NEWSLETTER
California Association of Criminalists

JUNE 1982

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This mailing includes the following items:

1. Seminar Abstracts - May 1982
2. Fall Seminar Announcements and Abstract Forms
3. Minutes - Board Meeting, March 5, 1982

OFFICERS FOR 1982-1983 (* Elected at Spring Seminar)

President - Fred Tulleners
*President Elect - John DeHaan
*Recording Secretary - Luke Haag
*Membership Secretary - Steve Cooper
Past President - Ed Rhodes
Treasurer - Mike White
Editorial Secretary - Geo. Sensabaugh
*Regional Director North - Benny Del Re
*Regional Director South - Sandy Wiersema

You will note a change in the Treasurer. Duane Lovaas resigned as Treasurer effective 30 June 1982. According to the By-Laws, in such circumstances the President appoints a replacement subject to Board approval. Mike White has been designated as Duane's replacement and will officially begin 1 July 1982. The transition of the books is in progress and should be in order in a month or so.

ASSOCIATION ACTIVITIES

Northern Section Meeting. The April dinner meeting was hosted by the Oakland PD and featured as speaker Dr. Donna Bakale of Surface Science Associates. Dr. Bakale spoke on instrumental elemental analysis and Surface Science's unique Use-an-SEM program.

Southern Section Meeting. The Santa Ana PD hosted a meeting in March featuring Dr. Van Thorp who spoke on alcohol and its effect on driving ability.

Study Group Meetings

1. Northern Trace Study Group. At the April meeting, Dennis Stetner, a Nikon representative, discussed factors which should be considered in the selection of a polarized light microscope. M. Blake distributed carpet fibers which formed the basis of the current fiber practical. Results of the fiber practical will be discussed in subsequent meetings.

2. Southern Serology Study Group. At the April meeting, John Hartman of Orange County SO discussed cytology with an emphasis on cells found in vaginal preparations.

UPCOMING MEETINGS

California Association of Criminalists - First Inter-American Congress of Forensic Sciences

1-5 November, 1982. Sacramento, California. Contact John DeHaan, Calif. Dept. of Justice Laboratory, Box 13337, Sacramento, CA 95813.

Mid-Atlantic Association of Forensic Scientists

Joint meeting with the Society of Forensic Toxicologists, 13-15 October, 1982. Rosslyn, Virginia. Contact Dr. Marina Stajic, Office of Chief Medical Examiner, Fairfax Hospital, 3300 Gallows Rd., Falls Church, VA 22046, (703) 560-7944 or Dr. Tony Cantu, BATF National Lab, Rockville, MD 20850, (301) 443-5213.

Northwest Association of Forensic Scientists

6-8 October, 1982. Portland, Oregon. Contact George Matsuda, Oregon St. Police Crime Laboratory, 222 S.W. Pine St., Portland, OR 97204 (503) 229-5017 or 248-5736.

Canadian Society of Forensic Science

30 Aug - 3 Sept. 1982, Halifax, Nova Scotia. Contact C.S.F.S. 171 Nepean St., Ottawa, Ont. K2P 0B4 (613) 235-7112.

Asian Pacific Congress on Legal Medicine and Forensic Sciences

18-22 Sept., 1983. Singapore. Contact Dr. Wee Keng Poh, Medico-Legal Society, 4-A College Rd., Singapore 0316.

International Association of Forensic Sciences

Summer 1984. Oxford, England Contact IAFS, c/o Forensic Science Society, P.O. Box 41, Clarke House, Harrogate, North Yorkshire, GH1 1BX, England.

WES SUMMERFIELD
1930 - 1982

Ill with the aftermath of a back injury complicated by diabetes, Wes Summerfield died March 11, 1982. He was hospitalized several times during the last year with a long and complicated illness, but was at home asleep when he passed away.

