

The CACNews

News of the California Association of Criminalists • Fourth Quarter 2009



The President's Desk

About That NAS Report ...

By now, everyone should be familiar with the National Academy of Science's (NAS) Report: *Strengthening Forensic Science in the United States: A Path Forward*, released this past February. In 2007, Congress convened the National Academy of Sciences' Committee on *Identifying the Needs of the Forensic Sciences Community* (NAS Committee). The purpose of the NAS Committee was to study the current status of the delivery of forensic sciences and make recommendations to ensure that its use is science-based, reliable and ultimately just. A panel of seventeen individuals, including scientists and lawyers, prepared the report issued in February 2009. The study and subsequent report was requested by the Consortium of Forensic Science Organizations (CFSO), an association of seven forensic science professional organizations: American Academy of Forensic Sciences, American Society of Crime Laboratory Directors, American Society of Crime Lab Directors / Laboratory Accreditation Board, Forensic Quality Services-International, International Association for Identification, National Association of Medical Examiners and Society of Forensic Toxicologists. The CFSO recognized changes in staffing, training, equipment and methods were needed to improve the delivery of forensic science services to the criminal justice system. In addition, consistent funding sources need to be identified to effectively achieve the improvements.

The National Academy of Sciences was directed by Congress to assess the quality and needs of the nation's crime laboratories. The report has generated significant publicity, from articles in magazines such as *Popular Mechanics* and *Scientific American*, newspapers around the country and law journals. Of course, to catch the reader's interest, the titles of these articles are usually negative, such as the article in the August 2009 issue of *Popular Mechanics*: "CSI Myths: The Shaky Science behind Forensics." One can easily see how this may cause a forensic scientist some distress. We are scientists who must make the most of whatever evidence has been collected. We often work under unpleasant conditions, such as crime scene in the middle of the night after only a few hours sleep. We are required to analyze the scene, often with little preparation or knowledge of the events. We must recognize the necessity to not only develop a plan to locate crucial evidence needed to investigate the crime, but also properly prepare the documentation needed to tell the crime scene's story to a jury many times years in the future. We need to examine and analyze evidence without compromising its integrity. We are required to have an in-depth understanding of the scientific processes that we utilize and be able to relay the significance of the results in both written and oral form. We must ensure that the methods we use are validated and proper controls are in place to guarantee the results are accurate. Though in real life an individual forensic scientist does not perform all of the tasks portrayed on popular television shows, we must possess a multitude of skills that we must be able to perform at any given time.

Not everything in the NAS report was negative. The value forensic science brings to the criminal justice system was recognized (and not just DNA!). Practicing forensic scientists have, for years, recognized the need for increased standardization and have voluntarily participated in accreditation and certification programs. The report mentions the disparities between operations in different jurisdictions and agencies. We are certainly familiar with that situation. We see the differences in services provided by agencies and recognize training opportunities are determined by local funding sources and organizational structure.

To address some of the recommendations in the NAS Report, the National Science and Technology Council (NSTC) Committee on Science (COS) established a Subcommittee on Forensic Science. The charter for the subcommittee

Not everything in the NAS report was negative. The value forensic science brings to the criminal justice system was recognized...



Mary Hong
CAC President

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Editorial Secretary Greg Matheson
(323) 415-8112
B8927@lapd.lacity.org

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

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

Webmasters Mark Traughber, Eric Halsing
(951) 361-5000
mark.traughber@doj.ca.gov

Advertising Contact the Editor

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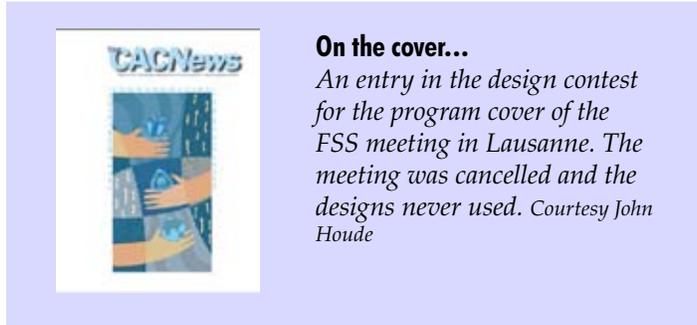
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Submissions should be made in the form of Windows compatible files on CD or by e-mail. MS Word files should be saved as version 2000 compatible. Alternatively, text files may be saved as plain ASCII files without formatting codes, e.g. bold, italic, 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.



On the cover...

An entry in the design contest for the program cover of the FSS meeting in Lausanne. The meeting was cancelled and the designs never used. Courtesy John Houde

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CACBits



CAC member Harry Klann explains how the use of PCR helped solve a 16 year old murder case in "Sleight of Hand," an episode of *Forensic Files* which originally aired in 2002.

In Case You Missed It

A brand new service called "CAC DateMinder" has been added to our website at www.cacnews.org and it's free to all CAC members. This is a auto-reminder service that reminds you about important dates (such as court dates, meetings, appointments, anniversaries, birthdays, etc.). You just tell it the date, time, and whether you want to be reminded once or on a regular basis, and the service sends you an email at the designated time reminding you about whatever it was.

The CAC Store is back up and running after a brief closure. This was done to upgrade security and make your PayPal transactions easier. To kick off the reopening, some of the previous years' apparel can be purchased at a steep discount!

The awards committee has posted both online and print versions of the application forms for the Ed Rhodes Award and the ABC Exam awards.

All the latest information on the Fall 2009 Seminar, including online forms for registration and abstract submissions, has been posted.

The SWGDRUG core committee currently has two pending documents out for review by the forensic science community. To ensure the documents address the needs of the community, SWGDRUG invites CAC members to comment and offer suggestions. Comments and suggestions should be submitted by September 30, 2009. The documents are: "SWGDRUG Recommendations" and "Supplemental Document SD-3" (which provides examples of the estimation of uncertainty of measurement in weight determinations.) CAC members are invited to review these documents and send comments to swgdrug@hotmail.com. These documents can be found in the pending documents section on the SWGDRUG website. www.swgdrug.org/pending.htm

ISO Training Offered

ASCLD-LAB will be providing a 2 1/2 day "International Preparation Course for Testing Labs" training at the Sonoma Valley Inn on November 16-18. This will be the 3 days immediately preceding the CACLD Fall Meeting which is being hosted by BFS at the same location on Nov. 19-20. For further information and a registration form, please visit the www.asclld-lab.org site. Click on the Communications tab and then on Calendar of Events. This is an excellent opportunity for those who want to have a good overview of the International (ISO) accreditation program without committing to the full week assessor training class.

For information regarding registration and/or billing, please contact ASCLD/LAB office at (919) 773-2600.



CAC Sponsored Course on IR Spectra

A class on the Interpretation of Infrared Spectra is planned for September 15 - 17, 2009 in Los Angeles.

This three-day (24 hour) course provides training in theory, identification, and interpretation of infrared spectra of organic compounds. The course is intended for forensic scientists involved in analysis of materials such as controlled substances, paints, fibers, and explosives where infrared spectra are used for identification. Students should possess knowledge of organic and physical chemistry commensurate with a baccalaureate degree in one of the natural sciences. Students should be familiar with preparation and presentation of infrared spectra. Class exercises will include practical problems that apply principles of infrared spectral interpretation and comparison. This is not a laboratory course. This course is POST reimbursable, Plan IV.

The class instructor will be Robert L. Julian, Ph.D., of the University of Wisconsin. The format will be classroom lectures and practical exercises. Prerequisites include familiarity with preparation and presentation of infrared spectra. A \$35.00 materials fee applies to all non-CA Dept. of Justice students. This charge is due at the beginning of the class. Make check(s) payable to the California Dept. of Justice. A \$360.00 tuition fee is required for personnel from private sector, out-of-state, or other agencies that are not California crime laboratories. CAC Funding: The California Association of Criminalists A. Reed & Virginia McLaughlin Training Endowment Fund has provided partial funding for this class. CAC members will not be charged tuition or material fees.

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The Editor's Desk

Transitions, Partnerships, & History

There is going to be a recurring core concept that will run through my editorials—the quality and importance of the California Association of Criminalists. It may be buried or it may be obvious, but it will always be there. I am a snob about our profession. What can be more important than serving the Criminal Justice System, and therefore humanity, by providing solid, unbiased, scientific conclusions to answer questions of evidence? I am also a snob about the CAC because it does such a good job supporting us in our endeavors.

I joined the CAC in my second year as a criminalist. Not because of altruistic professional reasons, but rather because it sounded like fun. After one of the seminars, the three attendees from my lab returned with stories of a hilariously entertaining banquet. It seems a Russian forensic scientist was in attendance at the seminar and was the special guest at the banquet. From what I heard, the “Russian” was extremely entertaining and a hoax. Sure there were technical sessions, but the idea of sharing a couple of days exchanging stories and having fun with other criminalists sounding like something that interested me.

There were no more visitors from the Soviet bloc, but the seminars turned out to be entertaining and, interestingly enough, educational. In those days, we paid our own registration, hotel and per diem. The only thing the City of LA provided was work time, a car and a gas credit card. But it was worth it because the CAC provided an occasional diversion from everyday work. It wasn't until a couple of years later that I discovered the power and benefit of involvement in the CAC.

After about four years with the LAPD Crime Lab I started to become disillusioned with my employer. I decided the City, the Department and the Crime Lab management didn't care about my colleagues and me and I was young enough to think they should. I was considering seeking employment elsewhere. One evening I was whining to my father about the fact the LAPD didn't care about me and wasn't providing me with professional satisfaction. His response helped change my professional focus and ultimately my interest in the CAC and other professional organizations. I expected him to agree and sympathize with my plight. However what I was told was that they don't care—and they shouldn't. It was my responsibility to create and foster my own professional satisfaction.

After the “talk” had a chance to percolate in my mind it dawned on me—I needed to work for the profession first and my employer second. If I focused on being the best criminalist I could be, then I would achieve job satisfaction and the LAPD would get the work product they wanted. Following this way of thinking led me to a more involved participation in the CAC and eventually the ABC, CACLD, AAFS and ASCLD. By setting the example of putting the profession first, I, along with many other dedicated professionals in the LAPD Crime Lab, helped improve our laboratory and make it a place in which we are proud to work.

It doesn't really matter why I joined the CAC, but it does matter that I and other people dedicated to our profession join and participate. By working to improve the CAC and the criminalistics profession we all win.

Transitions

There are many transitions we all make during the course of our careers. The above tells the story of my transition from having a job to embracing a profession. In this edition of the *CACNews*, share San Mateo Criminalist Annie Ouzounian's transition from caseload analyst to acting supervisor. One of my goals as editorial secretary is to improve communication and understanding between casework criminalists, supervisors and management. Annie's story, “Life and Times as an Acting Supervisor,” provides insight from someone newly experiencing a different professional perspective.

Partnerships

The rapidly expanding role of forensic science is not limited to the CAC's immediate sphere of influence. It crosses national and international borders and affects the professional life of all engaged in the field, from lab tech to lab manager. Partnerships and interactions with other professional organizations will help to reinforce and grow the CAC's leadership role in the delivery of forensic science services.

A newly formed group in the CAC, led by Peter Barnett, is leading the development of a national code of ethics—one of the recommendations of the National Academy of Sciences report. Working only within the sphere of the CAC, the committee could develop a perfect code of ethics for the national forensic science community, but it would probably go unnoticed or unaccepted. However, by partnering with other orga-

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If I focused on being the best criminalist I could be, then I would achieve job satisfaction and the LAPD would get the work product they wanted.



Greg Matheson
CAC Editorial Secretary

Transitions..., cont'd

nizations, the group's endeavors will quickly be known and hopefully accepted as the national standard. At the ASCLD meeting in September, the national forensic science community will receive its first broad exposure to the CAC's efforts. This will be followed by additional exposure at the AAFS meeting in February. The partnership created by having CAC members involved in leadership roles in other organizations, such as ASCLD, makes it possible for work products of the CAC to have national and international exposure.

Beyond pushing the CAC's ethics agenda forward, what is the connection between the CAC and ASCLD and why should CAC members care what ASCLD does? After all, the CAC focuses on casework analysts and ASCLD is a management group. In this issue of the *News*, Dean Gialamas, Director of the Orange County Crime Laboratory, ASCLD President, and CAC Member, provides the answers to why CAC should care and understand what ASCLD is and does.

Understanding what ASCLD is about and what it expects from its members should provide you with the knowledge of what you should expect from your supervisors and managers. Crime laboratories deserve quality management and I firmly believe it can be achieved if all supervisors and managers take seriously their responsibilities as defined in the ASCLD Management Guidelines.

History

The CAC has a long and exceptional history of providing leadership to the forensic science community. Preserving the CAC's history is important and should be a primary activity of the association. Thankfully, two events have merged to finally make this happen. The Forensic Science Center (FSC) in Los Angeles, home of the LAPD and LASD Crime Labs has designated cabinets and file cabinet space to be the home of

the CAC Archives. In addition, the current Historical Committee has embraced the new space, and is collecting and inventorying CAC historical materials.

The CAC has never had a place it can "permanently" store its historical materials. Since the FSC has a 75-year lease with CSULA we can rely on the CAC having archive space for over seven decades. The project is just getting started and there is still a lot of work to do but I am optimistic the archive will finally have an organized home.

If you have any CAC historical materials, we would like to add them to the collection. The plan is to organize the archive and make it available to CAC members for review or research.

Last Words – For Now

At the end of my last editorial I concluded with the following paragraph:

Finally, I want to challenge all of you, who had the persistence to get this far, to drop me an e-mail with your thoughts and ideas about creating change in the CACNews and the CAC website. Or, if you don't have any suggestions at this time, just send me an e-mail so I know someone read this to the end.

A big thank you to San Bernardino Sheriff's Department Criminalist Don Jones for proving to me that at least one person read the piece and took me up on my challenge. His comment was that now the editorial secretary was in Southern California there should be fewer references to the San Francisco *Giants* and more about the LA *Dodgers*. Well, as Don well knows, I am not much of a sports fan, but I do know the *Dodgers* are currently leading the *Giants* by 6.5 games.

There you go, Don. Enjoy the reference; it will probably be the last.



President's Desk, cont'd

was signed on July 7, 2009. The purpose of this subcommittee is to advise and assist the COS, NSTC, and other coordination bodies of the Executive Office of the President on policies, procedures, and plans related to forensic science. The subcommittee's goal will be to lead an interagency assessment of the federal government's ability to implement or promote the implementation of the recommendations in the NAS report. Included in the recommendations is improving the underlying research, practices and protocols, and standards used by forensic science disciplines.

