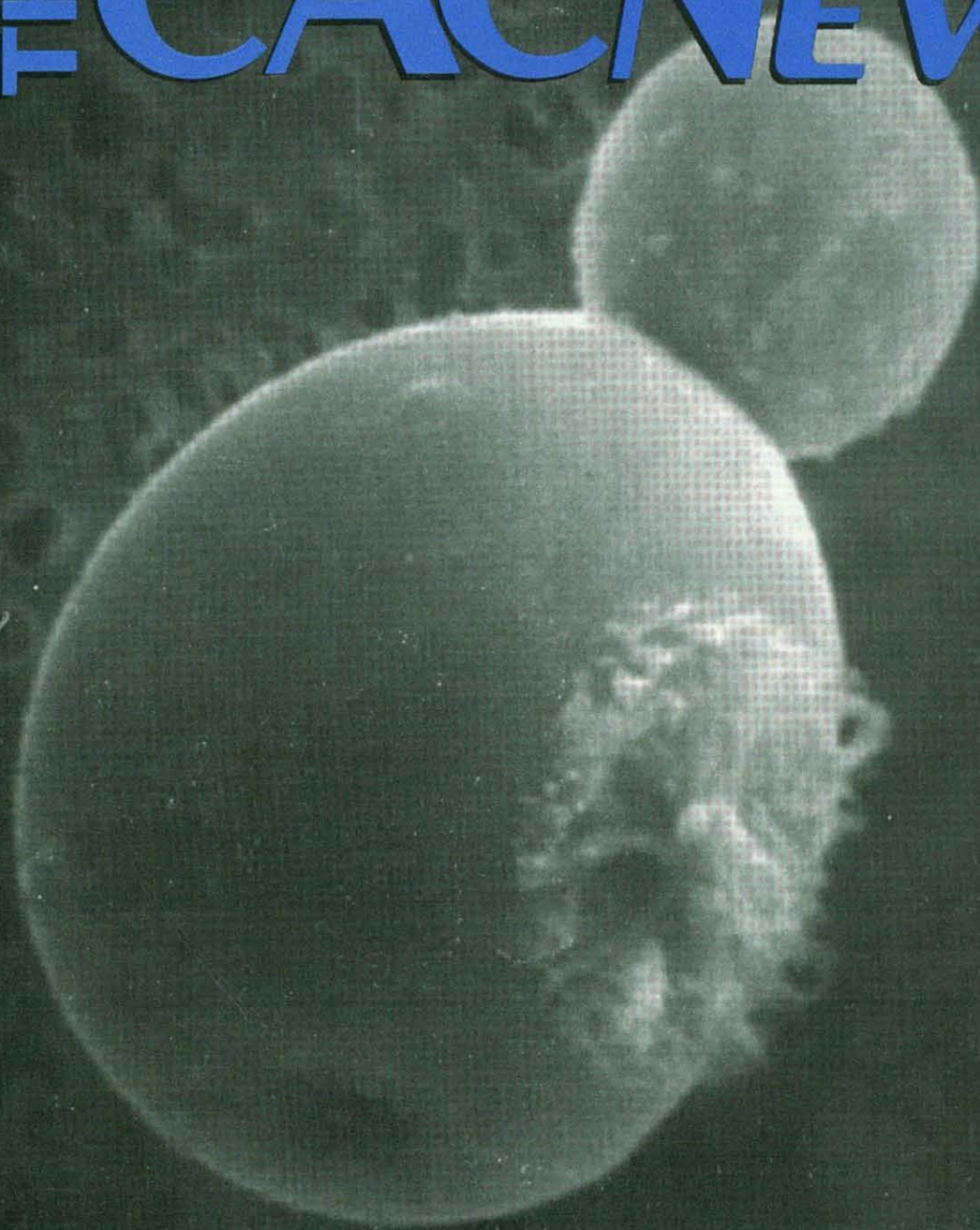


News of the California Association of Criminalists • Spring 1996

The CACNews



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The President's Desk

Carol Hunter



"Throughout the centuries there were men who took first steps down new roads armed with nothing but their own vision

—ayn rand

Throughout the past year, I have written these President's letters outlining my goals for the association during my term, discussing professionalism, and in-

forming you of the multitude of benefits of your membership in the CAC. I am left wondering what the lack of feedback from you really means.

I grew dismayed when I received a resignation letter from a colleague and member of CAC. The reason cited for the resignation was the deficiency in articles in the *JFSS* which are relevant to a generalist and because of the recent dues increase. Apparently, the BENEFITS OF MEMBERSHIP in this association are not as obvious to some as to others.

So one last time, I step onto the Presidential Soapbox to blow another large puff of enthusiasm your way!

Submit an article for publication or encourage your colleagues to submit articles. The quality of and variety within any journal of this nature is dependent upon the article submissions to the editorial board. CAC member submissions have been severely lacking.

But this Journal is not the only benefit of your membership. This year our regional association negotiated with AAFS to offer to AAFS non-members a reduced rate subscription to Journal of Forensic Science. Although I realize that many of you are members of AAFS and this is not a benefit that you will take advantage of, it is a benefit to our members nonetheless. Reduced registration rates to our semi-annual meeting training courses sponsored by the A. Reed and Virginia McLaughlin Endowment fund, study groups/dinner meetings and the wonderfully improved newsletter ALL are highly significant benefits each member receives. These are examples of those benefits which can be quantitated.

One of the most significant benefits are meetings and interacting with new colleagues and information exchange. Can you do this regardless of your membership? Yes, of course. But your membership exemplifies your professionalism and your ongoing support of the field of criminalistics.

Please turn to page 23

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Cal Lab of Forensic Science
3890 Prospect Ave. Ste. A
Yorba Linda, CA 92686
(714) 524-9461

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Forensic Science Associates
3053 Research Dr.
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(909) 387-2200

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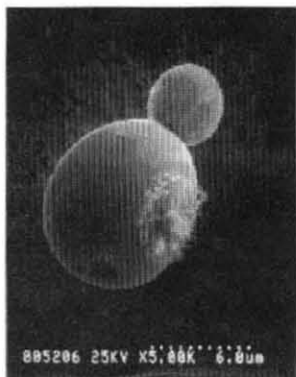
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(510) 238-3386



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On the cover...

This scanning electron micrograph of a gunshot residue particle at 5,000X was taken by Dave Hong, who insists that it proves GSR particles reproduce by budding ("Who says GSR is boring?") He goes on to describe the larger particle as 6 microns in diameter with both particles being composed of lead, antimony and barium.

The CACNews

PUBLICATION STAFF

Editor-in-Chief: **Raymond Davis**
(408) 299-2224

Art Director: **John Houde**
(805) 654-2333

Features: **Greg Matheson**
(213) 237-0064

Advertising: **Jennifer S. Mihalovich**
(510) 222-8883

Technical: **Frank Cassidy**
(805) 681-2580

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Notice to Contributors

This newsletter publishes material of interest to its readers and is 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 IBM or MS-DOS compatible files on 5.25 or 3.5 inch floppy disks (high or low density). 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 may 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. FAX submissions are also acceptable. The FAX number for the Editorial Secretary is (408) 298-7501. The deadlines for submissions are: December 15, March 15, June 15 and September 15.

Contents

Departments

- 2 **The President's Desk**
Notes from President Carol Hunter
- 4 **CACBits / Section Reports**
New FBI policy; CAC sponsored courses
- 5 **Jobs / Meetings / Courses**
Conference announcements

Opinion

- 6 **Editorial page**
Raymond Davis on giants; Reader's letters

Features

- 7 **Changes in Speed**
Jerry Massetti reports
- 9 **Forensic Potpourri**
Prints: lip and finger
- 12 **Interdiction of Illicit Narcotic Trafficking by Solvent Characterization Using GC**
David Blockus
- 14 **A Toxicological Analysis of Tetrahydropalmatine**
Dan Anderson
- 17 **Vote '96**
CAC Board Candidate's Statements
- 18 **A Case of Not-So-Spontaneous Human Combustion**
John DeHaan

Recreations

- 8 **Face Game**
Ed Jones
- 23 **Humor**
'toons; Frank Cassidy

CACBits/Section Reports

FBI Announces New Forensic Examination Policy

Effective July 1, 1994, the FBI Laboratory will no longer accept evidence from State and local law enforcement agencies for forensic examination in cases involving property crime investigations, except those cases that involve personal injury or for crimes that were intended to cause personal injury. The Laboratory will continue to accept evidence relating to violent crime investigations, including those that may involve property crime. These new guidelines are being implemented, in part, to ensure that the FBI continues to provide timely forensic assistance to law enforcement agencies investigating crimes of violence or threatened violence.

The following are examples of State and local property crimes that will not be accepted for forensic examination by the FBI Laboratory as of July 1, 1994:

Arson of vacated residential dwellings and commercial buildings (Because arson of occupied residential dwellings is considered a violent crime rather than a property crime, such cases will not be affected by the new policy.); Nonfatal traffic accidents involving speedometer and/or headlight examinations, except cases involving law enforcement officers or State and local government officials; Vandalism and malicious mischief directed toward personal or commercial property; Hit-and-run automobile accidents that involve no personal injury; Auto theft, except cases involving auto theft rings or carjackings; Breaking and entering; Burglary; Minor theft (under \$100,000); Explosive incidents or hoaxes targeting unoccupied dwellings, vacant commercial buildings, or other uninhabited property.

At the discretion of the FBI Laboratory's Assistant Director (or designee), the Laboratory may agree to accept evidence from property crime cases that would not be accepted otherwise under the revised policy. Such exceptions will be considered only on a case-by-case basis and should not be regarded as setting a precedent for future case acceptance. However, all accepted cases will continue to be afforded the full range of forensic services offered by the FBI Laboratory.

—Reprinted from *Crime Lab Digest*
Vol. 21 No 1, Jan. 1994

CCI Announces CAC Sponsored Classes

The A. Reed and Virginia McLaughlin Endowment Fund, together with the CAC and the California Criminalistics Institute are co-sponsoring some CCI classes. The CAC Endowment Committee has approved funding for the following CCI Courses. These selections have been approved by the Association's Board of Directors: \$2,312 approved for "Courtroom Presentation of Evidence", to be held after the "Fire and Explosion Investigation" course, \$2,330 approved

for "The Microscopy of Rape Evidence", to be held August 27-29, 1996, \$2,000 approved for "Fire and Explosion Investigation", to be offered July 15-19, 1996 and \$3,600 approved for "Advanced Microscopy", to be held April 15-19, 1996.