Wes began his Department of Justice State lab career at Riverside in 1973. As the first editor of the DOJ TIE-LINE journal, he gave shape to many concepts carried on in the lab system. He was first to set-up a university student-aide research program for the State lab system. One of the earliest contributors to the research program, he also compiled the first resource manual on explosives analysis. As training coordinator, he administered the updated firearms and trace/instrumentation training courses by correspondence for many criminalists, some outside DOJ. Crime lab systems in other states have implemented many of the training, research and newsletter concepts that Wes pioneered. He was reassigned to lab casework in 1979 in Sacramento and provided assitance to the special CHP Multiple Disciplinary Accident Investigation Team and other agencies in complicated cases.

Wes grew up in Reno. His four years of Navy service was as a medical technician. He was a Korean war vet. After a career in atomic chemistry at the Mercury test site, he set-up the first crime lab in Nevada.

Professionally active as IAI (Nevada) editor, trainer, member of CAC and the American Academy, he still had time for community activities such as scouting, drug abuse education and Pop Warner football. His intense, energetic, enthusiastic spirit will be missed by all those who knew him.

Buried in Reno, he leaves Edith, his wife of thirty years, a son Scott, daughter Patty and many friends in many places.

EMPLOYMENT OPPORTUNITIES

Criminalists - Orange County Sheriff-Coroner

The crime laboratory will be recruiting for criminalists at the entry and journeyman levels. Requires B.S. degree in the physical, biological, or forensic sciences. Contact Margaret Kuo, Chief Criminalist, Forensic Science Services, Orange County Sheriff-Coroner, 550 N. Flower St., Rm. 201, Santa Ana, CA 92702 (714) 834-3073.

Polygraph Examiner - San Diego

Requires experience in law enforcement polygraph examinations. Contact Martin Rigby, City Administration Bldg., 202 C st., San Diego CA 92101 (714) 236-7139.

Assistant Laboratory Manager - Ventura County

Requires at least a B.A. or B.S. with a major in Criminalistics or a relevant natural or physical science and five years experience in forensic analytical work, including one year in a supervisory or administrative capacity. Responsibilities, under the general direction of the Laboratory Director, include administrative, operational, and staff supervisory activities. The laboratory has recently relocated to a brand new, expanded laboratory facility. Contact or send resume to Dr. A.K. Bergh, Director, Ventura County Crime Laboratory, 800 S. Victoria Ave., Ventura, CA 93009 (805) 654-2332.

Criminalist - Grand Junction, Colorado

Requires 2 years experience plus 2 years college level chemistry, also specialized training in photographic techniques. Contact Personnel Department, City of Grand Junction, 250 N. 5th St., Grand Junction, CO 81501.

Criminalist/Drug Analyst - Phoenix, AZ

Requires bachelor's degree in chemistry, criminalistics, or related field. Contact City of Phoenix Personnel Dept., 10 N. 3rd St., Phoenix, AZ 85003.

ETHICAL DILEMMA

By Peter Barnett
Forensic Science Associates

In reaching a decision about any issue most people would prefer to consider all of the information relevant to that issue. People charged with the responsibility of making a decision, whether they be scientists dealing with scientific issues or laymen on a jury charged with reaching a verdict in a lawsuit, would prefer to be able to make for themselves the decision to disregard certain types of evidence which they decide is irrelevant to their consideration. Certainly, not to have relevant information adversely affects the decision making process. To have the decision about what information will be available for consideration by the decision-maker made by another authority is frustrating and gives rise to feelings of being misled.

In our legal system we have decided, as a matter of policy, that some kinds of evidence will not be made available to the jury, or perhaps even to technical experts, in the investigation or trial of a lawsuit. There are several legal principles under which certain types of evidence or information may not necessarily be provided to certain of the parties in a lawsuit. In many cases, the decision to provide, or not to provide, information from one participant to the other in a lawsuit is easily made. In other situations, the decision is not obvious and the individuals participating in the lawsuit must make their own decision as to what their proper course of action should be. The case described below presents such a situation:

A defendant is charged with the commission of several sexual assaults. The examination of the evidence obtained from the victims of these sexual assaults reveals that, in the opinion of the original examiner, the evidence is consistent with the assaults being committed by the defendant.

