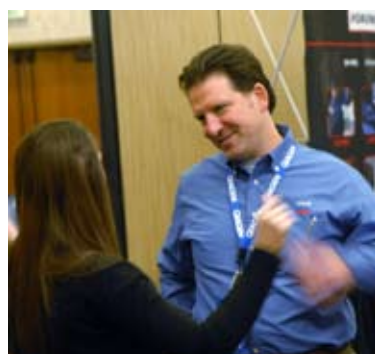
Burning Questions in Fire Debris Analysis



(top row) Linda Phelps and a beagle named Trevor; (middle left) Veronica Barclay and Bella, a black lab; (middle right) Troy Morrison and a yellow lab named Pyro. (left) James Hoult explains microbial degradation of gasoline; (right) Workshop instructor John DeHaan makes his point while Katherine Hutches listens.



Vendor Exhibits



“Picking Cotton” authors Jennifer Thompson & Ronald Cotton



Honors & Awards



"Would all the past CAC presidents please come forward?"



Banquet: Wine, Dine & Selfies!





Picking Cotton

Jennifer Thompson and Ron Cotton

Jennifer Thompson incorrectly (and unintentionally) identified Ron Cotton as the man who sexually assaulted her. Years later Mr. Cotton was exonerated. Their story is described as "One man's fight for truth. One woman's struggle to recover. Two lives forever connected. A true story of forgiveness and hope". This will be a powerful firsthand account of false conviction and how it affects everyone involved.

Can We "See" Innocence?

Linda Starr and Melissa O'Connell

Since its inception in 2001, The Northern California Innocence Project (NCIP) at Santa Clara University has won victory for 17 people. In some of those victories forensic science played a pivotal part. Linda Starr, legal director of NCIP, will provide an overview of NCIP's work, and identify some lessons learned from working with forensic scientists, as well as some thoughts for forensic scientists working with NCIP. Staff attorney Melissa O'Connell will then present the NCIP exoneration of Johnny Williams. In Mr. Williams' case, exculpatory biological evidence was inadvertently missed during initial testing. Thirteen years after his conviction, the evidence was re-examined, biological material was discovered and DNA testing proved his innocence. His exoneration demonstrates how re-testing can be critical to uncovering the truth.

Turns Out you CAN do PCR in a Barn:

Exceeding the Limits of Science-A Case Report

Lynne Burley and Norah Rudin

David Camm is a former state trooper who was acquitted and released in October 2013 after his third trial on charges of murdering his wife and two children on September 28, 2000. In 2005, another suspect, Charles Boney, was identified by way of a CODIS hit to crime scene evidence analyzed by the Indiana State Police. Boney was found guilty of the killings, but maintained that he and Camm acted together. In Camm's third trial, the prosecution theorized that Camm either hired or assisted Boney in the homicides; the defense contended that Boney acted alone. A private DNA laboratory, IFS, was hired by the defense to test hundreds of crime scene samples. We were retained by the prosecution team to review the work conducted by IFS. Our critical review addressed various technical issues including accreditation, proficiency testing, validation, case approach, interpretation, and statistics, as well as the overall efficacy of the DNA testing. We will present the various issues that arose in each of these areas, and the ultimate impact of the new DNA analysis on the third trial.

Missing Persons Cases in Mexico and Missing Migrant Workers in the US

Lance Gima and Eberth Castanon

Workers from Mexico have been traveling to the United States for decades. However, the complexities and arguably failure of the United States' guest worker programs have led to large numbers of Mexican nationals illegally entering the US. In order to avoid being apprehended, migrant workers, once in the US, travel through remote areas of California, Arizona, New Mexico, and Texas to find work. Unfortunately many of these "undocumented border crossers" or UBC's,

never reach their intended destinations and their bodies are left in the southern deserts of the United States. Some have called the death of so many human beings in our deserts a humanitarian crisis, however the identification of the found human remains is the responsibility of local coroner's offices and that identification often relies on forensic DNA technology. This presentation will offer statistics regarding the number of human remains found and some estimates as to the cause of death. Additionally, this presentation will include the viewpoint of the Mexican Migrant Worker Identification problem from a DNA Technical Leader from Chihuahua Mexico. The presentation will also summarize a project, funded by the National Institute of Justice that establishes a partnership between five Attorney Generals' Offices in Mexico and the Conference of Western Attorneys General, to acquire reference samples from families of the missing migrant workers in Mexico for analysis in the US with the resultant profiles entered into CODIS. The project also includes the submission of human remains samples found in Mexico thought to be from US citizens, submitted for analysis in the US with resultant profiles entered into CODIS. Finally, the problem of database fragmentation in Mexico will be discussed.

