

News of the California Association of Criminalists • Winter 1996

The CAC News



The President's Desk

B O A R D O F D I R E C T O R S

Pete Barnett

On Doing It Yourself

The CAC is involved in many activities: Publishing a newsletter, sponsoring dinner meetings, coordinating study groups on a variety of topics, sponsoring semi-annual seminars, speaking out on behalf of criminalists and criminalistics, establishing and enforcing ethical standards of professional conduct for our members, and sending representatives to national organizations such as the American Board of Criminalistics and the American Academy of Forensic Science. To be involved in these di-



verse activities requires the dedication of those individuals who are involved in these activities, and the commitment of financial resources to carry out all of these activities. Not all of these activities are supported by all members of the CAC, and there are many activities that the CAC could support, that we do not.

There are members who think the CAC should be doing things that it is not, and there are those that think the CAC should not be doing some of things that it is doing. People who want the CAC to do things get involved in the CAC and set about accomplishing what they want accomplished. The support for these activities, and the allocation of financial resources to support these activities, is directed by the CAC Board of Directors through the various committees which oversee these activities. The CAC is largely self supporting. The commercial vendors who participate in our seminars contribute substantially to the CAC, but their contributions only serve to reduce the cost of attending the seminar from what it would be otherwise. We occasionally can sponsor a class where nonmember participation brings in a little money. However, most of the money to support the CAC comes from membership dues. How to spend this money to accomplish the goals of the CAC is the responsibility of the Board of Directors.

As President, I get many messages from members and non-members alike asking, "Why doesn't the CAC do this" or "Why hasn't the CAC done that." The answer, quite simply, is that we all do what we can. If you want something done, you can't expect the CAC to do it for you. If the CAC can be of some assistance, bring your proposal to the Board or one of the Committees. If you don't get the response you want, come to a business meeting and bring it up again. If you still don't get the response you like, run for a position on the Board of Directors and make your proposal a priority of your term in office.

The point is, the CAC is only the organization that its members make it. It is only by the work of its members, and the decisions they make, that the CAC accomplishes anything. We have, do, and will accomplish a lot—if you want the CAC to accomplish what you want, you might just have to do it yourself.



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California
Association of
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Winter 1996

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On the cover...

Luke Haag enjoys the Fall Seminar hosted by the California Department of Justice (Riverside) lab in Palm Springs. More photos inside. *Photo by Phil Petzel.*

This page: Crystals of d-methamphetamine in gold chloride grow outward from a single point.

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CACBits • Section News

Northern Section Activities

The San Francisco Police Dept. Forensic Sciences Division hosted a dinner meeting on Nov. 14, 1996 at Caesar's Restaurant near Fisherman's Wharf with 56 people in attendance. The guest speaker for the dinner meeting was Forensic Document Examiner Lloyd Cunningham, a retired SFPD Inspector who is currently in private practice. Mr. Cunningham spoke about several topics in document examination including the past and present state of the art document examination techniques, computer generated documents, indented handwriting, ink dating and interesting cases he has worked on.

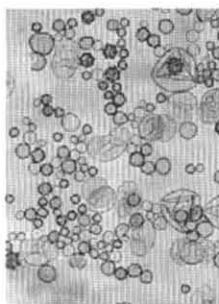
The ATF San Francisco Laboratory Center, under the leadership of co-chair **Robert Thompson**, hosted a Firearm and Toolmark Examiners Study Group prior to the dinner meeting. Thirty-two examiners were in attendance, representing ten different forensic laboratories. The guest speaker was **John Thornton** (Forensic Analytical) on the topic "Science and the Scientific Method", which afterward elicited questions and comments from the attendees. Robert Thompson (ATF) reviewed the current state of the National Institute for Standards and Technology (NIST) regarding the interpretability of IBIS and DrugFire imaging systems and their immediate plans for testing designs. **Lanning Lee** (Oakland PD) distributed samples of cartridges which were composed of a black plastic casing in .38 Special caliber. The bullet could be "popped" out, and is designed (with the proper hand tool, bullets and primers) to be used in the field as a reloadable cartridge. Refer to AFTE Journal vol. 20, No. 2, "USAC Plastic Cased Ammunition", by Will George.

Robert Thompson distributed the instructions, and passed around a metal drilling template used on AK47 receivers for full-auto conversions. Also, photographs depicting a paper template used in the cutting and welding of pipe to manufacture a STEN machine gun receiver. Also presented were photomicrographs showing a toolmark match of lathe chuckmarks on a silencer body found at a crime scene, to chuckmarks found on tubes seized in a machine shop that made the silencer.

The DNA/Serology Study (group also met at the SFPD prior to the dinner under the direction of co-Chairs **Jennifer Mihalovich** and **Tom Winder**. There were 15 individuals in attendance. The topic of discussion was "What does Theta tell us about human populations?" Dr. **Ed Blake** of Forensic Science Associates described to the group what theta is and why theta is used based on NRC II recommendations. Dr. Blake and Steve Myers of the DOJ DNA Lab both discussed how theta affects their population frequencies.

—Pam Sartori

Pollen Workshop a hit



On Wednesday, October 9, 1996, a one day Pollen Workshop was held at the Fall CAC Seminar in Palm Springs. The participants were honored to have Dr. John Jones, pollen expert of the Smithsonian Institute to lead the thirteen students into the wonderful world of pollen. The major topics covered included collection, preservation, extraction, and identification. Olympus America Inc. provided microscope for everyone in the class to use and one for the instructor with a video camera. The lasting impression from the class was that pollen is often overlooked and an underutilized source of information which the forensic community should consider.

Awards Committee Report

Recently, the Awards Committee selected the recipients of the Paul Kirk Award and the Edward Rhodes Memorial Award. In 1994 the Paul Kirk Award was altered and is now known as the Paul Kirk / President's Award. This award still honors outstanding new members of our profession, but works in conjunction with England's Forensic Science Society. The award was created to encourage the collegial relationship between the CAC and the FSS by promoting scientific exchange and fellowship between outstanding young members of our profession. On even numbered years the CAC selects a

winner and on odd numbered years the FSS selects a winner. The CAC recipient is then sponsored to attend the FSS meeting in England, as well as receive a \$100 stipend. The following year, when a member of the FSS is the recipient, that person is sponsored to attend a CAC meeting.



Brian Burritt is the recipient of the 1996 Paul Kirk / President's Award. Brian currently works sexual assault and homicide casework for the California DOJ, DNA laboratory.

Although being in the field for only a few years, Brian has made several presentations at CAC meetings and was chosen to be the "lead" criminalist in the validation of PolyMarker. Additionally, because of his experience with PolyMarker, he has been an instructor for the DQA1/PM class given by CCI. Brian will receive a \$100 stipend and will be sponsored to attend a FSS meeting in England.

The Edward Rhodes Memorial Award was created in 1995 to give a CAC member, who is preparing for a career in criminalistics or is newly employed in the field, an opportunity to attend a meeting such as a major Forensic meeting (e.g. CAC Seminar or AAFS meeting), or a significant related scientific meeting (e.g. InterMicro or Promega).

Brooke Carpenter is the recipient of the Edward Rhodes Memorial Award for 1996.



Brooke works for the Santa Clara County Lab as a drug analyst and recently gave a presentation at a CAC meeting on microcrystalline tests. Additionally, she has given presentations on the DNA research she did while working toward her Master's degree at U.C. Berkeley. This award will help fund her trip to England for the FSS/CAC joint meeting in July 1997.

—Shanin Sullivan



Microbe hunters . . .

Marc Taylor searches for semen stains on a recent KNBC (Los Angeles) news feature, "Dirty Hotels," which aired in November.



Steve Osman / LA Times

Get the story . . .

CAC Treasurer Michael Parigian was featured in a Los Angeles Times story on the Ventura County Sheriff's Lab this month. Numerous case anecdotes were shared by several of the criminalists in the lab, including quotes from client agencies.

Insider Information

New hires:

San Bernardino County Sheriff has hired Caroline Kim to work DNA. She has a B.S. in biology with an Anthropology minor from U.C. Irvine and an M.S. in criminalistics along with a Professional Certificate in advanced investigation from the University of New Haven. San Diego Sheriff has hired Kathy Wagner

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First Quarter Financial Report

Cash Balance July 1, 1996 \$36,951.04

INCOME

Interest	\$ 185.84	
Meetings	\$ 176.73	
Seminars	\$ -	
Membership dues	\$ 290.00	
Membership applications	\$ 565.00	
Certification (ABC)	\$ -	
Advertising	\$ -	
Endowment income	\$ -	
Other	\$ 3.50	
Total income	\$ 1,221.07	\$1,221.07

EXPENSES

Travel	\$ 3,740.14	
Printing	\$ 3,650.37	
Postage	\$ 269.01	
Supplies	\$ 26.50	
Bank fees	\$ 117.74	
Accounting service fees	\$ -	
Awards	\$ -	
Meetings	\$ 251.41	
Seminars	\$ -	
ABC support	\$ -	
Memorial donations	\$ -	
Endowment Exp., admin.	\$ 178.27	
Journal	\$ -	
Phone	\$ 95.45	
Refunds	\$ 5.00	
Newmember	\$ -	
Consultations	\$ 2,325.50	
Other	\$ 132.99	
Total Expenses	\$ 10,792.38	\$(10,792.38)

Cash Balance September 30, 1996 **\$27,379.73**

Cash on hand 9-30-96	
Savings	\$25,521.18
Checking	\$358.55
Fall 96 seminar	\$1,000.00
Spring 97 seminar	\$500.00
	\$27,379.73

Note: Merchandise Account Balance Sep 30, 1996 = \$1,608.16

—Michael John Parigian,
Treasurer

Jobs • Meetings • Courses

Criminalist Position

The Acadiana Criminalistics Lab, located in New Iberia, Louisiana, is seeking to fill a new position slated to begin January 1, 1997. The successful candidate will possess at least 2 years crime laboratory experience in one of two fields—serology or drug analysis. Additionally, she or he will have an educational background which enables them to be trained in the other field (serology or drug analysis). This is necessary because this is a small laboratory where cross-training and multi-discipline analysts are employed. Once trained, this analyst will split their analysis time 80/20 between serology/drug analysis. The salary range will be \$37,961 to \$39,487 annually.

For more information contact David M. Epstein, Director Acadiana Criminalistics Lab, 5004 W. Admiral Doyle Dr., New Iberia, LA 70560, 318-365-6671 - voice, 318-364-1834 - fax, leonstein@aol.com.

Forensic Drug Chemist Supervisor

(Forensic Scientist Supervisor)

SALARY: \$45,650-\$71,271

The Department of Criminal Justice Services is seeking a qualified individual to examine drug evidence and supervise six forensic drug chemists in the Northern Laboratory, Division of Forensic Science, Fairfax, VA. Performs and trains others to conduct forensic chemical analyses of suspected controlled substances using state-of-the-art methodologies and analytical instrumentation. Prepares Certificates of Analyses on findings for use by the criminal justice system and testifies in court as a qualified expert on laboratory test results. Communicates with and instructs law enforcement agencies and legal officials on testing procedures, results and the handling of evidence. Must possess a valid driver's license. Position may require frequent overnight travel. Employee must provide own transportation.