The CAC was one of the groups contacted by the subcommittee to provide input. I have accepted this invitation. The mechanism of our involvement will be made clearer within the next few weeks. We should be honored that we have been recognized as a national leader in the establishment of standards and best practices for forensic science. The recommendations of the NAS Report will most certainly be pursued. We cannot have the attitude that it is too monumental a task, will cost too much money, and/or will never happen. We must step up and accept this challenge to ensure forensic science continues to serve the justice system. We must increase the communication with other forensic science associations so

that our voices will be better heard. We have already started down this path; the work product of the CAC National Ethics Code Committee will be presented at the ASCLD meeting in September. In addition, a workshop is being developed for the AAFS meeting in February as a medium to present the ethics code draft and encourage feedback. The CAC has recently formalized a liaison position with the CACLD with the hopes of increasing communication and working together on issues that affect both groups.

The CAC response to the NAS Report has been prepared and is printed in this issue. The response presents the professionalism of the CAC and the leadership role CAC members have taken with respect to some of the recommendations in the NAS report. The recommendations highlighted are those regarding certification, ethics, development of standards, and support of Forensic Science education. Also, the response offers the CAC as a resource in the endeavor to improve the delivery of forensic science services at a national level.



UnPopular

In the recent article, "Reasonable Doubt" [*Popular Mechanics*, August, 2009, by Brad Reagan, Photography by Christopher Griffith.] a journalist attempts to expose the weaknesses of forensic science. The author is an occasional contributor to *Popular Mechanics* and has also written about sports and wrote a book on 9/11 myths.

The premise of the article is that the methodology of forensic science was "Created by cops—often guided by little more than common sense." Oh, no! Not the dreaded common sense! We mustn't have any of that in OUR laboratory!

As is so often the case in popular press articles on forensic science, journalists give the subject the once-over-lightly, and editors insert sophomoric illustrations ending up with a hot cover topic that is sure to sell magazines. The public is left with yet another cloudy picture of forensic science, just as they got during the O.J. trial a decade and a half ago. I was hoping things had changed for the better. Thanks, *CSI*.

The article is rife with half-truths and innuendo, the stuff of good tabloid journalism. As a kid, I used to enjoy reading *Popular Mechanics* because it explained how stuff worked. I'm sorry to see they've lost their way. Perhaps that's why I haven't picked up an issue for so long. Wouldn't the readership have enjoyed an article about how forensic science was able to accomplish its mission without the use of wizardry such as we see on TV? Wouldn't that have sold as many magazines as a hit piece?...silly question.

I saw no reference to accreditation or proficiency testing in the article, but there was the statement that "Not all forensic disciplines are in dispute." Well, that's a relief, but that admission is literally buried in the story, while the incendiary "created by cops" line is four times bigger and set apart. Hey, I know how to use a good pull quote, too. It's fun to put a spin on an article.



"Forensic examiners use the marks left on bullets to match them to specific firearms, but the technique lacks a solid base of research, and errors are common."

This quote stands alone and is unattributed, presumably the opinion of the author. But it is in the illustrations that the depth of the article is betrayed. I've faithfully re-created one of them here.

Perhaps bullet identification errors wouldn't be so "common" if one didn't use steel forceps to pick up copper-jacketed bullets! I know if I did that my career in the lab would be short, indeed.

John Houde

Didn't Inhale?

"Spanish cities' air is laced with cocaine, other drugs." This was the headline for a piece written by Ciarin Giles, Associated Press, and published in the San Diego *Union-Tribune* on Sunday, May 17, 2009. To briefly summarize, a study performed by a Spanish government scientific institute had found low levels of cocaine and other drugs in the air in certain areas of Spanish cities. However, the tests were done in those city areas where drug use was likely. Also, Miren Lopez, one of the study's scientists stated: "Not even if we lived for a thousand years would we consume the equivalent of a dose of cocaine by breathing this air."

So, why should I and other readers of the *CACNews* care about this? Subsequent to a match at the 2007 Wimbledon Championships, a urine sample provided by Martina Hingis was found positive for cocaine. The reported concentration was 42 ng/mL. In the beginning of 2009 WADA (World Anti-Doping Association) established a threshold for cocaine of 50 ng/mL, but since her purported violation was before this she lost all her prize money from 2007 and was banned from professional tennis for two years.

How does the 50 ng/mL threshold compare with those of other organizations? For the National Institute for Drug Abuse the minimum for a positive urine for illicit use of cocaine is: 1) a positive screening procedure with a threshold of detection at or above 300 ng/ml with a confirmation of the presence of benzylegonine above a threshold at or above 150 ng/ml using gas chromatography/mass spectroscopy.

For the U.S. Department of Defense the urinalysis cutoff level for cocaine (as its metabolite, benzylegonine) is 150 ng/mL at screening level (immunoassay) and 100 ng/mL at the confirmatory level (GC/MS).

So, could the 42 ng/mL level in the urine sample from Martina Hingis be due to passive inhalation? I don't know. But think about her life style. As a former World No. 1 she would be invited to attend many parties hosted by the rich and famous as well as those who (like remoras) attach themselves to world-class athletes. Augmenting her prize winnings would be product endorsement contracts for things like tennis rackets, shoes, clothing, watches, and various cosmetics. Doubtless these contracts would require her to at least make appearances at these soirees. Bottom line, world class athletes like Martina Hingis would find it virtually impossible to avoid low levels of cocaine exposure due to passive inhalation.

Bob Blackledge
Forensic Chemist Consultant

Ref.
www.acmt.net/cgi/page.cgi?aid=7&_d=52&zine=show

NIJ Conference 2009

For more than a decade, NIJ's annual conference has brought together criminal justice scholars, policymakers, and practitioners at the local, state and federal levels to share the most recent findings from research and technology.

The conference showcases what works, what doesn't work and what the research shows as promising. It puts a heavy emphasis on the benefits to researchers and practitioners who work together to create effective evidence-based policies and practices. The DNA Grantees Workshop, formerly a separate event, is now an integral part of the NIJ Conference. Combining the former DNA Grantees Workshop with the NIJ Conference allows the NIJ to feature innovations in forensic sciences and related policy and resource issues.

The program always features interesting special speakers and informative panels, including special speakers Clea Koff, Forensic Anthropologist solving mysteries surrounding the mass graves in Rwanda, Bosnia, Croatia and Kosovo; Gil Kerlikowske, Director, Office of National Drug Control Policy; Eric Holder, US Attorney General. Forensic ; Forensic Panels included Using Forensic Evidence to Solve Crime. (One CA participant - Joe Peterson); Bringing Forensic Science Testing to the Crime Scene (No CA participant); Designer Amphetamines: Drug Use, Forensics and Law Enforcement (No CA participant); Forensic Science Demonstrations and Poster Sessions (Several CA posters); Advances in Digital Forensics (No CA participant); Sexual Assault: Obtaining DNA from Evidence Collected up to a Week Later (No CA participant); Making Sense of the DNA Backlog (One CA participant - Greg Matheson); Beyond Traditional DNA Markers: Predicting a Person's Appearance from DNA Evidence (No CA participant); The Future of Forensic Science: Findings From the National Academy of Science Study (Two CA participants - Barry Fisher and Dean Gialamas).

Proximity to the decision makers in any field is extremely important. Those with easy access to the people that hold the purse strings and decide how a profession does business are most likely to influence the decisions and acquire resources. Though the NIJ Conference is designed to provide participants with updates on NIJ funded projects, it clearly demonstrates the potentially lopsided influence east coast practitioners can have on our field.

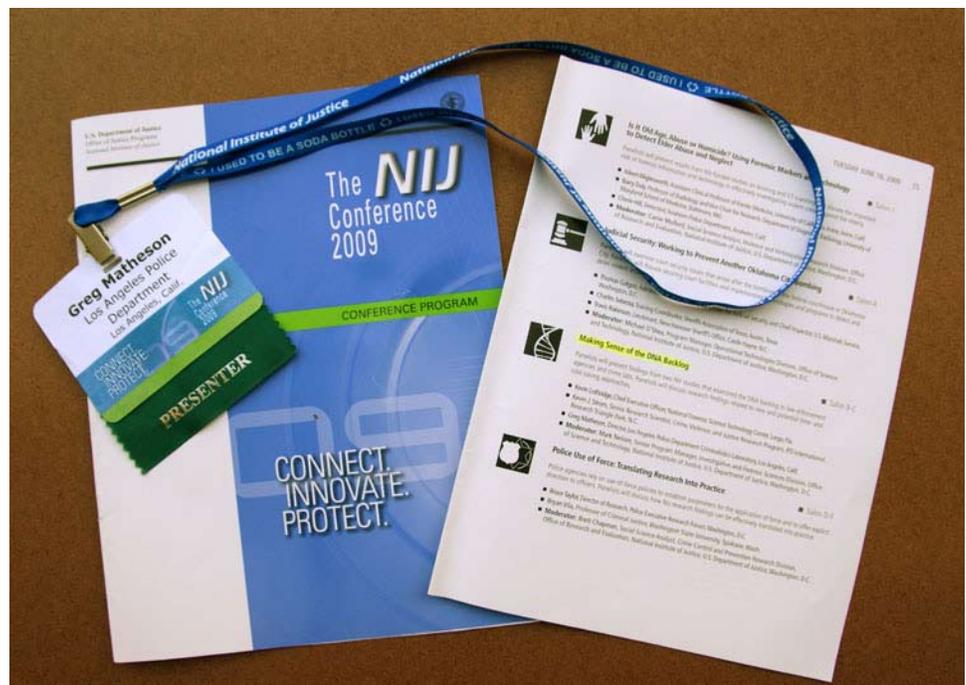
The CAC has always contributed significantly to the forensic science community. However, the Association needs to remember that to fully realize its potential in the national arena, CAC members must participate in national events. It's important our voice is heard as loudly as our associates elsewhere in the country.

Greg Matheson



Conference Participation

All agencies that are recipients of an NIJ grant are invited to send an NIJ funded representative. Unfortunately, the conference is always located in the Washington DC area, which means attendance and participation in the program by west coast Forensic Scientists can be limited. At this conference, California based Forensic Scientists were relatively well represented on the various forensic science panels, but overall the number of California attendees was very small. Californians only represented approximately 3.5% of the conference attendees. This contrasts significantly with the 55% of attendees from the Washington DC, Maryland, and Virginia area.



Synonyms for Toxic Blood Reagents

Caitlyn Middlestead, Santee, CA & John I. Thornton, Napa, CA

We all know benzidine is carcinogenic. No one uses it, and everyone avoids it. But would we recognize it if it was in a bottle labeled Fast Corinth Base B? And some laboratories use, albeit carefully, o-tolidine, o-toluidine, or o-dianisidine. Would we recognize o-toluidine if it was labeled 2-methylaniline? Would we recognize o-dianisidine if it were labeled Lake Blue B? We all have an MSDS that will describe these materials, or at least the ones that we use. But a typical MSDS will have just a few of the most common synonyms. With a full array, there are likely to be some surprises, and there might be a bottle of something around that is nasty, but about which we are not fully informed. Below is a list of synonyms for benzidine, o-tolidine, o-toluidine, and o-dianisidine. It is assumed that no one will be using benzidine. It is included here only because of its history and because its carcinogenicity has been definitely established.

The toxicity of the others is strongly indicated, but not clearly settled in all respects. The reported toxicity seems to be somewhat dependent upon which particular MSDS is consulted. An example is o-dianisidine, which has something of a history as a presumptive test for blood and which now is in some commercial acid phosphatase test kits. With respect to carcinogenicity, one MSDS states: Reports of Carcinogenicity: NTP: No IARC: No OSHA: No" but later in the same MSDS states "Chronic: Possible Carcinogen." Another MSDS reports: "Carcinogenicity: ACGIH: A1- Confirmed Human Carcinogen California: carcinogen, initial date 10/1/90." A third MSDS is silent with respect to carcinogenicity, but states "Although it is not classified as hazardous according to European Regulation 1999/45/EC the product should be handled with the usual care for all chemicals..." And in California, the State

Department of Public Health declares it, and o-toluidine, a carcinogen under Proposition 65, (The Safe Drinking Water and Toxic Enforcement Act of 1986). How would we know this? By going to the internet, where we will find it under "Chemicals Known to the State of California to Cause Cancer or Reproductive Toxicity", (an 18 page list), although on Google it is rather hard to find under that title. It is much easier to find it under "Departamento de California de Salud Publica, Rama de Salud Ocupacional, Sustancias Quimicas Causantes o Causantes Potenciales de Cander (sic) o Toxicidad Reproductiva." (This is California, after all). In any event, it would seem prudent to view o-dianisidine as carcinogenic.

And o-tolidine? One MSDS states that it is a "probable" carcinogen. Another MSDS states that it is a "possible" carcinogen. And yet another states: "Carcinogenic effects: (Proven) by OSHA. Classified 2B (Possible for human) by IARC, Classified A2 (Suspected for human) by ACGIH, and 2 (Reasonably anticipated) by NTP." But see below.

And o-toluidine? Pretty much the same as o-toluidine. Most MSDS' declare some liability with respect to its carcinogenic properties. But with respect to carcinogenicity, one MSDS states: "No information available," and, with respect to general toxicity, states: "Toxic effects are not known. Related chemical (o-toluidine) can cause irritation, with burning sensation, coughing, laryngitis, shortness of breath, headache, nausea, vomiting. . . blood and central nervous system effects, anemia, reticulocytosis, hematuria, weakness, depression, respiratory distress, irregular heart rate, eventual coma and death." Wow! It would seem to be responsible for everything other than weight gain and hair loss.

The toxicity of these compounds should not rest on which particular MSDS one chooses. Yes, certainly, we can make the associations if we have the chemical name and the structure in mind, but who is likely to do that? So here are the synonyms: (Obvious variant spellings and foreign language cognates' have not been included, e.g., benzydina [Polish], benzidin [Czech]).