All of the evidence is then submitted to an independent laboratory for re-examination. Re-examination results in the finding of antigens in several of the cases which are foreign to the defendant and the victim, or in the failure to find antigens from the defendant that should be there given the amount of semen present. Based on this information the defense consultant indicates that it is his opinion that the evidence does not support the charges against the defendant in several of the cases. This information is provided to both defense counsel and the prosecuting attorney.

The prosecuting attorney decides to hire another consultant to do additional examination of the evidence and act as a consultant to the prosecution. The prosecution's consultant confirms the analytical results obtained by the defense consultant. The prosecution consultant indicates to the prosecuting and defense attorney that his findings are essentially the same as the defense consultant: That is, that the evidence does not support the allegations against the defendant in several of the offenses.

Ethical Dilemma

At trial, the defense consultant testifies that, in his opinion, the evidence does not support the allegations. The prosecution consultant testifies, but does not mention his agreement with the defense consultant. Rather, he describes the various difficulties and pitfalls in examining this type of physical evidence. He is not asked any questions either in direct or cross-examination concerning his examination of the physical evidence. The overall impact of his testimony is to emphasize the difficulty and unreliability of examination of the biological evidence in sexual assault cases. This, of course, provides evidence which the prosecuting attorney can use in argument to challenge the testimony of the defense consultant.

Section III. G. of the CAC Code of Ethics says, "It is not the object of the criminalists appearance in court to present only that evidence which supports the view of the side which employs him. He has a moral obligation to see to it that the court understands the evidence as it exists and to present it in an impartial manner". In this case the prosecution consultant had fully informed both defense counsel and prosecutor of his opinion that the evidence did not support the allegations against the defendant. Does this absolve the criminalist of all responsibility to make his opinion known to the court? Does the criminalist have the obligation to make his opinion known to the trier of fact, in this particular case a jury, or only to the "court" as Section III. G. states? What should the criminalist do to make sure his opinions are put before the trier of fact?

The response to the last ethical dilemma was small, and divided. Dave Stoney, Jim Gaskill and Art Terkelson feel that neither of the criminalists have committed an ethics violation. Gaskill and Terkelson suggest that laboratories should discourage attorneys who are "shopping for experts". Stoney differentiates between discrete items of evidence and the overall case. He contends that as long as the criminalist "considers fully the evidence surrounding any particular test or interpretation of a test result" he has fulfilled his obligation, but if he "suspects there has been a deceptive screening of the evidence which would affect the validity of the tests, (he has) an obligation to correct the situation". Stephen Shaffer feels that the first criminalist (who recommended that a second criminalist re-examine a portion of the evidence) has violated Section III. H. of the Code of Ethics. The second criminalist has, according to Shaffer, violated Section III. G. of the Code of Ethics if he is aware of the situation. Carol Rhodes essentially agrees with Steve Shaffer, and both agree that the criminalist cannot "knowingly and intentionally assist the contestants in a case through such tactics as will implant a false impression in the minds of a jury".

Response to June Ethical Dilemma

◯ The criminalist has fulfilled his ethical obligations.

◯ The criminalist has violated Section __________ of the Code of Ethics.

Comments:

Return to: Peter Barnett
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Emeryville, Ca. 94608

BIBLIOGRAPHY OF ENZYME (AND SOME OTHER) GENETIC POLYMORPHISMS IN SOUTHEAST ASIA

A. Baer, Department of Biology
San Diego State University
San Diego, CA 92182

(Editor's Note: The following bibliography was solicited to provide genetic data on S.E. Asians.)

I. Global

AE Mourant, AC Kopec, K Domaniewska-Sobezak. The Distribution of the Human Blood Groups and Other Polymorphisms. Ed. 2. Oxford University Press, London, 1976. (Note: publication of a new edition is expected in 1982, to cover the years 1970-75; work is currently in progress on the years 1975-80.)

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AK Ghosh. Polymorphism of red cell glyoxalase I. With special reference to South and Southeast Asia and Oceania. Hum Genet 39:91-95, 1977.

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V Panich. G-6-PD variants in Laotians. Hum Hered 24:285-290, 1974.