Qualifications: Bachelor's degree in Chemistry or related scientific field (advanced degree preferred). Demonstrated experience in forensic drug analysis and supervision / training of technical staff. Comprehensive knowledge of theory and application of organic, inorganic, analytical and physical chemistry, instrumental analysis (GC, GC/MS, IR, UV) and laboratory safety. Knowledge of forensic science techniques and procedures, criminal court actions and rules of evidence. Experience presenting testimony in a court of law as an expert witness required, as well as knowledge of quality assurance / control

and laboratory practices. Ability to manage multiple tasks efficiently, maintain accurate records, analyze and interpret data, establish work priorities and develop sound conclusions from analyses. Must possess a valid driver's license. Applicants must submit a State Application form (#10-012) to the Department of Criminal Justice Services, 805 East Broad Street, 10th Floor, Richmond, VA 23219, Attn: Human Resource Officer, no later than 5:00 p.m., **February 1, 1997**. For assistance, call (804)225-4399. Faxed applications will not be accepted.

Forensic Scientist Section Chief

(Trace evidence)

SALARY: \$39,940-\$62,355

The Department of Criminal Justice Services is seeking qualified applicants to provide statewide technical supervision and oversight of the Trace Evidence Section of the Virginia Division of Forensic Science in Richmond, VA. As Section Chief, this position develops, coordinates and monitors caseloads, technical methodologies, QA/QC protocols, technical training, proficiency testing and research. Performs specialized forensic testing on evidence such as glass, paint, explosives / explosive residues, flammables, synthetic fibers and general chemical analysis. Testifies as expert witness, and communicates with and instructs the law enforcement community on testing procedures, results and the handling of evidence. Qualifications include a bachelor's degree in chemistry or closely related scientific field. An advanced degree in chemistry is preferred. Experience as a Trace Evidence Examiner with court qualification in at least two of the areas of trace evidence. Knowledge

of general forensic science, criminal court procedures and rules of evidence, and laboratory safety and quality assurance practices. Demonstrated ability to supervise and train technical staff, maintain accurate records, analyze and interpret data, manage multiple tasks efficiently, establish work priorities and develop sound conclusions from analysis. Must possess a valid driver's license. **SELECTED CANDIDATE MUST PASS A BACKGROUND SECURITY CHECK.** Applicants must submit a State Application form (#10-012) to the Department of Criminal Justice Services, 805 East Broad Street, 10th Floor, Richmond, VA 23219, Attn: Human Resource Officer, no later than 5:00 p.m., **December 31, 1996**. For assistance call (804)225-4399. Faxed applications will not be accepted. **AN EQUAL OPPORTUNITY EMPLOYER.**

The above postings are internet listings, accuracy not verified.

Criminalist

(Serology / DNA)

SALARY: \$35,577 — \$53,365

The Tulsa Police Dept. is seeking a criminalist for the serology / DNA section of their Forensic Laboratory. Preferred is a Master's Degree with at least three years experience in the serology section of a forensic laboratory. Responsibilities include assisting in the development of DNA analysis using D18S0 and STR and processing cases from evidence intake to court testimony. Contact Carla M. Noziglia, Director, Forensic Laboratory, Tulsa Police Dept., 600 Civic Center, Tulsa, OK 74103 (918) 596-9128 or FAX(918)596-1875.

Ed Jones' Face Game

California DV Players



Answers inside back



Potpourri

Congratulations to Gary Asbury and the staff at the Riverside DOJ Crime lab for a very successful CAC Fall Seminar in Palm Springs. The program content, the facilities and the food were excellent. In fact, I don't recall a seminar where the food and service was as good as it was at the Riviera Spa & Hotel. Despite the heat (110°) and the hotel shutting down electricity on Wednesday of the seminar, the staff did an admirable job attending to the

needs of speakers, participants and vendors. An outstanding effort. I particularly enjoyed the Friday evening Polynesian banquet. Our hosts had hired a South Pacific Island ensemble that played south seas music and showcased native dances. The banquet was held poolside in perfect temperature with an extravagant buffet. The evening was made more memorable for me as I won the grand prize! Thanks Gary, I'm looking forward to my return trip to Palm Springs and staying at the Riviera Hotel.

What do you think about the new CAC Membership Roster/Phone book? We are looking forward to your feedback. Do you like the new format or was the old format more to your liking. Please let me know or you can contact a member of the Board of Directors and give them your input. The Board meets on January 21, 1997 in Orange County and they can pass along your opinions, pro or con. Thanks.

From the Reader

Locard Lives On

Not to take anything away from Ed Jones' fine article on Locard ("Mute Witness: The Evolution of Locard's Exchange Principle", *The CAC News*, Fall 1995), I think I may have found a much earlier reference to this often paraphrased adage. Pierre Margot, of the Institut de Police Scientifique et de Criminologie in Lausanne, Switzerland, sent me via the internet the following quote taken directly from a 1920 publication of Mr. Locard's. Please forgive my amateur attempt at translation, but I believe it gets the point across.

"Nul ne peut agir avec l'intensité que suppose l'action criminelle sans laisser des marques multiples de son passage, tantôt le malfaiteur a laissé sur les lieux des marques de son activité, tantôt par une action inverse, il a emporté sur son corps ou sur ses vêtements les indices de son séjour ou de son geste."

"No behavior with the intensity of alleged criminal activity can occur without leaving behind traces of its passage. Sometimes the criminal will leave traces of his activity, sometimes it is

I want to take this opportunity to acknowledge our biggest contributor to the *CACNews*: John Houde, Senior Criminalist with the Ventura County Sheriff's Office Crime Lab. John is the Art Director and genius behind the *CACNews*. He provides an invaluable service to this newsletter by virtue of his interest in making our forensic quarterly newsletter one of the best regional society publications in the country. John performs this service without fame or glory except for a microscopic mention of his name in the credits. John does all the layout work, assists labs in advertising for upcoming CAC seminars, works with paying advertisers, and with the printer over at Fleming's Letter Shop in Oakland. Most important of all, he makes me look good as the Editorial Secretary. And as the Editorial Secretary, I routinely receive the newsletters of other regional criminalistic organizations. It's difficult for me to be objective about the work John performs after reviewing the other newsletters, but I believe we have one of the best publications in the industry. After reviewing the newsletters, I pass them along to John for his perusal. In one particular issue, he found that someone had copied his artwork without attribution. I told him that I would have been flattered to have someone copy anything from me. Thanks for the fine work you continue to do on behalf of the *CACNews*.

Last but not least, I want to take a few lines to mention that I have retired as a Supervising Criminalist from the Santa Clara County Crime Lab. It was a challenging two years, mainly due to the Accreditation process, Chairing the CAC Spring Seminar, being involved in the acquisition of an SEM/EDAX system and to being a new supervisor. I learned a great deal more about criminalistics and about myself during the past two years than at any other period of my career. Now, I'm looking forward to a career that will give me the opportunity to share my knowledge and experience as a professional presenter. One of those opportunities is to continue teaching the Courtroom Presentation course at CCI.

Raymond

in reverse, he takes away traces of his stay or movement on his body or clothing."

—Edmond Locard, in *L'enquête criminelle et les méthodes scientifiques* Paris: Flammarion, 1920. *Bibliothèque de Philosophie Scientifique*, pg 139.

—John Houde, Ventura

Master's Not Needed

As a criminalist with the Los Angeles Police Department Scientific Investigation Division, and a member of the CAC, I am concerned with the DNA Advisory Board (DAB) and its intrusion into our profession. I use the word "intrusion" because the DAB have seen fit to draft guidelines requiring a Master's degree for the technical leader of each law enforcement DNA laboratory. This enhanced educational requirement is absolutely unnecessary, and I bristle at the audacity of the DAB to interfere with my career path.

Please turn to page 18

Capillary Gas Chromatography Characterization and Classification of Some Hydrocarbon Solvents and Alkyl Glycol Ethers

Wayne Moorehead and Tom Dickan

Abstract

Examination of many petroleum products and non-petroleum products by capillary gas chromatography assists the fire debris analyst in ignitable liquid classification (Class 0 through 5, ASTM E1387-95). Over 50 liquids including reformulated petroleum products such as Super Hi Flash Naphtha, several VM&P Naphthas, Isopar M, Isoparaffin 370, Shell Sol 142HT, and alkyl glycol ethers were obtained, characterized, and then classified according to the ASTM protocol.

Analysis was performed by a Hewlett-Packard GC/MS with a 15m x 0.25mm diameter DB-1 column having a 0.25 mm film thickness, initial time and temperature were 2 minutes at 40°C. The GC was ramped at 25°C per minute to 300°C and held for 2 minutes. This programming provides good resolution over the ignitable liquid range. The NIST 75K library was used in identifying specific components in the chromatograms.

The petroleum industry's trend toward using isoparaffin, norparaffin, cycloparaffin, and alkyl benzene compounds as starting solvents for a multitude of household, commercial, and industrial products may require more use of the GC/MS in identifying ignitable liquids from fire debris extracts. Additionally, communication with the fire investigator to determine the nature of the identified product present, i.e., intentional addition (gasoline in kitchen) or innocent presence (degreasing solvent in the kitchen) is suggested.

Keywords: Arson, fire debris, solvents, hydrocarbons, GC/MS, alkyl glycol ethers, ignitable liquids, capillary GC-FID.

Introduction

Today's consumers and industries enjoy a variety of commercial products, some of which are ignitable, including adhesives, sealants, insecticide carriers, jet fuels, charcoal starter fuels, and solvents. In the past, straight run petroleum distillates consisting of straight chain alkanes, aromatics, and simple blends of distillate products were common (1). Fire debris

analysts were able to characterize ignitable liquids primarily into five classes, mostly n-alkane based petroleum distillates, with a sixth category for those few products which were either single item (i.e., ethyl alcohol, acetone, etc.) or not a petroleum distillate (e.g. turpentine and lacquer thinners)(2). Either through regulation or consumer demand, petroleum and chemical companies have begun changing formulations to be more environmentally conscious. To meet this challenge, modern petroleum products are manufactured through distillation, reforming, blending, desulfurization, hydro-treating, alkylation, extraction, cracking, and redistillations to deliver the desired end use characteristics (3,4). The examination of a small number of recent reformulated petroleum products and glycol ethers by gas chromatography/mass spectrometry was conducted for pattern recognition and classification into six classes, 0 through 5, based on the ASTM E1387-95 method (5). The categories include the Light Petroleum Distillate (LPD), Gasoline, Medium Petroleum Distillate (MPD), Kerosene, Heavy Petroleum Distillate (HPD), and Miscellaneous class ignitable liquids.

A capillary gas chromatograph with flame ionization detector at one time was sufficient to perform the analysis on the vast majority of ignitable liquids and fire debris residues; however, the application of the gas chromatograph with mass spectrometer will become more prevalent in the future to determine the presence of ignitable liquids due to the number of Miscellaneous class ignitable liquids. Particularly if the analytical results show a Miscellaneous class ignitable liquid, the results should be discussed with the fire investigator to determine the possible source of the identified liquid.