BENZIDINE

(1,1-Biphenyl)-4,4'diamine
4,4'-Bianiline
4,4'-Biphenyldiamine
4,4'-Diamino-1,1'-biphenyl
Benzioine
Fast Corinth Base B
CI 37225
p,p'-Diaminobiphenyl
CI Azoic Diazo Component 112

O-TOLIDINE

(1,1'-Biphenyl)-4,4'-diamine, 3,3'-dimethyl
3,3'-Dimethyl-(1,1'-biphenyl)-4,4'-diamine
3,3'-Dimethyldenzidine*
Bianisidine
CI 37230
CI Azoic Diazo Component 113
Diaminoditoly
DMB
Fast Dark Blue Base R

O-TOLUIDINE

4-Aminotoluene
p-Aminotoluene
2-Methylaniline
2-Methyl-1-aminobenzene
CI 37077
2-Methylbenzenamine
o-Methylbenzenamine

O-DIANISIDINE

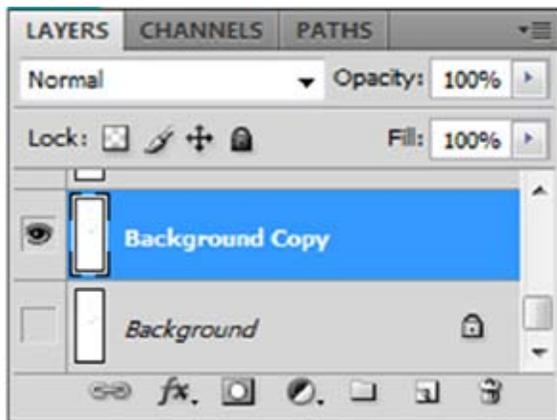
3,3'-Dimethoxybenzidine*
3,3'-Dimethoxy-4,4'diaminobiphenyl
Azoene Fast Blue
Azofix Blue B
Azogenet Fast Blue B
Blue Base NB
Brentamine Fast Blue B
Cellitazol B
Diazo Fast Blue B
Fast Blue B
Hiltonil Fast Blue B
Kako Blue B
Kayaku Blue B
Lake Blue B
Naphthanil Blue B
Bis (2,2,4-trimethyl-pentanediolisobutyrate) diglycolate

* The "benzidine" portion of these names would alert a worker to the structural similarity of this compound to the nasty stuff benzidine. But it must be kept in mind that tetramethylbenzidine, sharing the same portion of the name, is considered to be non-carcinogenic, and is often used in lieu of benzidine, and is the chemical used in commercial Hemastix®. So the "benzidine" appellation does not instantly damn a compound.

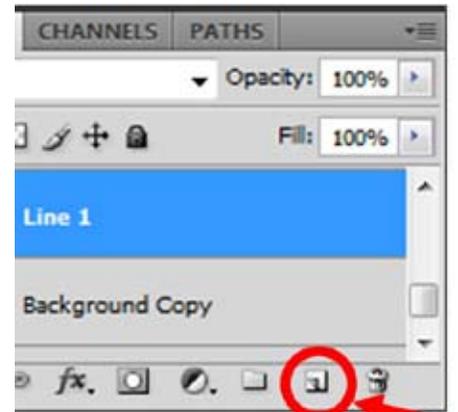
Sometimes an area of convergence reconstruction is needed for a bloodstain pattern analysis, but all there is to work with is a digital image of the pattern. If the image is of sufficiently good quality—several good stains for reconstruction are in focus, the pattern is on a flat surface, and lens distortions are insignificant—the area of convergence can be reconstructed in Photoshop. Of course, you could also just draw lines on a printout of the image, but using Photoshop lends more accuracy and more versatility, and provides a more professional final product. Don't forget: document your actions in your notes, or turn on the History File, or do both. To turn on the History File in Photoshop click Edit > Preferences > General; in the dialog box, click History Log and choose Metadata. This saves the History File as part of the Photoshop file. To view it, click on File > File Info... and click the History tab.

1. Open the image in Photoshop (from the Menu Bar, choose File > Open...).
2. Choose: File > Save As. In the Format field drop-down menu choose "Photoshop (*.PSD; *.PDD)." This creates a new Photoshop file while leaving the original image intact as a separate JPG file. You may wish to give the PSD file a different name.
3. Duplicate the image's layer:
 - a. From the Layers Panel, right-click on the "Background" layer, choose Duplicate Layer..., and then choose OK.
 - b. Turn off the "Background" layer (click on the eye to the left of the layer's thumbnail—it will disappear and the content of the layer will not be visible in the workspace).
 - c. From now on, place any new layers above the "Background Copy" layer.

Now there are two layers of the original image: one working ("Background Copy") and one reserve ("Background"). If the "Background Copy" layer accidentally becomes altered, delete it and repeat Step 3 to create a clean image to work with.

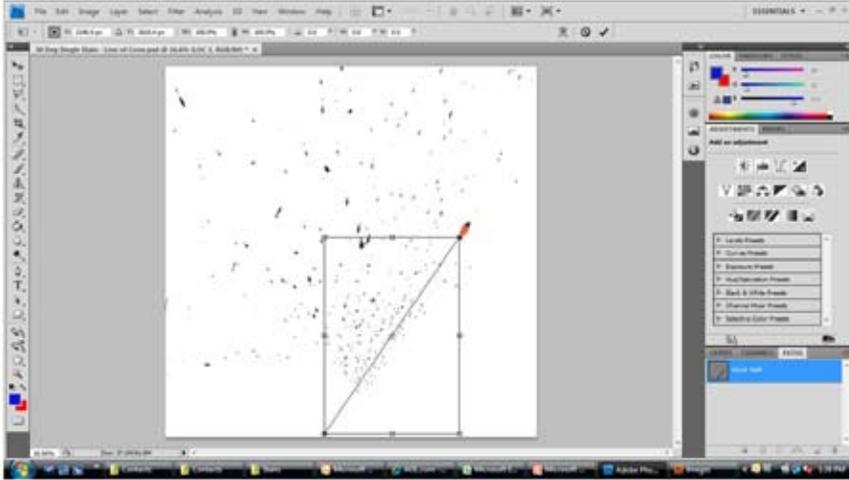


4. Make sure the "Background Copy" layer is current (if it's not highlighted, click to the right of the layer's name).
5. Create a new layer called "Line ___". Start with "1" in the blank. Use a unique number in the blank each time a new "Line" layer is created.
 - a. Click the "Create a new layer" icon at the bottom of the Layers Panel. A new layer is created and made current (highlighted).
 - b. Double-click on the layer's name, type in "Line ___", press Enter.

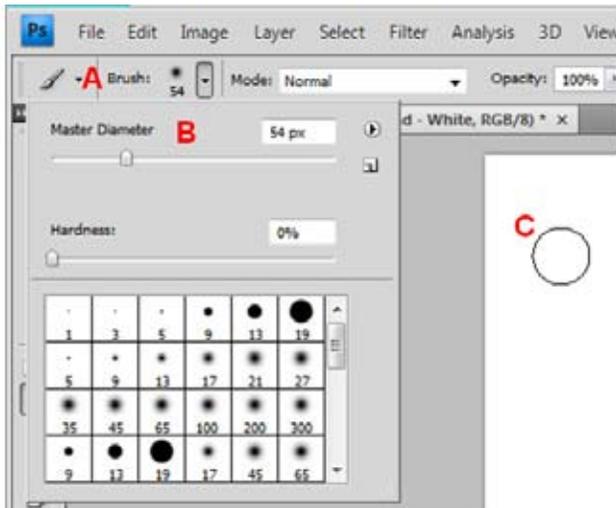


"Create a New Layer" icon

6. Draw a line of convergence from a directional spatter stain.
 - a. Use the Zoom Tool to enlarge the stain: type "Z", click-and-drag a box around the stain.
 - b. Use the Pen Tool to create a linear path along the major axis of a well-defined stain. Type "P", right-click on the depressed tool, choose Pen Tool. Click once at each end of the long axis: don't click-and-drag, just click.
 - c. Use the Direct Selection Tool to fine-tune the path's placement. Type "A", right-click on the depressed tool, choose Direct Selection Tool.
 - i. Click-and-drag a box around one end of the path. The end of the path will become a solid square.
 - ii. Click-and-drag the solid square into position.
 - iii. Repeat with the other end of the path, as needed.
 - d. Use the Path Selection Tool to move the path so that it starts at the head of the spatter stain.
 - i. Right-click on the Direct Selection Tool, choose Path Selection Tool.
 - ii. Click on the path and move the far end to the head of the spatter stain.
 - e. Extend the path beyond the anticipated area of convergence.
 - i. Zoom out by double-clicking on the Hand Tool .
 - ii. Press Control-T to use Free Transform. A box will appear around the path.
 - iii. Press the Shift key while clicking-and-dragging the other end of the path to extend it beyond the anticipated area of convergence. Release the mouse before releasing the Shift key.

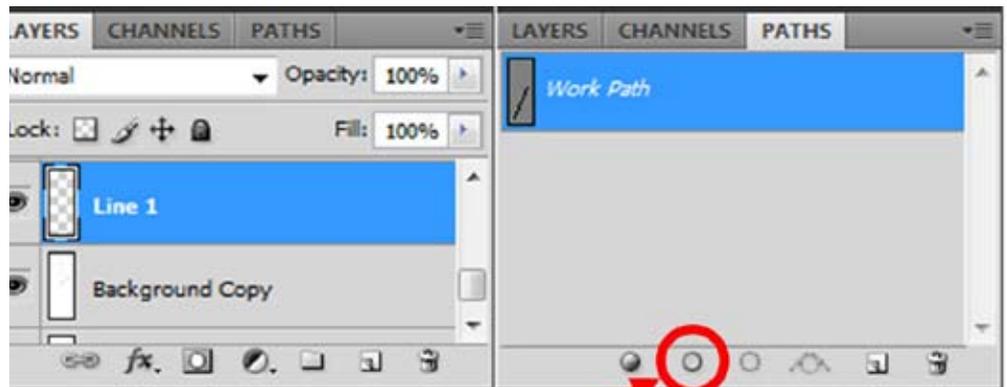


- iv. To save the changes, click the Brush Tool , and then click "Apply" in the dialogue box.
- f. To turn the path into a line, first set the desired width and color.
- i. Set the width by clicking the drop-down "Brush:" menu at the top of the screen and setting the master diameter. To see how big it will look, move the cursor over the image without clicking. 



A: "Brush:" drop-down menu
 B: Master Diameter slide-bar
 C: Actual diameter of brush

- ii. Set the color by clicking on the top colored square at the bottom of the Tools Panel . Choose a color from the dialogue box.
- g. Stroke the path. 



"Stroke path with brush" icon

- i. Make sure the "Line_" layer in which the stroke will be drawn is current (highlighted).
- ii. Click on the "Paths" tab to the right of the Layers Panel's tab. Make sure the path to be stroked is highlighted (click on it to highlight).
- iii. At the bottom of the Paths panel, find the open-circle icon (second from the left) and click it. The path now shows a line drawn on it, saved in the layer that is on (highlighted).
- iv. To turn off the path, click in an open area of the Paths panel.
- 7. Repeat step 6 for each spatter stain to be used in the reconstruction.
- a. A different layer for each line facilitates turning off (poking out the eyes) of those that turn out to be undesirable, such as those too affected by gravity or that turn out to be from another source.
- 8. Text layers may be added using the Horizontal Type Tool  to denote the area of convergence, its measured location, and to include a header with information such as case number, page, date, your name, and (very important) the filename (including extension) of the final product.
- 9. Save the final product as a JPG: File > Save As... In the dialogue box after "File name:" enter a unique name; after "Format" choose JPEG (*JPG; *JPEG; *JPE); click "Save;" in the JPEG Options dialogue box, often the highest "Quality:" (12) is the preferred choice.

To learn the basics of Photoshop:

- Sign up for an on-line class through a local college, e.g., Grossmont College in San Diego.
- Check Foray Technology's on-line tutorials and training schedule for week-long classes (www.foray.com/training/index.php).
- Get a tutorial workbook, such as "Classroom in a Book" and teach yourself.

Why is ASCLD Important to the CAC Membership?

Dean M. Gialamas
Director, Orange County Crime Lab
ASCLD President

As you read the title, you may be wondering why on earth would Dean feel the need to write this article. Or perhaps you're thinking, who cares. Well, knowing each of you in the CAC (as a long-time active member myself), I know that you won't stop here and that many of you read the *CACNews* issues cover to cover. The truth is that CAC Editorial Secretary Greg Matheson (and an ASCLD Board Member) outreached to me and asked me to cover this topic, particularly in light of the National Academy of Sciences report issued in February 2009 entitled, "Strengthening Forensic Science in the United States: A Path Forward." This is a great opportunity for many of you to learn about ASCLD and its importance in the forensic community, and perhaps most importantly, why it really is an organization that is important to the CAC and the forensic community.

A Walk Down Memory Lane

First, let's take a walk down memory lane and find out how the American Society of Crime Laboratory Directors (ASCLD) got its start. ASCLD was founded in 1973 by a small group of crime lab directors convened by then FBI Director Briggs White. The formation of this group was the result of a report issued by the Law Enforcement Assistance Administration (LEAA) that was a sweeping concern to the leaders in the criminal justice and forensic community (...hmmm ... sounds a little like déjà vu considering the NAS report!). The LEAA researched and reported results of a voluntary proficiency testing program that determined that serious concerns were identified about the quality of work in the nation's crime labs. Based on the data collected during this voluntary proficiency test, the results were all over the place. The fact that so many labs with presumed similar methods could get such a wide degree of results was of great concern to the LEAA and the criminal justice community.

In 1974, ASCLD was incorporated as a non-profit professional organization with its primary focus on advocacy, communication and education. As a result of the LEAA report, a committee was formed called the Committee on Laboratory Evaluation and Standards to respond to the LEAA issued report. As the committee worked on its mission it morphed into the Committee on Laboratory Accreditation. In 1982, the committee was formalized into the Laboratory Accreditation Board. Then in 1988, the American Society of Crime Laboratory Directors / Laboratory Accreditation Board (ASCLD/LAB) was formally created as a new corporate entity and spun off of ASCLD as a strategic partner. (Those of you who have been around a while will recall CAC's efforts

in professional certification which eventually spun off to become the American Board of Criminalistics.)

ASCLD Today

Today, ASCLD is composed of over 650 crime laboratory directors and forensic science managers dedicated to providing excellence in forensic science through leadership and innovation. They represent over 250 local, state, federal and private crime laboratories in the United States. Our membership also includes laboratory directors from over 20 countries, as well as national and international academic affiliates. As an organization, ASCLD provides leadership in the forensic community as well as assistance to its members by providing information, training and networking opportunities.

Our Mission:

"To promote the effectiveness of crime laboratory leaders throughout the world by facilitating communication among members, sharing critical information, providing relevant training, promoting crime laboratory accreditation, and encouraging scientific and managerial excellence in the global forensic community."