VI. Malaysia

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A SPOT TEST FOR TUNGSTEN OXIDE

David Stoney
IFS Criminalistics Laboratory

The presence of tungsten oxide on lamp filaments has well-known diagnostic significance for the determination of whether the lamp was on or off when the bulb envelope was broken. At the Yosemite CAC meeting Peter Barnett discussed the optical properties of tungsten oxide and a powdery material which is found on the posts of some lamps. Optical properties are useful to differentiate this other powder material and any contaminants from tungsten oxide. Another useful means of differentiation is a spot test for tungsten oxide. The test can be found in any of the editions of Feigl's inorganic spot tests; check the index under "Tungsten oxide in an insoluble residue." The residue of sublimed tungsten oxide in burnt out lamp bulbs is in an ideal state for the test. (When present in minerals a preliminary fusion step is recommended). The reagent is a strongly acid solution of of stannous chloride in hydrochloric acid. A small portion of the powder to be tested is scraped onto a microscope slide and a cover slip placed on top. Using 100X magnification and incident light the powder is observed as the reagent is introduced by capillary action. Tungsten oxide changes rapidly from the original pale yellow to a deep blue. The compound formed is an insoluble lower oxide of tungsten. Since the color is insoluble a conventional macroscopic spot plate test is not recommended: the color is not released into solution and only the finely divided particles of tungsten oxide turn blue.

FOOTWEAR EVIDENCE - AN UPDATE

J.D. DeHaan, California Department of Justice
Technical Support Unit, 3301 C Street
Sacramento, California 95816

Introduction

In the best tradition of murder mysteries, footwear impressions are fairly common at crime scenes even in urban environments. Although they are often fragile, and sometimes easily overlooked, they can provide an excellent means of linking a suspect closely with the crime scene or reconstructing criminal activity. There are several problem areas involving footwear evidence: recovering the evidence impression itself, obtaining good quality test impressions for comparison, interpreting the data obtained from footwear impressions and, finally, presenting results of that comparison in court. Each of these problem areas will be considered in turn.

Recovering the Evidence Impression

There are basically two types of footwear impressions found at crime scenes: two dimensional prints on hard, smooth surfaces and three dimensional impressions in powdery or deformable materials. Two dimensional prints can be found as transfers of dust, flour, soil, paint, mud, grease or any other solid or liquid. Before any attempt to lift such impressions, the impression must be carefully photographed, both with and without a photographic scale in the field of view. Color photographs are preferred over black and white. This allows filtration and other photographic manipulation to enhance the contrast of a faint print against a colored or confusing background. After photography, if the print is in dust or similar powdered material, it is relatively simple to attempt a lift in much the same manner as recovering a dusted latent fingerprint. Standard fingerprint tape can be obtained up to four inches in width and for partial or narrow shoe impressions this will often be adequate. Several manufacturers make large, opaque rubber adhesive lifters for latent fingerprint work. These can be smoothed down over an impression and the recovered powder pattern protected by replacing the transparent protective acetate sheet. Unfortunately, these lifters generally come in only white and black and neither may be the ideal color as a background for a comparison.

The most adaptable lifter is the one sold by Sirchie Labs and Lightning Fingerprint Co. which is approximately six inches by fifteen inches in size. (Sirchie Labs; Residue Footprint Lifter Catalog #FR 001 - be sure to specify the clear protective sheets as opposed to the opaque black and white backing sheets most often sold with these products.) This is a transparent acetate sheet with a bubble-free adhesive and a separate clear protective sheet. The backing is pulled off, the clear sheet laid down over the print and the resulting transfer protected by affixing the protective sheet. This permits a direct overlay with test impressions as well as the substitution of any colored background to enhance the photographability of the evidence print. Remember that clean shoes, especially rubber sneakers or those with crepe soles can leave latent impressions on clean surfaces such as tile or glass, resulting from their own residual oils. Fingerprint identification technicians should be encouraged to look for such latent shoe prints which can be dusted with ordinary fingerprint powder and lifted in the same way as latent fingerprints.

