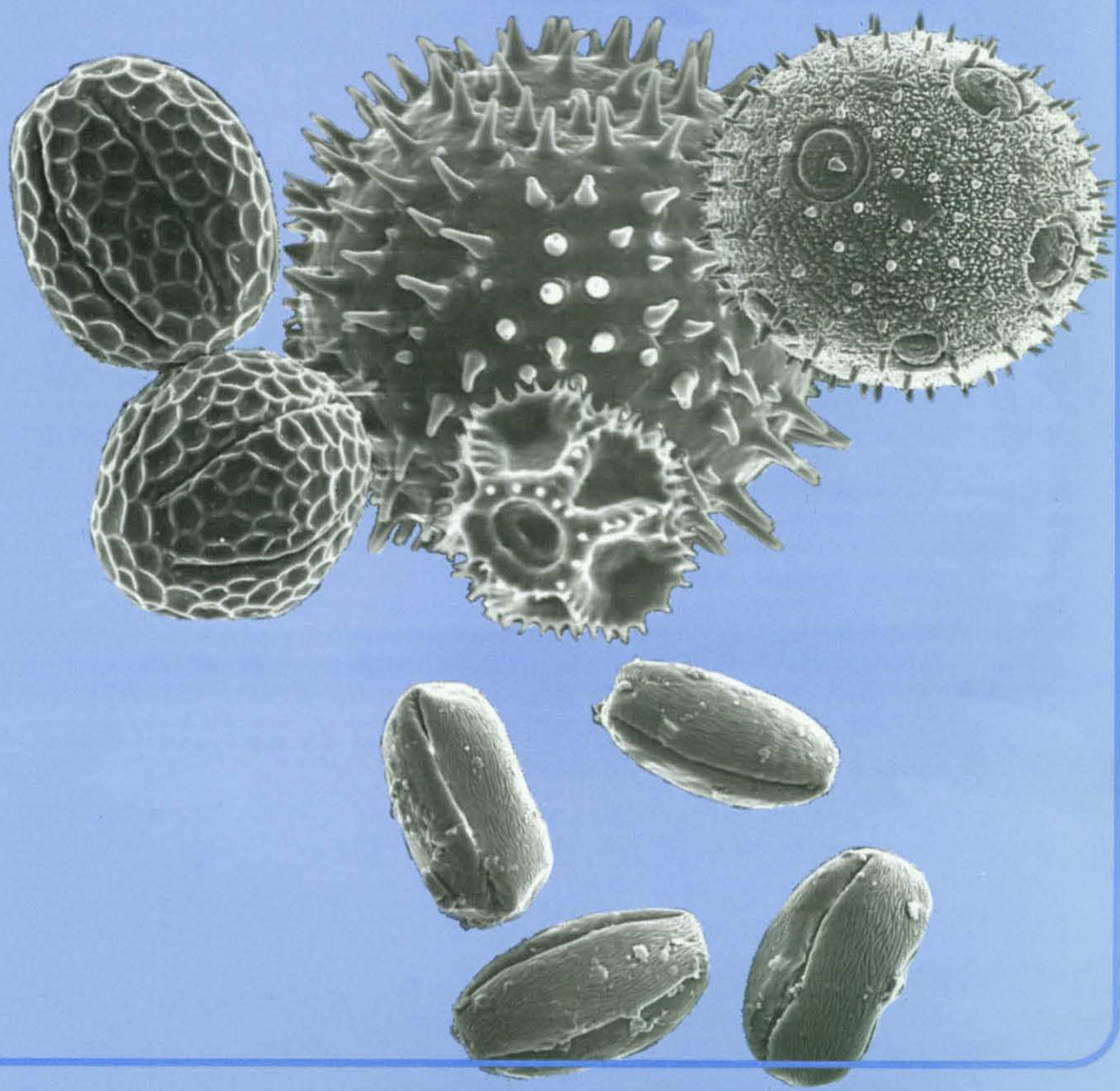
News of the California Association of Criminalists • Summer 1996

The CAC News



The President's Desk

After sitting back quietly and unobtrusively as a CAC member for the past 25 years, it is now my honor to serve the CAC as President. As I remember the people who have been CAC presidents, and the CAC's accomplishments under their leadership, I can only hope that in my brief time as president I can help the CAC continue its role as an organization which serves its members, the justice system, and society in many effective ways. Many of the current CAC projects are a new direction for the CAC: Amicus curiae briefs, appearances before national commissions studying forensic science, and efforts to create legislation that we feel is important to enable us to effectively do our jobs. This is a departure from the usual seminars, study groups, workshops and dinner meetings. All of these activities are necessary if we are to fulfill our professional obligation to our employers, our clients, and the public.

Pete Barnett

In my remarks upon receiving the traditional coconut, symbolic of the CAC Presidency, from Past President Carol Hunter, I spoke of the concept of professionalism. We hear this term being used so much, and it is so fundamental to the role of the CAC, I believe it is appropriate to reiterate our professional obligations, and to consider how the CAC can help each of us satisfy these obligations.

A profession has been defined as, "A vocation in which a professed knowledge of some department of learning or science is used in its application to the affairs of others." There are three parts of this definition: "Vocation," "knowledge of some department of learning or science," and "application to the affairs of others." All three of these parts are critical to the definition —one is not a professional without fulfilling the obligations inherent in each part.

"Vocation" - A vocation is what you do, and a job is where you do it. A vocation is more than just being able to perform those tasks you are paid for. A vocation is something that is yours and no one can take it from you. It is a valuable asset you possess. You have a personal stake in both the development of those attributes that increase the value of this asset, and in the actions of others that decrease the value of this asset. The professional's personal stake in this asset means that

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The CACNews

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On the cover...

From the CCI Web Page, http://www.ns.net/cci, is a sample of 140 pollen images that were generated on the Zeiss DSM 960 Digital Scanning Electron Microscope located at the California Criminalistics Institute. These images were made by Criminalist Linda Wraxell who at that time was a volunteer student assistant.

On this page... A scene from the Basic Bullet Path workshop at the Spring '96 Seminar.

The CACNews is published four times a year (January, April, July, and October) by the California Association of Criminalists, a non-profit professional society dedicated to the furtherance of forensic science in both the public and private sectors. Please direct editorial correspondence to the Editorial Secretary.

Notice to Contributors

We publish material of interest to our readers and are pleased to receive manuscripts from potential authors. Meetings and course announcements, employment opportunities, etc. are also solicited. Advertisements are also accepted, although a fee is charged for their inclusion in *The CAC News*. Please contact the Advertising Editor for further information. Because of the computerized typesetting employed in *The CAC News*, submissions should be made in the form of MS-DOS compatible files on 3.5 inch floppy disks or by e-mail (70642.773@compuserve.com). Text files from word processors should be saved as ASCII files without formatting codes, e.g. bold, italic, etc. An accompanying hardcopy of the file should be submitted along with the disk to illustrate the author's preference for special emphasis. Graphics, sketches, photographs, etc. may also be placed into articles. Please contact the Editorial Secretary for details. The FAX number for the Editorial Secretary is (408) 298-7501. The deadlines for submissions are: December 15, March 15, June 15 and September 15. **Nonmember subscriptions** are available for $24 domestic $30US foreign—contact the Editorial Secretary for more information.

Summer 1996

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CACBits / Section Reports

Joint Meeting Gears Up

THE BRITS HAD OJ NOW THEY NEED YOU!!!

Remember how great the joint meeting in Pasadena with the Forensic Science Society was? Well, it's is going to happen again, but this time in Harrogate, North Yorkshire, on July 9-13, 1997

You're right, it's not that far away. Preliminary efforts for program organization are already underway. The general theme of the meeting is INTERNATIONAL SCIENCE AND JUSTICE. Specific presentations are being solicited under the topics:

- Crime Scene Investigation
- Major Incidents (e.g. OJ, Oklahoma City, etc.)
- Courtroom/Legal issues
- Enhancement Techniques
- Drugs (Designer drugs, Clandestine labs)
- DNA (of course!)
- Training

Anything else related to forensic science.

We need to do serious and detailed planning to try to meet the standard of participation set by our colleagues in Pasadena. If you are planning on attending, or even thinking of maybe attending this meeting, please contact **Jim White** at Orange County Sheriff-Coroner (714) 834-6384, FAX 934-4519 and become a part of this historic event.

The Brits in general, and the Forensic Science Society in particular, are famous for their hospitality. You are urged to take advantage of this fun opportunity for some quality professional development.

Fire Debris Workshop Held

The Northern Section Trace Evidence Study Group sponsored a one-day workshop on fire debris analysis. The workshop was hosted by the Washoe Co. Sheriff's Crime Lab and the Bureau of Alcohol Tobacco and Firearms San Francisco Laboratory Center. Twenty-seven people attended, representing twenty different agencies.

Various individuals gave presentations on GC/MS analysis of fire debris with a group discussion following. Dr. John Hughes of Hewlett-Packard gave excellent suggestions on how we could improve our current GC/MS methodology in this area. The group discussed the various ASTM standards governing fire debris analysis, including the revisions made in the past year. The group consensus was that the newly revised classification scheme used by the ASTM is in need of improvement and has significant downfalls. A small committee of volunteers was formed to develop a new classification scheme which will be presented to the study group within the next year for peer review.

A notebook of standard accelerant chromatograms (GC/FID) was distributed to each laboratory represented at the meeting. Standard isoparaffin and aromatic liquids were distributed to each laboratory as well. If anyone else is interested in receiving standard isoparaffin liquids, contact Sam Blittman at the ATF. His phone number is (510) 486-3170. If anyone has any suggestions for future workshops, please contact **Diane Bowman** at (702) 328-2800.

Spring '96 Draws High Praise

Open letter from Dean

Please accept my sincere appreciation for your hard work and efforts for a fantastic experience in Milpitas. Admittedly my first northern seminar experience, it is sure to be one never forgotten.

Of special compliment to you was the Fire Investigation Workshop taught by **John DeHaan** and Monty McGill. This was truly a fantastic workshop! Having sponsored a number of training classes through the CAC's Training and Resources Committee, I know how difficult it is to attract top quality instructors and provide them with the state-of-the-art equipment and facilities necessary to educate effectively. Not only was this accomplished, but I know, more importantly, that every student attending the workshop went back with a tremendous wealth of information.

It is experiences like this that make me proud to be a CAC member. There are very few professional organizations in the US that can provide such quality training opportunities. In the very near future (and some have already had the experience), criminalists will find themselves in a position of defending their competency and professionalism. No longer is the criminal justice system assuming that the mere fact we have chosen this career or because we are employed for a certain agency or laboratory means we are qualified as professionals. Competency and professionalism must now be uniquely demonstrated. We, as a profession, are now individually required to answer to a higher standard.

Quality CAC seminar workshops, such the recent Fire Investigation Workshop, provide the training needed to attain high individual professional competency. Thank you all, again, for a great learning experience!

Dean M. Gialamas
Los Angeles

Jobs • Meetings • Courses

CRIMINALIST II/III (FORENSIC TOXICOLOGY) Ventura, CA

$2660 - $3543/mo Criminalist II
$3298 - $4402/mo Criminalist III

EDUCATIONAL INCENTIVE: Possible educational incentive of $133 - $173 per month (II), $165 - $220 (III), based on completion of a Master's degree.
FINAL FILING DATE: Continuous

Positions may be filled at the II or III level depending upon the qualifications of successful candidates. Under general direction, criminalists perform the more difficult and complex physical and chemical analysis required in the forensic sciences and criminal investigations by utilizing complex analytical equipment such as gas chromatographs, gas chromatograph/mass spectro-meters, UV, HPLC, and FT-IR. Duties may include analysis of narcotics and other drugs and complex toxicological analysis of blood, urine or other biological specimens. The criminalist may routinely provide expert testimony in courts of law relative to the laboratory work performed, and will perform other related duties as required.