The Egg Roll DUI Defense:

Challenges and Lessons at DUI Trial

Debrah Stonebarger

After attending a holiday social gathering on December 21, 2012, where he had been eating and drinking, the Defendant Coulter Mann was traveling northbound on Highway 101 in far northern California.

At approximately 8:54 PM, and at the moment of receiving a cell phone call, the Defendant drifted into the southbound Lane of Hwy 101, causing a fatal head-on collision with the driver traveling south. Due to the condition of the Defendant's vehicle after the collision, and his broken ankle, he had to be extricated from the vehicle and transported to a local hospital for emergency treatment. His legal blood draw occurred at 10:55 PM and was a 0.20%.

The Defendant was an Assistant Principal at a local middle school and was a very well-liked and well-respected member of the community, as was his entire family. During trial in January of 2014, the Defendant and his two attorneys, one of which was the Defendant's father, and a toxicologist defense expert put forth the defense that the Defendant was not impaired at the time of the collision, and that the cell phone call was the sole cause of the collision. The Defendant had admitted to drinking several high ABV beers and eating food. Of specific interest to the Defense was that the Defendant had consumed 6-7 egg rolls just prior to arriving at his social gathering. According to the Defense the multitude of ingredients in the egg rolls slowed down the Defendant's absorption to the point that he had not absorbed enough alcohol to be at or above a 0.08% BAC at the time of the collision so he was not impaired. The lack of impairment was supported, from the Defense's perspective, by lack of perceived impairment by lay personnel, an emergency medical responder, and the physician at the emergency room where the Defendant was treated for his injuries. The Defense further opined that the impact of the collision caused the quantity of unabsorbed alcohol that was in his stomach to be finally pushed into the small intestine where it was all absorbed by the time of the legal blood draw.

CACNews Update

Greg Matheson, CAC editorial secretary and John Houde, CACNews art director will share with attendees the impressive history of the CACNews and the importance of members and non-members to support the production of the CACNews through technical, editorial and special interests submissions.

Let's Get Naked

Mignon Dunbar

Many analysts may rely on biological screening results to determine the next step in their analysis, whether it is taking a sample through the DNA process or stopping testing. In this presentation, interesting results regarding presumptive saliva negative cases will be shared to show one analyst's life altering experience. Curious as to how other analysts would have processed certain samples, a survey was created and the results will also be shared.

Progress Towards a GelSight-Based 3D-Topography Imaging and Analysis System for Firearm Forensics

Ryan Lilien, Todd Weller, Pierre Duez, and Marcus Brubaker

We will present recent results obtained using TopMatchGS-3D, an accurate, fast, and low-cost 3D imaging and analysis system for cartridge casings [1,2]. The prototype scanner incorporates the GelSight retrographic sensor to measure 3D surface topography at a resolution of 1.4 microns per pixel [3]. Last year we introduced the base scanning system and presented initial results obtained using a small dataset. In this presentation we will describe results from a larger dataset of over one hundred 9mm Luger firearms, representing more than 20 firearm manufacturers and 7 ammunition types. The casings represent the types of evidence and test-fires seen in a real-world setting. They contain milled, filed, granular, and striated marks as well as poorly marked casings. Data collection took place both in-house and at several collaborating California crime labs.