Materials and Methods

A capillary gas chromatograph with an automated injector and mass selective detector (GC/MSD) was used. The capillary column was a DB-1, 15m, 0.25mm i.d. having a 0.25mm film thickness (J&W Scientific, Folsom, CA) with helium carrier gas having a linear flow of 1 ml/min at 100°C. A Hewlett-Packard 5970 GC/MSD, (Avondale, PA) with the injector tem-

perature at 250°C and a source temperature of 200°C was used. The temperature programming started at 40°C for two minutes, then ramped at 25°C/minute to 300°C with a hold time of two minutes. To collect all peaks, a short solvent delay of 0.10 min. was used. The spectra were obtained under electron impact with the following settings: multiplier voltage 1889V, electron energy 70eV, filament 300mA, source pressure 8E-6, mass range 20 to 450 AMU, and transfer line 280°C.

The neat liquid standards were obtained from D.C. Atkins & Sons(6) which obtains hydrocarbon solvents and alkyl glycol ethers directly from the petroleum and chemical manufacturers for use in formulated industrial, commercial, and home products. A representative example of companies whose products were examined include Shell Chemical Company(7), DuPont(8), Chevron Oil Company(9), Ashland Chemical Company(10) and Exxon Chemical Company(11). Neat liquid standards were diluted 4:30 with Carbon Disulfide (J.T.Baker, Phillipsburg, NJ, Instra-Analyzed Reagent) and 1 µL of diluted liquid sample was injected into the GC/MSD. Chromatographic comparisons were made against an n-alkane standard consisting of C₆—C₁₀, C₁₂—C₁₄, and C₁₆ (Figure 1) The retention time for undecane (C₁₁) was separately determined. The chromatogram of a product was compared against the n-alkane series and the ASTM guidelines. The spectra obtained were examined and compared against the 75K National Institute of Standards and Technology (NIST) mass spectral library database. Compounds, whose mass spectra were difficult to differentiate, were not specifically identified (e.g. tri-alkyl benzenes).

Results and Discussion

A large number of the products analyzed, 72% (36 of 50), now conform to the Miscellaneous category. Isoparaffins, cycloparaffins, and alkyl benzenes are represented in 42% (17 of 40) of the samples examined. (This percentage excludes the ten glycol ethers.) The list of products, the company source of the particular product, ASTM classification, carbon number (alkane series), and characterization, can be viewed in Table 1.

Typical medium petroleum distillate chromatograms can be found with Shell Sol 142HT, Figure 2. Shell Sol 340HT, and Isopar M, are examples of the new "environmentally friendly" solvents available as starting products for paints and coatings, dry cleaning, insecticides, lighter fluids,

Orange County Sheriff Department, Forensic Science Services, 320 North Flower St. Santa Ana, CA 92703

and specialty solvents. Though Shell Sol 340HT and Isopar M have the bell shaped curve of a MPD, both fall into the Miscellaneous class. Shell Sol 340HT has C₁₀ as the major n-alkane, Figure 3, but C₁₁, the only other n-alkane, appears as a relatively minor peak. This does not qualify for the MPD designation. Isopar M, containing mostly isoparaffinic compounds, has no significant n-alkanes and its range is just out of the MPD range, Fig. 4.

Amberlite Oil #111, Fig. 5, has the bell shaped curve in the range of a Kerosine class ignitable liquid, Fig. 6, but has no n-alkanes, thereby resulting in a Miscellaneous class characterization. The chromatogram of Heavy Detergent Feedstock, Figure 7, shows significant n-alkanes in the Kerosine or HPD range with no bell shaped curve resulting in a Miscellaneous class product.

Depending on the product formulation, a non n-alkane containing product can have compounds with retention times consistent with an n-alkane. Dibasic Ester-1, Dibasic Ester-2, and Dibasic Ester-5 have major peak retention times consistent with C₁₀ to C₁₂ n-alkanes (indicative of a MPD) but have no bell shaped curve. These dioic acid dimethyl esters fall into the Miscellaneous class. Two of the alkyl glycol ethers, EM and EB, have single peak retention times consistent with n-alkanes C₆ and C₉, respectively, in Table 1. These and other non n-alkane products, including variously configured hydrocarbons, may be formulated into preparations which may mimic a portion of a petroleum distillate or alkane series or appear to be possible pyrolysates.

Solvents representing different companies with aromatic compounds giving a chromatogram similar to the identification region of gasoline (e.g., ethyltoluene, 1,3,5-trimethylbenzene, and pseudocumene) are introduced in Figure 8 through 13 with a standard of gasoline, Fig. 14. Cyclo Sol 63, Cyclo Sol 53, SC Solvent 100, Super High Flash Naphtha, and TS 28 Solvent have the five peak group similar to gasoline. Of the different products, Cyclo Sol 63 most nearly mimics the alkyl benzene region of an evaporated gasoline and is only carefully distinguished.

In a recent article in *The CAC News* (Gialamas, 12), insecticide carriers consisting of a "xylene range aromatic solvent" having similarities to the m-ethyltoluene / pseudocumene pattern in gasoline were presented. The way to resolve this similarity was through the use of careful chromatographic pattern analysis and a GC/

MS with the analyst systematically analyzing the sample. According to Gialamas, examination of the sample for aliphatics would assist in their classification as a Gasoline class ignitable liquid.

After the analysis, the importance of communicating the analytical results with the fire investigator can not be understated. Depending on the results of the analysis, the investigator may want to further question the property owner about the kind of household, commercial, or industrial products that were in the vicinity of the recovered fire debris samples to eliminate the presence of possible "alibi" products prior to trial. The analyst may wish to characterize some of these products chromatographically to exclude or include them as possible sources of the recovered volatile substances from fire debris.

Conclusion

Today, more than ever, fire debris analysts must be guarded in their interpretation of chromatograms from fire debris extracts due to the many new products being developed by the petroleum and chemical industries for the home market. These unique chemical mixtures and the resulting unusual chromatographic patterns may be confused with classical petroleum distillates or be completely misidentified without the involvement of the GC/MS in identifying specific compounds in ignitable liquids from fire debris extracts. In addition to sophisticated detector systems on the GC, more communication with the fire investigator by the fire debris analyst to determine the nature of the identified product present, i.e., intentional addition (gasoline in the kitchen) or innocent presence (degreasing solvent in the kitchen), will be required.

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Acknowledgement

The authors would like to thank D.C. Atkins and Son, Inc. of Los Alamitos, a special formulary laboratory, for their generous contribution of hydrocarbon solvents and alkyl glycol ethers. Without their assistance, the project would not have been possible.

Disclaimer

All company names, brand names, and product names are used for information purposes only, are the property and/or trademark of their respective companies and are not endorsements by the authors or the employers of the authors. The conclusions are those of the authors and no other entity or person.

Fig. 1 n-alkanes

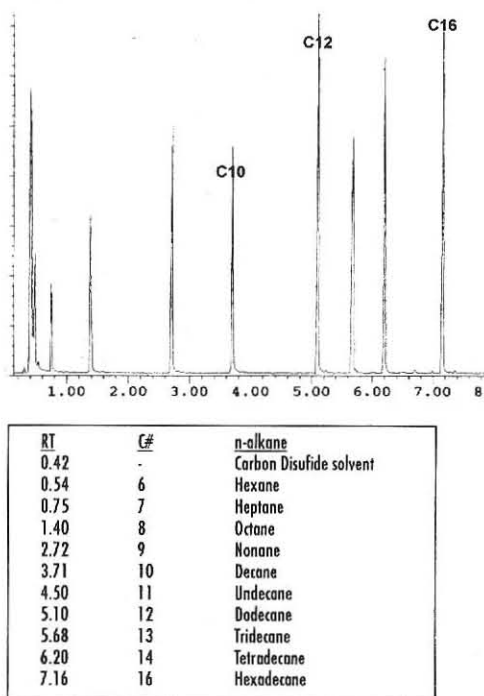
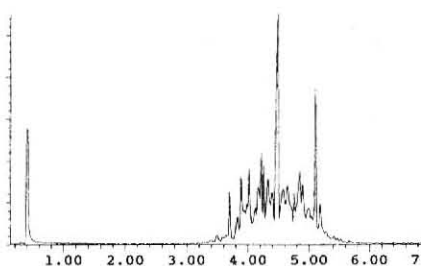


Fig. 2 Shell Sol 142HT



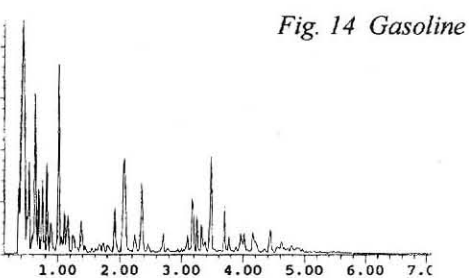
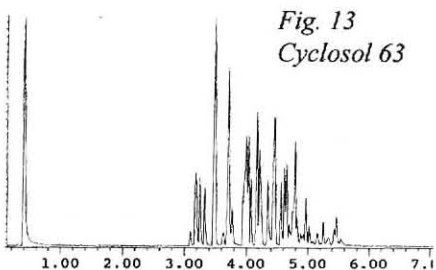
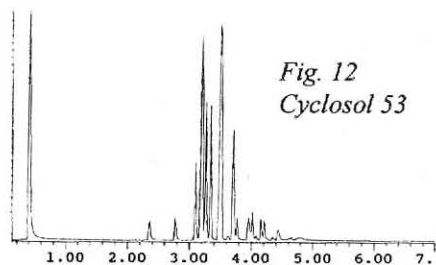
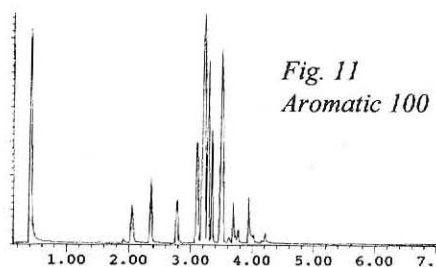
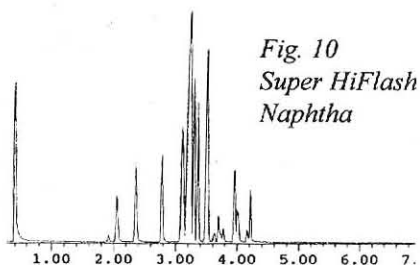
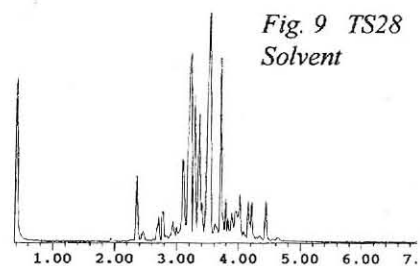
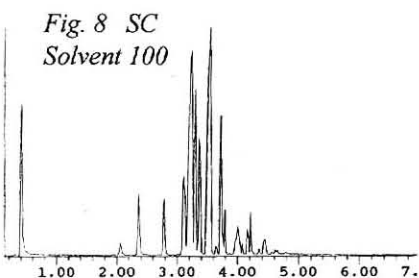
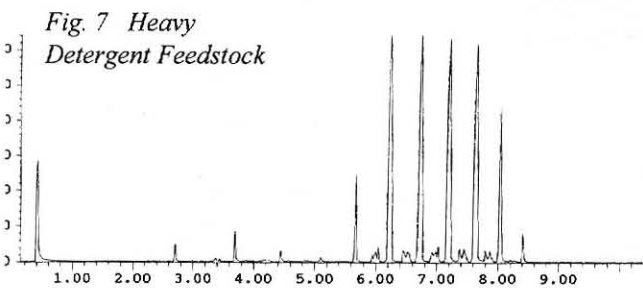
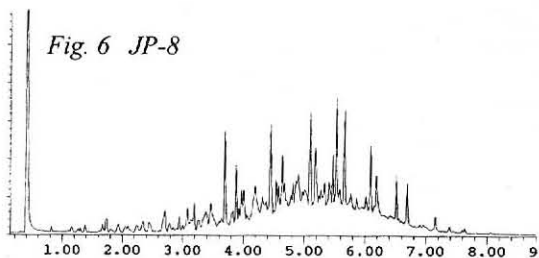
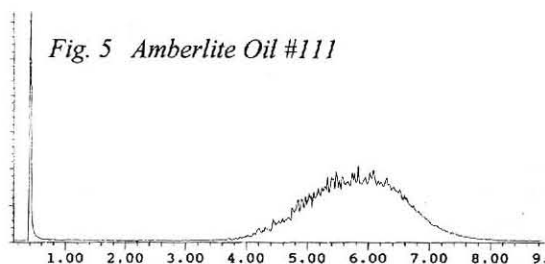
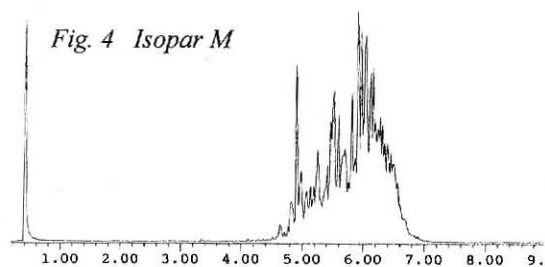
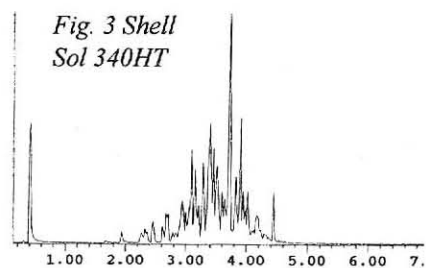