Code of Ethics and Professional Responsibility

ASCLD, like all established professional bodies, has a robust code of ethics (though admittedly, I have seen none better than the CAC's Code of Ethics) and is the only professional forensic membership association that has a guidelines document for the conduct of managers and supervisors of forensic laboratories to safeguard the integrity and objectives of the profession.

Our code of ethics is somewhat different than that of the CAC but for good reason. After all, laboratory managers bear additional ethical responsibilities beyond those expected of bench level forensic scientists. They include additional responsibilities for:

- The integrity and quality of the work product of all crime laboratory staff and operations,
- enforcing ethics and professional responsibility in the workplace,
- hiring, training and supervising subordinates, and
- budgeting and expenditure of authorized funds.

In 1987, ASCLD created its "Guidelines for Forensic Laboratory Management Practices." It is still a "living" and current document today just as it was when it was created. Its key sections include guidelines for supervisors and managers in the following areas:

- Responsibility to the Employer – where categories include Managerial Competency, Integrity, Quality, Efficiency, Productivity, Safety, Meeting Organization Expectations, Security, and Management Information Systems.

Please turn to page 26



Our code of ethics is somewhat different than that of the CAC but for good reason. After all, laboratory managers bear additional ethical responsibilities beyond those expected of bench level forensic scientists.

Commentary on Becke Line Explanations

John Thornton
Napa Sheriff's Department

Meagan Gallagher
California Department of Justice Regional Laboratory – Ripon

Those of us engaged in trace evidence examination make extensive use of the Becke Line technique for refractive index determinations of glass, fiber, polymers, and minerals. F. Becke first described the technique 1893,¹ and it has since become one of the most fundamental practices in trace evidence examinations. An abundance of forensic literature exists discussing the technique in terms of how one goes about using it, but there is often little said as to why it works, and when an explanation is offered, the explanation is generally imperfect. The forensic science literature is not alone in this regard. Standard texts for optical mineralogy, the field of study for which this technique was originally developed, are either curiously silent in the explanation of the phenomenon, or provide an unsatisfying or inadequate explanation. Few of the standard texts in optical mineralogy bother to give a reference to Becke's original article.

Becke Line

Becke described the phenomenon that bears his name in 1893. An English translation of the portion of his article that introduces this phenomenon accompanies this discussion. We are unaware of a previous translation. The Becke Line, along with the oblique illumination technique, which also tracks refractive index by using a compound microscope, are typically referred to as "immersion methods" of refractive index determination. The Becke Line technique is occasionally referred to as the "central illumination" method.

The typical practice for Becke Line determinations requires immersion of a specimen in a liquid of known refractive index and examination under a compound microscope. The specimen in focus is then slightly defocused, causing a bright line to shift from the margins of the specimen, with the direction of this travel being related to the refractive index of the material being studied. Increasing the distance between the specimen and the objective lens of the microscope causes the bright line, *i.e.*, the Becke Line, to move from the specimen margin toward the medium of higher refractive index, which may be either the liquid or the interior of the solid specimen.

Using these observations, we determine whether the refractive index of the specimen is higher or lower than the refractive index of the immersion medium, and subsequently select another immersion medium based on this conclusion. We can establish the refractive index of the specimen by repeating this process until the refractive index of the specimen and the liquid match, at which point the Becke Line will no

1 Friedrich Johann Karl Becke, "Über die Bestimmbarkeit der Gesteinsgemengtheile, besonders der Plagioklase auf Grund ihres Lichtbrechungsvermögens," (Regarding the Determination of Mineral Compositions, Especially of Plagioclase, on the Basis of its Refractive Ability), *Sitzungsberichte der Kaiserlich-Königlichen Akademie der Wissenschaften zu Wien* 102 (1893) 358-376.

longer be observable, and, for monochromatic light, the specimen will virtually disappear.² The specimen and the immersion medium of known refractive index are then identical, and the refractive index of the specimen is thus established.

For the first half century after Becke described this technique, microscopes were designed with a fixed stage and moveable objectives. The method originally described "raising the focus," to increase the distance between the specimen and the objective.³ But with few exceptions, microscopes now have fixed objectives (on a turret to facilitate changing objectives) and a specimen stage that moves up and down. Raising the focus effectively decreases the distance between specimen and objective. The phenomenon is of course the same, but the terminology must be appropriate to the type of microscope used.

Becke Explanation

In his original work, Becke considered a thin section in which more than one mineral phase would be represented, that is, one mineral butted against another.⁴ This condition, which is unlike the typical forensic consideration of a solid immersed in a liquid of known refractive index, drove his explanation. Becke explained the phenomenon as resulting from certain light rays, (and particularly those that are not parallel to the optic axis of the microscope), exceeding the critical angle at the junction of two solid minerals, and thereby being reflected. While critical angle is related to refractive index, Becke's explanation diminishes the role of refraction in favor of reflection.

Although mineralogists immediately accepted and used the Becke Line technique effectively, they did not embrace Becke's explanation with an equivalent amount of enthusiasm. Becke's explanation required rays that are not parallel to the optic axis of the microscope, yet experimental observations show the Becke Line effect even when the illumination is perfectly aligned with the optic axis.

Hotchkiss explanation

In 1905, twelve years after Becke's original article, Hotchkiss⁵ published an explanation of the Becke Line phenomenon, saying "the extreme usefulness of the Becke method led the writer to endeavor to find a more detailed explanation of the phenomena (sic—note plural) observed." His explanation included a complex diagram emphasizing critical angle and reflection, with the angles of rays expressed in degrees out to ten minutes of arc. Though certainly more detailed, his explanation is nevertheless unsatisfying.

2 If polychromatic light is used, the specimen will not totally disappear because of the dispersion of the immersion medium, *i.e.*, a variation of refractive index with wavelength. Refractive index may be expressed at other wavelengths and other temperatures, but the convention is to describe it in terms of monochromatic light of 589 nm (the Fraunhofer D line) and at 20 °C.

3 In German, students were taught the "3H" Rule – "Beim Heben des Tubus wandert die helle Linie ins höher brechende Medium." (When lifting the tube, the bright line moves toward the higher refracting medium). (Thanks, Katja Sauler, for helping us out on this!)

4 For example, the separate phases of feldspar, mica, and quartz may be observed in the mineral granite.

5 Hotchkiss, W.G. "An Explanation of the Phenomenon seen in the Becke Method of Determining Index of Refraction," *American Mineralogist* 36:305-308 (1905).

cont'd on next page.

Commentary on Becke, cont'd

The Hotchkiss explanation assumed two conditions that will not conform to forensic science applications of the Becke Line method. The first assumption can be reconciled fairly easily while the second cannot. The first assumption, which was also presented in Becke's original article, assumes that two minerals, that is, two solids, would be in contact with one another. The Hotchkiss explanation assumes a vertical interface, parallel to the optic axis, between the two solid minerals. In typical forensic practice a solid will be immersed in a liquid. While this represents a different set of conditions, the substitution of a liquid for one phase does not require a large conceptual reach. Hotchkiss' second assumption, however, renders his explanation more or less unacceptable. Hotchkiss assumes the illumination rays to be converging. Contrary to the conditions used to observe the Becke Line, the diagram accompanying his explanation displays some rays approaching the solid (or the liquid) at 45 degrees from the optical axis. This is never the condition under which the Becke Line method is used; the method universally employs light that is parallel to the optic axis, delivered by a lowered substage condenser which has been stopped down to provide parallel light. Experimental observations clearly show that parallel light can promote the Becke Line phenomenon. Hotchkiss also speaks of "highly polished contact surfaces," which clearly are not essential to the Becke Line method. In short, the Hotchkiss explanation provides what he promised—"a more detailed explanation"—than Becke's original article, but it doesn't materially advance our understanding of the phenomenon.

Using a working example of the Becke Line method, the shortcomings of both the Becke and the Hotchkiss explanations become apparent. Common table salt, (NaCl, refractive index 1.544) immersed in a medium of 1.540 (Canada balsam, or Cargille 1.540 liquid) provides one of the most elegant demonstrations of the Becke Line phenomenon. The Becke Line is quite apparent, even with carefully selected axial illumination, yet the cubic NaCl is clearly not a lens. Snell's Law dictates that a ray entering another material along the normal, (*i.e.*, perpendicular to the surface), is not refracted. Conditions of the critical angle being exceeded resulting in internal reflectance scarcely applies to axial illumination, which we typically employ for Becke Line determinations.

If we accept the Becke / Hotchkiss explanations centering around internal reflectance / converging light / refraction, we are unable to explain the Becke Line with NaCl and axial illumination. The most devastating problem here is that the cubic NaCl can slow down the light rays, hence the 1.544 refractive index, but NaCl cannot cause light incident to the normal to change its direction.

Grabham explanation

In 1910, Grabham suggested an alternate explanation,⁶ which is probably the most frequently encountered explanation for the Becke Line phenomenon. He postulated that refraction, rather than internal reflection, is the principal means of generating the Becke Line. In this explanation, a particle immersed in a liquid acts as a lens and causes convergence or divergence of light delivered to the margins of the solid specimen. By Snell's Law, a lenticular specimen, *i.e.*, having the shape of a biconvex lens, will refract light to converge it

6 Grabham, G.W. "An Improved Form of Petrological Microscope with Some General Notes on the Illumination of Microscope Objects," *Mineralogical Magazine* 15:341-347. (1910).

when the specimen has higher refractive index than the surrounding medium, and will diverge it if the medium is of a lower refractive index. Defocusing upward or downward will then permit this convergence or divergence to appear as a bright line, *viz.*, the Becke Line. A diagram presenting a particle with a lenticular shape, roughly corresponding to a biconvex lens, often accompanies this explanation. Light rays that are parallel to the optic axis strike a slightly inclined interface, a condition that Becke did not countenance. This explanation predominates in the forensic literature, even in contemporary accounts. The optical mineralogy literature, as well as various internet sources, prove an abundant array of drawings of an irregular but nevertheless biconvex lens shaped particle. Certainly lenticular particles exist, that is, particles that are thinner at the edges than at the middle, and consequently resemble a lens. But we also encounter many specimens in shapes that do not even remotely resemble a lens. Unfortunately, however, this explanation is not much more defensible than Becke's reflectance explanation. It doesn't suffer from being entirely wrong, but it isn't graced by being entirely right⁷. Grabham's explanation, however, does depart from the Becke and Hotchkiss explanations in that he treats of a solid immersed in a liquid.

Diffraction explanation

Any phenomenon that can be explained by ray optics must be explained by diffraction theory as well, and it is here that we find a more satisfying explanation of the Becke Line phenomenon. Faust attempted to provide an explanation based on diffraction theory in 1955,⁸ but even here his explanation may be faulted. With diffraction, we must switch from thinking of light in terms of rays to thinking of it in terms of waves. Light rays can bend and spread around obstacles. In 1813 Fresnel showed that a careful examination of the edges of a shadow reveals a pattern of light and dark lines. This deviation from rectilinear propagation, termed diffraction, allows us to perceive detail. Light may reach our eye by means of reflection and refraction, but it is diffraction that enables us to resolve detail in any object. Out-of-focus images, such as those seen with the Becke Line phenomenon, may be related to Fresnel diffraction patterns. In this regard, the margins of a specimen may both absorb light rays as well as retard them. On raising the focus, *i.e.*, increasing the distance between specimen and objective lens, the maximum intensity of the diffraction pattern shifts to the specimen side of the margin when object retardations are less than half a wavelength, but the maximum intensity is on the liquid side when the retardation is between half and a full wavelength.

⁷ Engineers are sometimes teased about assuming that a horse is spherical in order to simplify the math. Something similar may be happening here if the explanation of the Becke Line requires that an object act as a lens in order for the Becke Line phenomena to be observed.

(A postscript to this comment – after we finished with the draft of this manuscript, we became aware of a risible discussion of the Becke Line in Elizabeth M. Slayter, *Optical Methods in Biology*, Wiley-Interscience, 1970. In the figure at page 584, to illustrate the formation of the Becke Line she actually shows a particle with a totally spherical shape!)

8 Faust, R.C. "Refractive Index Determination by the Central Illumination (Becke Line) Method. *Proc. Phys. Soc.* 68 (Series 12-B):1081-1094 (1955).

In his 1955 explanation of the Becke Line, Faust correctly treats the Becke Line as a diffraction phenomenon, with the Becke Line attributed to asymmetrically diffracted waves originating at the specimen edge. Intensity of the light—Becke's bright halo—is a function of retardation, and retardation is a function of refractive index. But a problem emerges here in the work of Faust. His work implies that with light parallel to the optic axis of the microscope, the Becke Line would be seen with specimens with faces inclined to the axis, but not with specimens with margins parallel to the axis. However, it is an unassailable observable fact that objects with vertical faces are capable of showing the Becke Line. Hotchkiss accepted that as a fact, and even before that it figured into Becke's original thinking. Faust's explanation suffers from this conclusion, which flies in the face of observation. The problem appears to be Faust's calculations using an object of exactly half a wavelength retardation. Objects with vertical edges show Becke Lines with perfectly axial rays *except* in the special case where the retardation is half a wavelength. Distinct diffraction fringes do result in the case of half a wavelength retardation, but in the plane of sharp focus these are symmetrical on both sides of the object margin and consequently the Becke Line is not seen.⁹ It is immaterial whether the specimen has inclined or vertical margins. In the case of vertical margins, as with our old friend NaCl, much more diffraction occurs at these edges than an inclined edge, rendering a brighter Becke Line even with the same retardation, because the change in

⁹ It is only to a first approximation that we may think of diffraction as involving the interaction of light waves – constructive and destructive interference – as each point on a light wave being a point source for the propagation of further waves. It works pretty well, but not perfectly. (Anyone with further interest may wish to review the Babinet Principle in an advanced physics text.)

phase at the edges is more abrupt. In the case of precisely one half wavelength retardation, diffraction is symmetrical on both sides of the plane of sharp focus and consequently the Becke Line is not observed.

Summary

So where does all this leave us? Consider the following question, a simple one and arguably not a well crafted one, but on the other hand not an unfair one either—a question that could possibly be asked in court—How does this work?