Our algorithm's match score is a function of the similarity between the casings' true breech-face impression and their aperture shears. For breech-face impression comparison, automatically identified distinctive features (corresponding to informative microscopic toolmarks) are used to match and align two casings. By requiring spatial coherence of matched features, the methodology is able to strongly indicate when two casings were fired through the same firearm. In contrast to cross correlation based methods, feature-based techniques compute the match score using only the portions of the surface identified as informative (ie., the matching microscopic toolmarks). The algorithm compares aperture shears by first extracting the linear shear profile and then aligning two profiles while accounting for baseline correction and warping. The scoring function is a confidence score where each candidate match (pair of casings) is scored based on the likelihood that the two casings were fired through the same firearm. Unlike other systems, the TopMatch score reflects the true confidence of the match. In addition, the system can explain the rationale of its decision, providing interpretability to the match score.

The TopMatch system is able to match casings with high accuracy. True positives (known matches) have extremely high scores while True negatives (known non-matches) have low match scores. There are virtually no false positives (ie. known non-matches mistakenly identified as a match).

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3D Laser Scanning for Crime and Accident Reconstruction

Craig Fries

3D Laser Scanning has revolutionized all phases of accident and crime reconstruction. The Documentation of physical evidence is now so accurate and complete that experts can work directly with the 3D Working Model years after the fact as if they were working in the crime scene itself. Measuring millions of data points in mere minutes, a modern 3D Laser Scan is capable of capturing every inch of a scene with precision and detail sufficient to locate the smallest evidence.

A typical scan contains approximately 10,000,000 data points - a level of detail akin to having the entire scene and all the physical evidence extracted and delivered to the experts lab for thorough and exacting analytical forensics. Harnessing these rich datasets with the analytical power of modern computers allows unparalleled depth of Analysis. From determining the velocity of vehicles involved in accidents, deriving critical values from video footage and scene photographs to exacting line of sight calculations and ballistic trajectory trace back, the 3D Working Model provides the expert with a toolset based upon physical evidence that was previously unavailable.

One of the fastest growing areas of growth is the use of the 3D working Model to analyze opposing expert's conclusions and opinions. Being able to plug the underlying assumptions back into the 3D Working Model allows the expert to determine how well, or not, the results match the physical evidence.

Once the dataset has been utilized to complete a thorough investigation and derive fact-based conclusions supported by the physical evidence, the final stage of the process also benefits greatly from the underlying 3D Working Model. The Visualization of the dataset and the conclusions via 3D computer animation and simulation allows the expert to present their findings in a clear, compelling manner to the trier of fact. Using the laser scan data directly in the visualization provides a level of realism and accuracy that far exceeds what was possible before. In addition to being visually compelling in its own right, the scan data gives the expert the opportunity to animate over the exact same dataset upon which their calculations were performed. This increases the accuracy of the final visualization, eliminating the need to resort to mere illustrations and elevating the animation to a true engineering visualization. This ability to maintain the highest level of scene fidelity increases the likelihood that the animation will be admitted into the trial setting and significantly helps combat the CSI-effect often seen in urban courtrooms. Today's juror comes to the trial with an expectation, born from TV and other media that the facts and findings will be presented in a visually compelling manner. Mr. Craig Fries pioneered the use of the 3D Animation and 3D Working Model in forensics in the US. In this presentation he will demonstrate its use via compel-

ling graphics and analyses in all three phases of the reconstruction process, pulling from 20 years of experience and over 1000 cases, all while maintaining a 100% admissions trial record.

Synthetic Cannabinoids and Cathinones:

A Case Study from Seizure to Trial

Brittany C. Huntington

Synthetic cannabinoids and cathinones, often referred to as “Spice” and “Bath Salts,” have plagued law enforcement investigators and controlled substance forensic chemists for over five years. These substances started off as legitimate research chemicals in academia, but were adopted by users for the high they produced while skirting state and federal controlled substance laws. As these substances slowly became controlled substances, suppliers and distributors would quickly switch to different, but similarly structured substances. The new substance would often differ from the controlled substance by only a few atoms, different ring structures, or as positional isomers, which would allow for its distribution without expressly breaking the law.

While the current laws have had difficulty keeping up with the massive number of synthetics being trafficked and identified, most of these compounds could be prosecuted under The Federal Analogue Act. Passed in 1986, the Act allows any substances “substantially similar” in chemical structure to a Schedule I or II controlled substance, and which have an activity or is represented to have an activity similar to a Schedule I or II substance, to be charged as such. Because of the huge influx of these substances as drugs of abuse, and the serious concern they have caused nationally, prosecuting attorneys have begun to prosecute these cases using The Federal Analogue Act.