Three dimensional impressions require more effort for proper recovery. In addition to careful photography, most impressions can be, and should be, recovered by some casting process. Choice of casting material is up to the examiner. This author has had good experience with standard grade plaster of Paris purchased from a hardware store. As long as some provision is made for reinforcing the cast, the cast is made a suitable thickness (preferably at least 3/4") and some care is used in handling, no serious problems have been encountered. Plaster of Paris can be added to a premeasured quantity of water (approximately four cups for an average size shoe impression) by a kitchen strainer or flour sifter. The plaster is sifted into water in a plastic pail without stirring until the mixture will absorb no more plaster. This self-measuring technique, although requiring more time than direct addition of plaster to the water, prevents formation of lumps and minimizes air bubbles in the resulting mixture. Other examiners prefer using a casting medium which provides not only slightly higher precision in replication of dimensions, but is also considerably harder and more resistant to chipping and breakage. The differences between these casting materials are described in some detail by Vandiver.[1] He describes the use of "R & R Castone" which is alpha-hemihydrated gypsum. In addition to its superior physical properties, it is easier to mix and is less susceptible to contamination by bubbles trapped in the mixture. It is available from Dentsply International Inc., P.O. Box 905, Toledo, Ohio 43691. Minimum order is 25 pounds for about $10.00. Vandiver also describes the use of premeasured quantities of this casting material in large plastic bags. Water is added to the bag and the contents kneaded to achieve a mixture. Once mixed, a corner is torn from the bag and the material is easily poured into the impression.

Some criminalists object to the white or yellow color of such impression casts and would prefer to deal with a darker colored material for both photography and comparison. Goldman has described the use of black cement and mortar color in Duroc dental casting material to provide a dark grey casting material with some success.[2]

Comparison Methods

Once in the laboratory, the examiner is faced with photographs, lifts, or casts of footwear impressions and a variety of shoes, boots, and sneakers with which to compare them. Although in some cases a direct comparison of the suspected shoe against the positive cast of the impression is possible and, indeed, preferable, it is more often required to simulate crime scene conditions and obtain test impressions of the suspected footwear in various media. For two dimensional impressions where the evidence impression is in dust or similar material, the sole of the shoe can be dusted with charcoal or fingerprint powder and the shoe rocked directly on the footprint lifter as previously described. This provides a transparent test print which can be overlaid on evidence impressions for a ready comparison and photography. Some examiners prefer to dust the sole of the shoe with talcum powder and then impress the shoe onto the "active" side of a sheet of office carbon paper. This provides a very high contrast test print which can be easily protected with a sheet of clear acetate and can be easily photographed. In either case, the use of such powdery impression materials is preferable to fingerprint ink since they can be easily removed from the footwear with a minimum of disturbance to the remaining evidence. The Metropolitan Police Laboratory recommends the use of ordinary bond paper which is stored in an iodine fuming tank until it is light tan in color.[3] The shoe to be tested is lightly moistened with a swab or a sponge and then impressed on the iodine treated paper. Water from the shoe causes the iodine to react with the starch in the paper sizing and instantly produces a dark purple print on a light tan background which is easily photographed. This method has two unique advantages: there is no permanent contamination of the footwear itself once the water dries and, most importantly, it can be made to easily simulate the conditions of the crime scene print. It will be found that many evidence impressions are not of perfectly dry materials but are of waterborne solutions of dust or even of liquids such as oil, paint or blood. These "liquid" impressions will have considerably different details. Features produced by the capillary action of the liquid as it spreads onto the contact surface will often not be duplicated in impressions using "dry" media. Any conditions of the evidence impression can be duplicated by varying the amount of liquid added to the shoe before the test impression is made.