Proposed answer: Several explanations are possible. They complement rather than fight with one another. One explanation describes a specimen acting as a lens, converging and pinching the light inward from the margins of the specimen, or diverging and spreading the light out from the edges. Another explanation is based on reflection and refraction at the interface of the solid specimen and the liquid medium. These explanations are both consistent with observation and with the physical laws that govern this phenomenon. Neither explanation represents a complete, overarching explanation, however. A more durable explanation centers on the diffraction of light. Light waves emerging from a solid specimen and traveling into the surrounding liquid medium are diffracted, that is, are dealt with in a process where light waves from the edges of the specimen interact with one another and are consequently partitioned into several domains. Some waves are reinforced, and they manifest themselves as areas of relative brightness. These bright areas form at the expense of other waves, but the overall result of this interaction is an area of brightness, which is related to the refractive index of the specimen and the surrounding medium. We refer to this as a Becke Line.

Regarding the Determination of Mineral Compositions, Especially of Plagioclase, on the Basis of Refractive Ability

F. Becke

Sitzungsberichte der Kaiserlich-Königlichen Akademie der Wissenschaften zu Wien, 102 (1893) 358-376

[Note: The basic translation of Becke's article was done by Thomas Keller, M.D., Forensic Science Group, School of Public Health, University of California, Berkeley. Corrections and amendments were done by Katja Sauler, M.S. A literal translation of Nineteenth Century scientific German often doesn't work particularly well,¹ and the literal text has been edited by John Thornton and Meagan Gallagher to render it more coherent to a 21st Century reader conversant with the subject. . In this editing, however, every effort has been made to maintain the essence of Becke's development and commentary while avoiding areas of obscure terminology. The translation has been redacted to include only the portion that discusses the Becke Line phenomenon and the related subject of oblique illumina-

tion; the remainder of Becke's article dealt with the specific subject of the identification of the mineral plagioclase.

Friederich Johann Karl Becke was an Austrian mineralogist. He was born in 1855 in Prague, which was then part of the Austro-Hungarian Empire. He moved to Vienna and was rector of the University of Vienna until his death in 1931. Apart from the Becke Line, he is known for his work on metamorphic rock recrystallization and for the development of descriptive terminology and classification of mineral assemblages].

While the properties of double refractive and polarization in petrographic textbooks and handbooks are described, and while the determination of mineral composition from thin sections finds detailed usage, until now the differences in refractive indices of different minerals has seldom been used. Satisfactory results have been achieved using the know appearance of the "relief" of the "rough surfaces" of "bright
cont'd on next page.

¹ If anyone needs convincing of this, see *Reading Rilke: Reflections on the Problems of Translation*, William H. Gass, Alfred Knopf, New York, 1999.

Becke Translation, cont'd

illumination" of those minerals whose refractive indices exceed that of Canada Balsam. Michel-Levy and A. Lacroix² have based mineral properties on the intensity of illumination, which depends on the deflection of light rays transferred through the mineral section. The refractive index values are divided into seven categories, the basis of which are ill-defined and are certainly a matter of subjective estimation.

In handbooks of general microscopy, complete listings are realized by means of the different refractions of different objects. The majority are extravagantly catalogued, yet considered only in the forms of conical and cylindrical bodies (air bubbles, oil drops in water, tubules, etc.). In the straightforward case where the minerals actually occur as thin sections, there is so little consideration that virtually no information can be derived.

In the following discussion an attempt has been made to correct this situation, when the relationship of the illumination that appears on the edges of various strongly refractive thin sections of minerals are considered.

Whenever two different strongly refractive materials meet in a thin section, certain refractions of the prevailing light enters in a manner so that the visibility of the edge is affected.³ For simplification, we will assume for the present that the edge runs parallel to the optical axis of the microscope and that the two materials are of the same refraction. For the moment, we consider the deflection that the rays take through the mineral thin section.

In the accompanying Figure 1, a material of lesser refractive index, "AB" abuts a material of higher refractive index, "BC", by the vertical edge "B." We observe that at each point of the plane the light rays strike at different angles, so that a cone of illumination is formed whose aperture angle is determined by the thickness of the illuminated surface. We consider such a ray formation falling at the point of the surface separation at "B."⁴ The rays 0-11, which strike from the side of the material with the lesser refractive index are bent at angles and visibly leave from the material of higher refractive index as a compacted beam. All of the rays, which meet the separation plane from the side of the higher refractive index that fall below the critical angle are totally reflected – in our case rays 2, 4, and 6. Ray 6 defines the border of total reflection. The remaining rays – 8, 10, and 12, are deflected at an angle and take the indicated paths in the Figure.

The light rays striking uniformly from underneath thus leave the plate in such directions that the preponderance of the rays enter on the side of the section of higher refractive index. In addition, the intensity of the totally reflected rays 0-6 is also stronger on the side of the section of higher refractive index than those refracted at an angle from the other side of "B."

Beam enhancement of greater intensity appears to come
 2 Tableaux des Mineraux des Roches. Paris, 1889

3 [Editors' Note: Becke's discussion centers around two materials of different refractive index. In his discussion, he implies that the two materials are two solid minerals. In typical modern practice, and particularly so in forensic science practice, one of the materials will be a liquid of known refractive index. The same considerations applies to a solid and a liquid as to two solids.]

4 Figure 1 is fabricated according to the plan of Snellius, the knowledge of which I owe to the Leitfaden der Physik für Studierende (Manual of Physics for Graduate Students) by E. Mach, Prague, 1891. The plan is based on the assumption $n_1 / n_2 = 100 / 104$.

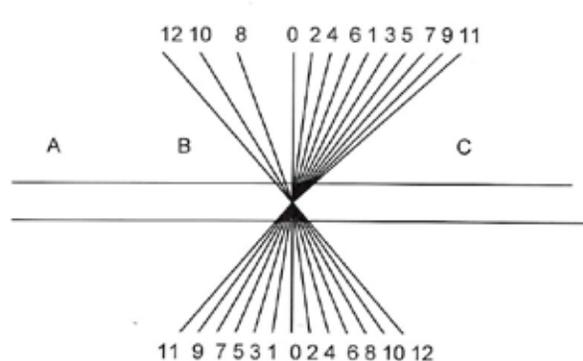


Figure 1

from the edge of the adjacent component of the section of higher refractive index, "BC", if, by adjusting the microscope tube higher, the upper surface of the plate, "ABC", is seen in the focal plane of the objective. An opposite effect appears when the microscope tube is adjusted deeper.

The phenomenon is therefore the following: By an intermediate adjustment, both materials appear equally bright and the border edge appears as a sharp line. Elevating the tube forms a bright line adjacent to the edge of the more refractive side, which, with further elevation, appears farther from the edge, widens and then fades away. Lowering the tube forms a similar occurrence on the side of the mineral of lesser refractive index.

When mineral sections of different refractions are adjoined opposite each other, the bright illumination of the border lines creates an optical illusion; with the microscope tube at a higher elevation, one believes the entire surface of the section of higher refractive index is more brightly illumination. The differences disappear as the border is covered.

It is inferred from Figure 1 that constriction of the cone of illumination increases the light contrast up to the border angle of total reflection. The appearance would not be made more distinct by further constriction, however. It follows from this that the smaller the observed differences in refractive index, the more sharply constricted must be the cone of illumination; a widely open light cone would obscure the refractive differences and the unilateral illumination enhancement would be too slight to remain visible. Microscopes for mineralogic and petrographic studies contain a convex lens over the polarizer⁵, which effectively expands the cone of illumination and narrows the perceptibility of the refractive differences. Because so little use had been made of this method observation up to now, I believe it necessary to mention this.

The iris diaphragm attached under the polarizer of von Fues's newer instruments proves quite satisfactory in obtaining a suitable modulation of the illuminating cone. The same effect can be achieved on Reichert's apparatus by raising or lowering the polarizers after a suitable diaphragm is attached.

It is also apparent that objectives with a small aperture and a long focal length cannot exhibit the images mentioned so distinctly. The smaller the aperture of the objective, the more the cone of illumination must be constricted.

Furthermore, it is easy to understand that the images described will become more distinct with the thinness of the sec-

5 [Editor's Note: a substage condenser].

tion. Every point of the vertical boundary plane can be viewed as the exit point of an asymmetric light beam. When many such points lie over one another in varying elevations, the displacement of the microscope tube going from a higher position to a lower position gradually effects a transfer of illumination. A thinner section necessitates a lesser microscope tube adjustment and facilitates a faster adjustment of illumination.

A considerable deviation of the edge, "B" from the instrument's optical axis would be less disruptive if the lesser refractive index mineral overlapped on the upper side. In other cases, overlap of the material of higher refractive index can intensify the effect and even shift the greater light intensity to the side of the material of lesser refractive index.⁶ This hazard increases as the difference between the refractive indices decreases. Such situations, disclosed through inadequate resolution of the edge and lateral displacement of the image with movement of the microscope tube, may be thereby recognized and for the most part avoided.

An absolute necessity, furthermore, for image visibility is the absolute cleanliness of the boundary. Foreign bodies, decay products on the edges, chips of glass between sections, and Canada balsam oozing into the margins completely blot out the image.

Up to this point, no consideration has been given to the light ray diffraction crossing in or out of the covering medium (Canada balsam) on the upper and lower surfaces of the thin section. Whichever medium refractive index is in closest approximation to the section examined may be considered the most suitable condition. The case where the encompassing medium possesses a noticeably higher refractive index will not impair the observation, but this will occur only rarely. On the other hand, a covering medium of considerably lower refractive index is not advantageous. The light rays above "B" would, by diffraction, be strongly dispersed at right angles and changes in illumination would be likewise evident. Therefore, while in general the differences between quartz and orthoclase in balsam is very distinctive, the observation becomes more difficult with ether and chloroform, which are sometimes used to cover the thin sections. The contrasts of minerals of high refractive index are not so clearly discerned in balsam for the same reasons. On the other hand, the differences between agate and granite, for example, can be well recognized by the use of methylene iodide as a cover medium.

Refractive differences can be brought into more meaningful observation when oblique illumination or the method of Schlieren is used. In order to understand the illumination effect occurring here, we will think of a mineral of high refractive index surrounded by one of lesser refractive index, as seen in Figure 2.

The plate is illuminated with a narrow light cone whose aperture corresponds to the total reflection angle by the crossover from a mineral of higher refractive index to one of a lesser refractive index. We record the course of the light rays in two beams, which strike at two areas, "A" and "B", of the surface boundary.

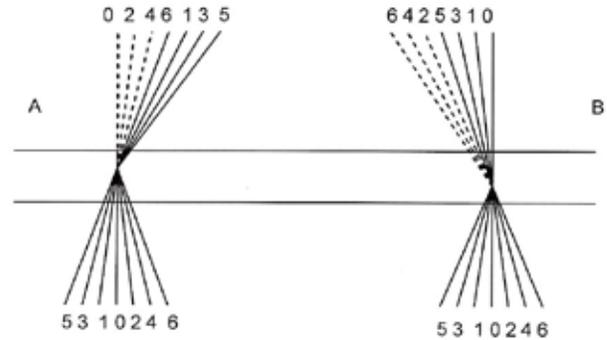


Figure 2

Half of the light cone 0-6 is now considered absent, so that the light rays go through the plate as indicated by the heavy lines. More rays will thus be reaching the objective as a consequence of total reflection from the side of the higher refractive index, which is oriented away from the light rather than toward it. Since the image is reversed in the microscope, the side of the more refractive section is seen brightly illuminated, which reflects the obliquely falling light backwards, overshadowing the section positioned opposite. As the direction of incident light is noted, the section of stronger refraction stands out silhouetted against the background of the section of lesser refractive index. By the same token, the section of lesser refractive index appears as an empty space in the preparation.

Observation of the image is easier as the aperture of the objective is narrowed, since here the illumination contrast derives chiefly from the light rays totally reflection, which encloses a small angle with the axis of the microscope.

Oblique illumination can easily be produced on von Fuess' instrument by lateral displacement of the iris diaphragm aperture. The Abbe illumination apparatus can of course also be used here, but its usage is not achieved with all polarized light microscopes.

Dimming of the border illumination using the principles of Toepler's Schlieren-observation has the same effect as oblique illumination, since, for example, it permits the microrefractometer of S. Exner.⁷

The preference of observation methods will remain an issue of subjective choice. I frequently employ all in order to have multiple control.

The observation methods described here are able to differentiate differences that are indeed very small. For example, when two quartz sections with axes crossed at roughly 90° are approximated, the section which transmits polarized light as the extraordinary beam ($\epsilon = 1.553$) can easily be differentiated from the other section whose beam corresponds to the ordinary beam ($\omega = 1.544$). The former appears distinctly more refractive. The relationship is transposed after the specimen is rotated 90°. A difference of 0.009 in refractive index is discernible with the greatest ease.

Even much smaller differences are discernable under favorable circumstances.

Leucite sections in fine cuttings of Leucitophyra from reeds contain slender double lamination in the double refractive main body. The planes of extinction are in approximately

cont'd on next page.

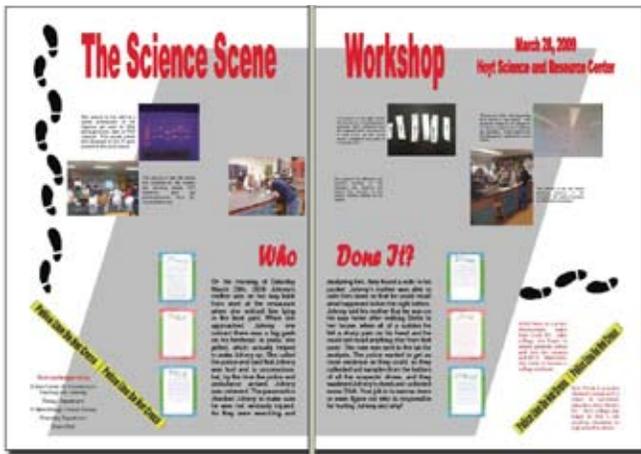
⁶ The illumination relationships occurring in these cases can be easily clarified when one considers the requirement for light rays extended to the right or left, a fixed boundary by "B", and imagining the plate "AC" rotating around "B."

⁷ S. Exner. A Microrefractometer. *Archiv für mikroskopische Anatomie*, 25, 1885, p. 97.

Becke Translation, cont'd

one hundred parallel sections, but the axes of elasticity cross. If the section is thereby brought into the position of extinction so that the direction of vibration of the polarizer with ϵ of the main body (ϵ of the laminations), then the laminations appear with central illumination and a strongly narrowed light cone by a high position distinctly brighter than the surrounding. When the preparation is rotated 90° the opposite situation occurs. The difference of the refractive indices that are perceived amounts to hardly less than 0.001. The observation was made with a von Fuess II microscope with a 7 objective and 2 ocular using the iris diaphragm beneath the polarizer⁸.