"Fire and Explosion Investigation" will be offered prior to the Courtroom Presentation of Evidence. If "Fire" recoups all or part of the allocated \$2,000 then any recouped funds up to \$2,000 may be applied to the cost of presenting the Courtroom Presentation of Evidence course. CCI will make every effort to accomplish this in order to more effectively utilize the allocation of funds.

Course announcements for Advanced Microscopy, Fire and Explosion Investigation and Microscopy of Rape Evidence are available to CAC members. We apologize for the short notice on the Advanced microscopy Course and we hope it does not inconvenience any CAC members.

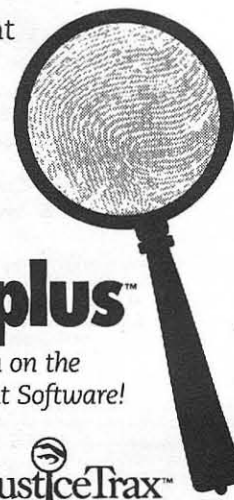
The Trajectory Analysis course scheduled January 29-31, 1996 was co-sponsored by the CAC Endowment Fund and CCI with \$2,060 provided for Lucien Haag as instructor.

CCI can be reached at (916) 227-3575.

—Victor Reeve

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Jobs • Meetings • Courses

Winning in Court Training Conference Set

May 20 and 21, 1996 is when the biannual "Investigation of Crime: Winning in Court" training conference will be held. The fee is \$250 prior to April 30th and \$280 after that. There will be a \$25 cancellation fee. The conference is being presented in San Francisco at the Marines' Memorial Club/Hotel, and is presented by the Center for Medicolegal Research and Consultation. Continuing legal education hours have been applied for with various State Bars and with law enforcement accreditation agencies.

Contact:

Karen Griest, MD
160 Washington, SE #234
Albuquerque, NM 87508
(505)281-8109

Two Southwest Groups Co-Host Meeting

The Southwestern Association of Forensic Scientists (SWAFS) and the Southwestern Association of Forensic Document Examiners (SWAFDE) will co-host their fall training sessions from October 15th through the 20th, 1996.

Scientific papers regarding the examination of forensic evidence will be presented, as well as training workshops for the various specialties.

Contact:

Quentin J. Peterson
Tucson Crime Lab, Tucson PD
270 S. Stone Ave.
Tucson, AZ 85701
(520) 791-4494.

First Technical Working Group for Materials Examination (TWGMAT)

An Overview of the First Technical Working Group for Materials Examination (TWGMAT) was held at the FBI Training Academy, Quantico, VA, November 13-15, 1995.

The groups formerly known as the Technical Working Groups for Fiber and Paint Examination (TWGFIBE and TWGPAINT) have combined to form a group for materials examination. The "materials" will start off to be fibers and paint with an eye to the future to possibly include glass, polymers, and other trace materials. This group consists of forensic scientists from each of the regional U.S. organizations, England, Germany, and Canada. Currently TWGMAT is writing guidelines on fiber and paint analysis. These guidelines, which are task specific, e.g. Microscopy, Vibrational Spectroscopy, QA/QC, etc., are being written with two things in mind: first, with the *Daubert* decision affecting testimony, high profile cases attracting intense media scrutiny and other groups generating guidelines (ISO, ASTM, and TWGDAM, to name a few), the need for documentation and guidelines may be more critical now than ever. Secondly, guidelines help ensure uniformity and consistency in analyses. It is important to remember that guidelines, which suggest minimum requirements for an adequate analysis, are vastly different than standard operating procedures (SOPs), those step-by-step procedures that each laboratory must generate. The fiber guidelines are almost done and the paint guidelines are just beginning to be formalized. If you would like to see the guidelines and comment on them, please contact Ed Bartick at the FBI FSRTC at 703-640-1537.

Other projects that TWGMAT has begun are compiling bibliographies on paint and fiber literature, conducting round-robin studies in paint and fibers, and taking and compiling surveys on paint and fiber analysis. One of the most ambitious undertakings is the formation of a database. The database for fibers is starting with automotive carpet fibers

and is a text-searchable database. A paint database, which is also text searchable, has already been developed by the Canadians, but to keep it running, and to feed in new information, money for personnel is needed. Money is also needed for expansion of the system to include the data from the U.S. and possibly expansion of the system to include spectra data. A search for funds is currently in progress.

Lastly, a symposium will be held the week of June 24, 1996, in San Antonio, Texas, and is titled "The International Symposium of Trace in Transition". The theme of this symposium is "Relevance and Reliability." Abstracts for posters and papers will be accepted.

*Faye Springer
Sacramento DOJ*

Joint Meeting Date Announced

The "Second Occasional Joint Meeting" of the CAC and the Forensic Science Society will be held in Harrogate, North Yorkshire, England from July 9 to July 13, 1997. The theme of the meeting is "International Science and Justice." Presentations are solicited from all forensic science disciplines involved in laboratory and scenes of crimes investigations.

Inquiries from the U.S. and Canada regarding abstract requirements or general meeting information should be directed to:

Jim White

Orange County Sheriff-Coroner
320 N. Flower St.
Santa Ana, CA 92703.
(714) 834-6384 (voice)
(714) 834-4519 (FAX)

e-mail: CACFSS@criminalistics.com

Further information may also be found at:

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

...on the shoulders of giants.



Ed Jones' article on Edmond Locard (*CACNews*, Fall 1995) got me thinking about the pioneers in our profession. I wondered how they were able to carry on their study and research while maintaining full time careers. Particularly when there was no support to do so. No forensic associations or journals were available to them. No

seminars to obtain and exchange information, no funding from government agencies, no overtime pay, no sophisticated equipment, no special training. Nothing, except themselves. They cut their own path to fame and fortune. Well, at least fame if not fortune. They are remembered to this day for their extraordinary contribution to forensic science. Or are they? In the very next issue of the *CACNews*, Winter 1995, Ed Jones asked if

we could place a name next to the photographs of six famous forensic scientists. How many did you name? I got two out of the six correct. I admit that some of these pioneers are more famous (to me) than others. Whether they are remembered or not, I have benefited from their dedication to their science. Their tireless work is only part of the reason they are famous. The most notable part is that they wrote it down. They published their work, gave lectures, wrote to colleagues or wrote a book. They shared their knowledge. So whether you remember them or not, their legacy still lives on in the lives of criminalists, forensic chemists and fingerprint experts

Simply stated, learning from another person's case work and experiences can directly increase the opportunities for wisdom.

working in private and public crime laboratories today.

The work produced by these "giants", their thoughts and ideas are captured in their work through meticulous notes, precise and accurate test results, elegant diagrams and drawings and other recorded data. Even their penmanship was noteworthy. I suspect that people like Locard opened up the minds of other scientists to the

please turn to page 11

From the Reader

Just Say Hello

*"I see you at the meetings, but you never say hello;
Your focus seems to fall on just the folks you know,
I feel a bit forlorn, among these others new as I—
While you who invited us, keep passing on by.
Why not cross the room, you who talk of fellowship?
Walk over here and say hello; it's such a tiny trip.
After that, you can be sure we will understand,
If you cross the room again, to chat with your old friend.
Perhaps we'll come again—to your next regular meeting.
But that may be your last chance to extend a cordial
greeting."*

—David Barton

We would like to announce the first New Member Orientation and Reception at the Spring 1996 CAC meeting in Milpitas.

To new members: Meet fellow CAC members and officers; find out about benefits of membership and op-

portunities for involvement; join us in welcoming the new members to our organization. All CAC members are welcome. Look in your Spring registration packet for more information.

—Lisa Calandro
Hayward

CAC News Cited in Science and Justice

In the January/March 1996 issue of "*Science and Justice*" (formerly the *Journal of Forensic Science Society*), **Dean Gialamas** listed as citations for his paper two articles published by the *CACNews*. We believe this is the first instance of the *CACNews* being cited in a peer review journal.

Readers spotting any other citations of our humble publication are asked to forward them to us.

—Ed.

Corrections:

On page 18 of the Winter 95 issue, the figure "600°C" should read "60°C".

Changes In Speed: August 1995

Jerry Massetti

It wasn't just the signs on the freeway that changed recently. Several widespread changes in clandestinely manufactured methamphetamine suddenly emerged beginning in August 1995. Amphetamine began to be routinely detected in suspected methamphetamine samples by two dozen crime laboratories in the Western United States by mid-September. The amount of active ingredient in these samples affected detection limits of whatever techniques were being used to analyze them.

Outbreak

Amphetamine had been a rarity. Up until August 19th, the ten laboratories in the California State Department of Justice crime lab system that analyze street drugs had not received even one submission that contained amphetamine during all of 1995. CA DOJ Riverside Laboratory spotted it in a mixture with methamphetamine in a residue left on a filter paper submitted from a clandestine laboratory scene. On August 20th, CA DOJ labs in Fresno and Santa Barbara received suspected methamphetamine samples that contained amphetamine as a major active ingredient. Dozens of samples were detected by those three CA DOJ laboratories within the next three weeks alone.

An informal poll of other California and Western US crime laboratories revealed that, by mid-September, something definitely had happened to meth samples. "It's taking forever for the druggies to get those cases out", one supervisor commented. "All that caffeine and nicotinamide is sure difficult to deal with"

Senior Criminalist, CA Dept, of Justice, Fresno Laboratory

(or words to that effect). And, "Yeah, we have that stuff, too" was pretty much the consensus of opinions rendered by labs in Kern, San Bernardino, Los Angeles, Orange and San Diego counties. Labs in Las Vegas, Flagstaff and Phoenix acknowledged similar changes in their methamphetamine samples had occurred.