Education, Training and Experience: Equivalent to a Bachelor's degree in chemistry, biochemistry, toxicology, pharmacology, or a similar closely related field, and one year of experience in criminalistics for the II level (3 years experience for the III level).

NOTE: Prior to actual appointment from the eligible list, the successful candidate will be required to pass a thorough background investigation conducted by the Sheriff s Department s Personnel Bureau, which may include a polygraph examination. Background investigation findings may be a basis for removal from the eligible list.

Contact Ventura County Personnel at **(805) 654-2639**.

Position Wanted

I am seeking a position in a crime laboratory. I have extensive lab experience in DNA extractions, PCR, designing of probes, analytical chemistry, and Macitosh and DOS computer presentation graphics and scientific software usage.

Marcie J. Merritt

[redacted]

FORENSIC SCIENTIST GeneLex Corporation

Immediate opening for qualified forensic scientist at Genelex Corporation, a nationally recognized leader in forensic DNA testing. Primary duties will be in the identification, screening, DNA analysis, interpretation and testimony regarding serological evidence derived from major crimes. Other responsibilities include the training and supervision of laboratory personnel and the presentation of studies at national and regional meetings. A minimum of five years forensic experience including some form of forensic DNA analysis are required. ABC certification at both the general and specialty levels are required within two years of employment.

Located in Seattle, Washington, GeneLex has been perfroming DNA analysis since 1987 and is currently implementing the latest in STR methods. The modern, fully-equipped laboratory has outstanding technical, administrative and customer service support. GeneLex provides a collegial work environment and is dedicated to contributing to the professional and personal growth of its employees. The compensation package includes competitive salary, health care benefits, profit sharing and stock option plans.

For further information or to submit a resume, please contact:

Howard C. Coleman, President
GeneLex Corporation
2203 Airport Way South, Suite 350
Seattle, WA 98134
(800) 523-6487
FAX (206) 382-6277

NWAFS—Utah Joint Meeting

A joint meeting between the Northwest Association of Forensic Scientists and the Utah Forensic Science Association is scheduled for September 30 through Oct 4, 1996. The meeting is co-sponsored by the Utah Dept. of Health and the Utah Dept. of Public Safety. Location is the Quality Inn Center in Salt Lake City, UT. Contact Jay Henry, Utah Dept. of Public Safety, Criminalistics Laboratory, 4501 South 2700 West, Salt Lake City, UT 84119. Phone:(801) 965-3870 or FAX: (801) 964-4544.

NEAFS 22nd Annual Meeting

The Northeastern Association of Forensic Scientists will hold its twenty-second annual meeting this October 3—5 at the Pocono Manor Inn in Pocono Manor, Pennsylvania. The hotel number is (800) 233-8150. For further infomarion, please contact George W. Chin, New Jersey State Police, North Regional Laboratory, Route 46 East, Little Falls, NJ 07424. Phone: (201) 256-7790 or FAX: (201) 256-0621.

North of 49 — The Development of Forensic Science in Canada

Douglas M. Lucas

Canada is the second largest country in area in the world. From St. John's, Newfoundland to Victoria, British Columbia is over 4800 miles and from Pelee Island in Lake Erie to Alert on the Arctic Ocean is almost 2900 miles. Our southern border with the USA, is over 3200 miles long, much of it along the 49th parallel of latitude - thus the title of this paper.

Pelee Island is at about the same parallel as Redding, California; Edmonton, Alberta, which many think of as a northern city, is at about the same level as Dublin, Ireland. The north magnetic pole is located in the Queen Elizabeth Islands in our Northwest Territories. When I was Director of the Centre of Forensic Sciences for the Province of Ontario, as I sat in my laboratory in Toronto, I was closer to Florida than I was to Fort Severn, Ontario on Hudson Bay.

The population of Canada is about 29.6 million in ten provinces and two territories. The provinces range from Ontario's 11.1 million to Prince Edward Island's 133,000. Despite the enormous area, about 90% of the population live within 250 miles of the border; about 50% live south of forty nine. While predominantly English speaking, Canada is officially bilingual and 80% of the population of Quebec are Francophone.

The realities of this geography impact on the delivery of forensic science services.

Presented as the "Founders' Lecture" at the Spring Seminar of the California Association of Criminalists, May 16, 1996.

History

The first settlers from Europe were the French who developed colonies along the St. Lawrence river in the 17th century. The conflicts in Europe between England and France spilled over into North America and in 1759 there was a decisive battle on the Plains of Abraham near Quebec City. Although fewer than 9,000 troops were involved, about 150 died including both generals. Unfortunately, to this day this skirmish on a September day over 200 years ago is referenced during disputes about the sovereignty of Quebec. Canada was officially ceded to Britain in 1763 by the Treaty of Paris that formally ended the seven years war.

During the American Revolution, many loyalists fled the New England Colonies to resettle in Canada. In 1812, during the renewed conflicts in Europe between France and Britain, President Madison declared war on Britain because of its embargo on American shipping. An attempt was made to capture Canada and hold it hostage. Battles were fought back and forth across the border but, in the end, in 1814 everything reverted to the status quo. The USA does have two legacies from this war; one is from the bombardment of Fort McHenry in September 1814 when Francis Scott Key wrote a poem about the "Rockets red glare and the bombs bursting in air." The other derived from a raid on Washington in August 1814. In retaliation for the American burning of the town of York (now Toronto) in 1813, a British/Canadian force set fire to a number of public buildings including the President's house. The mansion had to be whitewashed to cover the damage and it has remained The Whitehouse ever since.

Prosecutions are conducted by *"Crown Attorneys"* . . . Their responsibility is to advise the police on legal matters and to present the case provided to them by the police. Disclosure of the crown's case to the defence is mandatory.

Canada was not born from revolution but rather from an endless series of political conferences that culminated on July 1, 1867 in the proclamation by the British Parliament of the British North America Act which united the Provinces of Ontario, Quebec, Nova Scotia and New Brunswick into the newly independent country of Canada. Manitoba, British Columbia, Prince Edward Island, Saskatchewan and Alberta joined over the next 38 years and finally, Newfoundland in 1949.

Under the BNA Act the only authority which remained in Britain was the power to amend Canada's Constitution, this only because the provinces could not agree on an amending process. In 1982, with the consent of nine of the ten provinces, this last tie with Britain's Parliament was cut. The one province that did not agree was Quebec and this remains a source of irritation in that province.

The BNA Act gives to the Federal Government the power to enact the criminal law but the administration of that law is the responsibility of the provinces. Thus Canada has a single Criminal Code, first enacted in 1892, which applies uniformly across the entire country. Each province is, however, responsible for enforcing the Code and for administering the courts. This also has influenced the development of forensic science in Canada.

Government Structure

The Federal and Provincial governments are parliamentary in nature. The Federal Parliament consists of an elected House of Commons and an appointed Senate. The executive authority lies in the Prime Minister and his Cabinet. The Prime

Minister is the leader of the party which has the most seats in the House of Commons. The leader of the party with the next largest number of seats is referred to as *"Leader of Her Majesty's Loyal Opposition"*. Currently there is a certain irony in the fact that this position is held by the leader of the party which has as its main goal the separation of Quebec.

In the provinces, the organization of government is similar except that in most there is no equivalent to the Senate.

The Courts

The provinces have authority over the administration of justice. Thus each province has its own court system and prosecutors. The criminal courts are similar in each province with a *"Provincial Court"* which tries *"summary conviction"* offenses (misdemeanours), and some lesser indictable offenses (felonies). This court also conducts preliminary hearings of indictable offenses. There are no jury trials in a Provincial Court. The **"Superior Courts"** try indictable offenses with or without a jury (at the discretion of the accused). Each Province has a Court of Appeal however, the final court of appeal for the country is the Supreme Court of Canada.

All judges are appointed and hold office until retirement age conditional only *"on good behaviour."* Provincial Court judges are appointed by the Provincial Cabinet. Other judges are appointed by the Federal Government.

Charges are preferred in the name of Her Majesty in the form *"Her Majesty the Queen* (usually shortened to Regina) *versus* — (the name of the accused)." Prosecutions are conducted by *"Crown Attorneys"* appointed by the provincial cabinet. Their responsibility is to advise the police on legal matters and to present the case provided to them by the police. Crown Attorneys have no investigative function. Disclosure of the crown's case to the defence is mandatory.

Death Investigation

Investigation of sudden or unexpected death is a provincial responsibility assigned to coroners or medical examiners depending on the province. Regardless of the name, most are medical doctors

appointed by the provincial cabinet who serve an area on a fee for service basis. Except in the larger centres and in Quebec, forensic pathology is practiced as a sideline by pathologists qualified in other branches of the specialty. Coroners can also require the police force in the jurisdiction of the death to assist with these investigations. Each province has at least one full time coroner or medical examiner who serves as the chief and ensures proper training, management and record keeping.

In about 1% of cases when there is reason to ensure public disclosure of a public safety concern or some other matter, public inquests are held presided over either by the coroner or a provincial judge, with a jury of five citizens in some provinces. The main function of an inquest is to make recommendations that might prevent such deaths in the future.

The Police

In the earliest days, the duty of keeping the peace was a public responsibility born by *"all free, fit and proper males between the ages of fifteen and sixty."* As settlers prospered they hired stand-ins and this evolved into the appointment of a *"High Constable"* for an area. Although the RCMP is often identified as a national symbol of Canada and considered to be our historic police agency, local and provincial police forces predated the RCMP by at least fifty years.

In the more sparsely settled west, a major problem was with whiskey traders from south of the border causing difficulties with the Indian population. In 1873, as a result of the need to police these vast areas, Parliament passed *"An Act to Establish the Northwest Mounted Police."* Recruits were required to be *"able bodied males between the ages of 16 and 40 years who know how to ride a horse."* Their pay was 75 cents a day. In June 1874, *"275 men, 339 horses, 142 oxen and 189 wagons set forth on a 1000 mile march"* from Fort Garry (now Winnipeg) heading for Fort Whoop-up in southern Alberta. An example of their duties was the control they had to exercise over Chief Sitting Bull in 1877 after he fled to Canada following the Battle of the Little Big Horn.

The NWMP established their Headquarters at Pile of Bones (now Regina) in 1882 and the first northern patrol reached Hudson Bay in 1890. The Force was granted the designation *"Royal"* in 1904 and, in 1920, to recognize their national stature the RNWMP was renamed the Royal Canadian Mounted Police.

As a Federal police agency, the RCMP has jurisdiction over many Federal statutes but, because enforcement of the Criminal Code is a provincial responsibility, they do not per se have jurisdiction in criminal matters except in the Yukon and Northwest Territories. However, as policing became more expensive, most of the provinces abandoned their provincial police forces and entered into contracts with the RCMP. As a result, they are now the provincial police (and, in some communities, the municipal police) in all the provinces except Ontario and Quebec. In these two provinces many municipalities have either "regionalized" police services into larger units or have contracted with their provincial forces. As a result the number of small municipal forces is declining.

Because of their origin as a quasi-military force, the RCMP retained the traditional red coat of the British army for ceremonial dress and many of their other traditions can be traced to their military origin. In addition to horses, dog sleds were an

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Raymond Davis

Tack så mycket

I would like to take this opportunity to thank the entire staff at the Santa Clara County Crime Lab for putting on one of the best seminars I have ever attended.

Although I was the Seminar Chair, it was their hard work, dedication and attention to the smallest details that made the seminar such a success. All I had to do was act nervous and worry a lot. And I did! I have received so many compliments that I wanted to share just a few with you. A number of people liked the hotel we selected. They felt it set the right atmosphere for a technical meeting. I have to confess that the waterfall really had a calming effect on my nerves. Others really appreciated the number and high quality of the presentations and finally, the participants in the five workshops we offered thought that the material and instructors were excellent. I know that everyone who attended truly got their money's worth. A special thanks to all of the speakers who took the time and effort to write their abstracts, to present their ideas, technical tips, opinions and case studies. This organization flourishes, due in part to the individuals who make contributions at seminars, study group meetings and the *CACNews*.