This presentation will follow one large synthetics importation and distribution case through the seizure, analyses, and trial phases, and will include many of the chemical issues encountered.

Adverse Effects of Blanket Quality Assurance Criteria on the Interpretation of Sample-to-Sample and Lab-to-Lab Variable DNA Data

Alan Keel

It is generally accepted that the data generated from an experiment speaks for itself and that while there may be disagreement as to the interpretation of a particular result, the disagreement can be articulated and each argument will be given the weight it commands. Because of the virtually universal adoption of PCR-based DNA analysis of “forensic unknowns,” together with the sensitivity and personal discrimination provided by this universal technology the FBI QA Standards, CODIS Operating Procedures, and Scientific Working Group Guidelines define and prescribe various criteria that attempt to assure the quality of experimental data generated by accredited and CODIS-participating laboratories. However, the interpretation of that data will vary from sample to sample and from lab to lab, even with the same sample. That inherent and unavoidable variation allows for QA criteria intended to strengthen our reliance on the data to be applied in ways that undermine or mischaracterize the sample data or even ignore the sample data. Some case-specific examples including pre-trial and post-conviction evidence admissibility, mixture-interpretation avoidance, and CODIS eligibility as the result of the misuse of QA criteria will be presented.

I-502 and the Washington State Patrol

Crime Laboratories

Catherine Dunn and Jason Dunn

Washington state voters chose to change the law in 2012 by supporting Initiative 502 and making recreational marijuana use legal for adults. This vote generated several changes including a legal redefinition of marijuana, the Washington State Patrol (WSP) Crime Laboratories’ approach to marijuana analysis, and regulation of marijuana sales. The WSP Crime Laboratories reviewed available literature, designed an analytical protocol for quantitative analysis of delta-9tetrahydrocannabinol, and worked through the legislative process to alter a major flaw in the wording of the initiative. As the law was altered in 2014, the WSP Crime Laboratories continue to adapt procedures to meet the demands of the law regarding marijuana analysis.

Rip Roaring RAPIDS: Evaluation and Comparison of the Integen X RapidHIT 200 vs. Traditional DNA Techniques for Crime Scene Samples

Alice Neumann Hilker, Lilia Patino, and Tan Ho

Based on an actual crime scene scenario, we compared and evaluated the RapidHIT DNA instrument’s performance versus traditional DNA lab techniques in the areas of time spent and concordance of data. Is it realistic to expect that crime scene personnel can load questioned samples into the RapidHIT at the scene and generate results during the course of an active scene and review the data upon arrival at the laboratory? Can mixed source samples that require differential extraction be loaded into the RapidHit instrument after an evaluation for sperm content and after the first part of the differential is performed?

In a brief evaluation period of two days, the San Mateo County Sheriff’s Office was provided with one kit (28 sample cartridges) for evidence runs and one cartridge of 7 samples to run as a QC and reference run. Drawn blood and other forensic samples were used to re-create an actual crime scene. Duplicate swabs were collected allowing one analyst to run the questioned samples using the RapidHIT in “real time” while a second analyst used the laboratory’s validated protocol to run the second swabs in “real lab time” at the laboratory. We compared the speed of analysis as well as the quality of the results obtained.

L.A. County Sheriff’s Oldest Cold Hits

Susannah Knetchel and Amber Sage

The Los Angeles County Sheriff’s Department Scientific Services Bureau has been uploading forensic unknown profiles to CODIS since 1994. In that time, we have entered 8,152 profiles. Since our first hit in 1987, we have had 3,864 Cold Hits, or matches, to convicted offenders, and 1,164 case to case hits. A review was undertaken of the oldest Cold Hit cases worked by our laboratory. The criteria for the case review was one, it had a profile uploaded to CODIS, two, it hit on a convicted offender, and three, it was otherwise unsolved until the hit. Ten of the oldest cases that were reviewed will be presented. These cases were sexual assaults and homicides, and span 1972 up to the early 1980s. The focus of the presentation will be the individual case circumstances as well as the unique obstacles that older evidence can present when DNA analysis is necessary. The initial laboratory work will be contrasted

Abstracts, cont'd

against the different techniques and technologies that were used in the CODIS era to obtain a profile suitable for upload. When possible, the outcome of the cases will be presented as well as any additional work that was done on the case after the Cold Hit.