Three dimensional impressions can be duplicated using a variety of test media in the laboratory. Different soils can have quite different capabilities for reproducing detail and dimensions. It is often useful to keep a test tray in the laboratory with samples of various typical soils; i.e., sand, silt, clay, etc., which can be moistened to various degrees to permit simulation of the crime scene conditions. Because of the capillary adhesion between the particles of damp soils, it will be found that the replication of detail and dimensions is much more precise in those "wet" media than in equivalent dry soils. Von Rummelhoff has suggested an ideal test medium consisting of a combination of Comet cleanser and grey fingerprint powder in a flat baking dish or photographic tray. It captures maximum detail in the shoe and is easily photographed.[4]

Although it is tedious and often troublesome for crime scene investigators to make casts of footwear impressions, it is important that we continue to recommend the taking of such casts whenever possible. The three-dimensional, 1:1, distortion free replica of footwear in a good cast is worth any number of poorly lighted, out-of-focus or skewed photographs. While it is true that some impressions would be virtually impossible to cast to show all the details visible in a good photograph, useful information is more often found in the cast than in the average photograph. Cook has offered good outline of the process of comparing shoe prints and tire impressions for the crime scene investigator.[5] Such procedures should be familiar ground to this audience and will not be discussed here. It is important to note that while the increased frequency of assembled and foreign made footwear has produced new identification problems; i.e., Vibram soles and their multitude of copies, the basic procedures of comparing class and individual characteristics still hold. Fawcett has also discussed the role of the footwear identification in considerable detail.[6]

New Data

The work of Davis and DeHaan on wear and accidental characteristics of footwear population was the first in-depth study of its kind.[7] For one reason or another, this work has not been duplicated elsewhere or extended to a larger population. It was apparent from that data that, although many wear characteristics are very common in the general population, some are highly unusual and deserve considerable weight in evaluating footwear evidence. Certain other gross features such as resoled shoes or the use of taps, are also potentially valuable features. Some new data on shoe sizes has been offered by Cook[8] and Cassidy.[9] This last reference is to be highly recommended to all footwear examiners as it covers all aspects of the identification process (including the manufacture of significant footwear types) in greater detail than any previous works including Abbott's classic on the subject.[10] Although the majority of her work deals with the characterization of footprints as opposed to the characterization of footwear impressions, much of the anthropological work of Robbins is of use to the footwear examiner.[11] The transparent grid overlay she describes is useful for the charting of individual characteristics in footwear impressions and is readily adapted with the "angular displacement method" described in Davis and DeHaan for recording wear characteristics.

One of the most dramatic new uses for footwear evidence is described in a recent paper by Davis.[12] For a number of years, the Metropolitan Police Laboratory has maintained a collection of not only reference impressions of manufacturers' standards, but of casework impressions. A system for descriptively encoding the tread pattern present on each impression was developed to allow the correlation of impressions by shoe type. These correlations have been used in an intelligence manner for linking a series of crimes to one suspect (which would have otherwise gone unconnected). It has also been used in predicting particular geographical patterns to the attacks of particular burglars with some success in preventing further attacks or speeding the apprehension. This is certainly a remarkable use of forensic laboratory data. For once, the lab can take an active role in preventing further crimes rather than sitting back and waiting for the crimes to happen. This may be the beginning of new trends in the use of laboratory analyses that we should certainly examine for applicability in other areas of evidence.

Courtroom Testimony

The ultimate test of footwear identification, like other types of evidence, is in the courtroom. Here is where the qualities and weaknesses of the method, the examiner and the identification are scrutinized. Whether one has made a specific identification of a responsible shoe or has indicated a general correspondence of class characteristics, it is often a question in the court's mind as to what "number" can be applied to this evidence. Unfortunately, with very few exceptions, there is not a collected body of information which can be used to provide acceptable "numbers" for the court's reference. As with many kinds of trace evidence, the identificiation of a specific impression depends upon the experience of the examiner and his or her ability to discern useful individual characteristics and reliably estimate how many such characteristics are needed to ensure that there can be no other shoe which could have left the evidence impression.[13] The most extensive data on wear characteristics remains the previously cited work by Davis and DeHaan. Cook offers some useful statistics in terms of a survey of 187,000 buyers of footwear and as to how frequently certain sizes and widths are sold.[14] Cassidy has some useful data on estimating the height of the wearer based upon the measurements of the footwear and impressions,as well as the results of some research projects in the acquisition of accidental characteristics and wear characteristics in control populations.[15] It is possible that perhaps the data generated by the Metropolitan Lab can be extended to an American population but it is unknown what effect a mixed population of races would have on a distribution of sizes and properties. We do have to be careful that we do not seize upon bodies of information simply because they look to be applicable without verification of their relevance. Where some of the extensive information developed from the study of footprints may be applicable to the study of footwear impressions it is certainly not as straightforward as some examiners would think. Shoes not only interpose another impression medium between the foot and subsequent impression, but can also change the way that foot makes its impression. Features discernible from footwear impressions can, in some cases, be linked directly to pecularities of the foot inside the shoe, but that is not at all the general case.