8 A little detective work is required here, as the nomenclature is archaic and obscure. Becke tells us who made his microscope, but doesn't tell us who the manufacturer is of his objective and ocular, and it does make a difference. In the 19th Century, a Zeiss 2 ocular was 4X, as was Reichert. There were no Reichert 7 objectives, and Zeiss had an entirely different means of designating magnifying power, e.g., A, AA, C, D, and F. Leitz was the only manufacturer that had a 2 ocular and a 7 objective. The Leitz 2 ocular was 6X and the 7 objective was 60X. On the basis of the foregoing, we conclude that von Fuess followed the Leitz nomenclature and that Becke is speaking of a 6X ocular and a 60X objective.



Missing Text Restored

During production of the print version of last quarter's issue (*The CACNews*, 3rd Q 2009), the left half of the text from the "Science Scene" poster was inadvertently omitted. Below is the full text:

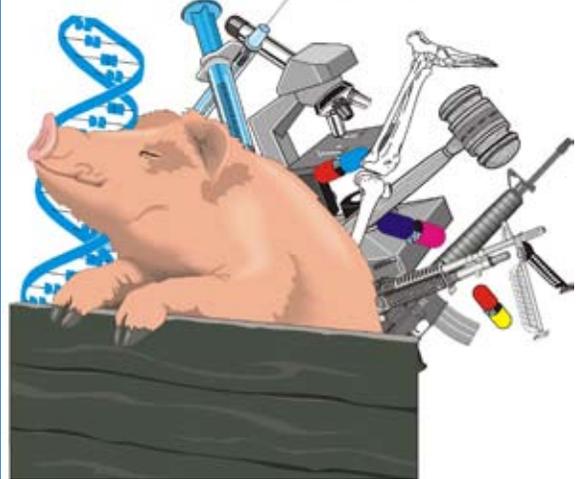
On the morning of Saturday March 28th, 2009 Johnny's mother was on her way back from work at the restaurant when she noticed him lying in the front yard. When she approached Johnny she noticed there was a big gash on his forehead. In panic, she yelled, which actually helped to wake Johnny up. She called the police and said that Johnny was hurt and is unconscious; but, by the time the police and ambulance arrived, Johnny was coherent. The paramedics checked Johnny to make sure he was not seriously injured. As they were searching and analyzing him, they found a note in his pocket. Johnny's mother was able to calm him down so that he could recall what happened to him the night before. Johnny told his mother that he was on his way home after walking Stella to her house, when all of a sudden he felt a sharp pain on his head and he could not recall anything else from that point. The note was sent to the lab for analysis. The police wanted to get as more evidence as they could, so they collected soil samples from the bottom of all the suspects' shoes, and they swabbed Johnny's cheek and collected some DNA. Your job is to narrow down or even figure out who is responsible for hurting Johnny and why!

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Thoughts on an Old Bandanna

I have this old bandanna, and I've had it for years. It is ragged and worn, but it is my favorite. It has been laundered so many times over the years that it has become softer and more absorbent than any other handkerchief that I own. I carry it in my pocket and use it specifically for cleaning my eyeglasses. So despite its bedraggled appearance, it is quite functional.

Recently, I have noted that it has developed worn spots or holes and, to my surprise, these holes appear to have a pattern. They are not simply random.

As I became aware of the existence of a pattern, I wondered as to the cause of the particular placement of damage sites. My first observation was that they are located on the major fold lines of the article. And it does seem reasonable that over a period of time the fibers would tend to break down along these fold lines. But then the question arises, why does the fiber breakdown occur specifically in areas where the decorative pattern is undyed? On those very same fold lines, the blue-dyed fabric appears to be unaffected by the same damage. Does the dye itself provide protection? If indeed there is such protection, is it due to a chemical reaction of the dye upon the fibers. Or could it provide some kind of filtration of damaging actinic light? Would a red bandanna exhibit the same behaviour?

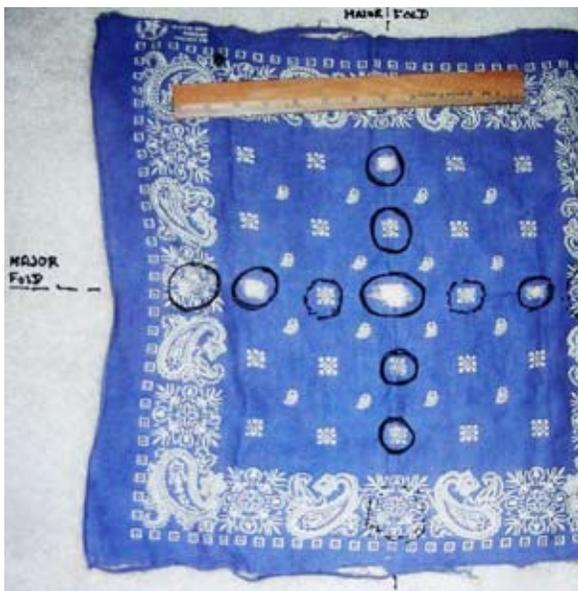
As I have neither access to laboratory facilities to experiment with this phenomenon, nor do I possess expertise in this area, I pass this observation to colleagues in the forensic science community and to fiber scientists. Perhaps someone can satisfy my curiosity.

I think a criminalist, by nature, should have a sense of wonder and curiosity about everything. I've always enjoyed reading the musings and analyses of Rudin and Inman as they become engaged in seeking meaning and truth in many subjects. I'd love to be there marking up napkins as they dine and solve problems. Well, for better or worse, here is my little puzzler. I'm sure that someone can come up with an answer very quickly. I can only conjecture.

Morris Grodsky



Photo 1 (above) is natural. Photo 2 (below, left) has been modified as to color, contrast, size and markings for the purpose of better visualizing the pattern of fiber damage on the handkerchief. Photo 3 (below) is a closer view of the damage.



How Much Should the Analyst Know and When Should She Know It?



—or—

There and Back Again

(apologies to J.R.R. Tolkien)

“But love is an emotional thing, and whatever is emotional is opposed to that true cold reason which I place above all things. I should never marry myself, lest I bias my judgment.”

—Arthur Conan Doyle

“We want the facts to fit the preconceptions. When they don’t, it is easier to ignore the facts than to change the preconceptions.”

—Jessamyn West

“Science ... warns me to be careful how I adopt a view which jumps with my preconceptions, and to require stronger evidence for such belief than for one to which I was previously hostile. My business is to teach my aspirations to conform themselves to fact, not to try and make facts harmonize with my aspirations.”

—Thomas H. Huxley

At this point, lunch, at least the kind where you sit down and order real food, is but a distant memory, enmeshed in more recent recollections of non-meals in airports, on planes, in faceless joints, in nameless cities. One simply prays to the GREAT GOD OF AIR TRAVEL for minimal delay and the coveted upgrade.

While we have been writing and speaking on the ideas of observer bias, confirmation bias and context effect for some time now, (Inman and Rudin, 1997, Krane *et al.*, 2008, Krane *et al.*, in press) we realized that we have never aired our thoughts in this venue. Or at least not for a very long time. While the so-called CRITICS OF FORENSIC SCIENCE (also known as THE USUAL SUSPECTS) have also been discussing these ideas for some time, (Rosenthal, 1966, Miller 1984, 1987, Risinger *et al.*, 2002, Dror and Charlton, 2006, 2006a, Gianelli, 2007) working practitioners have been generally unreceptive to the idea that subconscious bias presents a legitimate challenge to forensic analyses. Even those who accept the idea that criminalists are subject to the same foibles that afflict the rest of the human race often suggest that observer bias can be defeated by brute force of will, bolstered by the appropriate education, sufficient experience, and careful review. We respectfully disagree.

Before we address some recent published suggestions to this effect, we offer the results of a scientific experiment on SEQUENTIAL UNMASKING, that is, the order in which information is revealed, and its effect on the decision making process of the unwitting experimental subjects. (see Fig. 1)

Patrons of a pub evaluated regular beer and “MIT brew” (regular beer plus a few drops of balsamic vinegar) in one of three conditions. One group tasted the samples blind (the secret ingredient was never disclosed). A second group was informed of the contents before tasting. A third group learned of the secret ingredient immediately after tasting, but prior to indicating their preference. Not surprisingly, preference for the MIT brew was higher in the blind condition than in either of the two disclosure conditions. **However, the timing of the information mattered substantially.** [emphasis ours] Disclosure of the secret ingredient significantly reduced preference only when the disclosure preceded tasting, suggesting that disclosure

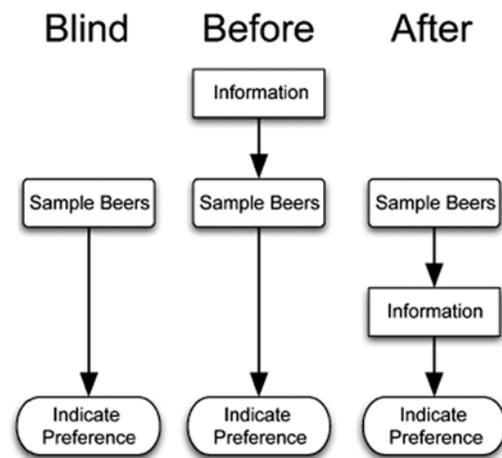


Fig. 1. Illustration of the three experimental conditions, in which we manipulated whether information about the presence of balsamic vinegar in one of the samples was disclosed and if so, when it was disclosed relative to tasting and evaluation.

From Lee L., Frederick S., and Arieli D., 2006

[In translating this experiment to forensic science, “sample beers” equates to “determine traits in the evidence” and “indicate preference” equates to “make a conclusion with regard to the correspondence between evidence and reference”]

affected preferences by influencing the experience itself, rather than by acting as an independent negative input or by modifying retrospective interpretation of the experience.

Before you dismiss this study as frivolous and irrelevant, please consider the following. The subjects of the study frequented a couple of pubs; they considered themselves “expert” beer drinkers with discerning palettes. The results are actually quite sobering (pun intended). The full paper (Lee *et al.*, 2006) is worth reading and can be downloaded from the URL in the references.

Recently, prominent members of the forensic science community published their ideas for countering the effects of observer bias. Specifically, in *A perspective on Errors, Bias, and Interpretation in Forensic sciences and Direction for Continuing Advancement*, Bruce Budowle and his many co-authors offer several suggestions to combat bias in forensic analyses. They also specifically reject a proposal, co-authored by us and a number of others, to institute SEQUENTIAL UNMASKING procedures (Krane *et al.*, 2009) designed to minimize bias resulting from information presented prematurely to the examiner.

While Budowle *et al.* openly acknowledge and accept that “confirmation and contextual biases are inherent in the psyche of human beings ...” that “... they also may cause a loss of objectivity ...” and that “... personal biases might override sound judgment, may affect interpretations in certain circumstances, and need to be minimized,” they then inexplicably opine that “... bias is not a serious pervasive concern ...” However they offer no data to support this belief; in fact, studies would suggest just the opposite. (Miller 1984, 1987, Dror and Charlton 2006, 2006a, Langenburg 2009, reviewed in Krane *et al.*, in press) Further, several of us review work from forensic laboratories on a daily basis and have had occasion to observe first hand, up-close and personal, the workings of forensic laboratories both nationally and internationally. In our experience, the opportunity for, and the realization of, subconscious bias is both more pervasive and more insidious than some might believe.

Budowle *et al.* correctly define confirmation bias as “... a proclivity to search for or interpret additional information to confirm beliefs and to steer clear of information that may disagree with those prior beliefs.” and contextual bias or context effect as “... using existing information or consistency to reinforce a position.” We entirely agree with their assertion that “We cannot deny that these biases exist; they are necessary for human beings to function. Unfortunately, they also may cause a loss of objectivity. Therefore, personal biases might override sound judgment, may affect interpretations in certain circumstances, and need to be minimized.” and that “Some blinding of the ancillary information may have merit and should be considered by the forensic community.”

However, the authors then proceed to blithely dismiss our published proposal to do just that. Specifically, Budowle *et al.* write that, “On the other end of the spectrum, recently a letter describing a sequential unmasking approach has been proffered for DNA interpretation. This letter has some points that are difficult to reconcile such as a case manager solely deciding what to test, how to test, and to supervise testing. This suggestion would strip the laboratory of a wealth of experience in carrying out an analysis and would rely on only one individual to effect case analyses.” This view of our letter seems to reflect some misunderstanding of its content. We are willing, able, and ready to engage in a debate about the ideas that we have put forth. However, it is more difficult to respond to criticisms based on apparent misinterpretations and misrepresentations of our proffered solution to what we all seem to agree is a very real challenge.

In fact, the preceding statement may be, in and of itself, an excellent example of confirmation bias. Budowle *et al.* perhaps responded based on their previous assumptions about our proposition, and failed to update their beliefs with the actual information outlined in our letter. Specifically, they set up a straw man with their allegation that only one individual would function as the sole case manager for a laboratory, that this one individual would have full control over all aspects of testing, and that the experience of all other analysts in the laboratory would be ignored.

Nowhere do we suggest that it is necessary or desirable for one individual to function as the sole case manager for a laboratory, or that a single individual would necessarily have full control over all aspect of testing, or that the experience of all other analysts in the laboratory would be ignored. Indeed, we are at a loss as to how to reconcile such an interpretation with specifics in our text; the title itself clearly emphasizes an ordered unmasking of domain-relevant information. For example, we specifically state that, “After the results of the initial interpretation are documented, information about reference samples should be unmasked in a sequential manner” And, with the explicit intention of forestalling criticisms such as has been lev-

We are willing, able, and ready to engage in a debate about the ideas that we have put forth. However, it is more difficult to respond to criticisms based on apparent misinterpretations and misrepresentations of our proffered solution to what we all seem to agree is a very real challenge.

eled in the paper under discussion, we clarify that, “We are not suggesting that forensic scientists be blind to information that might afford them the greatest opportunity to generate reliable information from evidentiary samples.” Further, we never suggest that one and only one individual in a laboratory (or external to the laboratory) be designated as the sole case manager that would “effect case analyses.” In fact, a better design, both administratively and professionally, would be to rotate responsibilities amongst qualified analysts, maximizing both education and experience. Many laboratories that use a group approach to case analysis already employ some form of a rotating case manager to organize individual cases. (Zeppa, 1999)

In support of their position, Budowle *et al.* offer “Some critics have suggested blind analysis is a possible way to alleviate the effects of contextual and confirmation biases. A hair or shoeprint examination carried out without knowing the estimated time between the crime and collection of reference samples could lead to erroneous interpretations. Ignoring elimination samples, when interpreting analytical results from evidence in a rape case, can provide false leads and reduce the power of the analysis. Complete ignorance to case specific information exhibits poor judgment and should not be considered.” Again, these examples that they would apparently like to attribute to us to expose the error of our ways, are solely a construct of the authors. We have never suggested that a report be issued without considering information such as suggested above, nor do we ascribe to the idea that complete and enduring ignorance of case specific information is a good idea. Intrinsic to our proposal is the idea that the analyst will even-

cont'd on next page.