CAC Awards Overview

Tobi Kirschmann

A brief introduction to the various awards and honors that are available to members of the CAC. Each year, the CAC recognizes its newer members, journeyman-level members, and "seasoned" members with a variety of awards, some that include significant financial benefit. However, there are relatively few members that either apply or are nominated to receive these awards. This talk hopes to inform members that these awards exist, what their benefits are, and encourage members to apply for them.

History and Development of the CAC Ethics Enforcement Procedure

John Murdock

In October 1977 the CAC BOD adopted a revised policy on ethics enforcement entitled "Handling of Charges of Unethical Conduct; Procedures Regarding the Ethics Committee" in order to provide "firm guidelines". These procedures were to provide: 1) for the "full and knowledgeable participation of the membership in the proceedings" and 2) that "the burden of proof that a charge of ethical violation is founded rests solely with the Ethics Committee". Some other association business also occurred in October 1977. An ethics matter surfaced which proved to be the catalyst for an in-depth critical analysis of the propriety of the newly adopted ethics enforcement procedure. As a result of this critical analysis, the newly adopted ethics enforcement procedure was modified to handle the October 1977 ethics matter. In June 1979, a three person ad hoc committee was formed to draft a revised policy for enforcing the CAC Ethics Code. The final draft of this policy (the 5th one) was adopted by the CAC Membership on November 7, 1980 at the fall CAC Seminar in Yosemite Valley.

Meeting the AB 1517 Goals: The OPD Lab Streamlined Processes

Jennifer Mihalovich and Helena Wong

AB 1517 encourages "evidence of sexual assault", which includes sexual assault evidence collection kits, to be submitted to the laboratory within 20 days of an incident OR for specimens collected at the hospital to be sent directly from the hospital to the crime lab within five days of the incident. The Bill encourages profiles from such evidence to be uploaded to CODIS within 120 days.

Alameda County has been in the untested sexual assault evidence collection kits (SA kit) spotlight for the last several years. The number of untested kits reported in the news ranged from 644 to over 2000 just for Oakland. The Oakland Police Department Criminalistics Laboratory has been analyzing SA kits under various programs for years. On December 31, 2013, the Department determined that approximately 220 victim SA kits had yet to be analyzed. Two different case management approaches were utilized to eliminate this backlog. One approach was to assign four scientists to work 80 kits in six weeks and the second was "All Hands on Deck." The backlog elimination date

was set -August 31, 2014; all eligible DNA profiles have been submitted to CODIS as of August 22, 2014.

A RADS program was implemented within Alameda County on May 1, 2014 in which one to three samples were submitted by the hospitals directly to a lab. Since the

OPD lab had streamlined SA kit processing, the Department elected to analyze contemporary SA kits within 20 business days. The OPD Laboratory approach was to analyze all potentially probative swabs and underpants. The PODS, teams of Forensic Biology scientists, acquired the kits from Property and Evidence Unit on Monday or Tuesday of the week with a CODIS eligible DNA profile entered into LDIS within ten business days of the receipt of the kit. The laboratory has met this goal and continues to meet the submission deadline of CODIS eligible profiles within the 120 days as recommended by the Bill.

Burn Barrel Baby

Heather Campbell and Kerry Russell

On August 18, 2012 a mother "freaked out". She admitted something bad had happened to her daughter and that she had made it worse. This presentation will cover the crime scene of a 2-year-old child burned in a burn barrel.

Synthetic Cannabinoids Investigation/Court Proceedings

Joseph E. Andreoli

This presentation will cover an investigation into the manufacturing and illegal sales of synthetic cannabinoids occurring in Boise, Idaho in 2011. The presentation will take a detailed look into the investigation leading up to search warrants, the execution of those search warrants, dismantling of the manufacturing operation and arrests, as well as the court battles that were fought regarding the investigation as well as the legality of the synthetic cannabinoids being used in the manufacturing process.