It wasn't until October when Northern California labs generally acknowledged that they were also receiving suspected methamphetamine samples that actually contained amphetamine or a mixture of the two. Exceptions to this were Contra Costa county and Santa Clara

Large scale labs are producing 20 to 100 pound batches of amphetamine in the same fashion as they have been to make methamphetamine in recent years.

counties who reported they had received a few exhibits of this type in August or early September. Labs in Oregon, Washington, Idaho and Colorado also indicated receipt of such samples in October. A Denver area criminalist commented that several pounds of amphetamine / methamphetamine mixture shipped by bus from LA was blended worse than the stuff he prepared as standards for his narcotic officers. In November, reports were received that numerous submissions like those described above were being received by laboratories in Midwestern states and Florida. An Iowa lab stated that amphetamine submissions greatly exceeded methamphetamine submissions. A lab in Tampa revealed an investigation into drug trafficking associated with Southern Californian Mexican Nationals had discovered

suspected methamphetamine was amphetamine heavily cut with dimethylsulfone.

Analytical characteristics

The amount of actual controlled substance in most submissions plummeted to very low levels, near 1 and 2 percent. Diluents included large amounts of caffeine, nicotinamide, inositol and, with increasing frequency, dimethylsulfone (DMSO2). Some reports indicated guaifenesin was also detected. A couple of isolated reports indicated a concentration of 96% amphetamine.

Only the racemic form of amphetamine was reported by analysts who determined the isomeric form of the amphetamine by gold chloride microcrystal test. This was a noticeable change to the single isomer, d-methamphetamine, that had been so common in street drug submissions.

By-products indicating the route of manufacture included molecular weight 232 substituted naphthalenes, phenyl-2-propanone and phenylpropanolamine. No dimethylamphetamine was reported.

The amount of methamphetamine present in samples that contained mixtures of methamphetamine and amphetamine decreased as time progressed during the last five months of 1995. Laboratories that reported heavily cut suspected methamphetamine samples which actually contained amphetamine were more likely to report amphetamine alone or that a substantially greater amount of amphetamine was present as compared to methamphetamine in the same mixture.

dl-phenylpropanolamine Substituted For d-pseudoephedrine or l-ephedrine

Efforts to regulate and control precursors used to make d-methamphetamine have caused a change in what is being used by clandestine laboratory operators. Instead of d-pseudoephedrine or l-ephedrine, dl-phenylpropanolamine is used as

starting material in the hydriodic acid / red phosphorous reduction reaction. The result of substituting phenylpropanolamine for pseudoephedrine or ephedrine is that amphetamine is produced instead of methamphetamine. The result of using the mixed isomer form of phenylpropanolamine is that both isomeric forms of amphetamine are produced.

Pharmaceutical suppliers of phenylpropanolamine generally do not supply it in a single isomeric form. Consequently, products containing phenylpropanolamine contain the racemic form of it.

Tablets containing l-ephedrine, d-pseudoephedrine and now dl-phenylpropanolamine are often extracted in order to use the active ingredient as starting material to make methamphetamine by reducing it with hydriodic acid and red phosphorous. Several incidents at large commercial drug stores have occurred where entire shelves of Actifed or Efidac or other equivalent over-the-counter ephedrine / pseudoephedrine / phenylpropanolamine products have been cleaned out by

operatives preparing to cook up a batch. Dozens of extraction labs have been investigated where millions of tablets are extracted for this purpose.

At least one brand of phenylpropanolamine tablet that is being extracted in large quantities and then reduced to make amphetamine has a bright yellow-orange coating. This color carries through the extraction process and hydriodic / red phosphorous reduction to the final product giving it a characteristic bright yellow-orange appearance.

Large scale clandestine laboratories operated by Mexican National work crews are producing out twenty to one hundred pound batches of amphetamine in the same fashion as they have been to make methamphetamine in recent years. The amphetamine product is salted out as the hydrochloride salt. The hydrochloride form of amphetamine is hygroscopic. Consequently, these samples typically exhibit a pasty texture. Sometimes the amphetamine product is still found to contain some amount of methamphetamine. It seems likely that those operating the

laboratory were furnished with a mixed precursor. More recently, the occurrence of only a trace amount of methamphetamine may more likely be due carryover from equipment, such as blenders, that were formerly used to extract tablets that actually contained ephedrine.

Acknowledgments

This information was compiled from comments made by dozens of criminalists and forensic chemists. Their combined input is greatly appreciated. Much of this information has been previously presented in the October 1995 issue of the *Journal of the Clandestine Laboratory Investigating Chemists*, Volume 5, Number 4, pages 9-11.

Post Script

A criminalist who is older than I suggests the reappearance of amphetamine is an example of certain things in drug trafficking that are cyclical in nature. If that's true, won't it be fun when we see lots of "barbs" again.

Match the famous faces at left with their biography / autobiography below.



Robert Churchill



Bernard Spislbury



Keith Simpson



Sir Sydney Smith



H. J. Walls



J.B. Firth

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• The Other Mr. Churchill

Lib. of Congress 65-12236

• The Scalpel of Scotland Yard

E.P. Dutton & Co., 1952

• Mostly Murder

ISBN 0-88029-306-3

• Forty Years of Murder

ISBN 0-88029-305-5

(Answers on pg 23)

Forensic Potpourri

Part one in a series.

Beginning with this issue, the CACNews offers selected articles from the "Police" forum on CompuServe. We hope those readers who don't have access to this service will enjoy the "Back-to-Basics" flavor of this interesting mix.

Lip Prints

Investigators often gain evidence through the use of odontology, anthropometry (measuring the body), fingerprints, and other techniques that determine gender, approximate age, height, and blood grouping. Today, however, investigators can also rely on lip prints to identify possible suspects or to support evidence gained in specific investigations.

As with fingerprints, experts can lift lip prints from objects found at crime scenes and compare these prints to a suspect's lip pattern. Lip prints can also support dental record comparisons in homicide cases where dismemberment makes identification difficult or when victims do not have teeth or readily available dental records.

Background

In 1970, Japanese researchers reported their findings on a lip print study. During the study, researchers examined the lip prints of 1,364 individuals, ranging from 3 to 60 years of age. They prepared the prints by using both photographs and a fingerprint system. (1) They then classified the prints according to their distinguishing features.

In 1991, the author conducted a lip print study, comparing the lip prints of 150 individuals, ranging in age from 4 to 85 years of age. This study included both genders, as well as five pairs of identical twins, and applied the same methods of classification and recording as those in the previous study.

However, in the second study, researchers transferred lip prints by using lip rouge rather than a fingerprint system. In addition, two findings from the first study were not considered in the 1991 study: Lip inflammation can alter lip prints, but the prints return to normal when the condition is relieved; and lip prints do not change with age. (2)

Although methods for obtaining prints differed somewhat in the two studies, the results were the same. Findings indicated that:

— Every individual has unique lip prints—no two were identical in any case

— Heredity plays some role in lip pattern development (Similarities were found between parents and children.)

— Unique features are distinguishable (Although parents and their children have similar groove traits, the prints are not identical, even in the case of identical twins.)

Classification Method

When classifying lip prints, experts divide distinguishing labial wrinkles and grooves of the lips into two categories—simple and compound. Simple wrinkles and grooves are subdivided into four groups: Those with a straight line, a curved line, an angled line, or a sine-shaped curve. Compound wrinkles and grooves are classified into bifurcated, trifurcated, or anomalous. (3)

Six types of distinguishing features exist in lip prints:

— Type I: clear-cut lines or grooves that run vertically across the lip

— Type I/: straight grooves that disappear halfway into the lip instead of covering the entire breadth of the lip

— Type II: grooves that fork

— Type III: grooves that intersect

— Type IV: grooves that are reticulate (net-like)

— Type V: grooves that do not fall into any of the above categories and cannot be differentiated morphologically. (4)

Experts cannot categorize a lip print as a single type, since combi-

nations of groove types exist in nearly all cases. Instead, they designate a single lip print type based on the prominence of groove type.

Recording Method

Once experts classify lip patterns, they record them by noting the combinations of groove types found in each print. A horizontal line divides the upper lip from the lower lip, and a median line partitions the right and left sides. Experts then record the combinations of groove patterns for each quadrant of the print. (5)

Conclusion

Findings from lip print studies make a strong case for their use in solving crimes. Although not useful for identification under conditions where only skeletal structures remain, intact lips provide prints that can provide valuable legal evidence.

Many law enforcement agencies remain unaware of the usefulness of lip prints when attempting to identify suspects, and as a result, important evidence is lost. With the increasing number of unsolved crimes, the criminal justice community must look seriously at any new method that provides the evidence necessary to gain convictions. Law enforcement personnel should begin to consider lip print analysis as yet another tool to use for solving crimes.

Endnotes

1 K. Suzuki and Y. Tsuchihashi, "Personal Identification by Means of Lip Prints," *Journal of Forensic Medicine*, 1970, 52-57.

2 Y. Tsuchihashi, "Studies on Personal Identification by Means of Lip Prints," *Forensic Science*, 1974, 233-248.

3 Ibid.

4 Ibid.

5 Ibid.

Mary Lee Schnuth
November 1992

Dr. Schnuth is an associate professor at Old Dominion University in Norfolk, Virginia.

A principle element of investigation must be the establishment of the identity of the deceased. Failure to answer the question "who was the dead person?" can cause delay to the enquiry.

The establishing of identity can be achieved by several methods. Physical recognition by friends or relations, personal effects, papers etc. can of course result in speedy identification. However, there are circumstances when identification cannot be achieved positively by these methods. Where death has been caused by fire, or by drowning, or where the body is in poor condition through mutilation or decomposition, identification can be severely hampered. Should it still be possible to obtain useful finger / palm prints from the cadaver, this method may well result in success where all other methods are exhausted, or just not possible. By useful finger / palm prints, I mean those that can be searched through the national fingerprint collection, or used to confirm a suspected identity from latent finger marks retrieved from articles handled by the deceased whilst he / she was still alive.

The positive nature of fingerprint identification requires that in all cases involving police investigation into causes of death, an attempt should be made to obtain the necessary fingerprint evidence.

Cadavers vary as to physical condition and each can present problems either for a police officer, making an initial attempt at obtaining prints by traditional means, or the expert using special techniques at a later stage. I will not deal here with normal fingerprinting methods applied to cadaver identification. It is assumed that the taking of inked impressions from hands in good condition is well understood. There are of course problems taking prints from a nonresponsive medium, especially when rigor mortis is present. However, suitable verbal advice is often sufficient in such cases.

The special examination of cadavers for fingerprints entails photography, inking and printing, powder deposition and casting.