The footwear examiner is under an obligation to offer the best and most complete and most accurate information discernible from the evidence under examination. More than anything else, one has the obligation to ensure that the interpretation of the impression and related evidence is not unduly biased in favor of one side or the other. In the absence of a uniform body of knowledge it is only the skill and professionalism of the examiner that will ensure that proper weight is laid to this potentially valuable evidence.

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2. Goldman, G.L., "Colored Casting Materials as an Alternative to Smoking or Dusting Casts", CAC Semi-Annual Seminar, Oct. 1979.

3. Davis, R.J., Metropolitan Police Lab, London, England, private communications, Sept. 1975.

4. Von Rummelhoff, J., "Does the Print Belong to the Perpetrator?", *Func. Photog.*, Nov/Dec. 1981, p 41.

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ARC VS. CHORD LENGTH WHEN MEASURING LAND WIDTHS

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At the Newport Beach semi-annual meeting Frank Cassidy presented a paper noting the difference between the dimensions of the land width when measured along the arc as opposed to the chord. This topic was also considered by Bradford and Brackett (1953) and by Mathews (1954). Bradford and Brackett identified the difference and calculated the error in measurement for five calibers and land widths ranging up to .16 inches. The results are presented in graphical form. The authors note that for any caliber the error does not exceed .001 when the land width is less than .06 inches. Mathews (1954) accepts .001 as the level of reproducibility when proper ammunition is used, even in guns that have seen much service. Mathews further points out in response to Bradford and Brackett's article, that for comparison measurements between fired bullets the difference between arc and chord lengths is of no consequence, since the measurement is being conducted by the same procedure on each bullet. Mathews notes that the same is true when measurements are used to predict the make and model of weapon, since the manufacturer's specifications cannot be trusted and measurements on fired bullets must be used for the standard values.

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PGM SUBTYPING DATA FOR CALIFORNIA BLACKS AND MEXICAN-AMERICANS

Data Compilation a d Analysis:
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Initial PGM subtyping studies of Mexican Americans suggested subtype frequencies differing from Caucasian subtype frequencies; the two populations do not differ in conventional type frequencies. To get better subtype frequency estimates, subtyping data from several laboratories has been pooled and analysed. Subtyping data for Blacks is also given.

Data Contributors:
Blacks

Forensic Science Associates, N=112
SERI, N=44 [illegible]

Mexican-Americans

Rod Andrus, DOJ Fresno, N=142
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1. Conventional PGM Typing and Comparison to Grunbaum Data

Blacks

Grunbaum Data N=1024

	Phenotype Frequency			Gene Frequency	
	1-1	2-1	2-2	PGM^1	PGM^2
Observed %	66.2	29.5	4.0	0.812	0.188
Expected %	65.9	30.5	3.6		

This Study N=156

	Phenotype Frequency			Gene Frequency	
	1-1	2-1	2-2	PGM^1	PGM^2
Observed	101	50	5	0.81	0.19
%	65	32	3		
Expected	102	48	6		
%	65	31	4		

Mexican-Americans

Grunbaum Data N=1586

	Phenotype Frequency			Gene Frequency	
	1-1	2-1	2-2	PGM^1	PGM^2
Observed %	58.7	34.7	6.2	0.764	0.236
Expected %	58.4	36.0	5.6		

This Study N=347

	Phenotype Frequency			Gene Frequency	
	1-1	2-1	2-2	PGM^1	PGM^2
Observed	207	118	22	0.767	0.233
%	59.7	34.0	6.3		
Expected	204	124	19		
%	58.8	35.7	5.5		