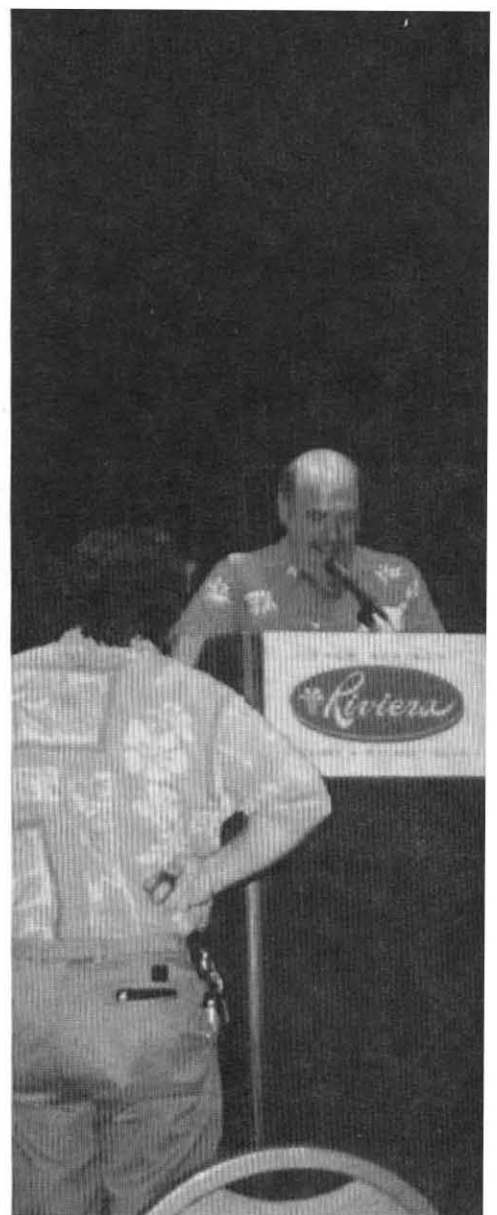
Table 1. Classification of Liquid Products

# Product Name Abbreviated	Source	Class	C Range	Characterization
1 200-HT Mineral Spirits	1	3	C9 - C12 Bell shaped curve	C10, C11, C12 n-alkanes
2 360-66	2	0	C9 - C11 Bell shaped curve	No significant n-alkanes from C8 - C12
3 Amber Lite Oil #111	1	0	C10 - C16 Bell shaped curve	No major alkanes, Kerosine range
4 Arcosolve PTB	3	0	Single peak between C8 & C9	1 -t-butoxy-2-methoxyethane
5 Aromatic 100	4	0	C9 - C10	C1 - C3 alkylbenzenes
6 Aromatic 200	4	0	C11 - C16 No bell curve	naphthalenes and indenenes
7 BT-67	1	1	C6 - C8 w/ Large C7	C7, isoparaffins, cycloparaffins, toluene
8 Blazo Fuel	5	1	C6 - C8 w/ Large C7	C7, isoparaffins, cycloparaffins, toluene
9 Carb. Spray Cleaner	6	0	C8 - C9	isopropanol, xylenes, ethylbenzene
10 Chemrite Choke & Carb Clnr	7	0	C8 - C9	1,1,1-trichloroethane, xylenes, ethylbenzene
11 Cyclo Sol 63	1	0	C9 - C13 No bell curve	C3 and C4 alkyl benzenes, naphthalene
12 Cyclo Sol 53	1	0	C9 - C10	C3 & C4 alkyl benzenes, xylenes
13 Dibasic Ester - 1	8	0	Rt of n-alkanes C10 - C12	C4, C5, C6 dioic acid, dimethyl ester
14 Dibasic Ester - 2	8	0	Rt of n-alkanes C11, C12	C5 & C6 dioic acid, dimethyl ester
15 Dibasic Ester - 5	8	0	Rt of n-alkane C11	C5 Dioic Acid, dimethyl ester
16 Glycol Ether DB	9	0	C11 - C12	2-(2-butoxyethoxy)-ethanol
17 Glycol Ether DM	9	0	C9 - C10	2-(2-methoxyethoxy)-ethanol
18 Glycol Ether DP	9	0	C10 - C11	propylene glycol diethyl ether
19 Glycol Ether DPM	9	0	C10 - C11	2-(methoxy-methylethoxy)-propanol
20 Glycol Ether EB	9	0	Rt of n-alkane C9	2-butoxy-ethanol
21 Glycol Ether EE	10	0	C7 - C8	2-ethoxy-ethanol
22 Glycol Ether EE Acetate	10	0	C8 - C9	ethylene glycol monoethyl ether acetate
23 Glycol Ether EM	10	0	Rt of n-alkane C6	2-methoxy-ethanol
24 Glycol Ether PM	9	0	C6 - C7	1 -methoxy-2-propanol
25 Glycol Ether TPM	9	0	C12 - C13	1-[2-(2-methoxy-1-methylethoxy)-1-methylethoxy]-2-PrOH
26 Hv. Dtrgent Fdstk Amber190	1	0	C9 - C19 No bell curve	No doublet at C17/C18, mostly C13 - C19
27 Hi-Solv 15	10	0	C10 - C12 No bell curve	C3, C4, C5 alkylbenzenes
28 Isopar M	4	0	C11 - C15 Bell shaped curve	isoparaffins of C9, C10, C11, C12
29 Isoparaffin 370	5	0	C9 - C12 No bell curve	isoparaffins of C7?, C8, C10, C11?
30 Mineral Spirits 140 EC	1	3	C10 - C12 Bell shaped curve	C11 and C12 n-alkanes
31 Paint Thinner Mineral Spirits	11	3	C8 - C12 Bell shaped curve	1,1,3-trimethylcyclohexane, C9, C10, C11
32 Parts Cleanr/Stoddard Solv.	12	3	C9 - C12 Bell shaped curve	C10, C11 n-alkanes
33 Petroleum Ether	13	0	Single Peak	pentane
34 Petroleum Naphtha	1	4	C9 - C16 Bell shaped curve	C10, C11, C12, C13, C14 n-alkanes
35 RAM 904	14	0	C7 - C12 No bell curve	cycloparaffins, C3 - C5 alkylbenzenes to indenenes
36 SC Solvent 100	15	0	C9 - C11 No bell curve	xylenes, alkylbenzenes consistent with gasolines
37 SC Solvent 450	15	3	C8 - C13 Bell shaped curve	C9 - C12 n-alkanes
38 STP Super Conc. fuel Inj clnr	16	4	C9 - C16 Bell shaped curve	C10, C11, C12, C13, C14 n-alkanes
39 Shell Sol 142 HT	1	3	C10 - C12 Bell shaped curve	C11 and C12 n-alkanes
40 Shell Sol 340 HT	1	0	C9 - C11 Bell shaped curve	C10 only significant n-alkane
41 Solvent G	1	0	C10 - C12 No bell curve	C4 alkylbenzenes
42 Super Hi Flash Naphtha	17	0	C9 - C11 No bell curve	xylenes, alkylbenzenes consistent with gasolines
43 TS-28 Solvent	1	0	C9 - C11 No bell curve	xylenes, alkylbenzenes consistent with gasolines
44 Tolu-Sol WHT Naphtha-25	1	1	C5 - C8	C7, cycloparaffins / isoparaffins, toluene
45 Treat-All Fuel Additive	18	0	C4 - C8	1-propanol, 2-methoxyethanol, methyl isobutyl ketone
46 VM & P Naphtha EC	1	1	C7 - C9	C8 n-alkane only
47 VM & P Naphtha HT	1	1	C7 - C9	C8 n-alkane only
48 n-Propyl Acetate	10	0	C7 retention time	n-propylacetate
49 JP-8	19	4	C9 - C16 Bell shaped curve	C10, C11, C12, C13, C14 n-alkanes
50 JP-10	19	0	C10 - C11 No bell curve	Tetrahydrobicyclopentadiene (CAS# 2825-82-3)

Key:

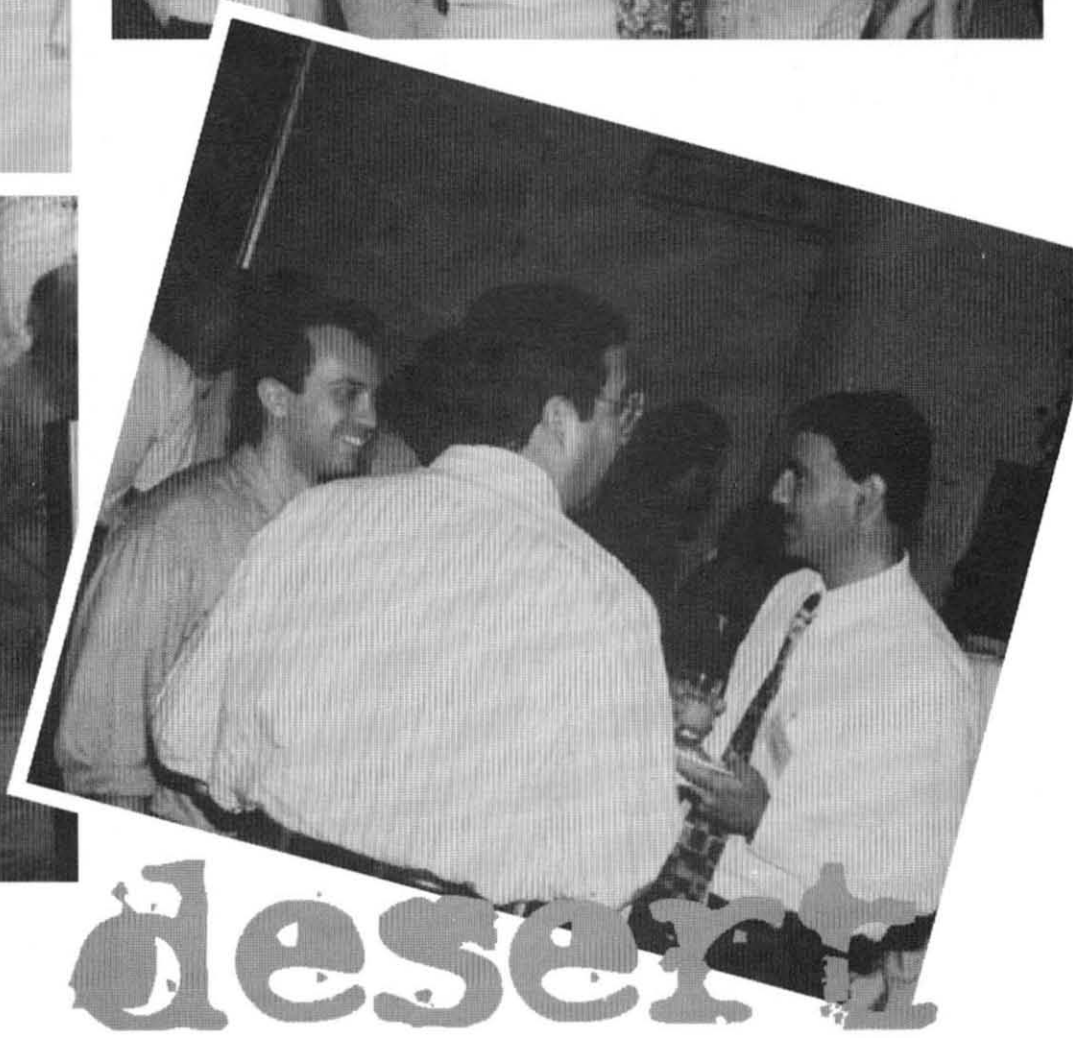
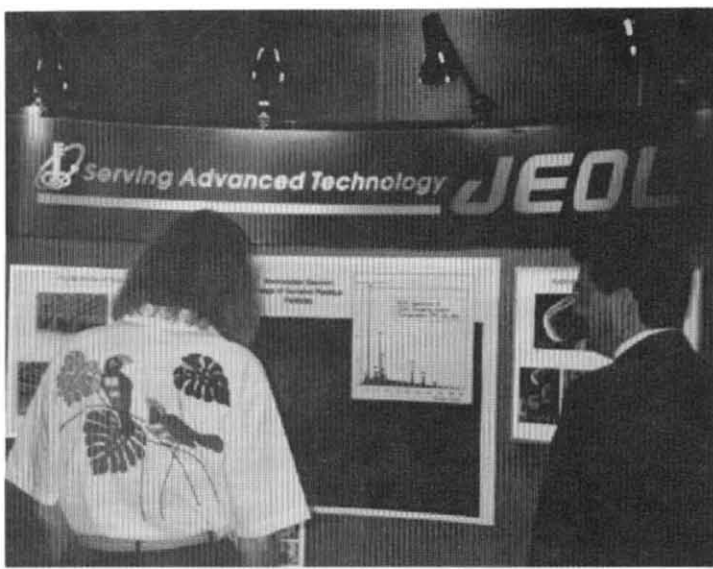
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ASTM Classification: 0-Micellaneous, 1-Light Petroleum Distillate, 2-Gasoline, 3-Medium Petroleum Distillate, 4-Kerosine



Photography by Phil Pelzel

Fall 1996 in



the desert



Forensic Potpourri

The Forensic Utility of Soil

By Bruce Wayne Hall, M.A.S.

From 1990 to 1992, investigators with the New York City Police Department (NYPD) conducted a joint investigation with the FBI, the Drug Enforcement Administration, and the Bureau of Alcohol, Tobacco and Firearms into an organized crime family. An element of the investigation involved the shallow burial of five murder victims on Staten Island. NYPD investigators forwarded digging tools seized as evidence during the investigation, as well as soil samples, to the FBI Laboratory for examination to determine whether the implements were used to bury the victims.

Investigators packaged two shovels and a pick separately, ensuring that brown paper bags sealed with evidence tape protected the blade and head portion of each tool. They also selected known soil samples from each of the five graves, based on noticeable color changes in the soil profile. (Differences in soil composition and texture generally manifest themselves through changes in soil color.) Investigators packaged these soil samples in labeled 35 millimeter (mm) film canisters. Additionally, they drafted a dimensional crime scene sketch that depicted grave locations and relevant landmarks.

The map assisted personnel from the FBI Laboratory in providing additional investigative assistance. While on site, Laboratory personnel collected additional soil samples taken randomly at distances ranging from 100 yards to approximately one-half mile from the grave sites. The

personnel also collected "alibi" samples—specimens that could confirm alternate and legitimate sources of the soil. These came from two residences where the shovels and pick could have been used for gardening or other purposes.

Prior examination of the tools revealed a small amount of soil (one-half of a film canister) from one of the shovels suitable for comparison. Soil samples recovered from the other shovel and the pick were contaminated by oil and rust, thereby limiting their forensic value.

Based on color, texture, and composition, Laboratory examiners determined that the soil recovered from the shovel shared characteristics with the soil taken from the burial sites. Conversely, gross dissimilarities existed between the soil on the shovel and that collected at the residences, effectively eliminating those areas as possible sources of the soil. During two separate trials, expert testimony regarding the soil samples contributed to the conviction of two principal members of the organized crime family.

FORENSIC VALUE OF SOIL

This case demonstrates the potential forensic value of soil when investigators properly collect, preserve, and package evidence before forwarding it for laboratory examination. Sometimes, attempts to exploit the forensic benefit of soil analysis meet with limited success, due to improper evidence collection and documentation. To ensure the best possible results, investigators are reminded to appreciate the nature of soil and follow certain guidelines when collecting, documenting, and forwarding soil samples, tools, and related items to the FBI Laboratory for examination.

The Nature of Soil

Soil can generally be considered the natural accumulation of weathering rocks, minerals, and decomposing plants. The formation of soil represents a dynamic process, influenced by a number of fac-

tors, including climate, geologic parent material, relief, biological activity, and time. Soil may develop in place (in situ) or after being deposited by wind, water, animals, or human activity.

Additionally, and of particular forensic significance, soil may contain materials produced by humans, such as brick fragments, roof shingle stones, paint chips, glass, and other items. Because these materials improve characterization, they may strengthen the association between specimens.

Soil varies laterally—that is, across the land surface—from place to place. These changes may be abrupt, occurring within a few meters, or gradual, over tens of meters. Soil also varies vertically, as a function of depth. Changes in soil relating to either of these dimensions are sensitive to the influences of nature and human activity.

Collection Guidelines

The nature of soil makes it imperative that investigators properly document the exact location from which they collect soil samples. Hand-drawn or detailed commercial maps best illustrate specimen collection sites, as well as their spatial relationships.

Questioned samples taken from the ground surface, such as those taken from the tread pattern of a shoe, should be compared to known specimens collected from like places. Further, because time governs the factors that affect soil formation, timeliness in evidence collection is important.

To ensure that examiners possess an adequate representation of soil variability, investigators should collect a sufficient number of known soil specimens at crime scenes and from surrounding areas. Establishing the uniqueness of the soil at a particular location to the exclusion of others greatly strengthens the association between specimens.

Of course, the available amount of suitable soil can limit the significance of

Mr. Hall is an FBI forensic scientist specializing in soil, glass, and building materials.

Of course, the available amount of suitable soil can limit the significance of the comparison. While in most cases, investigators cannot control the amount of questioned soil available for comparison, they do have substantial control over the number of known specimens collected.

In most cases, a 35mm film canister of soil from each location is sufficient for comparison. The nature of the crime scene and the investigation generally dictate the number of samples needed.

All samples should be packaged dry, sealed, and properly labeled. Investigators must allow moist soil samples to air dry overnight at room temperature before packaging. Overlooking this step has resulted in the receipt of some rather exotic "terrariums" within samples. Plant nutritional demands can also alter soil characteristics, and consequently, undermine the effort involved and the value of the soil comparison.

In addition, investigators should not overlook the collection of alibi soil

samples. They should collect these alibi samples from any area that suspects could claim as the source of the questioned soil. A suspect may contend, for example, that soil recovered from the shovel used to dig a victim's grave actually came from a garden. As with the New York case, if forensic examiners can identify dissimilarities between the soil found on a shovel and that of the suspect's garden or yard, they can eliminate the garden or yard as possible sources.

Forensic Soil Examination

When soil samples and related items are forwarded to the FBI Laboratory, qualified examiners conduct a forensic soil examination. This examination compares two or more specimens to determine if the soil can be linked by demonstrating a common origin.

Laboratory personnel perform the examination by comparing the color, texture, and composition of the soil samples. Because these characteristics result from

locality-dependent factors and are sensitive to a variety of influences, differences in the characteristics tend to disassociate two soil samples. Therefore, proper documentation of an adequate number of samples greatly increases the likelihood of associating soils that share a common origin. This, in turn, can provide crucial forensic evidence to associate—or disassociate—suspects with particular crime scenes.

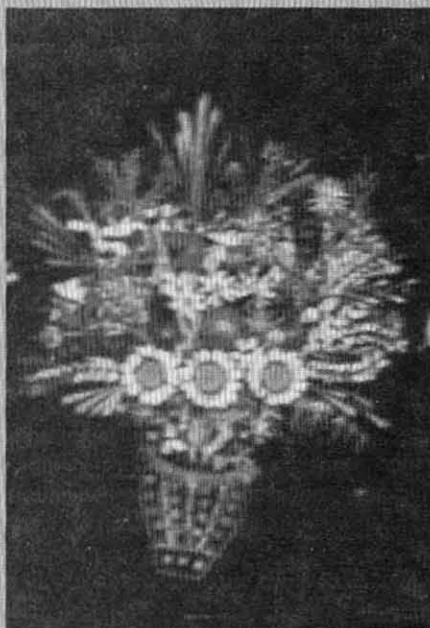
Conclusion

While forensic soil examinations can yield important information concerning crimes, successful results depend on proper evidence collection and handling by case investigators. By understanding the vulnerability of earthen materials to contamination, and by following appropriate packaging procedures, investigators can preserve the potential forensic value of soil-related evidence.

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TINY TREASURES

The title of "Premier Arranger" of diatoms on microscope slides probably belongs to Somerset, England resident Klaus Kemp. This November he accepted an invitation by the Microscopical Society of Southern California to speak about his technique. He had already given a demonstration to the San Francisco Microscopical Society. An example of his more artistic slides is printed here. The "basket of flowers" shown above is really a collection of carefully arranged diatoms and scales from butterfly wings. The entire figure measures a scant 0.15 inches across. This particular slide is from the collection of Paul Otterheimer.