The type of examination undertaken will depend on the particular condition of the hands in each case. Often, sequential treatments will be tried in order to increase the chances of success. It is essential that all visible detail be recorded prior to the start of examination, or before a treatment is tried which could result in damage to existing detail. The use of photography for this purpose is of great benefit. The use of a professional photographer is preferred, as fine ridge detail can be difficult to capture. The photographer may also be essential to record the results of various treatments during each stage of the operation, e.g. inked casts, lifts of aluminium powder taken from the skin or casts, powder deposition from burning magnesium tape etc. It is therefore, a great advantage for the photographer to be present throughout the process.

Inking and printing can be achieved by several methods, including inking the fingers and rolling the fingerprint card around the finger, wrapping an adhesive label around the inked finger and sticking it to an acetate sheet (conducted as a follow up to the ink and card technique), rolling the inked surface on a second glove on your own hand, removing the glove and cutting the resultant impression from the glove prior to mounting for photography. This method is particularly useful in cases where the skin is creased, as the pliability of the examiners hand assists in the smoothing the creases out.

If the top (epidermal) layer is detached, the skin can be placed over a gloved finger and rolled in the normal manner.

Powder deposition methods include applying aluminium powder to the fingers using a glass / carbon fibre, or animal hair brush and 'lifting' the prints using adhesive tape, applying black powder to the digit and 'lifting' the prints using an adhe-

sive label which is then stuck to a clear acetate sheet, igniting a magnesium strip and holding it at an angle approx. 6" below the digit, allowing a white layer to be deposited prior to photographing the result. Also, heating ammonium chloride in a 'bulb', blowing air through it with an insufflator and depositing white smoke on the ridges.

Casting methods involve the covering of the skin surface with suitable material such as Silcoset 101, Xantropen Plus and Revultex. Many of these materials have been adapted from use in dentistry.

The resultant casts may be photographed direct, or after the application of powder or ink. In addition, casts may be inked and printed, or powdered and lifts taken.

Casting is a very sensitive method and tends to record every crease of the skin. Highly creased fingers should therefore be injected with a substance which will smooth out the skin, prior to casting. These substances include, glycerol, embalming fluid, paraffin wax and Vaseline, all of which are injected into the finger bulb. It may also be possible to force body fluids into the bulb by winding string around the finger starting at the proximal joint and continuing to the distal crease. Both methods inflate the bulb and stretch the skin to remove creasing.

There are four basic types of problem which make the obtaining of prints difficult:

MACERATION. The immersion of the hands in water for prolonged periods causing deep wrinkles and the eventual separation of the epidermis from the dermis.

CHARRING or BURNING causes the dermis to shrink due to dehydration and the epidermis to become delicate and brittle.

DECOMPOSITION causes the skin to become slimy and discoloured, the epidermis may become loose, wholly or partly missing and there may be damage due to maggots or animal attack.

DESICCATION or MUMMIFICATION causing the skin to become

hard and leathery, creased and shrunken, tissue collapses.

Each of these conditions pose their own problems when trying to obtain prints and a combination of the above mentioned techniques may be used in order to obtain a searchable result. The preparation of the hands prior to printing processes may necessarily involve actions which cannot be performed satisfactorily with the hands attached to the cadaver and should be performed by trained operatives in an environment suitable for the purpose. Such processes include:

Boiling the fingers in Neatsfoot oil at 100 deg.C to shrink the swollen dermis in order to restore the ridges. Swelling of the dermis is common in cases of maceration, where the outer, epidermis is often missing.

In the case of charred, brittle skin, softness may often be restored by immersion in a 2% sodium hydroxide solution in order to facilitate inking or casting. This method may also be used in cases of mummification both to soften and swell the fingers. Careful control needs to be exercised when using this method due to the speed at which the process works on charred skin and the destructive nature of the treatment. In the case of mummification the time required for the process to work varies with every hand and may range from 1/2 hour to several days. Control has to be exercised over this procedure to prevent the flesh becoming too soft during the swelling process. This may entail the dipping of the hand / digit(s) in a formaldehyde or alcohol solution to harden the skin, prior to return to the sodium hydroxide solution.

Another method of smoothing out creases in mummified, leathery, creased skin involves the immersion of the skin in equal parts of distilled water, glycol and lactic acid. This is a slow process which takes on average 14 days to complete.

The above is intended as a brief overview of the work carried out by trained operatives when deal-

ing with the identification of cadavers. It is not intended as a definitive work on all methods adopted to obtain prints.

It must be noted that in the vast majority of cases the obtaining of prints from a cadaver is a relatively simple process, requiring an adoption of normal fingerprinting methods. Where normal methods cannot be used, it is usually still possible to arrive at a satisfactory result without resorting to lengthy processes, requiring the removal of hands to a suitably equipped laboratory. However, there will remain a small percentage of cases where the procedures which need to be adopted, dictate that the only practicable method of obtaining prints would be to remove the hands from the body for attention by experts in a controlled, well equipped environment.

The author is a fingerprint specialist in Great Britain.

—Ed.

Giants, cont'd

possibilities of applying their specialized knowledge to medico-legal matters.

Pasteur once said that "Chance favors the prepared mind." And, I'll add that "Perspective favors the experienced mind."

We all want to be ready for that "chance" event when it presents itself. We also want to have the ability to evaluate or interpret that event after it has presented itself. That's perspective. But how does one obtain this ability? Both chance and perspective require years of study, hard work and it seems, endless experiences so that one can be prepared for those moments of serendipity. Regardless of the profession, it's as if the gray haired ones always had the advantage. They had the wisdom to "see" the event and the perspective to evaluate it. Well, does this mean that we have to become old

and gray before we can acquire this ability? The answer is no, if you are to willing look to those in our profession who are carrying on the legacy established by the pioneers. Who are they, you ask? I know who they are for me. I have worked with a few of them, heard a lecture or two from them, read an article or book by them, seen their work at a crime scene or at the lab bench and took a class from them. These people are probably not aware of the impact they have had on my career. I have benefited from their curiosity, work ethic, perfection, stubbornness, or whatever drives some people to spend long and thankless hours at their work. I have benefited from their published articles and presentations at seminars and even their counsel and advice over the phone. Their dedication combined with your to know more about forensic science can shorten the time it takes to be ready for those chance events in your career. Simply stated, learning from another person's research and case work experiences can directly affect how well you do your own job. We can't speak with Edmond Locard or Harry Soderman nor can we speak with John Davis or Paul Kirk. We can, however, speak with those who have carried on their tradition. Look around you at work and see if you are working with one of the **new** pioneers right now. Maybe you're one of them! The next time you attend a seminar or training class be aware that the presenter or instructor might be one of those new leaders in our profession. If you haven't acknowledged them to yourself, then this is the time to do so. Make your own personal list of the professors, forensic scientists and others who have given you this great advantage and opportunity. Then one day, perhaps you too will write what Sir Isaac Newton wrote to his friend and colleague Robert Hooke in 1675, "If I have seen farther (than you and Descartes) it is by standing on the shoulders of giants."

Raywood

Interdiction of Illicit Narcotic Trafficking by Solvent Characterization Using Gas Chromatography

Dr. David L. Blockus, TRW Avionics and Surveillance Group

Introduction

The current system marries a commercial portable gas chromatograph (GC) detector, a laptop personal computer (PC), and signal processing algorithms developed at TRW. This ensemble forms a sophisticated yet portable system capable of identifying trace components of a large variety of compounds such as illegal drugs. The system is portable, rapid, reconfigurable, and relatively inexpensive, due to its use of commercial off-the-shelf (COTS) components.

The GC, manufactured by Microsensor Technology, Inc. (MTI), is the size of a large briefcase and weighs only 23 pounds [1]. It separates component chemicals by injecting a gas sample into a heated column, made of a long, thin tube coated with an adsorbent layer. An inert gas carries the sample through the column. Each component chemical within the sample interacts with the adsorbent layer to a varying degree, resulting in different transit times through the column. The GC used on this program was configured with two different column types to provide greater discrimination.

The system must be calibrated in the laboratory before deployment in the field. In the laboratory, expert users inject target chemical mixtures in calibrated amounts into the GC to record quantitative responses. These "chemical fingerprints" are organized into databases for subsequent matching and characterization of unknown

chemical targets. Preliminary tests of illegal drug samples have been conducted at the Santa Clara County Crime Laboratory and another site. The results show great promise for chemical sensor systems based upon portable GC instruments.

The PC is programmed to analyze chromatograph data and compare it with stored sets of calibration data. Software provided with the GC enables the user to configure the operating conditions, read out de-

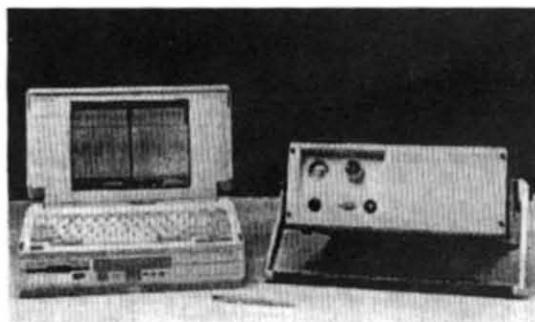


Figure 1. MTI portable gas chromatograph (right) and laptop computer (left).

vice status, and acquire chromatogram data.

The analysis of this data requires significant operator interaction to guide the calculations. Consequently, we designed more sophisticated methods to enhance weak signals in the presence of noise, and permit automated determination of volatile solvent profiles. These techniques permit nonexpert operators to make rapid measurements, which are then analyzed to characterize the materials. Quantitative analyses enable yes/no decisions as well as probabilistic measures. Speed and reliability are often of utmost importance in detection of contraband, so as not to block the free commerce of predominantly legal cargo.

Portable Gas Chromatograph

Conventional GC devices are stationary laboratory instruments about the size of a refrigerator, requiring hours to perform measurements. MTI manufactures a high speed microminiaturized GC ideal for our purposes. It has good portabil-

ity, being housed in a package the size of a briefcase, and weighing about 23 lbs. It provides rapid operation, acquiring a chromatogram in under two minutes, and has good sensitivity of about 10 parts per million (ppm). By means of an optional pre-concentrator, it can detect substances at the level of 10 parts per billion (ppb). It has multiple GC columns, which can be configured optimally to detect a wide range of substances with good discrimination. Multiple columns, composed of different adsorbent materials, permit corroboration of the identity of chromatogram peaks.