Effects of Different Swabbing Solutions on DNA Recovery

Nicole Grosey, Edward Panacek, MD, William Green, MD, and Cassandra Calloway

Recovering high yields of DNA from low copy number samples and samples with small amounts of DNA are important in forensic investigations. Swabbing methods and swab material have both been analyzed to improve DNA recovery, however, swabbing solution has not been thoroughly studied. Sterile water, currently, stands as the swabbing solution used for collecting potential DNA from surfaces, although, it has never been determined if it is better than other solutions. Detergents are known for their solubilization characteristics and may recover more DNA. Sterile water and five detergents (Triton-X 100, SDS, Tween 20, Formula 409, and Simple Green) were compared in their ability to recover DNA from a known saliva stain deposited on a glass slide, plastic cup, and glass bottle using quantitative PCR. Two different concentrations (2 and 3%) of SDS and Triton-X 100 were studied as well.

No differences were found between the eight different swabbing solutions. The five different detergents were not any more successful than water at recovering DNA from saliva deposited on a glass slide, plastic cup, and glass bottle. Even with a sample increase for water, SDS 3%, and Triton X-100 3%, the DNA yields were still similar to each other.

High variability was seen within solutions and between substrates with high standard deviations. Statistical signifi-

cance was not present between solutions. Therefore, water should continue to be used as the swabbing solution for collection of saliva. In addition, on average, DNA recovery from the glass bottle and the plastic cup was less than DNA recovery from the glass slide. The glass bottle and plastic cup were technically more difficult to swab due to the curved shape of the substrates, which resulted in the lower DNA recovery.

The Effect of Cyanoacrylate Fuming on the Bluestar Reaction

Trevor Allen and Rebecca Nelson

Cyanoacrylate (CA) fuming is sometimes performed while processing the interior of vehicles to preserve latent prints. Occasionally reagents such as Bluestar Forensic are also employed to detect latent bloodstains inside these vehicles. A white polymer coating is applied to surfaces within a vehicle upon CA fuming, which gave rise to the question if it interfered with the Bluestar reaction. An experiment was devised to determine if the Bluestar reaction would be inhibited by CA fuming on several different substrates commonly found in vehicles. Different blood dilutions were applied to these substrates and the Bluestar reagent was applied to sample sets before and after CA fuming. These results were photographed under the same settings and light conditions. Adobe Photoshop and Adobe Lightroom were used to evaluate the RGB color values associated with these reactions to determine if the color of the reaction was altered due to CA fuming.

The Good News/Bad News Caper: A Cold Case Collaboration Crossing State Lines in Search of a Serial Killer

Alice Neumann Hilker and Brittany Baguley

This presentation will discuss the investigation of the homicides of six young women in Northern California and Nevada in the early months of 1976. Our investigation spans nearly forty years and ten law enforcement agencies. It involves forensic evidence, profiling, re-testing, canvassing, and novel approaches to investigating cold cases.

Are Monozygotic Twins Distinguishable by Hair Protein Profiles?

Pei-Wen Wu, Robert H. Rice

Hair evidence can be an important element in criminal investigations because it is commonly recovered at crime scenes and is easily transferred between individuals and inanimate objects. Microscopic comparison and DNA analysis of hair shafts both provide useful information for identification of suspects. However, since nuclear DNA is generally lacking from hair shafts, the information gained is of limited discrimination ability. This project applies protein profiling to augment the value of human hair evidence based on findings that inbred mouse strains are distinguishable by profiles of their hair shaft proteins. Recent work has also shown that individual humans are distinguishable by their hair protein profiles, but whether identical (monozygotic or MZ) twins can be distinguished is uncertain. MZ twins are genetically identical, but significant phenotypic discordance can exist. Such differences may be attributable to epigenetic effects from developmental or environmental influences that alter gene expression. Therefore, this project explores the relative contributions of an individual's genetic constitution and development/environment to protein expression. Our study