A fine glass thread made from a capillary tube is used by Klaus to pick up and transfer the diatom or scale from a "strewn" slide to the arranged slide. Carefully guarded from the Victorian era is the secret formula used in making the "glue" which cements the tiny objects in place. Using trial and error, Klaus was able to develop a recipe that works well for him after about eight years of experimentation.

No less impressive are his technical diatom slides, also available commercially from Carolina Biological Supply.

—Edwin L. Jones, Jr.



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National Institute of Justice National Law Enforcement & Corrections Technology Center

Western Region
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Need Help? Odds against you?

Don't call the "Equalizer", read the following information and find out how to pick two thousand brains for technical support using the vast resources of the aerospace industry at the disposal of local law enforcement—including crime labs. Although only two years old, the program has already worked with Calif. DOJ, LA Sheriff's lab, San Diego, Oxnard PD, Ventura SO crime lab and numerous other agencies large and small.

The National Law Enforcement and Corrections Technology Center - Western Region (NLECTC-WR) was established at The Aerospace Corporation in October, 1994. The NLECTC-WR is operated in partnership with the National Institute of Justice, a branch of the United States Department of Justice. The parent National Law Enforcement Technology Center is located in Washington, D.C. Other regional centers are located in Charleston, South Carolina, Denver, Colorado, San Diego, Calif., and Rome, New York.

The mission of the NLECTC's Western Region is to develop and apply technologies and systems that will assist law enforcement and corrections organizations in performing their missions more effectively. The Center will:

- Establish close working relations with the law enforcement industry. Industry-wide briefings will be organized and hosted by the Center to provide information on new developments in technology; discuss law enforcement requirements, limitations and concerns; inform industry of potential markets; and present test and demonstration results. Ideas and concerns of law enforcement agencies as well as industry will be actively solicited at these meetings.

- Provide forensic analysis support.
- Communicate and disseminate information including news items, announcements of tests, test results and new technology bulletins. The [reprinted] World Wide Web page that you are currently reading provides one such information pathway!

- Identify common Department of Defense and civilian procurement items and joint projects that can qualify for state and federal grants.

The NLECTC-Western Region provides products and services to law enforcement and corrections organizations in a number of areas:

Image analysis

Image processing and analysis are central to a number of on-going DoD activities. Within the past year, enhancement of video tapes (by scientists at The Aerospace Corp.) played a key role in the apprehension of a suspect in the killing of a Manhattan Beach, CA police officer.

Audio tape processing

Using methods developed for satellite data analysis, NLECTC-WR scientists successfully extracted information from a very noisy audio tape that had been used to record a conversation between two suspects.

Computer architecture/ Data processing

Computer systems are playing an ever-increasing role in virtually all aspects of life; law enforcement is no exception.

Communication Systems

The Aerospace Corporation is involved in the architecture, specification, and procurement of military communications satellites. The fact that public safety agencies generally have great difficulty communicating directly by radio is well known to those involved in law enforcement! The advanced communication technology developed for the defense community will help in this critical area. Planning is now in progress for the develop-

ment of a new police dispatch center for several law enforcement agencies in Southern California.

Location/tracking

Location and tracking of people, vehicles or other objects is desirable in a number of situations. The Aerospace Corporation, through the Global Positioning System program and other activities, has substantial experience in the area of precise position fixing and navigation.

Equipment specification and standards

Assistance can be provided to the law enforcement community in setting forth equipment specifications. Both the users and suppliers can reap benefits through clear statements of technically sound requirements.

Forensic Analysis

An array of scientific instruments can be brought to bear on the gathering and examination of physical evidence. Laboratory instrumentation for forensic analysis includes optical and electron microscopes, a high resolution x-ray radiographic facility, and an extremely sensitive secondary ion mass spectrometer. Not all of the instruments are kept in laboratories. Very sophisticated mobile laser infrared spectrometers have already been used in field investigations, e.g., to search for clandestine drug laboratories.

The future

The staff of the NLECTC Western Region would like to hear from law enforcement and corrections professionals and from the public. Active involvement with the law enforcement community is the key to the success of the Center. A number of police officers and other officials have visited the NLECTC-WR to "get acquainted". Visits by other involved professionals are encouraged.

Points of contact at the Western Regional Center

Our mailing address is: National Law Enforcement and Corrections Technology Center - Western Region The Aerospace Corporation Mail Station M1/300 P. O. Box 92957 Los Angeles, CA 90009. Our street address is: 2350 E. El Segundo Blvd. El Segundo, CA 90245 The NLECTC-WR office telephone number is: (310) 336-2222. General inquiries may be directed to us at the above address and telephone number or may be sent via electronic mail. nlectc@courier4.aero.org

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In response to this growing segment, the Los Angeles County Bar Association is proud to introduce **expert4law** (www.expert4law.org), the definitive website for forensic expertise. This on-line referral service for expert witnesses, legal consultants, litigation support, lawyer to lawyer networking and alternative dispute resolution service providers, is the best of its kind because of its KEYWORD SEARCH function.

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Harry Klann, contd.

Speaking personally, I have been working with DNA since 1988 when I was a staff research associate in the UCLA Molecular Biology Institute. All told, I have over 13 years of clinical, research and criminalistics laboratory experience. Six years ago, I applied to the City of Los Angeles for the civil service position of criminalist. I met the educational requirements and was subsequently offered a job. Suddenly, an "advisory" board set up by the Federal Bureau of Investigation (pursuant to the Crime Bill of 1994) is rewriting the rules. Apparently there is a perception of "something wrong" — to quote one of our more famous forensic science experts— in forensic DNA typing. The DAB seems to believe that a Master's degree is just what the doctor ordered for what ails forensic DNA. (At least one member of the DAB thinks we should be thankful because they originally wanted a minimum of a Ph.D.)

Since I've gone this far, I'll take the plunge: I will match my common sense, academic knowledge, professional training and my wide variety of lab and crime scene investigation experience against any MS or PhD. Am I bragging? Not at all. I'll venture on to say if my fellow CAC members lack this level of confidence in themselves, they probably shouldn't be handling evidence or performing casework. (Naturally, I know when to ask for help, too.) If that offends you, perhaps you are just the person the DAB seeks to regulate.

Judging from the lack of audience participation at the DNA Users Group meeting in Palm Springs, I gather most CAC member/DNA examiners either already possess a Master's degree or

I hear the same old song-and-dance about databases, and validation "studies", and plans for spending grant money, and pie-in-the-sky technologies most government agencies cannot afford. In my opinion, discussions conducted at CAC meetings should be about our profession...

just don't care if the DAB meddles in our profession. When I attend CAC meetings, I hear the same old song-and-dance about databases, and validation "studies", and plans for spending grant money, and pie-in-the-sky technologies most government agencies cannot afford. In my opinion, discussions conducted at CAC meetings should be about our profession; casework experiences and basic, relevant science.

The general CAC membership—not just Mary Gibbons, Margaret Kuo and the handful of DNA examiners—must stand up, speak out and demand to be heard when these micro-managing, FBI-appointed advisory boards and others like them invade our turf. (There go my future invitations to Quantico.) We already have TWGDAM and ASCLD; do we *really* need another set of guidelines? I would love to know *why* the DAB wants DNA technical leaders to have Master's degrees. Remember, even the most complete set of DNA typing results only include or exclude a suspect. DNA analysis do not answer the ultimate question of identity, but fingerprint experts do so everyday. Shouldn't these experts have advanced degrees? It is also not inconceivable that future advisory boards may draft guidelines for firearms examiners. Many firearms examiners don't even have a Bachelor's degrees but I'll take a police officer/firearms examiner with 15 years of experience over some PhD any day. I guess I'm just funny that way, but common sense and experience go a long, long way in my book.

"What does this have to do with criminalists?", you ask. Well, why would these advisory boards just stop with DNA analysts? After the DAB guidelines become a fact of life, it is just a matter of time before other well-meaning boards move into neighboring areas of criminalistics.

Dr. Joshua Lederberg, Nobel Laureate and DAB chairman, recently responded to an e-mail of mine in which I expressed dissatisfaction with the Master's degree requirement. His response: *"I am personally very sympathetic to giving every reasonable weight to practical experience; and we certainly ought to consider what many other (qualify) 'Boards' do, namely to 'grandfather', existing practitioners on the basis of that experience."*

Let me get this straight: I am a Criminalist II with six years of experience, I have extensive training in forensic DNA typing (FBI, CCI, Promega, Perkin-Elmer, etc.), and I am currently performing casework and testifying in court as an expert witness. Now an advisory board 3,000 miles away is willing to consider

Click It

XXX

Visit our web page and take a look around. Thanks to the efforts of Pete Barnett and others, you'll find a veritable feast of current information about the CAC, upcoming events, newsletter tidbits, seminar abstracts and more. New items are constantly being added, so bookmark our site and visit often!



California
Association of
Criminalists



<http://www.criminalistics.com/CAC/>

grandfathering me into eligibility for a lead position in my own crime lab? And you were wondering why I am upset! Next, the DAB will look at my resume, see I am a California Department of Health Services-certified Forensic Alcohol Supervisor and say, "He's a DNA typing expert AND a Forensic Alcohol Supervisor! Nobody is *that* smart!"

—Harry Klann, Jr.
Los Angeles

An open letter from Harry Klann to FBI Director Louis Freeh

Dear Director Freeh:

I am writing to you about the minimum educational qualifications for forensic DNA Supervisor/Technical Leader proposed by the DNA Advisory Board (DAB). In the April 1995 *Crime Laboratory Digest* appeared an article entitled "Guidelines for a Quality Assurance Program for DNA Analysis." On page 23 of this Volume, subsection 2.2.3 concerns the Supervisor/Technical leader. The education subsection states "must have a minimum of a BA/BS or its equivalent in a biological, chemical, or forensic science..."

In a draft dated May 23, 1996, the DAB proposed that DNA technical managers will have a minimum of a *Master's degree* in biology or chemistry related area. There is no justification for the proposed Master's degree requirement for DNA technical managers. Well-trained, experienced DNA examiners, of any degree level, should be eligible to manage the technical operations of their agency's DNA laboratory. A recent poll (conducted by the American Society of Crime Laboratory Directors) of 88 crime labs showed that over 40% of these technical leaders possess only a Bachelor's degree.

Most DNA examiners have received extensive training in DNA analysis. Foremost among the available training courses are the FBI's own graduate level courses: 1) "Forensic Applications of DNA Typing Methods School", 2) "Laboratory Application of DNA Typing Methods School" and 3) "Advanced Aspects

of Forensic DNA Analysis." The syllabus for the first course included among the goals and objectives "competency in defending the methodology in judicial proceedings. I completed the advanced course in November 1992, but I still remember the instructors repeatedly and very enthusiastically telling the students, "YOU ARE THE EXPERTS." I took their admonishments very seriously.