MTI has achieved reductions in size and analysis time over conventional GC devices through the use of micro-machined silicon components. These miniaturized components include the sample injector, detector, and columns. The injector employs pressure actuated microvalves, composed of precision machined silicon orifices, and plastic membrane seals. The MTI GC uses a thermal conductivity detector (TCD). It consists of precision micro-machined silicon channels and very fine metal wires, deposited across the channels. The component chemicals possess different thermal conductivity than the helium carrier gas. As each component flows through the channels, past the heated wire, the temperature of the wire changes. The temperature change is sensed as a change in electrical resistance in the wire. The TCD offers good sensitivity and uniform response for a wide range of chemicals. The GC columns consist of precision narrow bore nickel tubing, with a diameter of only 100 μm . Each column is coiled to compact its 10 m length into a spiral with a diameter of only a few cm.

Chemical Fingerprints

Solvents associated with illicit cocaine and heroin processing are important since they are volatile organic compounds (VOC). Their vapor pressures at room temperature and pressure are many orders of magnitude higher than those of co-

caine and heroin. Several laboratories have measured relative concentrations of cocaine and heroin vapors (base forms) in the headspace above drug samples [2]. These extremely small values pose a severe challenge for detection.

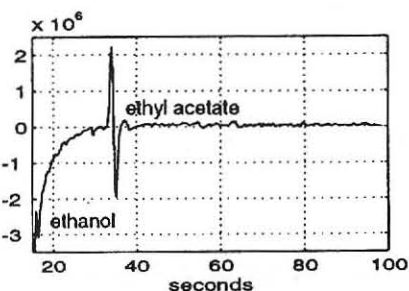
We list in Table 1 selected volatile organic solvents commonly detected in seizures of illegal drug samples [2,3]. We have organized the substances into two groups, associated with either heroin or cocaine. Some VOCs are found in both classes. The most commonly detected substances are underlined. Volatile breakdown products can be particularly important chemical signatures, since they continue to be regenerated, even after manufacturing solvents have dissipated.

Chromatogram Feature Enhancement

We have constructed software solutions to enhance the analysis of the chromatogram data. One of these solutions enhances the sensitivity of the GC by improving the signal to noise ratio. Enhanced sensitivity permits more accurate detection of a peak, within the chromatogram data, and extraction of the corresponding chemical concentration. Another solution performs a quantitative statistical analysis of multiple peaks,

which comprise the chemical feature fingerprint.

We can enhance feature extraction of the chromatogram peaks by processing the raw data. The processed data exhibits a dramatic enhancement in quality. Stochastic noise is dramatically smoothed. Sloping backgrounds are removed. Peak centers are more easily identified by zero crossings.



to minimize this possibility. We can also corroborate the data from the two different columns, since the corresponding peaks generally appear in different orders.

Test Results

We have conducted tests of illegal drug samples at Santa Clara Crime Lab and another site. Results from these tests are presented be-

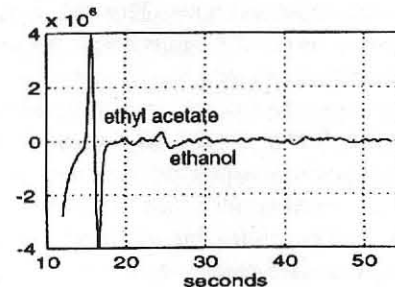


Figure 2. Street cocaine obtained by Santa Clara Crime Laboratory. (Left: GC column A; Right: GC column B.)

This enhancement technique consists basically of convoluting the chromatogram data with a matched filter. Similar techniques are often used in digital image processing as a means of automated feature extraction. Noise reduction and baseline levelling allow more robust algorithmic peak detection, unassisted by human interaction.

We have also developed a linear algebraic method, based upon a singular value decomposition, for matching the measured peak areas against a feature vector library. These techniques will allow us to perform characterization of a detected substance mixture by means of its feature vector fingerprint. Initially, one calibrates a pattern of multiple elution time windows, containing peaks for anticipated chemical mixtures. Subsequently, one matches the measured multiple peak pattern, corresponding to an unknown chemical target, against calibrated patterns in a library database. A large amount of unexpected clutter from unanticipated substances with similar elution times might be a potential problem. We have configured the GC adsorbent columns appropriately in order

low. For all of these measurements, the GC configuration remained fixed at the settings recommended by our solvent calibrations. Each solvent component was injected into the mixture at a concentration of 10 ± 2 ppm [4]

Figure 2 illustrates results from a "street" cocaine sample at the Santa Clara Crime Lab. The left figure pane illustrates data obtained from GC column A; the right pane illustrates data obtained from GC column B. Note the different vertical scales for each pane. Figure 2 exhibits clear peaks for ethyl acetate (about 10 ppm) and ethanol (about 1.0 ppm).

Figure 3 shows results from another sample of interdicted cocaine. There is an acetone peak (about 1.0 ppm) and a methyl ethyl ketone (MEK) peak (about 40 ppm). In addition there is a weak indication for a methanol or isopropyl alcohol peak at the limit of detectability (< 1 ppm).

The origin and history of illegal drug samples before interdiction are usually unknown. In addition there are severe forensic constraints imposed upon handling these samples after interdiction. These facts present formidable challenges to me-

Heroin		
Chemical Name	Formula	B.P.°C
Acetic Acid	CH_3COOH	118
Acetone	$(\text{CH}_3)_2\text{CO}$	56.5
Ethyl Ether	$(\text{C}_2\text{H}_5)_2\text{O}$	34.6
Cocaine		
Chemical Name	Formula	B.P.°C
Acetone	$(\text{CH}_3)_2\text{CO}$	56.5
Ethyl Acetate	$\text{CH}_3\text{COOC}_2\text{H}_5$	77
Ethyl Alcohol	$\text{C}_2\text{H}_5\text{OH}$	78.5
Ethyl Ether	$(\text{C}_2\text{H}_5)_2\text{O}$	34.6
Kerosene	$\text{C}_{12}-\text{C}_{18}$	175-325
Methyl Benzoate	$\text{C}_6\text{H}_5\text{CO}_2\text{CH}_3$	196
Methyl Ethyl Ketone	$\text{C}_4\text{H}_8\text{O}$	79.6

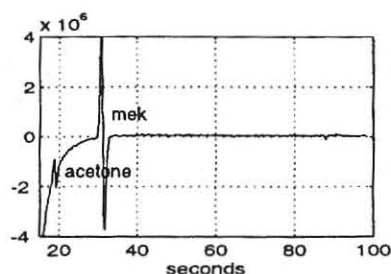
Table 1. Selected chemicals identified in illegal drug samples.

thodical scientific analysis of illegal drug samples. Volatile solvent component ratios within these samples probably depend upon place of origin, method of manufacture, subsequent processing, handling, and age.

Results from these preliminary tests indicate the observation of several expected solvents. Some of the measurements are at the limit of detection, and have better revealed small peaks due to the TRWASG software enhancements. The GC separation method permits excellent selectivity in identifying particular compounds. The system would provide even better results when coupled with more sensitive detector technology. Further tests are desirable. It would be preferable in the future to corroborate results by means of an independent testing laboratory, using different sensors.

Summary

We have teamed with Microsensor Technology, Inc. to develop commercially attractive portable gas chromatograph technology. MTI also assisted with preliminary instrument calibrations. Preliminary research has identified several volatile solvents associated with illicit processing of cocaine and heroin, and chemical breakdown products.



they do indicate that the overall approach is very attractive. This approach, using a portable, configurable GC system with excellent selectivity, merits additional refinement and testing. Enhancements, such as more sensitive detectors, more extensive calibrations, and software improvements, will yield user-friendly, fieldable sensor systems of great power in the war against chemical threats.

Acknowledgments

We gratefully acknowledge support from the Advanced Research Projects Agency through a subcontract from the U.S. Army Intelligence and Electronic Warfare Directorate. We thank Paul Johnson, MTI, Inc., for assistance with GC configuration, calibration, and data collection. Benny Del Re, Director, and staff at the Santa Clara Co. Crime Lab. provided us with helpful information regarding solvent profiles and access to interdicted illegal drug samples. Edward Poziomek, Dept. of Chemistry and Biochemistry, Old Dominion Univ., educated us on illegal drug chemistry.

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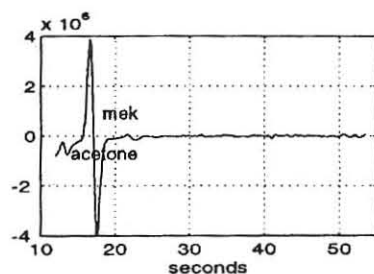


Figure 3. Interdicted cocaine sample.
(Left: GC column A; Right: GC column B.)

We have performed preliminary tests at the Santa Clara Crime Laboratory and another site. We developed signal processing algorithms for solvent fingerprint characterization and refined these methods while analyzing the GC test data. Our preliminary results are not definitive, yet

- [2] Poziomek, Edward J., Department of Chemistry and Biochemistry, Old Dominion Univ., Norfolk, VA 23529-0126, *private comm.*
- [3] Del Re, Benny, Director, and staff at Santa Clara Crime Lab.
- [4] Johnson, Paul, Microsensor Technology Inc., *private comm.* □

A Toxicological Analysis of Tetrahydropalmatine

Daniel T. Anderson, MS.

Abstract

Tetrahydropalmatine or Jin Bu Huan Anodyne is an alkaloid found in plants of the *Carydalis* species. The drug is considered to be a natural herb; part of traditional Chinese medicine with sedative and tranquilizing effects. It has been around for more than 1000 years as an analgesic, but only available in the United States for the past 10 years.

Documentation of the drug's involvement in patients is limited only to toxicity, not lethality. This paper will describe a case study report involving a female who committed suicide with a lethal ingestion of tetrahydropalmatine.

The analysis of tetrahydropalmatine consisted of screening and quantitation on a GC/NPD. Confirmation of the drug was performed on a GC/MS by comparison of a purified Jin Bu Huan Anodyne tablet.

The tetrahydropalmatine concentration detected in postmortem blood of a 50 year old female was 7.2 mg/L. The gastric levels suggested 3.8 g or 141 pills were ingested. To my knowledge, this is the first reported fatality involving the drug, tetrahydropalmatine.