It's my pleasure to pass the baton to the next CAC Seminar chairs, Steve Secofsky and Gary Asbury. I wish them and their staff at Riverside DOJ lab a successful meeting. Be sure to read the advertisement in this issue for more details on the Fall 1996 seminar. See you in Palm Springs. (For the Swedish impaired, tack så mycket translates to "thank you *very* much".)

Raymond

Technical Alert—Gasoline Formula Change

In compliance with Calif. Air Resources Board regs., refineries have decreased the concentrations of heavier components in gasoline. These components were very useful in identifying the presence of gasoline fire debris of suspected arsons. In fact the ASTM standards were written to incorporate these compounds in the identification of gasoline.

We find the new fomulation has about half the previous concentration of C3 alkylbenzenes and about 10% of the previous conc. of C4 alkylbenzenes. At 90% evaporation, the major components are C2 and C3 alkylbenzenes with only small amounts of the C4's visible. At 99% evaporation, the characteristic naphthalenes are visible, but in smaller concentrations than previously observed. Labs are encouraged to sample local sources to familiarize themselves with the changes. If you have any questions, please contact Bradley T. Johnson, Sacramento Co. Lab of Forensic Services, (916) 732-3840.

From the Reader

Guest Editorial—Dave Stoney

The essence of the job

Last month I had the pleasure to attend a Particle Identification Workshop at the Joint Meeting of the Midwest Association of Forensic Scientists and the Southern Association of Forensic Scientists. Twenty or so forensic microscopists, most with considerable casework experience, met for two days to jointly work on unknown particle identification. We each brought our own microscope along with a few "unknowns" for the other students. The instructors, Bill Chapin and Larry Peterson, brought an impressive assortment of supplies, samples and equipment.

We had an excellent exchange of techniques, ideas an analytical approaches (1). Several unknowns for cases in progress were identified through our collaborative efforts, along with many, initially perplexing, particles. We also discussed a variety of concerns about the fate of microscopists in forensic science laboratories.

What are the most important disciplines in the crime laboratory? Two obvious criteria to consider are the caseload (which discipline works most cases per month?) and the evidential worth (which discipline contributes the most important evidence to a case?). Blood/semen typing, drug identification and fingerprint processing / comparison come out strongly by these criteria; as for trace evidence—well, the cases take much longer to complete and establishing the evidential worth is often difficult, subjective and itself time-consuming.

With tightening budgets, expanding analytical capabilities and increasingly rigorous methods, crime laboratory management must consider the relative costs and benefits of the various analytical disciplines. Funds must be allocated and disciplines that have the higher costs and least benefits must be given lower priority. In this context concern was voiced over the role and com-

petitiveness of forensic trace evidence analysis. One particular concern was that forensic trace evidence analysts might be reduced to technicians who screen hairs for the DNA laboratory.

I have a more optimistic view of the ultimate fate of trace evidence analysis (although this may do little to ease our current difficulties). Readers may recall my previous comments on the matter (2) where I considered the "essence of criminalistics"—that which remains when each of the specialties is removed from the general practice. The functions that remain are dominated by microscopy and preliminary examination of the evidence. This is when trace evidence must be recog-

One particular concern was that forensic trace evidence analysts might be reduced to technicians who screen hairs for the DNA laboratory.

nized and recovered, when the decision must be made to devote the effort to analyze it, and when the relevance of other, more specialized methods may be judged in context. This role, from one perspective, appears to be mere sample preparation for the specialists. From another view it is recognized as the fundamental, most necessary function of the criminalistics laboratory. Ask anyone at McCrone Associates about the role of Anna Teetsov in the cleanroom....

I have three main points to make. The first is that caseload reflects demand and demand is predicated on knowledge of what the laboratory will do once cases are submitted. If the laboratory doesn't have sufficient, properly trained personnel or hasn't made it a priority to deliver efficient trace evidence services, then there will be a self-fulfilling reduction in demand. This is primarily an educational matter, but to do the teaching we must have the ability and forum to do so. The draining of our skills into management and forced labor in DNA or drug analysis units does represent a serious threat in this respect.

The second point is that trace evidence can easily escape legal, public and judicial notice. A bloodstain has a higher profile, drug analyses are an essential part of the corpus delicti, and omitting a search for fingerprints would be public heresy. Trace evidence, however, though almost always present, can easily become the "overlooked clue" not only by the offender, but also by investigators, forensic scientists, laboratory administrators and the court. We can usually get away with ignoring it, therefore, in a somewhat perverted sense, it is expendable. As our legal system matures an expectation of quality in trace evidence analysis will remedy this perversion. When its omission itself becomes an issue, its value will be properly appreciated.

The final point is that, for all the essential, spectacular impact of DNA typing methods, these are among the most easily delegated of the forensic scientist's duties. I am not referring to processing and preparing the specimens, but rather to the expensive, but routine analytical methods. DNA typing must be performed with the regularity and efficiency of a clinical laboratory. Eventually, once they are capable and available, it will be the private clinical laboratory that performs these tests. I cannot conceive that it is really more cost effective for forensic laboratories to develop their own DNA divisions, although I can well appreciate the political importance of doing so. Clinical laboratories, however, could never perform the essential preliminary search for trace evidence, case analysis and selection of specialists. In the words of Kirk and Bradford (3)

"It is always essential that at least one broadly trained person first survey the evidence to determine what examinations are required, distributes the evidence to the appropriate groups, and generally supervises and coordinates the resulting laboratory operation."

This person must necessarily use a microscope, and cannot reasonably perform the task without the close, interactive association with a microscopist.

1. Stoney, D.A. *Microscope* 1989, 37, 287-290.
2. Kirk, P.L.; Bradford, L.W. "The Crime Laboratory"; Thomas: Springfield, 1965; p. 53.

—Mr. Stoney is Editor of the *Microscope*.
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Graphics Missing

Editor:

I recently received and reviewed The *CACNews* Spring 1996 and am quite concerned about my published article, "A Toxicological Analysis of Tetrahydropalmatine." At your request, I submitted the article at the end of January, 1996. This should have provided sufficient time for revisions and comments by you, the Editor. Not only was the title of the article incomplete, but one table and four figures were completely omitted from the paper without any notification or consent by me. I feel my article was published in an incomplete form and thus was done an injustice.

—Daniel T. Anderson
Los Angeles

The CACNews is always eager to review technical material for publication. There are many disciplines represented in our membership, and we must try to appeal to them all, at least in part. Pictures, charts and other graphical aids are placed according to space and editorial constraints.

—Ed.

Forensic Potpourri

Second in a series

THE FORENSIC ANTHROPOLOGIST

In recent years, just as the investigation of a crime scene has become more complex and sophisticated, so has the task of the forensic anthropologist. Forensic anthropologists assist medical and legal specialists to identify known or suspected human remains.

The science of forensic anthropology includes archeological excavation; examination of hair, insects, plant materials and footprints; determination of elapsed time since death; facial reproduction; photographic superimposition; detection of anatomical variants; and analysis of past injury and medical treatment. However, in practice, forensic anthropologists primarily help to identify a decedent based on the available evidence.

For example, when a skeleton found in a wooded area is brought to a morgue or an anthropologist's laboratory for examination, the first step is to determine whether the remains are human, animal, or inorganic material. If human, an anthropologist then attempts to estimate age at death, racial affiliation, sex, and stature of the decedent.

If the skeleton shows evidence of prolonged burial or is accompanied by coffin nails or arrow points, it usually represents an historic or prehistoric burial rather than a recent death. Construction crews frequently unearth such skeletons during road or housing excavations. After combining all of the evidence, the anthropologist determines the skeleton's possible significance to medical and legal authorities.

Although the primary task of anthropologists is to establish the identity of a decedent, increasingly they provide expert opinion on the type and size of weapon(s) used and the number of blows sustained by victims of violent crime. It should be noted, however, that forensic pathologists or related experts in forensic medicine determine the cause or manner of death, not the forensic anthropologist.

Most anthropologists have advanced degrees in anthropology and have examined hundreds of remains. They are also thoroughly familiar with human anatomy and how it varies in different populations. Some anthropologists may also have experience in police science or medicine, as well as in serology, toxicology, firearms and toolmarks identification, crime scene investigation, handling of evidence, and photography. A limited number of anthropologists deal with footprint analysis and species identification of carrion insects in relation to estimating time elapsed since death.

Perhaps the anthropologist's most valuable skill is familiarity with subtle variations in the human skeleton.

Although most adult skeletons have the same number of bones (206), no two skeletons are identical. Therefore, observations of patterns or unique skeletal traits frequently lead to positive identifications. The most frequently used method for identification is to compare before- and after-death dental photo images. If such photo images do not exist, or if they are unavailable, then old skeletal injuries or anatomical skeletal variants revealed in other photo images may provide the comparative evidence necessary to establish a positive identification.

Hypothetical Example

Suppose hunters find a partially clothed skeleton lying on the ground in a heavily wooded area with much of its clothing torn and scattered by carnivores. Law enforcement officers are called to the scene, as is the medical examiner or non-physician coroner. The scene is photographed in detail, and the skeleton is examined and photographed before being removed to the city morgue.

At the morgue, the medical examiner examines the remains for evidence of trauma, such as stab marks in the shirt, blunt trauma to the skull and mandible, and broken bones. Photo images and photographs of the body show that no bullets or pellets having been noted. Also, examination of the clothing reveals no wallet or other personal identification.

The medical examiner determines through measurement of the pubic area that the remains are those of a middle-aged adult male. There is no evidence of facial or head hair to aid in determining racial affiliation. From measurements taken at the scene, the examiner roughly estimates the stature. Also, a forensic odontologist is called in to take dental photo images. Although the decedent has a number of large dental cavities, he shows no restorations or evidence of having seen a dentist. At this point, the medical examiner requests assistance from a forensic anthropologist, who conducts further study of the remains in the laboratory.

The forensic anthropologist's examination confirms the medical examiner's findings that the individual is a middle-aged male. However, questions remain that the forensic anthropologist must answer, such as: What is the individual's racial affiliation? What is the individual's age and stature? How long has the individual been dead? Is there any evidence of trauma or foul play at or near the time of death? Are there any distinguishing skeletal traits that may aid in establishing the identity? Is there any indication of postmortem treatment or alteration of the remains?

Racial Affiliation

The question of racial affiliation is difficult to answer because, although racial classification has some biological components, it is based primarily on social affiliation.

Nevertheless, some anatomical details, especially in the face, often suggest the individual's race. In particular, white individuals have narrower faces with high noses and prominent chins. Black individuals

ticular, white individuals have narrower faces with high noses and prominent chins. Black individuals have wider nasal openings and subnasal grooves. American Indians and Asians have forward-projecting cheekbones and specialized dental features.

Examination of this skeleton reveals traits consistent with white racial affiliation. Further examination of the skull produces a few strands of straight blonde hair. Microscopic examination shows the hair to be consistent with that of a white person.

Age and Stature

Usually, examination of the pubic bone, sacroiliac joint, amount of dental wear, cranium, arthritic changes in the spine, and microscopic studies of bones and teeth narrows the age estimate given by the anthropologist. After examining the skeleton, these indicators suggest that the man was between 35 and 45 years of age at the time of death.

Estimation of stature can be narrowed by measuring one or more complete long bones, preferably a femur or tibia. If stature estimates are based on incomplete long bones, less confidence can be placed in them. This measurement of the maximum length of the bone can then be plugged into a formula based on race and sex to produce an estimate. In this case the individual's stature was estimated at 5'7" to 5'9" with a mean stature of 5'8."

Time Interval Since Death

Estimating the time interval since death can be extremely difficult. For the most part, such an estimate is based on the amount and condition of soft tissue, such as muscle, skin, and ligaments present, the preservation of the bones, extent of associated plant root growth, odor, and any carnivore and insect activity. However, many other variables must also be considered, including the temperature at the time of death, penetrating wounds, humidity/aridity, soil acidity, and water retention. The longer the time since death, the more difficult it is to determine the time interval since death. In this hypothetical example, the anthropologist determined that the individual died 6 to 9 months previously, based largely on the condition of the soft tissue and the amount of root growth in the individual's clothing.