The bottom line: Given successful completion of the FBI DNA schools, sufficient casework experience, and the right motivation, if I can defend the methodology in court, I should be qualified to serve as my laboratory's DNA technical leader. A Master's degree requirement for the technical manager of a forensic DNA laboratory is unnecessary, and it places a limit on the career paths of many otherwise qualified candidates. It is my opinion that the DNA typing methods employed by forensic laboratories are not difficult to perform nor are the results difficult to interpret. Furthermore, the Polymerase Chain Reaction (PCR) is fast becoming the dominant technology in this field. Many of the tests are available in kit form (DQA1 + Polymarker, D1S80 and various Short Tandem Repeats). Essentially all that is required is an ability to follow a protocol. In addition, the manufacturers (Applied Biosystems, Promega Corp.) of these forensic kits also provide technical support and excellent training courses.

I respectfully request that you challenge the DAB's proposal to require a Master's degree for forensic DNA technical leaders.

—Harry Klann, Jr. August 5, 1996

Share Your Horror Stories

If any readers have had experiences with professionally made proficiency tests (e.g. CTS) where there is some possibility that the test was either designed or administered improperly, I encourage you to share those experiences with the next Southern Trace Study Group. (Time and place TBA early next year.)

—Wayne Moorehead, Santa Ana



New take on an old subject

This familiar fellow already made his debut in the Spring '95 *CACNews*, but a recent demonstration of the "Personal SEM" (R.J. Lee) at our laboratory added such a new dimension that I had to share. Featured here are increasingly closer views of the mouthparts. The insect is a fossilized specimen of dytiscidae (order coleoptera), a predatory diving beetle in its larval stage.

The exoskeleton has been converted over the eons entirely to a substance not unlike clear glass. His diving days ended about 15 million years ago, and he waited for discovery in a dried up lake which we now call the Mojave desert.

Edwin L. Jones, Jr.
Ventura

Collection and Handling of Biological Evidence for DNA Analysis

Part One in a Two Part Series

by Theresa F. Spear*

Introduction

Most of the evidence handling considerations which apply to biological evidence collected for analysis using conventional tests still apply when collecting evidence for DNA analysis. Thus, obtaining as much sample as possible, allowing it to dry quickly, and ensuring that it is not inadvertently mixed with other biological samples are still important considerations. Emphasis on certain aspects of sample handling will change depending upon whether the analyst is handling samples at the crime scene, examining evidence in the crime laboratory, or analyzing samples in a DNA laboratory. This article will outline considerations for biological evidence collection at a crime scene and during the initial evidence examination process in a crime laboratory.

It is PCR based (polymerase chain reaction) DNA testing rather than RFLP (restriction fragment length polymorphism) testing that generates heightened concern with respect to contamination issues. PCR based DNA testing depends upon the polymerase chain reaction process to repeatedly copy a target region in the evidence DNA. The "copied" DNA is then typed. This ability to "copy" a particular region of the DNA in the evidence is the reason PCR-based typing is both so sensitive and so prone to contamination. If a second source of DNA is mixed with the evidence DNA (e.g. two adjacent stains from different sources are collected together), the PCR technique will efficiently copy DNA from both sources. Thus, the final typing result can reflect the DNA contribution from both sources. Depending upon the DNA profiles of the individuals involved, the number of typing tests conducted and the relative amount of the two DNA samples, it may not be obvious that the final result reflects a mixture of two sources of DNA. Contamination that goes undetected has the greatest potential for confusing the interpretation process. The ability to see the "introduced" DNA type will depend on the ratio of the amount of introduced DNA to the amount

of "target" DNA. In general, it is possible to detect a second source of DNA in most PCR based tests if the "introduced" DNA comprises at least 10% (or greater) of the input DNA. It is less common to see a significant contribution to the final typing result if the "introduced" DNA comprises 5% or less of the total sample. *This means that the samples that are most vulnerable to contamination are those samples which contain a small amount of DNA. Small bloodstains, shed hairs or degraded biological samples with little intact DNA are all samples that are likely to contain relatively little DNA.*

Questions which arise with respect to contamination issues can sometimes be addressed by a second analysis. In order for this to be effective, a portion of the evidence stain (assuming that the division of the stain will not jeopardize the analysis) must be preserved *as early as possible* in the examination. In fact, one of the recommendations that the National Research Council makes in "The Evaluation of Forensic Evidence" is, "Whenever feasible, forensic samples should be divided into two or more parts at the earliest practicable stage and the used parts retained to permit additional tests. The used and saved portions should be stored and handled separately. Any additional tests should be performed independently of the first by personnel not involved in the first test and preferably in a different laboratory." Ideally, each laboratory should have a policy to guide analysts on this issue.

Experience in analyzing most biological evidence for DNA has shown that issues of contamination in the initial collecting and handling of evidence do not appear to be a significant problem, since the inadvertent mixing of two different samples has always been recognized as a significant problem in any area of evidence handling, most analysts have developed evidence handling techniques which help ensure the integrity of evidence samples. The intent of this article is to outline most of the general practices which analysts use to protect the integrity of their samples.

Sources of Contamination

Theoretically, any human biological

sample containing a sufficient amount of DNA which comes into contact with an evidence sample, could be a potential source of contamination. Since there is typically very little direct contact between an analyst and a sample, the analyst is very unlikely to be the source of contaminating DNA. Techniques which are designed to protect the analyst also serve to protect the sample. Thus, wearing clean gloves and manipulating samples through tweezers or other implements help ensure that there is no direct contact between a sample and an analyst. If the sample is extremely small, some consideration can be given to working with the sample in a biosafety hood (or any enclosure designed to protect samples).

The more realistic potential for contamination is from other biological samples at the crime scene or in the laboratory. There are potentially two ways samples could come into contact with one another: direct or indirect. Combining two adjacent stains, which originated from two different people, would be an example of direct contact between two samples. Indirect contact would occur through an intermediate object: gloves, forceps, scissors, sample work area, or unprotected pipette barrel. An example of an indirect contact might be where a sample is allowed to come into contact with an object or work surface which had not been cleaned and which contained small quantities of material from the last sample manipulation. The key in ensuring that contamination does not occur is to prevent any contact between different biological samples and ensure that any object which comes into contact with an evidence stain cannot transfer any contaminating material. Studies in our laboratory established that it is possible to transfer enough DNA from bloodstains to various implements (scissors, tweezers, and scalpel *which were not cleaned* after they were used to handle numerous bloodstains) to permit the "contaminating type" to show up in PCR based typing tests of relatively small one microliter sized bloodstains.

Good Sample Handling Practices in the Field

Once a decision has been made at a crime scene to collect a specific sample, issues arise as to how to collect and package it for transportation to the laboratory. Considerations relevant at this stage are the ability to obtain as much sample as possible, to minimize degradation and finally to ensure that samples are not inadvertently mixed with other samples at the scene. Depending upon what issues are

*California Department of Justice,
California Criminalistics Institute

involved (why the evidence is being collected), evidence collection at the crime scene may need to be compartmentalized to ensure its integrity. This is an especially important consideration if there is a series of related crime scenes (e.g. homicide scene and vehicle believed to be associated with the crime). Precautions taken by the analyst in the lab to compartmentalize evidence collected from different sources (e.g. victim and suspect) would apply to handling evidence in the field. Such precautions might include changing protective gear (e.g. lab coats and gloves) between scenes.

The standard recommendation for collecting biological evidence is to *not* remove the stain from an object but rather to collect the object with the stain. The advantages of this strategy is that the entire stain is obtained, it is not necessary to collect an "unstained control" sample and there are no further manipulations required which might negatively impact the sample. If the stain is on a smooth, non-porous surface (i.e., it can be easily "flaked" off), it will be necessary to protect the stain from contact with another object. Depending upon what the evidence item is, the stain can be protected by immobilizing it in a cardboard box (e.g. with pieces of wire) or by taping a piece of paper over the stain (if this will not destroy other evidence, such as fingerprints). *Provided that the stain can be adequately protected, this is the optimum collection procedure.*

Given that some stains are found on immovable objects, it is not always possible to collect the object with the stain and some samples will need to be collected in the field. If it is possible to *remove the stain by cutting it out (e.g. from a piece of carpet), then this is the next best way to collect biological evidence.* Remember to use clean scissors and to cut out an "unstained" control. There will be occasions when it is not possible to collect a stain by cutting it from an object (e.g. stain is on a concrete floor). The two methods traditionally used to collect these stains are: One, to use a clean implement (e.g. razor blade) to scrape the stain into a clean paper bindle or, two, to use a dampened cotton swab, thread or piece of gauze to collect the stain. *With these two methods, it will always be necessary to take an "unstained" control sample.* Scraping is practical only when the stains are found on relatively smooth and nonporous surfaces. The greatest advantage to collecting stains by scraping is that no water is introduced in the collection process. The addition of

water to an already dried stain could potentially dilute a stain or hasten its degradation (especially if it was not allowed to dry).

Given the nature of most conventional serology typing techniques, samples collected by scraping techniques were usually preferable to samples collected by swabbing techniques. This preference was largely due to the fact that typing tests used in conventional serology require fairly concentrated stain material and the dried flakes of stain material produced by the scraping techniques were very amenable to successful typing by standard conventional tests. There was little chance of getting a successful conventional typing result on a dilute stain distributed over an entire swab. The situation is somewhat different with DNA typing techniques. Although it is always preferable to obtain a concentrated stain, current DNA extraction techniques are capable of obtaining DNA from a relatively diffuse stain on a swab head and concentrating the recovered DNA. Given the sensitivity of PCR based typing tests, it is now possible to obtain clear-cut typing results from very small biological samples.

The most significant problem encountered while scraping stains is that samples tend to "powder" when scraped and it may be difficult to control the retrieval of the entire sample. The "powdered" stain which is not retrieved may contaminate adjacent stains. Thus, when it is not possible to collect the object containing the evidence stain or to remove the stain by cutting, the *best method for recovering evidence stains for DNA analysis will be to use a minimum amount of distilled water to dampened an appropriate, clean substrate (e.g. cotton swab or gauze) and then absorb the stain onto the slightly dampened substrate.* In an effort to keep the stain as concentrated as possible, the size of substrate used to absorb the stain is important. Ideally, the smaller the stain, the smaller the amount of substrate. Thus an analyst might choose to use a small piece of cotton gauze rather than a swab to collect a small blood spatter (1 or 2 mm in diameter). In order to protect the integrity of a small sample, the dampened gauze should only be handled with clean forceps. If a stain is not very small, *swabs are probably easiest to use* since they do not require the use of forceps or any other intermediate object.

There is also some evidence that certain substrates may be better than other substrates with respect to DNA recovery. Some preliminary studies indicate that it

is possible to extract more DNA from biological samples placed on cotton swabs than equivalent samples placed on Dacron swabs. Do *not* use "calcium alginate" swabs for sample collection since these swabs interfere with many of the DNA extraction procedures. Cotton gauze., which does not have any additive (e.g. fabric sizing), is also an acceptable substrate.

One additional consideration when collecting evidence for DNA analysis relates to minimizing the contact of the evidence with potentially deleterious material associated with the evidence. Thus, for example, it has been found that cigarette ashes tend to inhibit the PCR reaction resulting in a failed DNA test. Therefore, when collecting cigarette butt(s) from ash trays, it is a good idea to only collect the cigarette butt and not the accompanying ashes. This also applies to collecting biological samples from soil. To the extent that it is possible to separate the sample from the dirt matrix, there will be a greater chance of a successful DNA test.