Introduction

Herbal products are rapidly gaining popularity in the United States as remedies for various medical ailments. Jin Bu Huan Anodyne tablets, a traditional Chinese herbal remedy, have been used for more than 1000 years as a sedative and analgesic, but has only been available in this country for the past 10 years. Tetrahydropalmatine is an alkaloid with morphine-like properties and can be found in the plants of the *Carydalis* species. Because this herbal product is marketed as a dietary supplement rather than a drug, it is not subject to the rigorous safety testing required by the Food and Drug Administration. The prod-

Los Angeles County Department of Coroner, 1104 N. Mission Road, Los Angeles, CA 90033

uct, Jin Bu Huan, is available not only in health food stores, but also in a growing number of pharmacies that hail the virtues of 'natural' remedies.

The pharmacology of the drug can include analgesic, sedative, hypnotic and tranquilizing effects. The Jin Bu Huan package insert suggests the product is good for a patient suffering from insomnia due to pain. The literature indicates that the effects vary between adults and children. In children, the drug acts on the central nervous system and has respiratory depression with bradycardia. In adults, tetrahydropalmatine can cause hepatic injury with symptoms of fatigue, fever, nausea, jaundice and vomiting. There has been no cause of death linked to this drug, but there have been a few literature citations stating people will suffer from hepatotoxicity while on this 'natural' medication. However, they do recover without any type of liver disease.

Case History

A 50 year old female apparently checked into a motel room one evening and was found dead two days later by motel personnel. She was lying prone on the bed, fully clad, with no trauma or injury observed. There was a nine page suicide note left on the television console stating the decedent's name, reason for death, who to notify after death and the method of the suicide being oleander poisoning and cardiac glycosides. There were two empty pill bottles on a small table in the room, Ambien (Zolpidem) and Xanax (Alprazolam). In addition, there was a large green thermos bottle filled with dark liquid with leaves floating on top. On the nightstand were two pale yellow pills (no markings or scribes), a half-full liquor bottle, thermos cup and green coffee cup, both containing dark colored liquid.

The immediate family stated the decedent had been depressed for a long time due to the abuse she suffered as a child. She had been seeing a psychiatrist for many years

and was diagnosed with multiple personalities. Years prior to this incident, the decedent stated to her psychiatrist that she planned to take her own life by using oleander, covering it up with alcohol. The decedent sent a suicide note to this same doctor stating it was time to end her life and thanked her for all her help.

The individual did a lot of traveling and had taken several trips to Mexico and Asia. She would usually return with medication. However, her family did not know the names of the medications, but knew she used them for cold and menstrual problems.

Experimental

Materials: The drug, tetrahydropalmatine, was supplied in its Anodyne tablet form by Dr. Richard J. Ko, Food and Drug Chemist, State of California —Dept. of Health Services. In addition, John Beck, Chemist at Colorado State Univ. supplied a purified form of the drug which was later prepared in a 1.0 mg/ml solution in methanol. The internal standard, Carbinoxamine Maleate, was obtained from Sigma Chemical Company and was prepared as a 1.0 mg/ml solution in methanol.

Extraction: Two-milliliter aliquots of standards (0.10 - 5.0 mg/L), blanks and appropriately diluted case samples were added to disposable 16 x 125mm screw-cap test tubes, along with 100 ul of Carbinoxamine (10.0 mg/L internal standard), 2.0 ml of 20 % sodium carbonate buffer and 8.0 ml of 1-chlorobutane. The samples were mechanically rotated for 20 minutes and centrifuged. The organic layer was transferred to disposable 16 x 125 mm test tubes. The drugs were then back extracted into 2.0 ml of 0.1 N hydrochloric acid by vortexing. Following centrifugation and aspiration of the organic phase, the acid was alkalinized with 1.0 ml of 20 % sodium carbonate and extracted with 4 ml of 1-chlorobutane by vortexing. The organic phase was transferred to disposable 100 x 13 mm test tubes, evaporated to dryness, reconstituted with 100 ul of methanol and transferred to autosampler vials for analysis.

Instrumentation: Samples were analyzed on a HP 5890 GC equipped with a nitrogen-phosphorous detector (NPD). The capillary columns used were

a DB-1 (20 m x 0.25 mm i.d.) and DB-17 (20 m x 0.25 mm i.d.). The following conditions were used: column temperature, from 130 to 300 °C at a rate of 15 °C/min; injector and detector temperatures, 260 °C and 270 °C, respectively. The identification was confirmed on a HP 5890 Gas Chromatograph coupled with a HP 5972 mass selective detector by comparison with a purified Jin Bu Huan Anodyne Tablet.

Results and Discussion

From the onset of this case, the toxicological analysis leaned towards a suicidal ingestion of Zolpidem, Alprazolam or even the oleander. A femoral blood ethanol level of 0.01 gm% and routine drugs of abuse were analyzed for with the following drugs all being negative; barbiturates, cocaine, methamphetamine, opiates, phencyclidine and marijuana. The pharmaceutical (basic) drug screen of the blood revealed that the decedent had been taking Alprazolam, Zolpidem and large amounts of an unknown basic drug. Further investigation showed that the unknown drug would chromatograph on the GC/MS, and it matched, both in retention time and spectrum, the pale yellow pill found on the nightstand. The GC/MS gave a library match of 6H-Dibenzo[a,g]quinolizine, 5,8,13,13a-tetrahydro-2,3,9,10-tetramethoxy- to both the unknown drug from the blood sample and the pale yellow pill. The question then was, "What is this drug and could it really be the drug in her system?" The Merck Index gave a common name of tetrahydropalmatine, but the next step was to prove that this drug was one and the same as the drug found in her system. Through exhaustive efforts of chemical companies, Poison Control, drug information hotlines, ToxiLab, and Chinese Health stores, came some assistance from Dr. Richard Ko, State of Calif., Dept. of Health Services. A phone call to him provided not only a verbal confirmation of what the pills look like, but mass spectra and a promise to send a box of twelve tablets with the package insert and additional literature includ-

ing a contact person to receive a pure analytical standard. This information provided by Dr. Ko was extremely informative and the key to solving this suicidal overdose.

Both the Zolpidem and Alprazolam levels in the femoral blood are within therapeutic levels. However, it was not known whether the tetrahydropalmatine level was high or not. The drug levels in the formalin fixed tissues are not valid because in general, formalin will either leach or destroy the drug, rendering an invalid quantitation. Colorado State University provided information, obtained during their purification of Anodyne tablets, that there is 29-37 % tetrahydropalmatine in each 80 mg tablet. The gastric contents from the decedent had 3.8 grams of tetrahydropalmatine; based on an average of 33 % of tetrahydropalmatine in each 80 mg tablet, it was calculated that there were 141 pills ingested, which still remained in her stomach. This amount alone shows it was a suicidal ingestion of the drug, not an accidental overdose.

As you remember from the beginning, the decedent had written a suicide note stating the method of death as oleander poisoning. This avenue was pursued through a radioimmunoassay screen utilizing a Digoxin Kit. Apparently, oleandrin, active drug of the oleander plant, will cross react with this kit, yielding a

positive test. However, the biological specimens all tested negative while the thermos and cups with dark-colored liquid tested positive. There was a problem in this methodology as the limitations and sensitivity of the assay were unknown. Both the sensitivity and limitations were not investigated any further due to the quantity of drug/pills in the gastric sample and the complexity of the sensitivity experiments for the assay. The decedent's death was signed out as suicide due to a tetrahydropalmatine intoxication.

Acknowledgments

I would like to thank Dr. Richard Ko, Food and Drug Chemist, State of California, Department of Health Services for all his help in confirming the identification of tetrahydropalmatine. Dr. Ko not only sent me the Anodyne tablets, but also forwarded me reference literature and further contacts to continue my investigation. John Beck, Chemist/Graduate Student, Colorado State University also played a significant role in the resolution of this case. He had purified the drug, tetrahydropalmatine, from the Anodyne tablets and was able to supply me a pure analytical standard for quantitation purposes. Last but not least, is Dr. Ronald O'Halloran, Chief Medical Examiner-Ventura County and the Ventura County Sheriff's

Department Crime Laboratory where I was employed as a criminalist at the time of this case.

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The California Association of Criminalists has long been at the forefront of professional development in forensic science. Its leadership is a direct result of the contributions of its members. Since I consider it a both a responsibility and a pleasure to be active in the CAC, I have accepted the opportunity to contribute by running for President.

The primary responsibility of the President is to maintain the smooth operation of the organization. Beyond that, it is a post in which one may do as much or as little as one chooses. I hope to be able to offer some impetus to explore a few new ideas. The newly-formed Public Information Committee needs to be developed as a resource for those considering forensic science as a career. The duties of the Recording Secretary would be more readily implemented by a small committee, much as some of the Editorial Secretary's duties have been relegated to a few dedicated and talented individuals. A Safety Committee could serve to decipher OSHA and accreditation safety requirements, then provide recommendations on fulfilling regulations and offer formats for required documentation.

In the nearly seven years since embarking on a career in forensic science I have enjoyed staying active in the CAC. Professional activities include serving four years on the CAC Board of Directors as Recording Secretary, two years as Chair of the Historical Committee, and two years on the Merchandise Committee. I have been a member since 1989 and hope to continue serving the Association throughout my career.

Membership Secretary

Manuel J. Muñoz

I have been associated with the CAC continuously since 1983, when I first joined as a student member. Over the years, I have served as Seminar Chairperson (1994), Toxicology Section Chairperson (1990-94) and Narcotics Section Chairperson (1994). I have also hosted three dinner / study group meetings.

I have always been very proud of my affiliation with the CAC. My involvement, commitment coupled with my enthusiasm qualifies me to hold the office of Membership Secretary. I thank you in advance for your consideration of my candidacy.

Pennie Laferty

Let me give you some background information, so that you know who I am. I graduated from Cal Poly, San Luis Obispo with a B.S. degree in Environmental and Systematic Biology in 1981. I began my criminalistics career in 1989 when I entered the graduate program at Cal State, Los Angeles. I worked part-time in Keith Inman's lab, Forensic Science Services of California, until I became a criminalist with the Orange County Sheriff-Coroner Department in May of 1990. I completed the program at Cal State LA and obtained my M.S. degree in Criminalistics in 1993.

I joined the CAC in October of 1990, and I have been an active member continuously. Currently I am serving on the Awards Committee. I am also a member of AAFS and IAI.