Evidence of Trauma

After the dirt and forest debris were removed from the bones using water and a soft brush, a number of faint cuts became visible in the left ribs and the mid-back. The number of discrete cuts in three ribs and in one vertebra suggest that this male was stabbed a minimum of three times. No additional evidence of trauma was noted.

Distinguishing Skeletal Traits

Further examination revealed that the male sustained a fracture above his right eye and upper jaw bone at least several years before death. The individual also had a severely deviated nasal septum and presented evidence of a severe chronic nasal infection. This observation is noteworthy because if he sought medical help for the fractures or sinus condition, photo images may have been taken that would provide an excellent opportunity for positive identification.

Post-Examination Procedures

After the forensic anthropologist completes the examination, the medical examiner provides all information obtained from the skeleton to the law enforcement officials investigating the case. The information is then entered in the National Crime Information Center (NCIC).

In this hypothetical case, after several months, a search failed to locate a missing person matching this description. Therefore, the medical examiner and the detectives returned to the forensic anthropologist to request that a facial reproduction be attempted.

Two approaches are available to an anthropologist in reconstructing facial appearance during life. First, the anthropologist could work with a composite artist experienced in rendering sketches based on information supplied by eyewitnesses. Or, the anthropologist could call in a specialist in three-dimensional facial reproduction, a technique in which the head is constructed in clay directly over the skull and mandible or over good casts of them. Because of limited funds, and because an experienced composite artist is available on staff, the forensic anthropologist and artist worked together to produce a drawing of the person represented by the skeletal remains. This drawing was then made available to the public via the local media.

Shortly thereafter, two unrelated men who had seen the image on television came forward because they thought that it might be a relative. Medical and dental records for both individuals could not be located, but facial photographs taken within the last 2 years were available.

Using new techniques of photographic superimposition and comparison, the forensic anthropologist excluded one of the individuals outright. However, frontal photo images of the second individual taken 3 years before death showed the individual was treated for facial injuries sustained in a motor vehicle accident. The configuration of the frontal sinuses on the photo images matched exactly the photo images of the recovered skull, thereby positively identifying the victim.

Value of Forensic Anthropology

A forensic anthropologist makes significant contributions to an investigation. The greatest of these could well be the anthropologist's intensive training and experience in distinguishing between human and nonhuman remains, determining age at death, racial affiliation, sex, stat-

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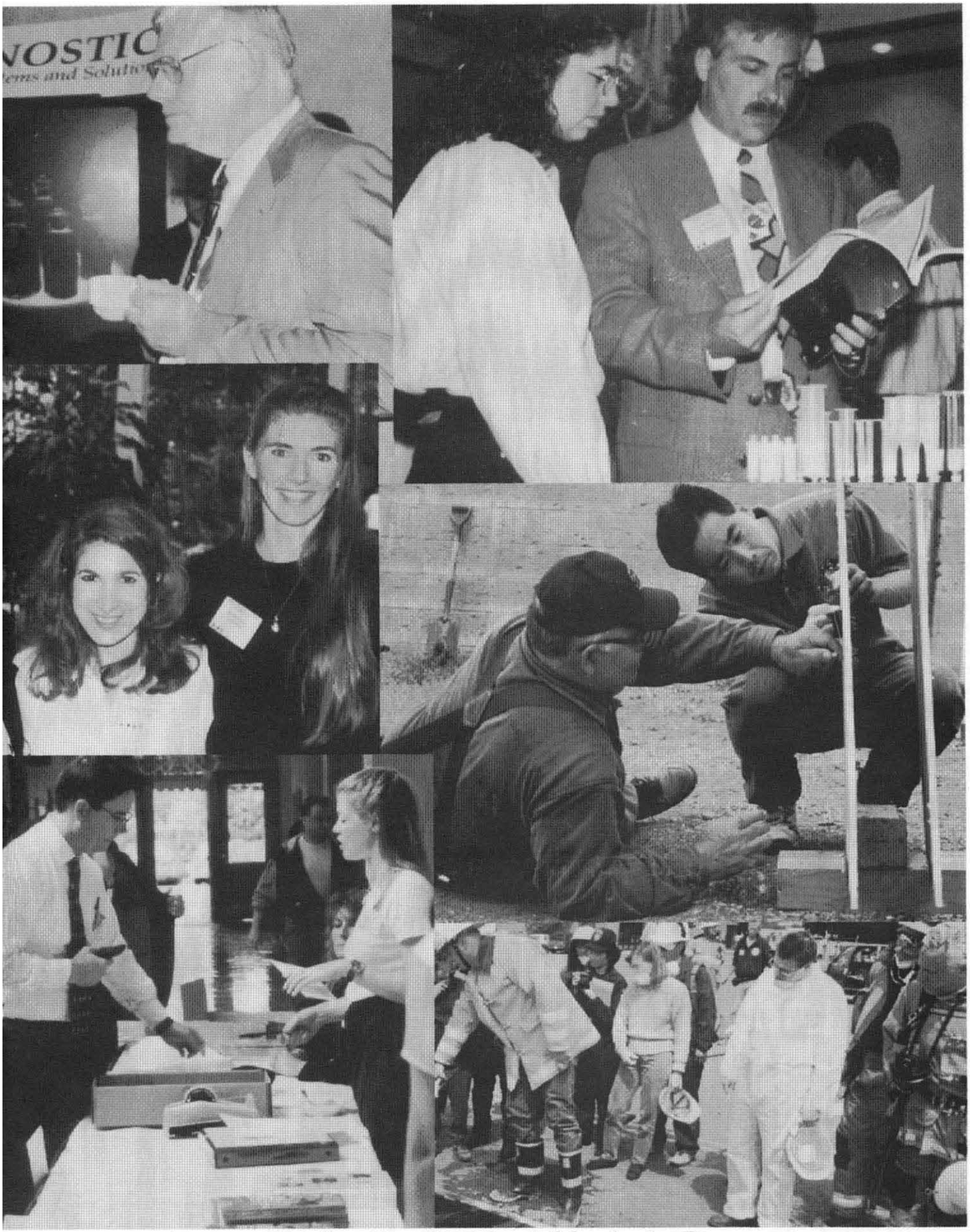

CAC SEMINAR

Absorption - Elution Using Monoclonal Antisera

Dorothy Beattie[1] and John Houde[2]

ABSTRACT

Absorption-elution is a commonly used technique for grouping dried blood samples. The availability of polyclonal antisera, a key ingredient in the procedure, is rapidly declining as manufacturers are discontinuing distribution of polyclonal antisera in favor of monoclonal antisera. Modifying an existing polyclonal procedure by doubling the concentration of the reference cells, increasing the elution time and eluting into saline alone produced an effective absorption-elution technique using monoclonal antisera. The antigen-antibody complex formed in the absorption phase using monoclonal antisera seems to require a longer elution time to break.

INTRODUCTION

Crime laboratories use a technique known as absorption-elution to determine the ABO group of dried bloodstains. This is an extremely sensitive method that allows typing from a very small sample (1), even down to about one square millimeter. In the absorption phase of the method, a sample of the questioned bloodstain is exposed to polyclonal (human source) A and B antisera. During this time any A or B antigens present in the stain will capture their corresponding antibodies from the antisera, forming an antigen-antibody complex which resists a washing step. The treated material is then thoroughly washed with isotonic saline to remove all unbound antibodies and leave only the antigen-antibody complex. In the elution phase a mixture of saline and reference cells of known A and B type are applied to the sample. This mixture is incubated briefly causing any antibodies that have been absorbed to elute off into the surrounding saline. This allows the reference cells to agglutinate and indicates the presence of A or B antigens in the dried blood.

We did not include group O in the present study because it is identified by reaction with H-lectin, a derivative of the *Ulex europaeus* seed, (common Gorse). It is not affected by the change from polyclonal to monoclonal antisera.

Although first proposed by Siracusa (2) in 1923, Kind (3) introduced absorption-elution for the detection of ABH antigens in 1960. The method was crude, but has been modified by a number of individuals. Based on the principles of Kind's work, Nickolls and Pereira (4) developed a procedure to group very small stains using short pieces of bloodstained threads. However, their technique took some skill and was very time consuming.

Howard and Martin (5) developed a method which was more practical and allowed bulk handling of a fairly large number of stains. It is this method that is currently used at many crime laboratories even in the age of DNA typing.

Following is a sample protocol for absorption-elution in determining blood type of a dried blood stain using polyclonal antisera.

1. Label plastic plate in rows and columns, forming squares.
2. Attach bloodstained threads and controls to each square.
3. Add one drop polyclonal antiserum to each thread in the appropriate column.

Absorption Phase

4. Place in humid chamber at 4°C for at least two hours.
5. Wash with chilled saline, blot dry.
6. Place in agitated saline for at least one hour.
7. Remove, blot dry, pressing hard.
8. Add one drop indicator cells (see "Preparation" below) to appropriate threads, e.g. A cells to anti-A, etc.

Elution Phase

9. Place into humidity chamber and incubate at 56°C for no more than 15 minutes.
10. Place samples on rotator (60 RPM) for 30 minutes or more.
11. Read under microscope at 100X and assign grade 0 through 4.

Grading Scheme:
Neg = no agglutination; +1 = occasional clumps of a few cells, but mostly free cells; +2 = more frequent clumps than +1; +3 = more than 50 percent clumping; +4 = complete agglutination, virtually no free cells.

Rewash:

12. Wash off threads with saline, blot and repeat steps 8,9,10 and 11. Several hours on rotator is usually required.

Preparation of Indicator Cells:

1. Label tubes "A" and "B".
2. Add two drops respective indicator cells (3%) to each tube.
3. Wash cells twice in chilled saline.
4. Add a solution of bovine serum albumin (2 drops BSA in 9 ml normal saline) to each tube containing indicator cells.

As early as 1980 it was predicted that for routine blood-group serology, monoclonal antibodies would replace polyclonal.(6) By 1995, manufacturers of polyclonal antisera were discontinuing production in favor of monoclonal antisera. Besides the benefits of a secure supply of consistently homogenous quality, there are questions of risk in harvesting human antisera and the desire to eliminate the possibility of communicable disease contamination. One supplier, Baxter, has already removed polyclonal A and B antisera from its catalog.(7)

Kohler and Milstein (8) received a Nobel prize in 1984 for their 1975 work developing a continuous culture of animal hybridoma cells which would provide a virtually unlimited supply of pure antibody. The technique was based on the fusing of a B lymphocyte cell, from the spleen of an immunized animal, with a myeloma cell that has the capacity for unlimited proliferation. This cell line can theoretically secrete the single antibody forever.(9)

Monoclonal antibodies consist of a single molecular species so their specificity can be far more precisely

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defined than that of conventional antisera.(10) In theory, using monoclonal antisera makes sense. They are cleaner, purer and more easily traceable to a standard. However, it may be that the subtle variations in the specificity of polyclonal antibodies can compensate for the variations in ABO antigens in dried blood stains allowing for the antigen-antibody complex to form more readily. We sought to determine whether or not monoclonal antisera could be substituted for polyclonal antisera in the absorption-elution method.

Materials and Methods

In creating a protocol for monoclonal antisera it isn't sufficient just to develop a process in which the monoclonals are effective, the procedure has to be practical and time-efficient. In addition, the monoclonals must be able to survive a rewashing step in order to be considered accurate and to eliminate the possibility of a contaminant giving false results.(11)

The various steps in the sample absorption-elution protocol allow several possibilities for modification. The following alterations were tested in the order listed. Polyclonal antisera control samples were run at each test step for comparison.