Proceedings of Lunch, cont'd

tually have access to all domain-relevant information but that, in contrast to common current practice, such information be revealed sequentially. Additionally decisions and conclusions must be documented chronologically relative to the unmasking of each additional piece of information. Such a process patently precludes any notion that the analyst would ultimately lack information relevant to arriving at a complete and informed conclusion. The analyst would always find out that the vinegar was added to the beer, just not before tasting it.

Rather than proactively minimizing the risk of inadvertent error by implementing SEQUENTIAL UNMASKING type protocols, Budowle *et al.* suggest that “*The best way to overcome and prevent potential biases in judgment is through peer review*¹,” specifically “*blind verification*².” They further suggest that “*Because of the QA systems in place, biases are not routinely problematic.*” We are aware of no evidence to indicate that the implementation of these types of quality assurance measures, as used by forensic laboratories today, minimizes subconscious bias; these procedures do not substitute for sequential unmasking.

Finally, Budowle *et al.* refer throughout their paper to the idea that “*The forensic community should consider documenting the numbers of ‘inconclusions,’ ‘exclusions,’ and ‘inconclusives’ ... of their laboratory results.*” They further suggest that, “*Such data, if it were to be published, would likely support the proposition that forensic scientists are not overly biased ...*” We find this proposition, frankly, stunning, and fail to see how the relative proportion of various possible conclusions reflects anything of consequence with respect to bias. First of all, this assumes that all bias would result in a change from exclusion to inclusion. The studies thus far (Miller, 1984, 1987, Dror and Charlton 2006, 2006a, Langenburg *et al.* 2009) indicate that changes can be in any direction amongst the three possibilities, depending at a minimum on the biasing stimulus, the specific situation, and individual confidence and proclivities. Second, this assumes that all inclusions associate a piece of evidence to a suspect, and that this association requisitely inculcates the suspect. Many situations exist in which this over-simplified model does not apply. For example, the inclusion or exclusion of a victim or neutral party as a contributor to a sample might either tend to inculcate or exculpate a suspect, depending entirely on the case circumstances and the relevant question. Sometimes, the number of contributors to a sample may be as important as the identities of the contributors. Increasingly, the dispositive question relates to the time or manner of deposition, or to the physiological fluid from which the DNA originates, while source is not the issue. That galaxy of possibilities is simply too complex and interwoven to expose or discount bias by a nominal count of exclusions, inclusions, and inconclusives.

1 We feel compelled to clarify that the term “peer review” properly applies to a specific process through which a manuscript submitted for publication in a professional journal is anonymously reviewed by several individuals in the same field to determine if it is suitable for publication. Co-opting this term as a synonym for the internal technical review performed in a forensic laboratory is inappropriate and misleading. It implies greater weight and authority to an internal technical review than is merited, conferring upon it a false sense of autonomy and independence.

2 We also take issue with the use of the term “verification” to describe an independent examination of an item or data. The term strongly implies that the conclusion of the primary analyst will in fact be verified, and would seem to leave little or no room for refutation. As thought follows language, we suggest that the use of more neutral terms such as examination, interpretation or analysis is more appropriate to the task.

In our continual review of forensic DNA protocols across the nation, we have been pleased to see that many laboratories have begun to include at least some elements of SEQUENTIAL UNMASKING, the simplest and most important being initial interpretation of evidence samples independent of any information about the reference samples. This implicit acceptance of the idea of SEQUENTIAL UNMASKING goes a long way toward minimizing observer effects, and their attendant dangers in forensic analyses.

Almost a decade ago, we published the editorial that would ultimately become the flagship column for the POL series. The piece was entitled, *How much should an analyst know?* (Inman and Rudin, 1997) At that time, our answer was, “*as much as possible.*” Using logic similar to that of Budowle *et al.*, we insisted that the effects of subconscious bias could be countered by good intentions and careful review, that the risk of subconscious bias generated by full access to all information at all times was more than mitigated by the advantages to the analyst and ultimately to the criminal justice system. In the intervening years, and in large part based on updated information gained by independently reviewing hundreds of laboratories, we have updated our beliefs and refined the question. We are now convinced that the correct question must be, not only, how much should an analyst know, but when should she know it? We believe that the forensic community as a whole must ultimately arrive at the same belief.

We’ll hoist a cold one to that!

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Crime Laboratory Review Task Force

The Crime Laboratory Review Task Force (Task Force) evaluation of forensic science in California is drawing to a close. The data has been collected from laboratories, attorneys and law enforcement agencies. The topics in the Task Force report to the legislation will include laboratory organization and management, staffing and training, recruitment and retention of staff, education, certification, accreditation, funding, performance standards, equipment, workloads, and statewide forensic science oversight. The report is in the final draft stages with the anticipated publication scheduled for mid October.

There are only two Task Force meeting remaining until the report is submitted to the printers; Thursday August 20 in Los Angeles and September 23 in Sacramento. Remember these meetings are open to the public. Therefore, it is imperative that should you want your voice heard that you attend these meeting. Additional information can be obtained from the Attorney General's web-site at http://caag.state.ca.us/meetings/tf/content/092309_CA_Crime_Lab.php.

The CAC has a strong reputation for professionalism and adherence to ethical standards. Because of these and other valuable traits, it is important that the CAC, through its many members appointed to the Task Force and its membership in general, lead the way in guiding the Task Force in a direction that provides value and improvement to the delivery of forensic science services in California. Though the CAC has only one official representative on the Task Force several of the people appointed to the Task Force are CAC members. It is essential that the opportunities afforded our community through the creation of the Task Force be used to benefit the criminal justice system as opposed to merely creating additional bureaucratic red tape. Toward this end, all members of the CAC need to be educated and aware of the activities of the Task Force. Please take the time to read the Task Force "Vision Statement", "Mission Statement," and visit the Task Force web site. Educate yourself on the process so you can play a part in providing direction and input to a group that can have a significant impact on the future of forensic science in California.

California Crime Laboratory Task Force

Vision Statement

Providing forensic science service that is timely and of the highest possible quality is essential to the effective prosecution of criminal cases, to protecting the rights of criminal defendants, and to the safety of the citizens of California.

Mission Statement

It is the mission of the Crime Laboratory Task Force to meet the mandate of AB 1079 by reporting to the Legislature on the status of the state, county, and local crime laboratories and to make recommendations on how best to ensure the timely and effective delivery of the highest quality forensic services. To carry out this mission the Task Force will:

1. Survey government crime laboratories in order to inventory their staffing, workload, budget, major instrumentation, and organizational placement within the controlling agency;
2. Survey client agencies and other stakeholders as the operation of government crime laboratories and suggestions for improvement of forensic science services;
3. Identify through presentations and information from external subject matter experts the most appropriate means of addressing the forensic science needs of California;
4. Identify specific areas in criminal laboratory organization and management, staff and training, funding, and performance standards where improvements could be made;
5. Work as a team in an open and transparent manner to ensure that the perspectives of all stakeholders, including prosecutors, defense counsel, law enforcement, and the public are heard and considered in completing the Task Force report and recommendations;
6. Complete and submit a final report of its findings on or before July 1, 2009, as required by AB 1079.

Jennifer Mihalovich



CAC Northern Firearms Study Group



On July 27, 2009, the California Association of Criminalists Northern California Firearms Study Group (CAC – NCFSG) met on the San Jose State University campus hosted by Dr. Steve Lee. There were 27 attendees, stretching from Sacramento to Fresno to hear a total of ten different presentations.

Two of the presenters are current students of the ATF-sponsored National Firearm Examiners Academy (NFEA) and each gave a presentation on a practical tool mark exercise each worked while at the Academy. Carlos Jiron of San Mateo County gave a presentation on identifying a hatchet to a cut piece of copper wire. In this, he stressed the importance of using like substrates and the usefulness of trace evidence with respect to identifying the portion of the hatchet that might have been used in the actual cutting of the copper wire. Todd Weller of the Oakland Police Department gave a presentation on the comparison of tape ends using parallel lighting to identify two edges as once having been joined together.

The theme of tool mark work continued with John Murdock and Terence Wong of Contra Costa County as they discussed a high profile burglary case. Terence also gave a presentation on the use of photographs of firearms for courtroom presentations. Terence has developed a small database of photographs of various firearms. Using commercially available software Terence was able to put together presentations of photographs to show the cycle of fire of various firearms as various parts were made transparent so one could look behind the scenes to the internal parts and functioning of the firearms. These were remarkable as much work was evident in the photography and preparation of the presentations.

John Murdock also gave a presentation on the AFTE Response to the NAS Report. John is the chair of the AFTE committee handling this response and he detailed several areas in which AFTE has been able to positively respond to the concerns expressed in the NAS report. The full text of the response is soon to be posted on the AFTE website.

Lillian Lau of San Francisco gave a presentation on her experience in the NFEA as well as the amount of work necessary once the Academy has been finished to enable one to be considered a trained firearm and tool mark examiner. The

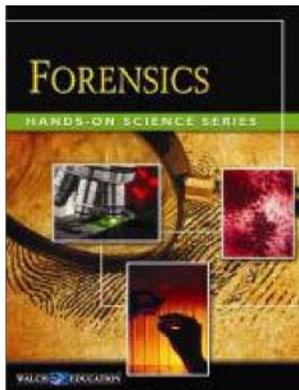
NFEA provides important exposure in many different facets of firearm and tool mark identification but by itself is incomplete to serve as the only training an individual should receive. There is much work to be done between the trainee and the trainer even after the Academy is finished and Lil detailed the extensiveness and importance of this training.

Bruce Moran of Sacramento County talked about a trip he and John Murdock took to Germany in March of 2009 to put on a workshop regarding consecutive matching striations and their applicability as scientifically defensible criteria in tool mark identification. They were invited by ENSFI (Eur. Network of For. Sci. Inst.) of which Bruce is an affiliate member. Fifty students were in the class representing 27 different countries. The class helped to spur students toward thinking about not only the usefulness of CMS but also further research ideas with regard to this topic.

Richard Grzybowski and Howard Kong of the Bureau of Alcohol, Tobacco, Firearms and Explosives also discussed new firearms and calibers that have made their way into crime labs. Howard discussed the FN Herstal FS2000 carbine which is a bullpup design and can produce markings on the side of the fired cartridge case that indicates passage through a switch that transfers the fired cartridge case to a tube from which it is then expelled out the front of the firearm. Richard discussed the 6.5 Grendel, 6.8 SPC (Remington) and 5.7 x 28 (FN) cartridges that have found their way into the ATF laboratory. He also discussed the AK74 (5.45 x 39) versus the AK47 (7.62 x 39) distinction.

Finally, I gave a short presentation on the evolution of the NFEA Testimony training that has moved from no classroom instruction prior to the students returning for rigorous moot court exercises to instruction at the beginning and two weeks at the end dedicated to preparing the students for courtroom testimony. This includes a mini-moot court for each student, instruction in various *Daubert* and *Frye* related issues, and presentation and discussion of various contemporary hot issues in firearm and tool mark identification.

Ron Nichols
Chair, CAC NCFSG



New Title Turns Students into Criminal Investigators

Educational materials publisher Walch Education released a title that may appeal to criminalists advising teachers or who teach classes themselves.

In "Hands-On Science: Forensics" author Brian Pressley targets middle and high school students who, just like the characters in popular TV shows, conduct experiments to determine exactly who did what—and how. Working from crime scenarios, students use chemical, biological, photographic, and other means to study the evidence and draw logical conclusions. The 20 activities in Hands-On Science Forensics include: A Car as a Crime Scene Matching DNA, Blood Pattern Analysis Microscopic Fibers, Car Accident Missing Person—Your Teacher!, Components of Soil Photographing a Crime Scene, Density of Glass Fragments Physical Properties of Soil, Detecting Blood, Processing a Crime Scene, Fingerprints Searching Through Garbage, Glass Fracture Patterns Shoe Prints, Handwriting Analysis, Tire Tracks, Human Hair versus Animal Hair, and Tool Marks. \$23.99 ISBN:0-8251-6515-6/ISBN13:978-0-8251-6515-3. www.walch.com.

Life & Times as an Acting Supervisor

By Annie Ouzounian
San Mateo County Sheriff's Office Forensic Laboratory

When I saw my former LAPD supervisor at the last National Institute of Justice meeting in Washington, D.C., I felt compelled to say something to him. "I don't know how you do it, Larry! After my recent experience as acting supervisor, I have much more respect for your work as a supervisor!" I had worked at the LAPD Crime Lab in the Serology/DNA Unit for five years before moving to Northern California and joining the San Mateo County Sheriff's Office Forensic Lab. Only having been in the Forensic Biology Unit for a little over two years, my current supervisor Alice Hilker asked if I would be interested in an acting supervisor role while she was out on maternity leave. I must say that I was pleasantly surprised and pleased to know that my supervisor believed that I could handle this task. But, since Alice is the DNA Technical Leader, the CODIS administrator, and the Supervising Criminalist of the Forensic Biology Unit, I knew that her shoes were not going to be easy to fill.

When I was first approached with this offer, I thought to myself, "how bad could it be?" I knew it would involve a lot more paperwork, which I didn't mind, and probably more interaction with detectives and DAs on the phone regarding their DNA and screening requests. Boy, was I in for a surprise! Yes, there was definitely a lot more paperwork, since I was doing all of the administrative reviews on every DNA case that was completed by the five DNA analysts as well as most of the screening reports that were completed by our two "screeners." But finding time to do that paperwork was difficult since I found myself on the phone constantly with detectives and DAs, each one telling me how important their case was and that they needed the results as soon as possible. When I wasn't on the phone, I found myself trying to put out some sort of fire that seemed to come up almost on a daily basis. Let's not forget all the fun of assigning and keeping track

of all the analysts' cases too! And, the weekly management meetings where we were asked the challenging questions of how to do more while spending less!