With respect to issues of contamination, the most at-risk samples are small samples. It may be advisable to take special precautions to ensure the integrity of these samples. One simple, effective precaution is to wear a new pair of gloves when dealing with this type of evidence. In addition, for very small stains, the use of disposable implements (e.g. tweezers, new razor blade) could prove beneficial.

There has been some concern regarding how to clean implements used to manipulate samples. One consideration that is relevant is the design features of the working surfaces of forceps. Tools with smooth, non-serrated surfaces are the easiest to clean. Experiments performed at the California Criminalistics Institute (CCI) have found that when a plastic squeeze bottle containing distilled water is used to wash off the working surfaces of implements (e.g. tweezers or scissors), then dried with laboratory tissue, *and this process is repeated*, no contaminating type was detected in PCR-based typing tests of very small bloodstains. Given the effectiveness of a water wash to eliminate any typing signal from heavily used instruments, it is probably not necessary to use bleach to clean these instruments. Potential damage, could be done to evidence stains if the bleach solution was not entirely removed from any implement used to manipulate the sample.

Next Issue:
Part Two of this Series

TRAINING & RESOURCES VIDEO

(CAC Members Only)

SEROLOGY / DNA

- S1 Electrophoresis Basics — Linhart • Glycogenated Vaginal Epithelia — Jones • Erythrocyte Acid Phosphatase — Rickard • Phosphoglucomutase — White / M. Hong
- S2 Immunology — Stockwell
- S3 Gm / Km — Stockwell / Wrasall
- S4 Peptidase A — Yamauchi
- S5 ABO — Thompson
- S6 Saliva — Spear (incl DNA Kelly-Frye/Howard Decision)
- S7 Presumpt. Tests/Species/ PCR Intro — Peterson/Mayo
- S8 Gc sub — Devine/Navette
- S9 Statistics — M. Stamm
- S10 Haptoglobin — D. Hong
- S11 Population Genetics & Statistics Course — Dr. Bruce Weir
- S12 Micro. Exam. of Sex Assault Evidence — Jones
- S13 DNA Workshop — Spring 1993

CRIME SCENE

- C1 Bloodspatter Lecture — Knowles
- C2 Bloodspatter Lecture — Chisum
- C3 Crime Scene Investigation Symposium — Fall '88 CAC

GENERAL INTEREST

- G1 ABC News 9/23/91: "Lab Errors"
- G2 48 Hours 9/25/91: "Clues"
- G3 Founder's Lecture: Stuart Kind — Fall '93
- G4 Founder's Lecture: Walter McCrone — Spr '90
- G5 Founder's Lecture: J. Osterburg — Fall '91
- G6 Founder's Lecture: Lowell Bradford — Spr '93
- G7 OJ Simpson Tonight Show Clips
- G8 "Against All Odds—Inside Statistics"

ALCOHOL / TOXICOLOGY

- A1 Forensic Alcohol Supervisor's Course — DOJ

TRACE EVIDENCE

- T1 Basic Microscopy Lecture — E. Rhodes
- T2 Tire Impressions as Evidence — Nause
- T3 Evaluation of Lamp Filament Evidence — Bradford
- T4 FTIR Lecture — Moorehead
- T5 Gunshot Residue Lecture — Calloway
- T6 Footwear — Bodziak
- T7 Footwear Mfg. Tour — Van's Shoes
- T8 Glass Methods — Bailey / Sagara / Rhodes
- T9 Fiber Evidence — Mumford/Bailey/Thompson
- T10 Trace Evidence Analysis — Barnett/Shaffer/Springer

FIREARMS

- F1 Forensic Firearms Evidence — Haag
- F2 Wound Ballistics: "Deadly Effects" — Jason

Please address requests to
Dean Gialamas, T&R Chair, c/o Los Angeles Co. Sheriff's Dept.
Scientific Services Bureau
2020 W. Beverly Blvd., Los Angeles, CA 90057-2404
(213) 974-7086 (213) 413-7637 FAX

Or FAX this ad with your selections circled above.

Name _____

Address _____

Phone _____

Info, contd.

as a Criminalist II to work narcotics, Rich Debevec as a Criminalist II to work blood alcohol and field calls, and Connie Milton as a Criminalist I to work DNA and field calls. Santa Clara County has hired Chris Coleman, Brooke Carpenter, Cyndie Holt, Cyndi Hall and Katie Tunnell. Sacramento Co. has hired Bruce Moran.

Resignations

Bruce Moran has left Santa Clara County. Chris Coleman, who was a recent new hire at the Los Angeles Police Department, resigned. Betty Lopez, a Lab Assistant with the San Diego Sheriff's has resigned to return to college full time. Norm Fort resigned from Ventura Co. Sheriff's Lab.

Retirements

Chuck Taylor and Don Hale retired from the LAPD lab. Both of them had worked with LAPD for an excess of 25 years.

Miscellany

In Aug. 1996 the Sacramento Co. Crime Lab occupied their new facility. Word has it that it's 48,000 square feet of a technological wonder. They are very proud of their new home. The offer is out to stop by for a visit. Call (916) 732-3839 for more information

While testifying at a murder trial, Don Jones of the San Bernardino Co Crime Lab was asked by the defense to show a piece of evidence to the jury. After being handed a pair of protective gloves, Don had difficulty putting them on. He commented that they were rather small. The defense attorney quickly responded, "Wrong trial Mr. Jones."

On Aug. 10, the Orange County Sheriff-Coroner lab renewed its Softball rivalry with the Huntington Beach team. Faced with a severe shortage of players, and recalling their drubbing at the last game, Huntington Beach was forced to take desperate measures. They recruited the boyfriend of Chief Criminalist Schwecke's daughter (a fine, strapping young man—6'5" and 240 pounds), and he brought a couple of friends. Huntington Beach jumped out to an early 3-0 lead, but Orange County answered with eight runs. Huntington Beach rallied for a decisive win in game one. Game two was even more decisive, and still in Huntington Beach's favor. Post-game pizza and beer capped off a fun day (we must have been having fun, or else how could you explain all the slow moving, groaning criminalists for the next few days).

—Greg Matheson

Notice to Contributors

We publish material of interest to our readers and are pleased to receive manuscripts from potential authors. Meetings and course announcements, employment opportunities, etc. are also solicited. Advertisements are also accepted, although a fee is charged for their inclusion in *The CAC News*. Please contact the Advertising Editor for further information. Because of the computerized typesetting employed in *The CAC News*, submissions should be made in the form of MS-DOS compatible files on 3.5 inch floppy disks or by e-mail (70642.773@compuserve.com). Text files from word processors should be saved as ASCII files without formatting codes, e.g. bold, italic, etc. An accompanying hardcopy of the file should be submitted along with the disk to illustrate the author's preference for special emphasis. Graphics, sketches, photographs, etc. may also be placed into articles. Please contact the Editorial Secretary for details. The deadlines for submissions are: December 15, March 15, June 15 and September 15. Nonmember subscriptions are available for \$24 domestic \$30US foreign—contact the Editorial Secretary for more information.

Recreations

Raymond's ANAGRAM

How many words of four or more letters can you form from the word "RAQUET?" There are at least 20...(answers at right.)

Four Workers and Their Dogs

Four workers were discussing how smart their dogs were. The first was an engineer, who said his dog could do math with calculations. His dog was named "T-Square", and he told him to get some paper and draw a square, a circle and triangle, which the dog did with no sweat. The Accountant said he thought his dog was better. His dog was named "Slide Rule". He told him to fetch a dozen cookies, bring them back and divide them into piles of three, which he did with no problem. The Chemist said that was good, but he felt his dog was better. His dog, "Measure", was told to get a quart of milk and pour seven ounces into a ten ounce glass. The dog did this perfectly.

All three workers agreed this was very good and their dogs were equally smart. They all turned to the State Worker and asked, "What can your dog do?" The State Worker called his dog, "Coffee Break", and said, "Show these guys what you can do." Coffee Break went over and ate the cookies, drank the milk, messed on the paper, screwed the other three dogs and claimed he injured his back while doing so, filed a grievance for unsafe working conditions, applied for Workers' Compensation and left for home on Industrial Accident!

Guacamole by any other name . . .

Ever been surprised to see another organization with the acronym "CAC"? Don't be. A recent internet search revealed 10,000 "hits" on those three letters, only a few of which related to us. Among our namesakes are: Canadian Architecture Collection, Center for Academic Computing, College Advisement Center (BYU), Combined Arms Center (US Army), Customer Assistance Center (Motorola), Clarke Alternator Controller (ship engines), and my personal favorite, the California Avocado Comission.

Answers to Raymond's ANAGRAM

QUART, ECRU, CUTE, CURT, CURE, CRUET, CART, CRATE, CRATER, CATER, RACE, RATE, RECUT, REACT, TRUE, TRACE, TRUCE, TARE, TEAR,

Face Game Answers: "California OJ Players": (top row l-r)

Anrea Mazzola, Colin Yamauchi, Renee Montgomery, Ed Blake, (bottom row l-r) Dennis Fung, Larry Ragle, Greg Matheson, and Gary Sims.

A Summary of the World

If we could shrink the Earth's population to a village of precisely 100 people, with all of the existing human ratios, it would look like this: There would be 57 Asians, 21 Europeans, 14 from the Western Hemisphere, (North & South) and 8 Africans. Fifty-one would be female, 49 male; 70 would be non-white, 70 non-Christian. 70 would be unable to read; 50 would suffer from malnutrition. One would be near death and one near birth. Only one would have a college education and no one would own a computer.

Interested in becoming a member?

- Receive the *Journal of the Forensic Science Society* and/or *Journal of Forensic Sciences* —
- Receive *The CAC News* —
- Lower, Member registration fees at CAC Seminars —
- Receive CAC Membership Roster / Seminar Abstracts —
- Receive Salary Survey of Government Labs —
- Membership in a prestigious Forensic Society —

1. Contact the CAC Membership Secretary, Penny Laferty (714)834-4510, to obtain an information packet and application.
2. Fill out and return the application to Penny along with your first year's dues & appl. fee.
3. Two of your listed references will be contacted.
4. Applicants are screened to ensure that they meet the requirements. (Outlined in Article 11 of the CAC Membership Handbook).
5. Your application will be presented to the Board of Directors at their next quarterly meeting. If approved, your application will be voted on by the membership at the next Seminar.

Locard's Principle



"Wherever he goes, he always brings some of it back with him."

Improve your aim.

Set your scene reconstruction sights on Sacramento, home of the 1997 Spring CAC Seminar. Among the events tentatively scheduled are workshops focusing on crime scene reconstruction, management and leadership skills for the technical person, shooting reconstruction, internet/construction of World Wide Web page, and clandestine laboratories. Also planned is a DNA User's Group Meeting.

Seminar Chair Ann Murphy and Co-Chair Jeff Herbert have chosen the Radisson with comfort and location in mind. A free shuttle to and from Sacramento Airport, State Capitol, Old Sacramento, Arden Fair will be available. Reserve your room now and take advantage of the special \$79 rate. And be sure to visit our website for more information:

<http://www.ns.net/dlecci/cacsac.htm>

Or give Ann or Jeff a call at the Sacramento County Laboratory of Forensic Services, 4800 Broadway, Suite 200, Sacramento, CA 95820. (916) 732-3840, FAX(916) 732-9620.

Spring '97
Sacramento

May 28-31