was conducted in a MZ twin cohort of 8 adult pairs through the cooperation of the California Twins Research Registry, and questionnaires regarding subject lifestyle and diet were also obtained. We collected samples of scalp hair for protein extraction followed by shotgun mass spectrometry analysis and spectral matching to the human protein database. Since certain peptides can overlap among the keratins, data were analyzed as either weighted-normalized or exclusive spectral counts to avoid this problem. Using either approach, twin pairs were readily distinguishable from each other by their protein profiles, consistent with previous findings comparing unrelated individuals. By contrast, distinguishing between the two twins of an MZ pair was difficult. Using exclusive spectral counts, the most discriminating option, profiles of several proteins distinguished between individuals in a single twin pair, and the twins in only one pair were distinguished by profiles of as many as three proteins. These results mimicked those with siblings of inbred mice, analogous to human MZ twins. Unlike dermatoglyphs, which are generated by developmental processes, hair protein profiles appear to be under strong genetic control and thus are much less discriminating among MZ twins than fingerprints. A role for epigenetic effects of ageing cannot be ruled out but, if it occurs, it appears to be uniform within twin pairs. Epigenetic effects of development and other environmental influences appeared small in this cohort. Thus, our preliminary data support the possibility of establishing a protein database for distinguishing among individuals (except MZ siblings). In conducting this study, an improvement in methodology was introduced. Instead of using sodium dodecyl sulfate to disrupt the hair structure and permit efficient disulfide reduction and alkylation, sodium dodecanoate was employed. This related detergent was removable by extraction with organic solvent after acidification, avoiding the ethanol precipitation step in our original protocol for detergent removal. This innovation is anticipated to permit processing of much smaller hair samples than were previously practical.

Quantitative Algorithm for Digital Comparison of Torn and Cut Duct Tape

Alicia Alfter, Fred Tulleners M.A., and William Ristenpart Ph.D.

The NRC established a need at the national level for the validation of forensic science methods. Currently, duct tape end matching is based on human judgment with no quantitative criteria for identification. In this research, the needs of the forensic science community are met by minimizing human contextual bias via a quantitative imaging algorithm, and corresponding mathematical methods to extract the edge profiles of torn and cut duct tape samples. The detected edges of the exemplar and an arbitrarily large number of test samples are algorithmically subtracted from one another. The resulting residuals are then used to calculate the sum of squared errors (SSE), a succinct metric that allows quantitative comparison of possible matches. A best or "most likely" match is determined by identification of the match with minimal SSE. The digital results are compared to a prior study of the same set of duct tapes that were visually assessed by a group of three researchers as part of an error determination study, thus providing a quantitative estimate of the respective error rates.

The MATLAB® software platform is used to code a series of mathematical functions in order to extract useful information from an image or a series of measurements. This research uses MATLAB® to obtain an edge profile of the duct

tape image and performs analysis on the data. A digital image of the duct tape is collected using a high-resolution scanner at 1,200 DPI. A digital profile of the tape is developed using the tear region and the parallel edges of the duct tape. The software performs a series of automated tasks which include the software setting threshold levels, performing an ad hoc smoothing mechanism to remove the yarns, and converting the coordinate points into a graphical format to assess the degree of difference along the tear region. The results are displayed on a color map graph showing the difference of the SSE values for a matching piece of duct tape in comparison to the other duct tape pieces in the database. The user examines the residual calculations and determines whether one pair is quantitatively a better match than other pairs examined. The results establish that if other pairs of known matches have SSE values in the same range, it strongly suggests that it is the correct match. Using our quantitative mathematical algorithm, we will discuss the capability of the algorithm to identify matching specimens in set of 200 duct tapes of a particular brand, look at overall residue values by themselves as an indication of uniqueness, and quantify the number of false positives and false negatives. This study will compare and contrast our results with the findings of prior researchers who conducted a manual comparison of these same duct tape specimens. This prior study was published in JFS 2012 by McCabe et. al. The end product is a quantitative and statistically rigorous guideline for end match comparison.