As a casework analyst for over seven years at that point, I had dealt with my fair share of rush casework and the pressure to get my cases out. I was already used to having some amount of stress at work. The difficulty I had with the acting supervisor role was dealing with the constant pressure from detectives and DAs who needed their cases done and trying to accommodate them when I knew the analysts in my lab were already under a great deal of pressure with all of the cases that I was assigning them. Since I wasn't doing casework while Alice was gone and we had just lost a DNA analyst two months before, we were definitely short-staffed. As a casework analyst, I was very aware of how frustrating it was for the analysts to get rush case after rush case with no apparent end in sight. I found that trying to balance this "supply and demand" was the difficult part of the job for me.

It did get easier as I got used to my role. I was able to handle the emotional stress a little better each day (I'm not sure if my husband would agree with that statement!). I really enjoyed being the person that all of the analysts felt they could go to when they had any questions or concerns and it was very gratifying to do my best to help. One thing that I tried not to lose sight of during my time as acting supervisor was the importance of communication with the analysts. Good communication is probably the most important element that allows analysts and management to work best together. I also think that it is important for management to be aware of the constant pressures that the analysts are under and to keep this in mind along with their expectations.

Now that I have had the great learning experience of seeing what life is like from a supervisor's point of view, I have a much greater respect and understanding for my supervisors, past and present, and what they have to deal with on a daily basis. As far as whether I'd pursue a permanent supervisory position in the future...let's just say that I really enjoy the challenges of working on the bench for now, but who knows what the future may hold!

Quality at All Levels

Jasmine Murphy Jefferson, M.S.
Los Angeles Police Department Quality Assurance Unit

Quality Assurance was defined by Merriam-Webster in 1973 as "a program for the systematic monitoring and evaluation of various aspects of a project, service or facility to ensure that standards of quality are being met." Although this formal definition was accepted in the latter 20th century, quality awareness is definitely not a new concept.

In the early 1900s, Henry Ford, the Bell System, and the Western Electronic Company all provided notable foundations in quality practices. Deming revolutionized industrial Japanese production strategies and emphasized the importance of continuous improvement in the 1950s. Prior to these quality control processes Japanese products were considered inferior to domestic products. By the 1980s, a heightened awareness of quality developed in response to increasingly competi-

tive foreign markets for manufactured goods, and failures of products and services to meet consumer expectations.

The meaning of the term "quality" has evolved from product quality, to Total Quality Management and now towards Performance Excellence. No matter what name is used to denote efforts to improve and ensure quality, all descriptions include an organization-wide commitment. If an organization is invested in creating and maintaining high standards of quality, it must be infused at three levels:

1. Organization Level – In establishing the foundational systems and objectives for the organization; all strategic planning must include a focus on quality.
2. Procedural Level – In each policy, procedure and in the design and execution of every activity performed within the organization – quality must be ingrained into every step of every process.

cont'd on next page.

Why is ASCLD Important, cont'd

- Responsibility to the Employee – where categories include Qualifications, Training, Employee Competency, Staff Development, Work Environment, Communication, Supervision, and Fiscal Obligations.
- Responsibility to the Public— where categories include Conflicts of Interest, Responding to Public Needs, Professional Staffing, Legal Compliance, Fiscal Responsibility, Accountability, Disclosure and Discovery, and Work Quality.
- Responsibility to the Profession— where categories include Accreditation, Certification, Ethics, Organization Participation, and Research.

These are the tenets and principles that make a laboratory successful. These guidelines comprise a set of principles that frame the concept of professionalism for forensic managers and supervisors. This is what each and every ASCLD member strives for. This is not to say that all labs must meet each and every one of these; remember these are guidelines not mandates.

Forensic Science in a Post-NAS World

Take a moment as RE-READ the principles above with the frame of reference of the NAS report. I am not going to go into the NAS recommendations here, but having those 13 recommendations in mind, take a closer look at those guidelines which were developed 12 years prior to the NAS report. Yes, I am serious. STOP and RE-READ the guiding principles now.

Now more than ever, you can see how those guidelines along with the NAS report are going to shape the future of forensic science. You can see how today's leadership will set the future tone and direction for forensic science. This WILL impact you...and if we as a forensic community do this right, it will be for the better. I believe that everything happens for a reason. We can choose to moan and complain about challenges that come our way or we can look at them as tremendous opportunities to seize.

YOU are our future leadership. About 10% of you reading this right now will be tomorrow's crime lab leaders. (I know because I was in your shoes on the bench) You many think that this only applies to management, but think again. For some of you, you will be "that management" that you complain about in the break room. Furthermore, EVERYONE in the laboratory has a professional obligation to meet the guidelines above. Just because you are not currently a manager or supervisor does NOT mean that you don't have an obligation to your employer, your peers, the public and the profession. You may not be *accountable* for making these principles happen in your lab but you are each independently and professionally *obligated* to make sure you do your part to make them happen!

Quality, cont'd

3. Individual Level—Each employee must demonstrate a strong understanding of the contribution every job title has on the overall quality of the organization.

A focus on quality must permeate all levels and facets of the laboratory. Laboratory management should develop and disseminate expectations of quality throughout the lab on a regular and consistent basis. Analyses and examinations should be performed using methods and operating procedures developed with consideration of the laboratory quality system framework. Quality Assurance units are responsible

The Consortium of Forensic Science Organizations

If you haven't already heard of the Consortium of Forensic Science Organizations (CFSO), you will soon professionally. The CFSO was formed in 2000 under the brainchild of retired LA Sheriff Crime Lab Director Barry Fisher. Barry has long been renowned for his crime scene books and his talent at being the "ambassador" of forensic science. His efforts in trying to get federal legislation to become a reality hit a stone wall when Congressional staffers told him that our profession was too small and did not speak with one voice to be on the radar screen. He is credited for creating a coalition of the major forensic science organizations now called the CFSO. The participant agencies in the CFSO are AAFS, ASCLD, ASCLD/LAB, FQS-I, IAI, NAME, and SOFT/ABFT. These seven organizations now speak with one clear voice for forensic science. And it hasn't come easy. How many times have you experienced several dedicated professionals coming together and being unanimous in thought? Perhaps just look at your peers in your lab. It takes work and compromise, but the end "prize" is worth it all.

Recent activity within the CFSO has focused on the pending legislation and areas of consensus among the forensic science stakeholders with respect to the NAS report. As a professional community, we have been and will continue to work with our critics, strategic partners and stakeholders to respond not only to the contents of the report but also to provide testimony to the House and Senate Judiciary Committees, the White House and our colleagues in the forensic community.

Just as ASCLD was formed to deal with criticism brought to the community in the 1970's, so, too, will another body or office be developed to once again bring change to our field. Time will only tell what that final outcome will be. However, you should know that it is organizations like ASCLD that are busy, behind the scenes, creating new paths and opportunities for our future.

As a leader in my organization and in the field in which we work, my mission as a lab director is to distinguish between issues that can be solved and dilemmas that need to be managed. I have shared and practiced that with my employees from day one as a lab director and with our Board as the ASCLD President. My mission, in its most simple terms is: To help you do your job better. When you distill down all the leadership traits, qualities and activities, at the end of the day, the reason for having a lab director (and hence ASCLD) is to focus on all the issues and challenges that face the complex organization of a crime lab and the community allowing you to simply do what you do best – Criminalistics: Science Serving Justice.

And that is why ASCLD is important to the CAC.

for facilitating the upkeep of the quality management system and maintaining associated records—the quality system must be owned by all employees and upheld across every job class to remain effective.

Accrediting organizations perform periodic checks of laboratory systems, but inspection and assessment does not replace the responsibility of the laboratory has for continually improving methods, policies, and procedures. To maintain distinction in the field of forensic science, laboratories must do more than meet minimum standards, but attempt to exceed quality goals and strive to attain performance excellence.

BOARD OF DIRECTORS

President:
Mary Hong



Orange County Sheriff-Coroner
320 N. Flower St.
Santa Ana, CA 92703
(714) 834-6383
mmh@fss.co.orange.ca.us

President-Elect:
Adam Dutra



San Diego PD Crime Lab
1401 Broadway, MS 725
San Diego, CA 92101
(619) 515-2793
adutra@pd.sandiego.gov

Recording Secretary:
Jamie Miller



Orange County Sheriff-Coroner
320 N. Flower St.
Santa Ana, CA 92703
(714) 834-4510
jemiller@fss.co.orange.ca.us

Treasurer:
Michael Parigian



Ventura Co. Sheriff's Lab
800 S. Victoria Ave.
Ventura, CA 93009
(805) 662-6803
michael.parigian@ventura.org

Regional Director: (North)
Jeanette Wallin



CA DOJ Jan Bashinski Lab
1001 W. Cutting Blvd, Ste 110
Richmond, CA 94804
(510) 620-3331
jeanette.wallin@doj.ca.gov

Regional Director: (South)
Janet Anderson-Seaquist



Ventura Co. Sheriff's Lab
800 S. Victoria Ave.
Ventura, CA 93009
(805) 662-6804
janet.seaquist@ventura.org

Membership Secretary:
Patricia A. Huck



LAPD SID-Serology /DNA Unit
1800 Paseo Rancho Castilla
Los Angeles, CA 90032
(323) 415-8815
N3190@lapd.lacity.org

Editorial Secretary:
Gregory Matheson



Los Angeles Police Dept.
1800 Paseo Rancho Castilla
Los Angeles, CA 90032
(323) 415-8112
B8927@lapd.lacity.org

Immediate Past President:
Jennifer S. Mihalovich



Oakland Police Dept.
455 Seventh St., Room 608
Oakland, CA 94607
(510) 238-3386
jsmihalovich@oaklandnet.com

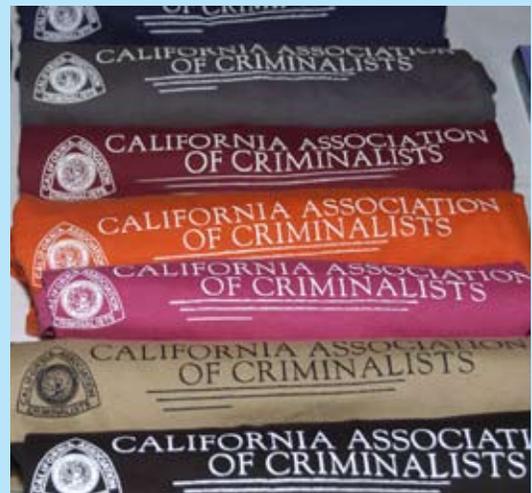
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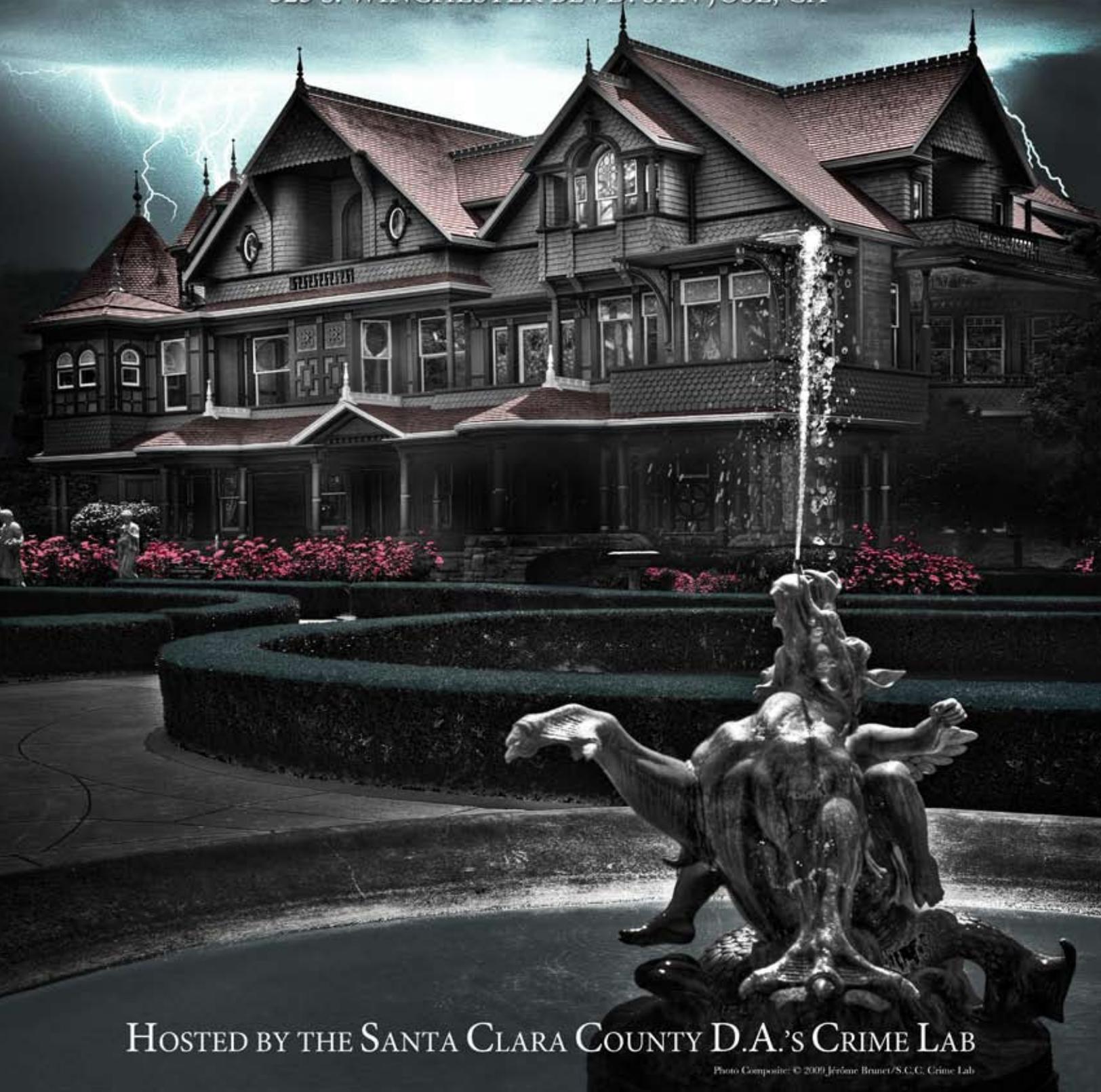
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