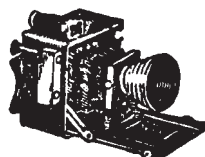




# THE PRINT

*The Official Publication of the Southern California Association of Fingerprint Officers  
An Association for Scientific Investigation and Identification Since 1937*

*May / June 2004 Volume 20 Issue 3*



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## A Review of "Morphogenesis of Volar Skin in the Human Fetus" by Alfred R. Hale

*(This review was published in the June 2003 issue, volume 26 number 2, of Identification Canada.)*

### DEAN HAMM

RCMP

Forensic Identification Section

Calgary, Alberta

### Introduction

Dr. Alfred Hale, a Professor of Anatomy at Tulane University, published a paper in 1952 titled "Morphogenesis of Volar Skin in the Human Fetus" [1]. During the introduction, Dr. Hale states that the research contained in this paper has two purposes:

- 1) To supplement previous work on the morphogenesis of the volar skin and to describe this process in quantitative terms.
- 2) To describe the development of the volar skin on fetuses taking into account the role that mechanical factors play in regulating the structure of the volar skin.

He asserted that previous research completed by numerous other people had shown that the human fetus begins developing epidermal ridges when the crown-rump length (CR) is approximately 70mm and is completed at 150mm. After 150mm the multiplication of individual ridges cease and that the configuration of these ridges are complete and will not undergo any other changes except for growth (persistence).

Dr. Hale referred to previous research that suggests the mechanical stresses that occur during the growth of volar skin may influence the overall dermatoglyphic configuration (overall pattern - level 1 detail). The rate at which the volar pads regress and the rate at which the ridges develop dictate the type of pattern found (i.e., arch, whorl, loop).

### Materials and Methods

Dr. Hale described the number and types of fetuses used, how they were preserved, how the skin was bisected and measured. Figure 1 taken from his paper shows the schematic drawing of the primary and secondary ridges in the dermal layer and how they are aligned with the epidermal ridges that we see on the volar surfaces. He uses the abbreviations RS for ridge separation, RB for ridge breadth and RD for ridge depth.

## Observations:

Dr. Hale concluded that there are three phases which occur during the formation of the epidermal ridges.

- 1) *The initial phase (70-140mm C.R.).* The first phase is when the primary ridges are established. The primary ridge penetrates deep into the dermal layer and the deepest penetration occurs where the sweat glands appear.
- 2) *The secondary phase (140-220mm C.R.).* During this phase the secondary ridges appear between the primary ridges. When the secondary ridges begin to appear the primary ridges cease to multiply. Secondary ridges continue to grow until their depth is approximately that of the primary ridges.
- 3) *The definitive phase (220mm C.R.)* The final phase is when the dermal papillae develop. During this stage stress lines appear over the secondary ridges. This causes the surface to begin to fold along the stress lines. The epidermis continues to thicken and reproduces the contour of the dermal layer and the rugae appear on the surface.

As a result of his observations, and the research of others, Dr. Hale wrote that:

- The interactions of mechanical and genetic factors are responsible for the initial differentiation of the primary ridges.
- The primary ridges are genetically controlled and that its unit of structure is the "epidermic wart" (Whipple).
- Differential growth plays the major role in the structure of the volar skin.

## Development of Minutiae

Dr. Hale is most likely the first researcher to delve into how minutiae develop. He states that branchings (bifurcations) arise out of the lateral swellings that occur on the primary ridge. During the period in which the primary ridges are developing the surface is growing at a rapid rate. As a result of this growth the ridges are pulled apart. This causes other ridges to grow in-between those that are being pulled apart. If one of these lateral swellings happen to be in the right place, at the right time, it will be pulled away from the original primary ridge and begin to form another ridge that is attached to the original ridge. Dr. Hale does not believe that secondary fusion occurs between two ridges in forming a bifurcation as the ridges are being pulled away from each other due to the growth of the surface.

Islands arise as proliferations of the basal cell layer before the appearance of the secondary ridges. The length of the island is directly related to the length of time between their initial formation and the appearance of secondary ridges (period of differentiation). That is to say, a new primary ridge developing just prior to secondary ridge formation would be short. Older islets, that have had a longer period to grow, would be longer.

Dr. Hale states, "...minutiae are products of the interaction between stress (mechanical factors) and the ability of ridges to multiply (genetic factors).."

## Relevance of Dr. Hale's Research to Fingerprint Examination

Understanding the research and conclusions of Dr. Hale helps us realize why friction skin is unique and why it (or its impression) can be used for personal identification.