Criminalistics is not just a job, it's a profession. Membership in the CAC promotes professionalism and provides a forum for the exchange of ideas. It also provides an opportunity for communication between

criminalists from public and private laboratories in a non-adversarial environment.

The main goal I would like to accomplish, as Membership Secretary, is to increase our membership and actively involve new members in the Association.

I would like the opportunity to serve as Membership Secretary for the California Association of Criminalists. I would appreciate your vote.

Marc Taylor

My name is Marc Taylor and I own a private criminalistics laboratory, Technical Associates, Inc. I have worked in the field of criminalistics since 1973, and have been a member of the CAC since 1976. My association with the CAC has been positive; the workshops and training programs sponsored by the CAC in addition to information gathered through study groups, the semi-annual meetings, and the newsletter have been critical to my professional growth as a criminalist.

My experience working in numerous regions throughout the country has led me to believe that there is a direct correlation between participation in an organization such as the CAC and professional competency. I believe that the CAC fulfills a critical function in maintaining and improving the quality of the field of criminalistics. I feel that I can benefit the CAC as Membership Secretary by encouraging and facilitating participation in this professional group, thereby helping to improve our profession.

Regional Director North

Pamela Sartori

The Regional Director North plays an integral part in the profession-

alism of the CAC. The duties incumbent of this position involve co-ordination of CAC dinner meetings, study groups and seminars. These activities are both informal and formal networks that provide members the opportunity to communicate ideas, to critique, to educate and to learn the latest advancements in the field of criminalistics.

After attending my first CAC seminar and study group, I realized the significant opportunities afforded to all members and I became actively involved. From 1990-1992, I co-chaired the Northern Drug Study Group and currently am co-chairperson for the Northern Serology Study Group since 1992. If elected to Regional Director North, I am certain that my positive prior experience, organizational skills and enthusiasm for CAC events will encourage other members to actively seek the opportunities provided to them in the development and improvement of their professional careers.

Recording Secretary

Laurie E. Rawlinson

I am a forensic serologist and the Training and Proficiency Supervisor for Serological Research Institute (SERI) in Richmond, California. I've been with SERI for 14 years and have been a member of CAC since 1983. I have most recently served the association in the capacity of CAC Chairperson for the Forensic Biology Exam Committee with the American Board of Criminalistics and continue on the current Exam Maintenance Committee (a much less demanding assignment!). I am interested in expanding my CAC service to the upcoming term of Recording Secretary. Although my qualifications for this position are limited, they do include the experience of having served as recording secretary for a condominium homeowner's association with similar duties. Thank you.

A Case of Not-So-Spontaneous Human Combustion

*J. D. DeHaan, Ph.D.¹ and
M. Scanlan²*

Introduction

Every summer, it seems, as the temperatures rise and news broadcasts focus on heat waves and the fatalities they produce, there is a resurgence of stories of humans becoming so hot that they have ignited in flames. It may be the horrific image of someone burning to death without apparent cause, or the lack of other newsworthy items but attention is brought to unusual fire deaths just long enough to settle the concept of "spontaneous human combustion" (SHC) in the collective psyche without the supporting data ever being brought to light. As Dr. John Hall pointed out last year in the *NFPA Journal*, SHC is considered a real event by many people. (1) This author has spoken to a number of professional fire investigators who consider SHC to be a possible, plausible fire cause. Cases of reported SHC are rare in the US, with only a handful being reported in the last 50 years. The two best-known cases (recently featured in an episode of *Arthur C. Clarke's Mysterious Universe* program on the Discovery channel) were those of Mrs. Mary Reeser whose extensively consumed body was found in her St. Petersburg, FL apartment in 1951 and George Mott whose body was burned in his bed in Ticonderoga, NY in 1986. There have been a larger number of cases reported in the United Kingdom, but surprisingly few in other industrialized countries. The reported cases have a number of features in common:

1. The burn damage to the body is centered on the torso with extensive combustion (to ashes) of the abdomen, upper legs and sometimes the chest, but with much less damage to the head, arms, lower legs and feet. The lower legs and feet often survive

with socks and footwear still intact. This is opposite to the pattern usually associated with fire injuries where the feet, hands, and head are damaged much more extensively than the torso.

2. The consumption of the body (usually both bones and soft tissue) occurs in close proximity to other combustible fuels that are left virtually undamaged. When the fire occurs in a room, the body and the chair, bed, carpet, or dressing gown immediately in contact with it are largely consumed but other objects in the room exhibit only smoke or heat damage (such as melting), and the fire has not spread.

3. While the room furnishings are undamaged by flame, they often bear residues of an orange, red, or brown oily or greasy coating of unknown origin.

4. There is often no obvious source of ignition in the vicinity of the victim. Since the most badly burned object "must" be the ignition source, ergo, the body burst into flame spontaneously.

5. Very often the victim is not seen for many hours prior to their discovery and the fire is discovered usually after self-extinguishment when someone comes looking for the victim or in response to smoke or smells. The fire's ignition is almost never witnessed, and in fact, the fires are almost never discovered while still burning.

The Forensic Problem— *Speculation and Theory, but Little Data*

Unfortunately, there is often an incomplete investigation of the death, lacking either full medicolegal examination of the body, toxicological tests, or competent origin-and-cause determination of the fire. When faced with such an information gap, people are often tempted to fill the gaps with whatever data and common sense come to hand. Medical people will describe the production of methane by the digestive process in the gut, along with the presence of phosphorus-containing compounds in the body. They can give examples where intestinal gas can be ignited outside the body by an open flame or electric arc. The chemists can speak of phosphorus compounds that can spontaneously ignite

¹ California Criminalistics Institute

² Oregon State Police

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- S4 Peptidase A — Yamauchi
- S5 ABO Antigen — Thompson
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Combustion, cont'd

and also the flammable properties of alcohol. The fire investigator describes how "normal" (external) fires, even when fueled by "hot" fuels such as jet fuel, will *always* burn away the limbs of an exposed body and leave the torso relatively intact. A fire intense enough to consume a body *had* to have been capable of turning the room into an inferno (because *everyone* knows how hot the flames are in a crematorium). The nonscientist is then tempted (and sometimes persuaded) into accepting the explanation of such mysterious fires to be the result of a human body generating combustible gases that (especially when an excess of alcohol is present) can be ignited by these spontaneous heating events (or by heating from an external source, *a la* microwave oven) to burst into flames.

Because such cases have been reported in the popular literature for centuries (by such knowledgeable authors as Charles Dickens) they are taken as fact, sometimes even by forensic scientists. As a result, such cases are put down to SHC, and the myth is reinforced and renewed. This is a perfect illustration of what Dr. Jon Nordby in his paper "A Tabloid Explanation vs Sherlock's Logic: Dousing Spontaneous Human Combustion" described as "Tabloid logic". (2) Where one is faced with a mysterious event, and when given several choices of explaining or rationalizing that event, one chooses the most outrageous explanation simply to be scientific investigation, "It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories instead of theories to suit facts." (3) One case reported in the Chicago press some years ago described the statements of two witnesses who reported seeing a woman burst into flames while she was crossing the street. Speculation began as to the possible causes of such events and reported that SHC was under consideration (in the absence of any real information). Two days later a smaller piece reported that the Medical Examiner's preliminary findings indicated that the lady was dead of other causes at least twelve hours prior to the fire. A third article a week later reported that not only had she died some time prior to the fire, but that traces of flammable liquids had been detected in her clothing. So much for spontaneous ignition of a woman walking across a street!

How then to address such mysterious cases? Like most mysteries, the answer often comes from having enough data of good quality. This is one situation where current scientific and engineering knowledge

When the body was recovered, it was found to have been almost completely consumed by fire between the knees and the mid-chest.

can help explain these events, without violating physical laws. In suspected "SHC" cases, some information is usually lacking but we know that some possible factors can be eliminated based on scientific data from many sources. For instance, intestinal gas requires release from the body so it can mix with enough air to fall into its flammability range and that its ignition requires an open flame, electric arc, or hot surface far in excess of the temperatures which could be produced by any process within a body. Alcohol diluted in the blood and tissues of the body will not sustain ignition. We know that cigarettes, stoves, hotplates, fireplaces, and room heaters are often present in such scenes and that they represent a competent and likely ignition source for the clothing, bedding, or furniture in the immediate vicinity of the victim. Sometimes, these ignition sources can be removed or switched off by the actions of fire victims themselves prior to loss of consciousness. We know that humans can be easily overcome by the carbon monoxide and toxic gases created by even small fires in such fuels, making escape impossible. We know that rendered animal fat can release enough heat to sustain ignition, but not at such a rate that spread to even nearby combustibles is guaranteed. We know that small fires, specially smoldering ones, can consume even large pieces of furniture such as chairs or sofas over a period of several hours without ever generating enough radiant heat or even open flame to ignite other combustibles in the room. At the same time, such low energy, smoldering fires can generate smoke (which condenses in a brown or orange film on windows, mirrors, and other surfaces in a room) and hot gases such that low melting point materials like plastic light fixtures and appliances in the room can reach their melting points. As scientists, we can see the predominance of proof suggests unfortunate accident as a cause, rather than mysterious forces at work.

A "Burning Body" with Reliable Documentation, At Last

Despite the information we have from the knowledge cited above, some of the best data about fires is based on

firsthand observation and photographs of fire in action. Unfortunately, fires involving human bodies burning by themselves are rarely witnessed, let alone recorded on film.

In February 1991, two hikers were startled to discover the burning body of an adult female sprawled in the woods near Medford, Oregon. They immediately called the authorities, and a deputy from the local sheriff's department responded to the scene. Upon arriving and discovering the victim to be well beyond medical aid, he had the presence of mind to photograph the scene before extinguishing the low flames issuing from the body. The victim was a well-nourished female who had been stabbed numerous times in the upper chest and back. She had been partially clothed (T-shirt, shoes, and socks were identifiable but the presence and nature of any pants could not be confirmed by post-fire examination) and was left facedown on a layer of dead leaves in a lightly forested area. Her left arm extended out to one side of the body, while the right arm was flexed away from the body on the other side.