Modifications tested:

1. Simple replacement of monoclonal antisera in the existing absorption-elution process, eluting for 13 min.
2. Elute for 13 mins and increase rotation time (the step after the elution phase where the reference cells and eluted antibodies are agitated).
3. Instead of eluting into the reference cell solution, elute into saline alone and increase the elution time from 13 to 30 mins.
4. Elute into saline alone for 30 mins and double the concentration of indicator cells.
5. Elute into saline alone for 20 minutes and use the double concentration of indicator cells.
6. Elute into double concentration reference cell solution (rather than saline alone) for 20 minutes.

We used blood samples from known sources and types varying in age from one to ten years old. Two different brands of monoclonal antiserum were used: Gamma Biologicals, Inc. anti-A, Lot AM48-2, anti-B, Lot BM55-3 and Baxter (Dade Monotype) anti-A, Lot 130.007.IA, anti-B, Lot 131.013.IA.

Results

The following results are numbered to correspond with the "Modifications tested" above.

1. Some monoclonal activity noted, but very minimal.
2. Excessive rotation time (2 + hours) yielded only minimal activity.
3. Strong monoclonal reaction but no activity after rewash.
4. Extremely strong monoclonal activity but rewash still weak.
5. Strong monoclonal activity and acceptable rewash.
6. Very weak reaction initially and even less activity after rewash.

The antisera from Gamma Biologicals, Inc. produced the best results with the new protocol. The Baxter product elicited a strong reaction for typing B, but the anti-A did not survive the rewash.

Discussion

There are three major changes in the new protocol: doubling the concentration of the reference cells, increasing the elution time and eluting into saline alone. The antigen-antibody complex formed in the absorption phase using monoclonal antisera seems to require a longer elution time to break. However, the sensitivity of the reference cells suffers if exposed to the elution temperature for an extended period of time. This may explain the fifteen minute maximum incubation time suggested in the original protocol.

We found that by making the following alterations in the protocol, monoclonal antisera may be successfully substituted for polyclonal.

1. Prepare indicator cells as above but with four drops instead of two.
2. Elute into saline alone for a longer period (20 mins for the first time, and 30 minutes when rewashing).
3. Adding less volume of indicator cells following the elution.

Conclusions

Gradually, absorption-elution is becoming obsolete in favor of DNA testing. However, smaller crime labs which do not have DNA labs on the premises frequently need the results in a more timely fashion than is elicited by sending a sample out to a DNA lab and awaiting the results. The above protocol using monoclonal antisera allows the testing to remain in-house even in the face of disappearing supplies of polyclonal antisera.

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Forensic Serology—Survey Results

A few months ago I posted the following scenario and asked for comments:

"In a sexual assault case, the victim is a ABO-O secretor and the suspect is an ABO-O secretor. Analysis of vaginal swabs revealed A, B, and H."

For each of the following statements, I would be interested in the opinion of people who are members of this forum as to (1), which statements are true, and (2), which statements should be included in a report of this analysis. Any other comments would be welcome, but please address those two questions.

1. **The suspect cannot be excluded as the semen donor.**
2. **This analysis provides no information about the identity of the semen donor.**
3. **Assuming a single semen donor, the suspect is eliminated as the semen donor.**
4. **The semen donor is either a Type A, Type AB, or Type B individual.**
5. **No conclusions are possible with these data.**

RESPONSE #1

I would guess that 1 and 5 are true and the remainder are false. I would report number 5 only. I look forward to the results of your survey.

RESPONSE #2

I utilize ELISA for ABO in body fluids. Report wording for a case like the one you describe would go something like this:

"If the seminal material identified originated from one donor, the suspect can be eliminated as that donor.

"If the seminal material identified could have multiple donors, the suspect cannot be eliminated as a donor."

If this situation happened to me, I would do all or at least most of the following to get to the bottom of the confusion.

1. I never assume a single donor. Many times, the victim is unclear or untruthful about the alleged criminal incident as well as consensual partners within a three-day window prior or after the alleged criminal incident. I would also find out how strong the case was against the suspect, what made the agency pull blood from this guy?

2. I would re-run the stain and the standards from the victim and suspect, provided the sample size was suitable to do so. I would make sure that the victim's whole blood type was consistent with a known uncontaminated saliva standard. I would make sure my positive and negative controls were functioning properly.

3. I would contact the agency to find out if the victim had/has multiple partners, and possibly find out what their ABO and secretor behavior is.

4. I would determine if the A and B activity could be coming from another source, like saliva, possibly from consensual behavior, or from details of the assault the victim didn't share, which would also introduce the idea of multiple donors.

5. I would run PGM subtyping on the stain if sample size allowed, to eliminate possible activity from saliva, and to compare those banding patterns to the standards.

6. I would attempt to determine the possible degradation in the stain to see if bacteria could be causing false B activity.

Hope this helps. ELISA seems to eliminate the possibility for false activity, due to negative controls run simultaneously with the samples. False activity due to improper procedure or washing would show up in the negative controls. More likely with ELISA, you might not detect an ABO type from a secreting donor and falsely eliminate him/her. Currently, any case with standards and semen identified would go to the DNA unit of the state lab, therefore preventing problems with interpreting donors of mixed samples. With some of the results we've seen here in Illinois, it isn't safe eliminate anyone with ABO, it's not always reliable.

RESPONSE #3

Here's my response to your questions:

(1) which statements are true:

1. *True*, although it is a biased statement to make. Based on the data, no male could be excluded as a possible donor.

2. *False*. The analysis may be providing information about the semen donor's identity.

3. *False*. An assumption of a single donor may not be a valid assumption. It has also been shown that bacteria, viruses, and plant materials can have A, B, and/or H blood group substance activity. These biological materials could be present, masking the suspect's ABH BGS.

4. *False*. The donor could also be a Type O secretor if the mitigating factors mentioned in 3 are present.

5. *True and False*. It's true that no conclusions can be drawn about the semen donor based on these results; however, it's false that no conclusions are possible. The analyst has drawn the conclusion that A,B, and H BGS are present.

(2) Which statements should be included in the report:

None of the statements. My report would read: "Analysis of the vaginal swabs revealed the presence of seminal fluid with A, B, and H blood group substances." Any interpretations that I had to make would be done on the witness stand.

The reason that I don't give an interpretation of the evidence in my report is because I would rather explain the possibilities to the jury than have a prosecutor or defense attorney attempt to explain the possibilities. I will usually just give the re-

sults of my analysis in the report. If I included my evidence interpretations in the report, my report may "stand alone" and I may not need to testify, but it may also allow either lawyer to distort the results to suit his or her needs (two examples are Statements #1 and 4). I feel that this could be unfair to either the State or the defendant. I also feel that I would be more objective in explaining the results of the analysis to a jury.

R 4

I think number three is most appropriate.

1. This statement can only be true if you assume that there is more than one semen donor. If you are going to make this assumption, you should state it explicitly. I wouldn't use this statement.

2. If you have confidence in your test results, this statement is not true. I would not use it. In the DNA era with differential cell lysis, my confidence in ABO testing is diminished.

3. True and appropriate.

4. I wouldn't use this statement.

5. Same as 2.

Fortunately we have differential lysis and DNA testing so we don't have to waste our brain power on ABO interpretation issues.

R 5

It has been my general policy to avoid written conclusions. I report facts and data. Conclusions and interpretations of the data can change with the addition of new information. I may be one of the few serologists today was are still willing to put weight on ABO results. But not much. If I accept the science then I must also accept the handicaps.

1) The suspect cannot be excluded as the semen donor.

This statement is, in itself, misleading. "The semen donor" implies a single source; I prefer "a semen donor." Can the suspect be excluded as a semen donor? No. Would my report reflect this? No. I'd give only verbal conclusions with this little data available.

2) *The analysis provides no information about the identity of the semen donor*—False; I feel that A/I typing does provide some information, although its interpretation must be done very carefully. Again, I would not include this in my report.

3) *Assuming a single semen donor, the suspect is eliminated as the semen donor.* At this point, I'd have to wonder if the ABO Type A and Type B antigens being detected are not the work of bacteria, for which the human vagina is not without. And again, I wouldn't apply much weight without other data. I think I'd have to say "false" to this question. If there were some means to eliminate my doubts, then I'd say true.

4) The semen donor is either a Type A, Type AB, or Type B individual Assuming there is a single semen source, and that the ABO results are not from possible microbial interference, then I'd conclude that the semen source is a ABO Type AB. At this point, I'd like to say that I recognize the possibility that either the ABO Type A or the Type B antigens are the result of microbial activity, and not necessarily simultaneous.

5) No conclusions are possible with this data.

Almost true. Very few conclusions are possible with this data. I see this information as a single data point in space, through which any number of lines or planes may pass. As soon as there are two, then only one line and infinite planes may pass. With three, then there is only one line (or maybe none) and one plane may pass. Then you wonder: Why does the line have to be straight or the plane flat?

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essential mode of transportation until as late as 1969 when the last dogs were retired. There is still a small troop of horses maintained for the world renowned RCMP Musical Ride.

Sheriffs have not been mentioned because, unlike the United States, sheriffs in Canada have no responsibilities in criminal investigations. Each county or district has a sheriff who is responsible for assisting in the operation of the courts.

The organization of police services is another factor in the delivery of forensic science.

Forensic Science — The Beginnings

When people (including most Canadians) think of Canada it is unlikely that the word "first" springs to mind. About the only discoveries that might be attributed to Canadians would be insulin and snowmobiles. Some other Canadian inventions that you may want to remember the next time you play Trivial Pursuit (a Canadian invention) are the gas mask, the electric organ, the paint roller, the pocket pack of Kleenex, frozen foods, the beer carton with the pop-up handle, and Standard Time.

In 1876, Alexander Graham Bell made the first long distance telephone call from his father's home in Brantford, Ontario to Paris— not the one in France— but Paris, Ontario, five miles away. The first commercial jet passenger plane was developed and flown in Toronto in 1949 but, in typical Canadian fashion, it was decided we couldn't afford it and produced jet fighters instead. The first commercial oil well in North America was developed near Samia, Ontario in 1857, two years before the first in Pennsylvania. Again, in typical Canadian style, we decided there was no need for two wells in North America and closed ours. The oil had a very high sulphur content which made it unpleasant to use in lamps, its commonest application in those days. However, an advertisement in the London (Ontario) *Free Press* in 1859 notified that:

"Professor Croft of Toronto after much labour has succeeded in deodorising the oil and rendering it useful as an article of commerce."

Prof. Croft was also the first forensic chemist in Canada.

For forensic scientists however, the most significant Canadian first was the first government-funded forensic science laboratory in North America (and one of the first anywhere) established in Montreal in July 1914. It will be described in more detail below.

The first use of science by the police and courts was the evidence of medical practitioners to assist in determining the cause of death. In Canada, the first such records involve Dr. William Dunlop. A graduate of the University of Edinburgh, Dunlop was a lecturer in Medical Jurisprudence there in the 1820s. After emigrating to Canada, he practiced his profession and established a formidable reputation which earned him the nickname "Tiger". He is remembered not for his practice of forensic medicine but rather for his last will which stated in part:

"I leave Parson Chavasse a small token of my gratitude for the service he has done my family in taking a sister no man of taste would have taken."

In April of 1859, Professor Henry Holmes Croft testified at the trial of Dr. William Henry King in Cobourg, Ontario that he found eleven grains of arsenic in the stomach of Mrs. Sarah King. Dr. King was charged with the murder and was subsequently convicted and executed. This is the first record of the use of a science other than medicine in Canada that can be located.

Prof. Croft was born in England in 1820 and received his education in the University of Berlin. In 1843, at the age of only 23, he was recommended by no less an authority than Michael Faraday to become the first Professor of Experimental Philosophy and Chemistry in Kings College (now the University of Toronto). Croft's laboratory still exists as a round appendage to University College. The design and location was to prevent the transfer of odours to the main building. This was wise in view of the lack of refrigeration, the distance some specimens had to travel and Croft's penchant for working with well-seasoned evidence.