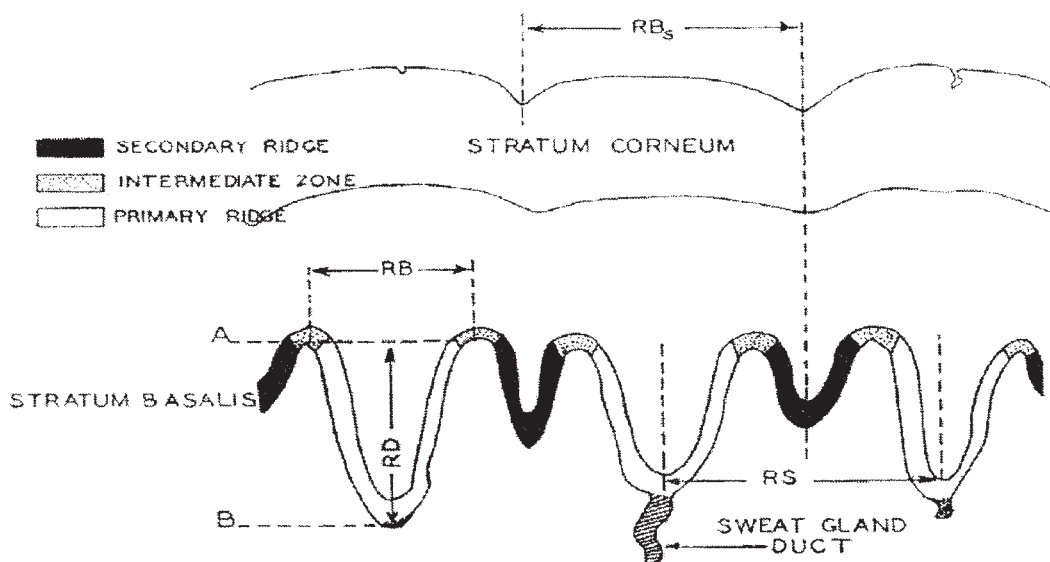


Figure 1

*Schematic drawing showing the plan measurement of ridge dimensions.  
The drawing is based upon a section of plantar skin from a fetus approximately 250 mm in C.R. length.*

Dr. Hale's paper shows through research and observation that:

- There is a genetic factor involved that dictates that friction skin develops on volar surfaces. Volar skin is genetically programmed in such a way that it can only produce friction ridges.
- Branches arise out of lateral swellings on primary ridges during their development. Mechanical factors (stress and growth), as well as timing, influence whether or not these branchings will form and how long each of the associated ridges will become.
- Timing as well as mechanical factors (stress and growth) determine where the primary ridges will develop and what length they will become.
- Secondary ridge appearance ceases the formation of primary ridges no matter what stage of development they are in (this is the reason why we often see incipient ridges).

Knowing how genetic and mechanical factors play a role in the formation of the ridge paths gives fingerprint examiners a crucial understanding of why comparative and spatial measurements between the length of ridges and placement of the minutiae can be used in the identification process. When one considers the knowledge of this and other research, the number of variables that can occur in a small area of volar skin, due to the genetic and mechanical factors, is astounding.

This has been a very brief overview of Dr. Hale's research paper. Dr. Hale's paper contains much more in-depth information that should be read by all who seek to understand the science behind friction ridge identification.

## References

- [1] Hale, A. R. "Morphogenesis of Volar Skin in the Human Fetus", *The American Journal of Anatomy*, Vol. 91, No.1, July 1952.

# Latent Print Tonal Reversal: Cause and Effect

*(This article is reprinted from the Winter 2002 issue of the The Criminalist.)*

**TIMOTHY SETHMAN**, CLPE, SCSA

Detective, ID Unit

Westmoreland County (PA) DA's Office

Understanding the cause and effect of tonal reversal will enable the latent print examiner to explain this phenomenon at trial.

The latent print examiner will occasionally have to compare a tonally reversed evidence print. This should not be confused with a color reversed print, which is developed with a light color process and placed on a dark background, or a laterally reversed print (left to right) or referred to as a mirror image.