Validation of Automated PrepFiler vs Organic Manual Extraction

Luis Sandoval, Steven Lee, Brooke Barloewen

The isolation of DNA from forensic samples is the most imperative, yet challenging, step in DNA profiling. Biological samples at crime scenes can be found in a variety of conditions which can expose the DNA to inhibitors and nucleases; all which impede STR Profiling. We investigated the efficiency of manual DNA Organic Extraction as compared to that of the new PrepFiler kit, which uses magnetic particles to bind and elute DNA, and is coupled with an automated robotic system. We also introduced the use of the Lysep Column which simplified the separation of a substrate from the lysate, thus minimizing human manipulation of a sample. We hypothesized the PrepFiler Extraction kit will improve the quantity and quality of DNA isolation in comparison to Organic Extraction. Blood and saliva samples in a variety of concentrations were extracted and evaluated in a substrate study to address sensitivity, reproducibility, and accuracy. The performance of both extractions were assayed using qPCR to compare quantities of DNA isolated, and STR amplification to detect any inhibitor or nuclease contamination. Results showed traditional manual techniques had greater recovery and sensitivity compared to PrepFiler at higher concentrations, but at lower concentrations the PrepFiler kit outperformed by yielding higher quantity and quality of DNA. Future work includes testing PrepFiler efficacy on other biological samples, and samples with nucleases and inhibitors. Overall future laboratory workflow would benefit from using the robotic system coupled with the PrepFiler kit, especially in cases with limited DNA samples, and would allow for higher throughput, reduction of PCR inhibitors, and eliminate use of toxic Phenol:Chloroform:Isoamyl Alcohol.

Development and Preservation of Environmentally Insulted Fingerprints Through the Use of Columnar Thin Films

Zachary C. Goecker, B.S., Stephen E. Swiontek, M.S., Akhlesh Lakhtakia, Ph.D., D.Sc., and Reena Roy, Ph.D.

Traditional fingerprint-development techniques do not generally protect the latent residue. This is especially disadvantageous in cases where genetic material in the residue may be useful for identification. Fingerprints that have been exposed to environmental insults such as ultraviolet radiation, extreme temperatures, humidity, and time could yield degraded and low amounts of DNA. That in turn may generate incomplete DNA profiles. By analyzing genetic degradation through quantitative Polymerase Chain Reaction (qPCR) of the DNA recovered from fingerprints, development techniques can be compared in regards to their ability to protect the molecular integrity of genetic material.

The fingerprint-development techniques that are used in this research are cyanoacrylate fuming, black-powder dusting, and columnar-thin-film (CTF) deposition. The CTF technique involves the resistive heating of a material inside a low-pressure chamber. That material evaporates and condenses conformally as a tight stack of upright nanoscale columns atop a fingerprint. The CTF entombs the entirety of the residue, serving as a barrier between the residue and the environment, and potentially preserving DNA in the residue.

Latent fingerprints were harvested from multiple donors and placed on one-squareinch brass substrates. These samples were subjected to two types of environmental insults (quantified by temperature and humidity) for certain durations. An equal number of samples were then developed by the CTF, cyanoacrylate fuming, or black-powder-dusting techniques. The quality of each of those developed fingerprints was determined subjectively using a comparative-quality method employed previously in this laboratory. The quality was also assessed using an objective-quantitative assay formulated through the use of Universal Latent Workstation (ULW) and other software.

Biological material from the developed fingerprints was collected using a wet swab and subjected to low-template DNA-analysis methods involving centrifugal separation of cellular components, previously used in this laboratory. DNA was then quantified using the newly developed Trio kit from Applied Biosystems® and the InnoQuant™ kit from InnoGenomics. The yield of DNA from fingerprints, which had been aged for defined periods of time, allowed the researchers to compare the degree of degradation due to the chosen development techniques. The collected data was also beneficial to explore the relationships between the development techniques, environmental insults, and the degree of DNA degradation.

The results from this research indicate there is a sufficient quantity of DNA in multiple latent fingerprints to analyze DNA amplicon length ratios. Thus, it is possible to determine the amount of degradation in the sample. Also, DNA was successfully extracted from beneath the CTF, pointing to the potential of the CTF development technique in the biological sector of criminalistics. Current data shows that the post-development quality of fingerprints previously exposed to -10°C decreases as the duration of exposure increases, although development itself can either improve or worsen the quality, depending on the parameters used for the development technique.

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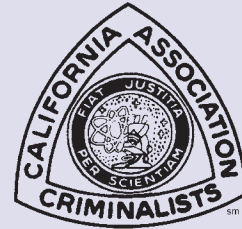


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