According to the book *"Dr. King's Life, Trial, Confession and Execution, Together With the Journal, Prison Scenes and Portrait; Also The Causes Which Led Him To Commit The Awful Crime"*, Prof Croft testified that, after finding the arsenic in Mrs. King's stomach he wrote to the coroner asking him to send Sarah's liver and kidneys since the arsenic might have been added to the stomach when it was displayed to the coroner's jury. Prof. Croft also testified that he found little arsenic in the liver, certainly not sufficient to cause death. The jury apparently disagreed and convicted Dr. King. The book does not enlighten us as to whether Prof. Croft learned anything about fallibility from this result but, as Dr. King was led up the gallows steps, he confessed that he had indeed murdered his wife, but with morphine not arsenic.

Croft kept current with developments in science and in 1876 testified in a case of a husband charged with the stabbing death of his wife, that not only were some stains on a knife blood (using Van Deen's guaiacum test), but they were: *"blood from one who could nurse young"*, presumably a female. For reasons upon which we can only speculate, he did not testify to such a finding later in his career.

Prof. Croft was succeeded by one of his students, Dr. William Hodgson Ellis, who had degrees in both chemistry and medicine. A record of his career in forensic science still exists in his laboratory notebook in the library of the Centre of Forensic Sciences. In a rape/murder case in 1878, in addition to the identification of blood, he testified to the significance of the number, size and position of bloodstains on the trousers of the accused man (i.e. bloodstain pattern interpretation). Ellis also introduced serological tests in 1904

only three years after their discovery by Uhlenhuth. He also made microscopic examinations of hair as early as 1897. Although he was a competent microscopist, nowhere in his notes is there any mention of examination for spermatozoa; also, nowhere is there any description of tests for alcohol even though Nicloux's method had been published in 1896. An interesting item found in his notebook is a newspaper clipping from the Rat Portage (now Kenora) News dated May 19th, 1900. It describes a coroner's inquest into the death by morphine overdose of one Oliver Doyle. Mr. Doyle is described as a heavy drinker who lived with a lady friend who was the proprietress of a brothel The story thus involved booze, sex and drugs— it could have been written just yesterday.

Prof. Ellis retired in 1919 but not before he made what proved to be his most significant contribution to forensic science, persuading one of his students, L. J. Rogers, to take up this work in 1911. At his birth in the late 1880s on a small Ontario farm, his parents could not possibly have predicted the career he would eventually choose, yet they christened him Linneus Joslyn Rogers. Linneus of course was after the great Swedish botanist; Joslyn was an old family name from a small Quaker-like sect whose religious practice was based upon *"giving witness"*. Linneus Joslyn was therefore *"the scientist who gives witness"*, a most appropriate name for a forensic scientist.

Rogers completed his Master's thesis in 1910 on: *"A Method for the Analysis of Chloral Hydrate in Tissue."* He became Professor of Analytical Chemistry in the University of Toronto in 1914 and held that appointment until his retirement in 1954. Until 1967, he continued active practice in the Attorney Generals Laboratory; his career thus spanned over half a century of some of the most significant developments in forensic science. Not only did he expand the scope of toxicological analysis, he also introduced blood alcohol analysis to the courts of Ontario in 1932 when he testified to finding alcohol in the stomach of a gentleman who died after consuming some moonshine. The moonshiners were fined for having liquor in their possession *"not purchased from a government vendor."* Rogers developed many of the techniques used in the scientific investigation of fires, explosions, safe burglaries, hit and run automobile crashes and firearms identification.

Stuart Kind in his 1988 Founder's Lecture on *"What Makes a Good Forensic Scientist?"* advised *"choose your parents wisely."* To this I would add *"choose your mentor wisely."* L. J. Rogers was my mentor and I could not have been more fortunate for he taught me his philosophy which essentially was *"don't theorize; experiment!"*

Developments in Quebec

In the early 1900s, Dr. Wilfred Derôme was Director of Laboratories at the Notre Dame Hospital in Montreal through whose windows the court house across the street stood in splendid view. This proximity led to Derôme being frequently summoned to provide expert testimony. Recognizing his need for more training, he travelled to France in 1909 to obtain a diploma in legal medicine at the University of Paris under Professor Balthazard. Because of Balthazard's interest in firearms, Derôme also become competent in this discipline and, in 1929, published the first book on the subject *"Expertise en Armes à Feu."* On his return from Paris, Derôme successfully lobbied the Attorney General of Quebec on the importance of this new specialty. In July 1914, the Premier announced the establishment of the Laboratoire de Recherches Médico-Légales. Initially, it was in a modest room rented for $75.00/month; the grand sum of $2,500 was provided for equipment. In 1924, it moved to somewhat larger, but no more modern premises on rue St. Vincent, a facility it continued to occupy until 1968 when it moved to its present location in the Sûreté du Québec Headquarters building on rue Parthenais. The Institute attracted little attention in Canada but a lot elsewhere. J. Edgar Hoover visited it twice before establishing the FBI Laboratory in Washington.

The Quebec Institute developed along European lines with the pathologists testifying to the results produced by their staff. From the beginning, Derôme reported on autopsies, fingerprint examinations, biological tests, and firearms examinations. Chemistry and toxicology were added in 1920 with the recruitment of a chemist, M. Franchère Pépin. In 1924, Dr. Rosario Fontaine, who also had studied in France, became Assistant Director and added document examination to the services. While in France, he had studied this subject under Professor Locard at Lyons. It was not until the 1950s that the Institute departed from the European style of the professor who testifies to everything and adopted the philosophy of specialization and sectional structure which, by then, were in place in other Canadian forensic labs.

Derôme published the first Canadian treatise on forensic medicine *"Précis de Médecine Légale"* in 1920. In another publication in 1930 he described the effects of blood alcohol levels. Based on this description, tolerance to alcohol must have been much greater than today, even after allowance is made for his by volume rather than by weight values.

"1. To the figures 1, 2 and 3 cc of absolute alcohol per litre corresponds a rather light intoxication. Some excitement and volubility may generally be observed; a flood of ideas assails the individual, particularly those of haughtiness and immodesty, which is sufficient evidence that the judgement is already perverted.

2. The figures 4, 5 and 6 represent the real phases of drunkenness which are productive of all sorts of crimes: obscene talk, abusive language, quarrels, wounds, rape, murder, etc. In that stage, the criminal act needs no explanation; it is rather expected.

3. The figures 7,8, 9 and 10 show our individual in the paralytic and co-

He may be seen sleeping himself sober in a rear corner of a ditch. Such pathological condition, however, is not without interest to the alienist on whom is incumbent the task of explaining the apparently beneficent loss of memory invocated by the drunkard concerning the motive of his criminal act.

Anyone who can write like that is clearly deserving of enormous respect. This was recognized by the Canadian Society of Forensic Science when it established its highest award of merit, the Derôme Medal.

Dr. Derôme died in 1932 and was succeeded by Dr. Fontaine who served as Director until 1964 and was followed by Dr. Jean-Marie Roussel. During this time the Institute was known as the *Institut de Médecine Légale et de Police Scientifique.* Subsequent Directors were J.P. Valcourt, B. Péclet, J, Dansereau and P. Boulanger. Today it is known as the Direction des Expertises Judiciaires and is headed by Yves St. Marie. It is a branch of the Ministry of Safety and Security and is comprised of six sections: Toxicology and Alcohol; Chemistry and Physics; Biology, Documents and Casino; Pathology; Forensic Accounting and Administration. The staff of 105 are all civilian. While all the Canadian labs were conceived in pathology, only the Montreal Institute retains it.

Another Canadian first, and one of which we are not so proud, was the first bombing of a passenger airliner in flight which occurred in Quebec in 1949. On September 9th, a Canadian Pacific Airlines DC-3 took off from the airport near Quebec City with 23 persons on board. Twenty minutes later it exploded killing all on board. Institute chemists examined the debris and, after much experimentation with dynamite bombs, identified the inorganic residues typical of a dynamite explosion on several parts of the baggage compartment. They also identified a portion of an Eveready dry cell battery. Their conclusion was that a dynamite bomb, triggered electrically, had exploded in the baggage compartment. Suspicion fell upon an M. Guay whose wife had been one of those killed and who had purchased an Eveready battery shortly before. He had a friend, M. Ruest, who was a watchmaker and on his workbench police found a piece of cardboard with multiple perforations and a black deposit. Tests showed this to be consistent with the detonation of an electric blasting cap. Given this and M. Ruest's occupation, it was reasonable to conclude that the device had been triggered by a clockwork timing mechanism. Both suspects were charged, convicted and executed.

Ontario

The second forensic science laboratory in Canada was established by the Attorney General of Ontario in 1932. Dr. Edgar Frankish, a pathologist, had studied under Derôme in 1926 and had established a small private medico-legal laboratory in Toronto. He was asked to become Director of the new *Attorney General's Medico-Legal Laboratory* located in part of an old house at 11 Queen's Park Crescent. Dr. Frankish travelled the province performing autopsies while his technician, Miss Verda Vincent, remained in the laboratory doing tests for blood, semen, hairs, fibres and plant materials. Toxicology was done by Prof. Rogers at the University. In 1941, Dr. Frankish became ill and the laboratory was left under the direction of a series of non-active doctors while Miss Vincent continued to do the lab work until her retirement in 1950.

In 1951, the Attorney General decided to revitalize the Laboratory. Dr. Noble Sharpe was asked to head it but he recognized that forensic science was no longer just a medical science but covered a much broader range of sciences. He recommended that a scientist be Director Dr. H. Ward Smith, a pharmacologist, was recruited from the University of Toronto and the modern era of forensic science in Ontario began. Later that year, the laboratory moved from Queen's Park Crescent around the corner to what had been the Hospital for Sick Children. The 3,000 square feet of lab space seemed more than ample. Dr. Smith began to assemble around him a group of young scientists of varying backgrounds and the services offered began to expand. From the beginning, this laboratory operated on a specific rather than a generalist basis.

By 1957, the staff of the *Attorney General's Laboratory* had increased from three to fourteen and the laboratory was moved into 11,000 square feet of redesigned space in what had been a liquor warehouse at 8 Jarvis Street. Although the building was shared with the headquarters of the Ontario Provincial Police, Dr. Smith insisted on maintaining a distinct identity by having a separate entrance and address and ensuring that laboratory reports were addressed to the Crown Attorney.

In 1966, the name was changed to the *Centre of Forensic Sciences* to enhance the appearance of independence from any prosecutorial authority. It is now a branch of the Ministry of the Solicitor General and Correctional Services. Dr. Smith died in 1967 and the author succeeded him In 1975, the Centre moved into a 70,000 square foot facility at 25 Grosvenor Street which it still occupies. The specialized sections of the laboratory are Biology (including serology, hairs and fibres, plant materials and, since 1990, DNA analysis), Chemistry (including trace evidence, flammables and explosives, GSR, soil, electronics, engineering and casino quality control), Documents and Photography, Firearms and Toolmarks, and Toxicology (including police breath test quality control).

In 1992, a 16,000 square foot Northern Regional Laboratory was established in a new government building in Sault Ste. Marie, Ontario. Its 13 member staff provides all services except Documents and DNA to the vast reaches of Northern Ontario.

The Centre and its regional lab have a total staff of about 140 civilians who provide service to all law enforcement agencies, coroners and other investigators in the province. As with the other Canadian labs, services are provided at no direct cost to the users. The author retired in 1994 and was succeeded by George Cimbura.

The RCMP Laboratories

In 1931, the Commissioner of the RCMP wrote to many of the large law enforcement agencies in the United States seeking their advice on how to establish a laboratory. A reply from the President of the Northwest Association of Sheriffs and Police recommended that:

"Beyond anything else, the police background of personnel running the establishment could not be overly emphasized. Doctors and chemists, ordinarily without a criminal investigation background are unsuited to this class of work. So many things will occur to the experienced investigator which would not occur to the doctor or chemist who have not been trained along investigative lines, that any comparisons between the two types are odious."