2. PGM Subtyping Data and Comparison to Bark's Caucasian Data

Bark Caucasian Data N=1301

Phenotype Frequency

	1+1+	1+1-	1-1-	2+1+	2-1+	2+1-	2-1-	2+2+	2+2-	2-2-
Observed	515	217	35	301	88	48	23	38	29	7
%	39.6	16.7	2.7	23.1	6.8	3.7	1.8	2.9	2.2	0.5
Expected	514	226	25	285	96	63	21	39	26	4
%	39.5	17.3	1.9	21.9	7.3	4.8	1.6	3.0	2.0	0.3

Gene Frequency

PGM^{1+}	PGM^{1-}	PGM^{2+}	PGM^{2-}
0.6287	0.138	0.1741	0.0584

This Study

California Blacks N=156

Phenotype Frequency

	1+1+	1+1-	1-1-	2+1+	2-1+	2+1-	2-1-	2+2+	2+2-	2-2-
Observed	68	29	4	36	7	7	1	3	0	2
%	43.6	18.6	2.6	23.1	4.5	4.5	0.6	1.9	0	1.3
Expected	69	29	3	32	8	7	2	4	2	0
%	44.2	18.9	2.0	20.6	5.0	4.4	1.1	2.4	1.2	0.14

Gene Frequency

PGM^{1+}	PGM^{1-}	PGM^{2+}	PGM^{2-}
0.665	0.142	0.155	0.038

California Mexican-Americans N=347

Phenotype Frequency

	1+1+	1+1-	1-1-	2+1+	2-1+	2+1-	2-1-	2+2+	2+2-	2-2-
Observed	93	87	27	40	38	22	18	6	10	6
%	26.8	25.1	7.8	11.5	11.0	6.3	5.2	1.7	2.9	1.7
Expected	89	92	24	42	40	22	20	5	9	4
%	25.7	26.5	6.9	12.1	11.5	6.3	5.8	1.4	2.6	1.2

Gene Frequency

PGM^{1+}	PGM^{1-}	PGM^{2+}	PGM^{2-}
0.506	0.261	0.120	0.113

It is clear from this study that the gene frequencies of the 1- and 2- alleles are significantly elevated in Mexican-Americans. This observation increases the discrimination index of the PGM genetic marker system in this population group (see below) and raises a number of interesting anthropological and biochemical questions.

From the perspective of the forensic serologist the recognition of elevated 1- and 2- gene frequencies in Mexican-Americans increases the usefulness of this marker in this population group but at the same time diminishes the significance of the more unusual (by Caucasian standards) phenotypes. A comparison of the discrimination indices is presented below:

Conventional Typing Discrimination Indices

Caucasians	Blacks	Mexican-Americans
0.523	0.470	0.526

Subtyping Discrimination Indices

Caucasians	Blacks	Mexican-Americans
0.757	0.721	0.823

It can readily be seen that the value of the PGM genetic marker system for distinguishing between members of the Caucasian population compared to its value for distinguishing members of the Mexican-American population is about the same using conventional typing procedures. However, using subtyping procedures there is a dramatic increase in the usefulness of this system for the Mexican-American population compared to the Caucasian population. This increase is most apparent by considering the individualization indices. They are as follows: Caucasians, 0.243; Mexican-Americans, 0.177. The difference is approximately 27%.

The discovery of the increased frequency of the 1- and 2- alleles in the Mexican-American population suggests that this phenomenon is the result of penetrance of the native American gene pool into European stock. This hypothesis raises the possibility of studying native American gene flow throughout the American continents using this genetic marker. For example what is the contribution of the ancient Aztec and Inca peoples? What differences exist between Eskimos, North American Indians, and South American Indians. What influence does this information have on our concepts of the introduction of man onto the American continent.
A finding of elevated PGM 1- and 2- alleles in native Americans raises biochemical questions concerning the maintenance of this polymorphism and the potential role it may play in natural selection. For example, are there dietary and/or climatic factors that favor individuals carrying the (-) alleles in equitorial and/or high altitude environs. Whatever factors are revealed by studies such as these, forensic science will have played a small but significant role.

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