When the body was recovered, it was found to have been almost completely consumed by fire between the knees and the mid-chest. The responding crime scene personnel reported that the bones of the pelvis and upper legs had been largely reduced to a grey powder and were not recoverable. The outline of the legs and torso were de-

Insensibly one begins to twist facts to suit theories instead of theories to suit facts

lineated by a layer of charred leaves. There was no other fire damage at the scene. Stab wounds are visible on the shoulders. There were surface burns and scorching to the back of the neck and the lower legs which appeared to be the result of the combustion of

clothing items. The soft tissues of the upper legs, torso, and right arm were consumed by fire, along with the bones in those areas. The combustion of the torso proceeded to the bottom of the lungs. The right arm burned away from the shoulder to the wrist.

Many of the features of this incident parallel reported incidents of so-called spontaneous human combustion — extensive burning of the torso and upper legs including destruction of bones in the involved areas; survival of head, hands, and feet; no fire involvement of nearby combustibles. Most such fires occur indoors, however, and limited ventilation is thought to play a role in limiting fire spread. The actual combustion of the body and specific factors of ignition and duration of burning have never been documented to the extent they were in this case. In this case, the facts of the onset of combustion were revealed by careful scene investigation and crime reconstruction. The victim was apparently murdered and then set afire as part of an anger-retaliation type of arson-murder.⁽⁴⁾ The fire was most probably ignited in the crotch area of the body, possibly using a small (less than 500ml quantity of charcoal starter fluid (typically a mid-range petroleum distillate) to which the suspect had access. (Lab tests for such accelerants were negative.) However, direct ignition of clothing items could provide a suitable fuel for ignition and this could account for their absence in the post-fire debris. Since the victim was seen hitchhiking at a nearby rest stop about five hours prior to the discovery of the body, the fire had burned less than five hours. The weather was still, cold, and foggy during the fire. The clothing ignited and sustained combustion until the body fat began to render down and be absorbed by the charred clothing and charred leaves beneath the body. The rigid, absorbent char would make continued combustion of the body fat possible. At the time the body was discovered the flames were still being sustained in the thoracic region by this process.

The body fat is high in water content and a considerable portion of the heat generated by the flames would go into driving the moisture from adjacent fat before it will ignite. The heat

output would be expected to be low.

Such a low heat output would not be expected to ignite even nearby combustibles, produce a significant hot gas layer or consume significant oxygen in normal rooms, or even produce enough radiant heat to drive combustion of carpets (or dead leaves) any distance from the burning fat. The next question is: what size fire could the body fat on a well nourished human maintain? Data on heat release rates from bodies is absent from the literature, however, the amount was roughly what was estimated from the visible flames.

The comprehensive destruction of the body, both soft tissues and bones, was accomplished over an extended period (five hours) while the heat output from the combustion of the body fat at any one time was low. (The flames from the combustion of the clothing involved probably produced the largest open flames of the entire process, and they would last only a few minutes.) This process would produce very localized heat effects. The char-supported combustion of rendering fat (as visible in the scene photographs) would produce localized heat (both flaming and smoldering combustion) which would be expected to demonstrate localized temperatures well in excess of 500-600deg C. The orange color of the glowing char visible in the original scene photos, if rendered accurately by the photographic process, indicates surface temperatures on the order of 1000deg C. (7) Such temperatures, which are typical for glowing combustion, are adequate to accomplish the destruction of the body fat, tissue, and cartilage. Partial destruction of bones to powdery form over a period of time has been demonstrated only in laboratory tests at 500deg C, but this case shows clearly that a mechanism for more complete destruction exists under these conditions of burning. (8) This limited heat output was achieved in open air, with unlimited ventilation.

It is often assumed that high temperatures (~1000deg C) are needed to consume a body (as in a crematorium). In fact, the high temperatures provided by the gas burners in a crematorium are created specifically to result in the relatively complete combustion of a normal body in 2-3 hours. Without that

external supply of heat, the body will burn much more slowly, with the resulting low rate of heat release. The very low heat release rate results in minimal damage to the surroundings, pre ding radiant heat ignition of even nearby combustibles. When fires involving human bodies occur indoors, it has been suggested that limited ventilation controls the combustion rate, and thereby the rate of heat release. While such a mechanism is possible in some fires, it is clear from this incident that even with unlimited ventilation, the heat output of a well-nourished body burning progressively is so low that involvement of other fuels would be unlikely unless they are in direct contact with the burning fat and tissue. Further, such a small fire in a complex fuel such as body tissues could produce considerable quantities of high molecular weight pyrolysis products which would then condense on windows and walls to give a red-orange or brown appearance, as well as heat the air and consume enough oxygen in a room to produce the stuffy atmosphere often noted in indoor fire death scenes. This case demonstrates that a body can be ignited by a modest external source of flame and burn naturally over a long period of time in the absence of other significant fire damage, circumstances which have sometimes, erroneously, been attributed to "spontaneous human combustion".

Conclusion

The accused has been found guilty of this crime and has been sentenced to prison. The elements of the crime reconstruction were corroborated by physical and testimonial evidence. Case information and photographs were courtesy of Oregon State Police, Medford, OR. From a scene investigation standpoint, the documentation of the body *in situ* is most valuable. Every fatal fire demands good photographs of the body before it is moved, as well as after. In a case like this one diagrams and sketches of the burn patterns and fire damage could supplement the photos particularly since the body is so fragile that even careful movement is likely to disrupt it. Samples of the clothing and the burn debris under the body would be very

important, not only for the identification of any accelerant, but equally importantly, to allow the reconstruction of the fire by characterizing the fire behavior of the materials involved. Whether they melt or form a carbonaceous char; what their heat release rate might be; or whether they support flaming combustion, glowing combustion, or both, are important data. Samples of the blood and organ tissues can be analyzed by GC/MS for volatile components which could be linked to accelerants. Naturally, the scene should be searched for sources of ignition and shoe impressions that could aid in the reconstruction.

Such extensive combustion of a body in such a short time is unusual but not unexplainable. Similar damage is seen sometimes in vehicle fires where the body is supported, at least in part, by the metal seat frame and springs. This allows for better ventilation and also for the rendered body fat to sustain a pool fire whose flames then can directly impinge on the body. (Any hapless barbecue cook can attest to the damage even a small fire of this type can do to food on the grille.) In this case, the rendered fat was absorbed into the charred leafy debris under the body, which could sustain a "wick effect" fire fueled by the body fat.

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President, *cont'd*

There are many changes happening within our profession and some originate from outside forces.

****** The ABC steadily works toward improving and expanding the certification process.

****** The national DNA Advisory Board will be redefining professional educational requirements of the DNA analyst, the technical leader, DNA certification and DNA laboratory accreditation. This stringency will not end at the doorstep of the DNA section of your laboratories.

****Get involved in your future!**

Accomplishments this year have been fantastic thanks to the dedication of committee chairs and their committee members and the current Board of Directors! You've heard about the success of the New Member Reception and the first Orientation will be at our Spring '96 meeting... design of a new and up-to-date CAC brochure is underway by the Public Information committee ... Training and Resources together with the Endowment committee (and with cooperation with CCI) have greatly expanded the training courses offered this year into an excellent selection in many areas of expertise; your CAC BoD and several other concerned members have offered continued input to the Chairman of the national DNA Advisory Board; the CAC DNA Quality Assurance committee chair is working on an amicus brief on behalf of CAC; the Historical committee will be demonstrating the first of many poster sessions at the spring meeting; and the list goes on. This has been an exciting year for me as President of this association. The next time you see a committee chairperson, a committee member, or a board member, you might want to tell them "thank you for a job well done" in helping the CAC to be one of the most outstanding criminalist organizations in the country.

Carol

Recreations

GARBAGE IN-GARBAGE OUT!

A number of years ago, my doctor prescribed a thyroid supplement (Levoxyl) which I take daily. This time, however, the re-fill bottle had a couple of warnings that had not appeared before: 1) "Some nonprescription drugs may aggravate your condition. Read all labels carefully. Check with your doctor if a warning appears, and 2) Take medication on an EMPTY STOMACH < 1 hour BEFORE or 2 to 3 hours AFTER a meal unless otherwise directed by your doctor."

I complied with this for several days until I could talk with the pharmacist. I asked her what was different about my medication now. She said, "Ignore that because you have been using the drug for a long time. Recently, the computer has printed some warnings that were not meant to be. We weren't aware of it until a patient brought in bottle of capsules that had the warning, 'Shake well before using.'"

Submitted by Frank Cassidy

Insider Info

New Hires: **LAPD** - Michelle Kim and David Purdy as Criminalists; **DOJ Berkeley** - Martin Buoncristian as a Criminalist and John Tonkyn as a Senior Criminalist; **LASD** - Greg Wong (from OCSD), Annette Ratonel, Vern Traxler, Lai Chwa (from LA Co Coroner) Dean Gialamas (from Cal Lab) as Criminalists; Amy West and Walter Freeman as Lab Techs; **Riverside DOJ** - Mark Traugher as Senior Criminalist (from OCSD); **OCSD** - John Soo and Paul Mirra as Criminalists (from SBSO); **Sacramento Co DA** - Faye Springer (from Sacramento DOJ); **Ventura SO** - Crystal Craver, Keith Nakagawa, as Criminalists.

Promotions: **Riverside DOJ** - Michelle Merritt, Elissa Mayo and Rick Takenaga to Senior Criminalist; **LAPD** - Debbie Daniels and Gerald Blanton to Criminalist III.; **OCSD** - Jim White to Senior Forensic Scientist; Robert Bunney, Joe Jaing and Ruth Ikeda to Forensic Scientist II.

Resignations: **Oakland PD** - Diane Bowman (to Washoe Co. S.O.); **Riverside DOJ** - Chris Loptien (to Jefferson Co Sheriff's Crime Lab); **Sac'to DOJ** - Faye Springer (to Sac'to Co DA's); **OCSD** - Greg Wong (to LASD), Mark Traugher (to DOJ Riverside); Carolyn Gannett (to AZ DPS, Flagstaff)

Retirements: **San Diego SO** - Ferris Van Sickle (after ten years); **Santa Barbara DOJ** - Frank Cassidy (however, he has returned as a half-time retired annuitant)

The Lockhorns



Face Game Answers

- Expert Witness—Walls
- A Scientists Turns to Crime—Firth
- The Other Mr. Churchill—Churchill
- The Scalpel of Scotland Yard—Spilsbury
- Mostly Murder—Smith
- Forty Years of Murder—Simpson

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