While many of us would take exception to this, it was the conventional wisdom then, and for a long time after, in many departments, including the RCMP.

In 1936, Dr. Maurice Powers a graduate in medicine from McGill University, having heard about the Commissioner's interest in establishing a "medico-legal department", wrote the Commissioner applying for the position. While at McGill, Powers had attended lectures in forensic medicine presented by Dr. Fontaine. Dr. Powers was inducted into the RCMP as *"Force Surgeon"* at a starting salary of $150/month on December 30, 1936. He was immediately sent to New York for six months of practical instruction in the Medical Examiner's Office and at the NYPD. He studied serology, microscopy, toxicology, photography and ballistics as well as pathology. While this amount of training in so many disciplines might appear inadequate by today's standards, it was quite substantial for the time.

When Dr. Powers returned to Regina, he was undoubtedly anxious to start applying his newly acquired expertise but first he had to be properly prepared. The Commissioner wrote to the Training Division CO:

"As Surgeon Powers has had no training, will you please have an Officer give him such personal instruction, particularly in saluting, as is necessary for a Surgeon in this Force."

On September 22, 1937, The Commissioner formally announced that a scientific laboratory had been established at Regina to assist all the Divisions in their investigations. The facility was quite modest, a bedroom in the officers' mess. By 1939, the basic equipment had been obtained but the new Hilger Spectrograph ordered from England was delayed by having to run the German naval blockade. The Regina lab moved into a proper facility in 1953 which was replaced with a new laboratory building in 1995.

Powers assembled a group of police officers with appropriate qualifications as his staff. Corporal S. Lett was trained in document examination in Toronto and Washington; Sgt. J. Mallow, a graduate in engineering, qualified in fingerprints and photography. Sgt. J.A. Churchman a veteran of the British army in World War I and at the time the NCO in charge of the Montreal Drug squad had, by coincidence, just published an article *"Powder and Ball"* in the *RCMP Quarterly*. He was sent for training in "ballistics" to the New York City Police Dept. Lance Corporal James Robinson came from the Northwest Territory Patrol to be trained in hairs and fibres.

One of Robinson's recollections concerned his attempt to build a collection of hair standards. He asked a constable in the north to obtain samples from the Eskimo and sent him four envelopes, labelled "Scalp - Male", "Pubic - Male", "Scalp - Female" and "Pubic - Female". In due course the first three envelopes were returned with a handwritten apology from the constable stating:

"I am not able to fill the fourth request as the women I know well enough are not in the settlement at the present time."

Once the pattern of specialized examiners had been established in Regina, Dr. Powers recorded the impracticality of sending exhibits from all over Canada to this one labora-

Douglas M. Lucas (r) with Raymond Davis

tory He therefore persuaded the Commissioner to open a second laboratory, at Ottawa, in 1942. In March 1943, Powers was appointed Director of RCMP Laboratories but, unfortunately, did not live to fully exploit his new authority. In October of that year, while flying from North Battleford to Saskatoon, his RCMP pilot became lost in a snow storm, the plane struck some telephone wires and crashed killing both Powers and the pilot. This was a tragic loss to the RCMP and its laboratories for this prime mover and organizer of laboratory services undoubtedly had much more to contribute.

Surgeon Powers was succeeded briefly as Director by Sgt. Mallow who had expanded his range of expertise through a two month course in toxicology and blood chemistry in New York. He later added the analysis of glass, paint, soils and metal filings to the repertoire of the laboratory. In 1946, Dr. C.D.T. Mundell assumed command. He served only two years and, following his retirement, the laboratories no longer provided pathology service. Inspector Churchman became Director of Laboratories and began the process of further regionalization with the establishment in 1957 of a laboratory in Sackville, New Brunswick. Space problems dogged this laboratory as it moved from one building to another. In one location the officer in charge complained to Ottawa that:

"The bullet recovery apparatus is housed separately in a chicken shed a quarter of a mile away."

One of the features of the parliamentary form of government is that members of the cabinet are in the House of Commons each sitting day during *"Question Period"* when they can be asked any question about their portfolio by any member. Astute managers in the public service have been known to take advantage of this by quietly slipping information for a question to a member of the opposition. The media cover Question Period closely since it is a great source of material with which to embarrass the government. While it cannot be confirmed that the RCMP was responsible, this process was successful in getting a laboratory opened in Vancouver. The Force had been trying without success to establish a lab there and in July 1960 a question was asked of the minister responsible for the RCMP (who also happened to represent a British Columbia constituency):

"I am told that one or two RCMP members spend more time travelling by plane to court in British Columbia than they spend in the laboratory at Regina. Would the Minister tell us what study has been made of the situation and whether any thought has been given to the establishment of a laboratory in British Columbia."

Three years later the Vancouver laboratory was opened. (One member of the serology section in Regina actually had travelled 89,000 miles in one year for court appearances.) The original building was not designed for forensic laboratory purposes and the NCO in charge complained that the concrete blocks used to bulletproof the firing room:

—are not sufficient to prevent a bullet from escaping the building. This would lead to adverse publicity"

(to say the least). In fact a bullet did escape one day but fortunately caused only property damage to the marble staircase in the entrance. A modern laboratory building was built and opened in 1975.

Pressure to increase the number of laboratories continued, some of it due to operational requirements and some, it must be acknowledged, political (The argument *"if they have one, why shouldn't we?"* is hard for a politician to resist.) The Province of Alberta started talking in 1967 about establishing forensic laboratories in both Calgary and Edmonton. Because the RCMP police the province on contract, they agreed to establish a lab in Edmonton in 1968.

The introduction of breath testing in Manitoba in 1969 was the driving force behind the opening of a lab in Winnipeg in 1970. Originally planned as a sub-section of the Regina Laboratory, it would provide only scientific support to the Breathalyzer program By this time however, the workload in Regina had outgrown its facility and, rather than enlarge it, in 1972 it was decided to expand Winnipeg to full laboratory status. This laboratory moved into a new facility in 1986.

By 1978 the Sackville laboratory building had outgrown its usefulness and the decision was taken to build a new laboratory in Halifax to serve the maritime provinces. When it was completed, the Sackville lab would be closed. As might have been predicted by anyone who has ever tried to close a laboratory, the problems were insurmountable. Halifax opened but Sackville did not close, although thirty of its positions were transferred to Halifax. Sackville eventually did close as part of an austerity program in 1992.

Counterfeit currency has long been a problem in Canada. As early as 1880, the problem was recognized however, in the absence of any professional expertise available to the police to provide evidence for prosecutions, they turned to an obvious source of expertise — other successful counterfeiters. These individuals were not only able to establish the spurious nature of exhibits but were also capable of recognizing the workmanship of their competitors. Reported losses were probably more fiction than fact since much counterfeit currency circulated freely in the market place without its true nature ever being detected. In the early 1970s, 85% of all the uttered counterfeit money surfaced in Canada was in the Province of Quebec. The RCMP therefore decided to open a *Counterfeit Document and Examination Centre* in Montreal in 1979. This section also fell victim to austerity and was recombined with the Ottawa lab in 1992. In the early 1970s, the Ottawa lab moved from

the beautiful grounds of "N" Division in Rockliffe Park along the banks of the Ottawa River where the horses of the Musical Ride graze, to a new facility at RCMP Headquarters in Ottawa. It is now the RCMP Central Forensic Laboratory and serves as lab headquarters and as a training and research facility.

Originally, aside from Surgeon Powers who was actually civilian although he wore a uniform, all laboratory staff members were sworn officers. To develop the necessary expertise, the Force had a program of sending members to universities to obtain degrees, a few even to the PhD level. This program could not keep up with demand so the Force started recruiting *"Civilian Members"* in 1951 to supplement the *"Regular Members."* As might be expected in an organization with such a strong quasi-military tradition, these members, regardless of their academic background, had a lesser status than the regular members. For example, they were only permitted to use the sergeants mess since they did not have the status required for the officers' mess. The problems familiar to any organization with a mixed sworn / civilian staff resulted in a decision in the early 1980s to entirely civilianize the laboratories. This has been accomplished gradually through attrition and voluntary transfer of regular members to the extent that currently less than 5% of the almost 350 staff members in the six laboratories are regular members. The labs are part of National Police Services established to serve the needs of all law enforcement agencies and criminal courts in Canada. The current Director of Laboratory Services, Dr. Harold Peet is the first civilian to hold that position which has the status of an Assistant Commissioner. His predecessors include Supt. J.A Churchman (1948-59), Supt. A. Mason-Rooke (1959-65), A/Commr. C.R. Eves (1965-69), A/Commr. R.A. Huber (1969-75), A/Commr. A.M. Headrick (1975-84), A/Commr. P. S. Gazey (1984-87) and A/Commr. R.A. Bergman (1987-90).

The reasons for locating a forensic laboratory in an area include the attitude of law enforcement officials, the political climate, budgetary considerations, availability of qualified staff and, sometimes, one would hope, the need. In the RCMP, the specific criteria that have been used are:

1. *An area having more than 60,000 reported crimes per year or,*
2. *An area having more than 36,000 reported crimes per year with a 2.5 cases/ law enforcement officer submission rate.*
3. *An area having a laboratory case load in excess of 4,500 per annum.*

These case load figures may seem low but they do not include many of the high volume types of cases such as drugs and DWI alcohols. Most of the latter are done by police breath test technicians while most of the former are done in a separate lab system which is part of the Health Protection Branch (formerly Food and Drugs) of the Federal Department of Health and Welfare.

Other Laboratories

Aside from the RCMP, progress in forensic science elsewhere in the country was sporadic and varied. Beginning in about 1890, the British *Columbia Department of Mines Laboratory* in Victoria provided a few services including *"blood identification"* to police on the Pacific coast. Toxicology was added in the early 1900s and, in 1943, the Provincial Analyst, Dr. C. G. B. Cave, added some criminalistics type examinations. This work ended when the laboratory burned down in 1958. In the 1920's, the *Vancouver City Analyst Laboratory,* established in 1907 under J.F.C.B. Vance, began assisting police and coroners on the British Columbia mainland with toxicology and a few other services. In 1953, the City Analyst, E.J. Fennell persuaded the Vancouver Police Dept. to introduce breath tests for alcohol using the Harger Drunkometer. This device continued in use until 1957 when it was replaced with the Breathalyzer which was the only instrument used in Canada until the 1990s and which is still widely used in less populated areas. The City Analyst Lab closed in 1995. The *Vancouver Police Department* also established firearms and documents sections in 1947. It is the only police force in Canada, other than the RCMP, to have an internal forensic science service other than latent prints.

The only other forensic laboratory services provided by government in Canada are toxicology services provided by the *Office of the Chief Medical Examiner for Alberta* in Calgary and by the *Toxicology Laboratory of the Victoria General Hospital* in Halifax.

There are no academic programs in forensic science in any of the Canadian universities. All of the Canadian labs, of necessity, provide their forensic training of staff in house.

The Canadian Society of Forensic Science

In March 1953, Dr. Charles Farmilo of the Food and Drugs Laboratory in Ottawa and Inspector James Churchman of the RCMP, who had been having periodic informal discussions about the need for a forum for interchange of information between forensic scientists in Canada, met with several others at the RCMP Laboratory. Dr. Farmilo was elected chairman of an organizational committee and invitations were sent to potential members to attend a meeting on October 16th, at the National Research Council building in Ottawa. Twenty-one persons attended from Montreal, Toronto, Ottawa and St. John. Seven delivered papers. The name of the organization was agreed upon as the *Canadian Forensic Society.* Already one of the problems of two official languages was apparent as the motion for the name was proposed by a member from Montreal and it was not until six years later that the omission of the

word "science" from the name was corrected.

In 1963, the *Canadian Society of Forensic Sciences / La Société des Sciences Judiciaires* became incorporated. Annual scientific meetings are held in various locations across the country. In January 1963, the Society began publishing a Newsletter which was superseded by a Journal in 1968. In addition to its charter, seal and heraldic emblem bearing the slogan *"Science in the Aid of Justice"*, the Society has a very special gavel that passes from one President to the next. The CSFS gavel incorporates, as an expansion wedge to hold head and shaft together, a sliver of mastodon tusk retrieved from the Yukon River. The head is Canadian oak, the shaft Canadian elm and the metal discs on the head are from a Northern Ontario mine.

Membership in the Society is now over 600. The Society is also the principal scientific advisor to the Federal Minister of Justice. The Alcohol Test Committee advises on draft legislation, sets standards for equipment and test procedures and evaluates and recommends equipment for ministerial approval. The DNA and the Drugs and Driving Committees provide similar advisory services.

Conclusion

Forensic science in Canada has a long and eventful history. Canadian forensic scientists, with good reason, take pride in their heritage and their distinguished predecessors. The development continues and, some time in the next 50 years, I expect that another Canadian will be privileged to present your Founder's Lecture and tell tales about some of those interesting characters of the 1990s.

Acknowledgements

A paper such as this is based to a considerable extent on anecdotes and legends, the provenance of which is difficult, if not impossible, to establish. A conventional list of citations is not, therefore, appropriate however several valuable sources of information must be acknowledged. Harold Peel Director of Laboratory Services for the RCMP provided much of the information about that agency while Yves St. Marie did the same for the Quebec Institute. A fascinating book, *"A Century of Crime"* by Marjorie Freeman Campbell published in Toronto in 1979 was the source of much of the information from the 1800s. In 1969, The Canadian Society of Forensic Science Journal published articles by Roussel Huber and Lucas on the history of the profession in their respective jurisdictions. Similarly, the Silver Anniversary edition of the same Journal in 1978 contained excellent papers on the development of the various specialties by Churchman, Huber, Baird, Emson, Cimbura, Doriou, Clair, Dawson, Kirby, Brown, Erickson, Charlebois and Lucas. These have been a gold mine of information. An article by Garry Saunders on *"The Fiftieth Anniversary of the Crime Detection Laboratories"* in the RCMP Gazette in 1987 was the source of much of the material about those labs. All of these supplemented by informal discussions over a beer with too many colleagues to name have been my sources. Any inaccuracies are, however, my sole responsibility.

Forensic Potpourri

ure, elapsed time since death, skeletal trauma, postmortem damage and alteration of the skeleton, and establishing positive identification based on skeletal and dental evidence. Such information can be obtained from complete bodies or those partially destroyed by burning, air crashes, intentional mutilation and dismemberment, explosions, or other mass disasters. In fact, a forensic anthropologist is now an integral member of most mass disaster teams.

Conclusion

Many forensic anthropologists offer their services to law enforcement agencies, coroners, and medical examiners. However, if a law enforcement agency does not have access to a forensic anthropologist, experienced experts can be found in many of the larger universities, in anthropology museums throughout the United States, and in some medical examiner's offices. It should be noted, however, that not all physical anthropologists are qualified to practice forensic anthropology. A list of board certified forensic anthropologists can be obtained from the American Academy of Forensic Sciences. Forensic anthropologists have much to contribute to law enforcement and would welcome the opportunity to assist in the successful resolution of an investigation.

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* * *

Ultraviolet Forensic Imaging

Imagine the same ultraviolet rays that cause people to get sunburns in the summer also helping to catch and prosecute criminals. Researchers are discovering that these rays can literally "cast a new light" on evidence that might not even be detected using conventional investigative techniques. While ultraviolet (UV) technology is still in its early stages, it has already helped to solve crime and is proving to be a significant development in the field of forensic research. Ultraviolet Light

The word "ultraviolet" means

simply "beyond violet." Think back to high school science classes about the rainbow. Its colors are merely the sun's white light split by a prism. At the top of this spectrum is red, followed by orange, yellow, green, blue, indigo, and finally, violet. The next tint in the prism would be ultraviolet, but our eyes cannot see this color. However, photographic equipment can visualize the ultraviolet spectrum quite well.

Uses of Ultraviolet Light

How can ultraviolet or "invisible" light be used in law enforcement? One application is in the analysis of bite marks on human skin. In searching for better ways to photograph bite marks, it was discovered that ultraviolet light provides more detail and contrast to an injured area than standard lighting techniques. This discovery led to the development of two techniques for ultraviolet photography.

In one method, known as reflective ultraviolet imaging, the wound is flooded with UV light, and the reflected ultraviolet image is photographed. An ultraviolet bandpass filter mounted on the camera lens blocks all light returning to the film except UV. Proper film selection ensures that only the UV light rays reach the film. Many powerful electronic flashguns produce sufficient ultraviolet illumination for this process.

In the second method, called fluorescent ultraviolet imaging, the wound is flooded with only UV light. However, a different filter is used to block all UV rays returning to the camera so that only the visible light colors fluorescing from the wound will be captured on the film. This type of fluorescent photography must be performed in darkness.

Results

The results have been surprising. Thus far, the photos produced by the reflective ultraviolet imaging method have proven most useful. These photographs show wounds in greater detail than would be possible with conventional photographic equipment and reveal images of wounds that could not be seen by the naked eye. Certain qualities of UV light make these results possible. Because ultraviolet light waves are very short (only a few millionths of 1 millimeter), their maximum penetration into human skin is usually less than that of visible light. (Due to variations in skin pigmentation, thickness, and other tissue factors, the penetration of UV can vary by up to 1.5 millimeters.) Because of this limited range, wounds that are deeper than 1.5 millimeters will only rarely be revealed in ultraviolet light. Still, though UV light waves are short, they are very intense. Therefore, any pigmentation, wound pattern, or bruises on the surface of the skin, no matter how faint, will be revealed.

Linking Technologies

Although preliminary results of UV photography were very encouraging, limitations to its usefulness as a forensic tool soon became apparent. Potentially valuable physical evidence, such as minor wounds that could not be seen without enhancement, was being overlooked. Because investigators had no indication of these trace injuries, they did not request UV photography, which could have revealed the injuries in greater detail. Therefore, a system was needed to provide an ultraviolet scan of victims so that investigators could "see" any injuries or marks that would otherwise be missed. A solution was developed by combining several technologies. A video intensifier tube, which is sensitive to light waves from the ultraviolet spectrum through the infrared, was modified to detect only ultraviolet light waves. With the modification, the ultraviolet image is intensified over 70,000 times. The resulting images are displayed on a video screen contained within the device, which can be linked to other video equipment, such as a standard video cassette recorder (VCR), a graphics computer, or a conventional camera for still photographs. Use of the intensifier and VCR allows investigators and forensic researchers to visualize an ultraviolet image immediately, without waiting for film to be developed. The entire body of a victim can be scanned to highlight injury patterns that might otherwise go unnoticed. The equipment also vastly enhances the quality of still photographs, since the hand-held spotlight provides uniform illumination of the skin's surface.

Additional Uses

Other aspects of crime scene and suspect investigations have been enhanced through the use of the intensifier. In one case a suspect reportedly shot himself when challenged by a police officer. The officer stated that the victim grabbed his pistol in a reverse grip, and using his thumb as the trigger finger, shot himself in the heart. The victim's family, however, claimed that he had been shot by the officer. Using the trace metal reagent and ultraviolet illumination, the forensic examiner was able to illustrate graphically the pattern of metal contact from the pistol to the hand of the shooter. Analysis proved that the victim held the gun and shot himself. Marks on the trigger thumb and on the palm of the hand used to steady the gun documented in every detail the officer's version of the incident.

Conclusion

The limits of this technology remain unknown. However, case evidence illustrates the value of ultraviolet technology to law enforcement. Ultraviolet light allows investigators and forensic researchers to examine clues and recover evidence that could not have been detected previously. While the application of ultraviolet light is still a relatively new field, it promises to be an indispensable tool for law enforcement.

—Michael H. West, D.D.S. and Robert E. Barsley, D.D.S., J.D.

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Barnett, cont'd

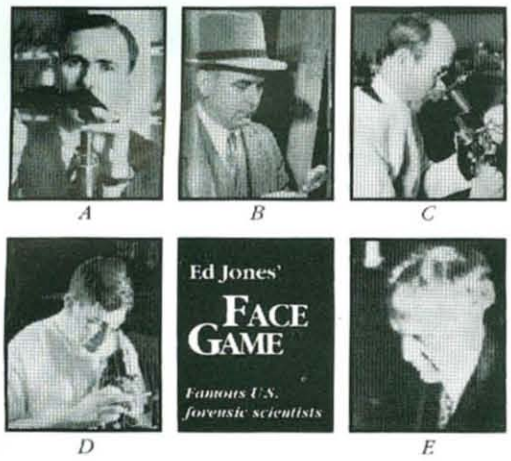
the responsibility for the development of this asset falls squarely on the professional, and this responsibility can neither be avoided nor assigned to another person or organization.

"Knowledge of some department of learning or science" — There is some body of knowledge or procedures that "belongs" to the profession. This is equivalent to saying that there is some category of questions that is unique to the profession. There are, of course, many technical aspects of criminalistics that appear to be unique to our profession: Firearms identifications, genetic typing of dried blood stains, investigation of clandestine laboratories, or comparison of suites of trace evidence. I think though, that these technical aspects miss the main point: The job of the criminalist is to reconstruct a unique incident from the past, and to apply that reconstruction in a process that will have a real effect on someone on the present. What other profession, or intellectual activity, has that responsibility?

"Application to the affairs of others" — This is, I believe, the critically defining element of a profession. The "others" to which we apply our knowledge are more or less ignorant about our department of learning or science, and are, therefore, unable to fully evaluate the quality of its application to their particular affair. Our obligation, then, is to ensure that we effectively apply criminalistics to those affairs of others where such application would be of value. This application carries with it a responsibility to convince the user that the information we can provide should be sought and used. A failure of a professional obligation has occurred when a student does not study, a patient does not take prescribed medication, or a jury ignores evidence and reaches a verdict contrary to the evidence.

The role of the CAC is to assist its members in achieving their professional aspirations and fulfilling their professional obligations. It accomplishes these goals by developing, defining and disseminating the "department of learning or science" that all must have in order to practice, and provides us with a collective voice for the "application to the affairs of others" the learning and science that we possess.

Recreations



Answers

A) **Calvin Goddard** (firearms), "Science Catches the Criminal", H. Robinson, Blue Ribbon Books, NY, 1935. B) **Arthur Koehler** (wood ident.), "Kidnap: The Story of the Lindberg Case", G. Waller, Dial Press, NY 1961. C) **Luke S. May** (trace), "Luke May of Seattle...", J. Beck, *J. For. Sci.*, 37(1). D) **Milton Helpern** (pathology), "Autopsy", Helpern and Knight, ISBN 0-312-06211-7. E) **Robert W. Wood** (UV in forensic sci.), "Crime Lab", D. Loth, Messner, NY, 1964

Words to Live By

"Juries hate scientific evidence. They think they won't be able to understand it so naturally they can't understand it. As soon as you step into the box you see a curtain of obstinate incomprehension clanging down over their minds. What they want is certainty. Did this paint particle come from this car body? Answer yes or no. None of those nasty mathematical probabilities we're so fond of.

"If they hate scientific evidence they certainly hate arithmetic more. Give them a scientific opinion that depends on the ability to divide a factor by two-thirds and what do you get from counsel? 'I'm afraid you'll have to explain yourself more simply, Mr. Middlemass. The jury and I haven't got a higher degree in mathematics, you know.' Inference: You're an arrogant bastard and the jury would be well advised not to believe a word you say."

P.D. James, DEATH OF AN EXPERT WITNESS, Warner Books, New York, 1977, page 96.

Robert's Rustic Rubrics

1. The Three Levels of Talent:

1) Those with superior talent become creators

2) Those with sufficient talent become teachers

3) Those with no talent whatsoever become critics

—Submitted by Bob Ogle

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