A tonally reversed latent print is caused by the development of furrows of friction ridge skin rather than ridge portions. The intention upon development is to cause the ridge portions to develop to a darker color, but the result is opposite. Tonal reversals can be found when the background collects so much powder that it appears as dark as the dark lines within the boundary of the friction skin print. Refer to figure 1a and 1b for an example of a tonal reversal. Third level detail examination may reveal the pore openings as dark spots along light color spaces. If the pores are seen in the light lines, then the print is certain to be a tonal reversal, but use caution not to interpret randomly scattered powder as pores. A tonal reversal may not be readily seen, until the examiner conducts a comparison with inked impressions.

An examiner will usually notice a bifurcation (dividing ridge) is present in one print, and an ending ridge in another. Two adjoining bifurcations (island) in one print will appear as a short ridge in the other. Tonal reversals are more noticeable about the core and delta areas where the ridges change direction. An example of this would be the core area where the inner most recurve or staple with no enclosed rods will in a tonally reversed print appear as a recurve with a single rod enclosed. In the delta area, a clue to distinguish a tonal reversal is by the presence of a bifurcation (dividing ridge) opening towards the core in one print, whereas, the other print shows no ridge at this point. Cores and deltas may not always be visible in these cases.

A tonal reversal should be expected when there is a loss or a gain on a ridge count between groups of ridge characteristics on opposite sides of focal points, such as the core and delta. Not all prints that appear in dark fields are tonal reversals. Prints that occur when a substance on a surface is picked up on the ridges and re-deposited by the same ridges with little pressure may appear to be a tonal reversal, but is not; nor are all tonally reversed prints in a dark field. Blood that is pooled on the ridges and pore openings and then re-deposited with a heavy

pressure will cause the blood to track into the furrows pushing the blood off the ridges. This same effect can take place with perspiration and sebum with heavy pressure, again, pushing the perspiration and sebum into the furrows. Upon applying a powdering technique, powder will adhere to the furrows.

The first indication of a potential reversal by an examiner may be nothing more than being unable to resolve some nonspecific problem in tracing or ridge counting. If this should occur, care must be taken in tracing ridge flow through the problem area. In utilizing ridge tracing an examiner will usually be able to locate the area where the print is reversed and the point at which the ridges change from dark to light. The same effect can be demonstrated as mentioned above in the blood print utilizing inked impressions. If ink prints are repeatedly taken without re-inking, eventually the ridges become void of ink, causing the furrows to reproduce dark on light. Slipping and redepositing: when this occurs, the reversed area will be in the area of the ridges that cross the direction of slippage and can cause partial tonal reversals.

For trial purposes, it may become necessary to produce two sets of charted enlargements, the first being the tonally reversed as it appears on the evidence and a second enlargement in which a tonal reversed print negative has been flipped (emulsion to emulsion) to reproduce dark ridges and light furrows. Having two sets of charted enlargements will aide the examiner in explaining this phenomenon of a tonal reversed print to the court.

An interesting article authored by David S. Pierce, Sarnia Police Department (Ontario, Canada), published in the *J.F.I.* 1989, studied the effects of synthetic based materials (loosely referred to as plastics) in which tonally reversed latent prints sometimes appear. Pierce, utilizing a variety of latent print development techniques and samples of various polyethylene bags with deposited prints, conducted tests to determine the frequency of tonally reversed prints in an attempt to identify its

causes. Results showed plastics, which contain surface treatments, were different, continued dusting of normal or moist prints passed initial visualization and caused a transition from position to a tonally reversed print. [sic] Tonally reversed prints occurred only after considerable aging. Pierce refers to slip, a form of lubricant, found mostly on low-density bags, is likely the substance affected by latent print deposit. Pierce concluded from his tests that various treatments and additives seem to account for the tendency of plastics to record latent prints as tonal reversals. Also, powders by nature, abrasive and working on portions of surface coatings that have been chemically weakened by fingerprint deposits, is also a likely explanation for tonal reversals. [sic] Fingerprint development on plastics that are known to be free of additives or treatment do not record in a tonal reversal, suggesting that surface treatments are responsible for powder adhering. The extended processing of plastics appears to remove the print deposit taking with it the surface treatment.

Though this writer finds a limited amount of published material on the subject matter, my research of tonal reversal prints finds a consensus that the major contributing factor to a tonally reversed print is pressure. Pressure on the friction ridges compresses the ridge structure and allows the furrows to be outlined causing a reversal.

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2. Clements, W. W. *The Study of Latent Fingerprints*. Charles C. Thomas: Springfield, IL, 1987; pp 82-84.
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4. Pierce, D. S. Tonally Reversed Friction Ridge Prints on Plastics. *J.F.I.* **1989**, 39 (1), 11-22.

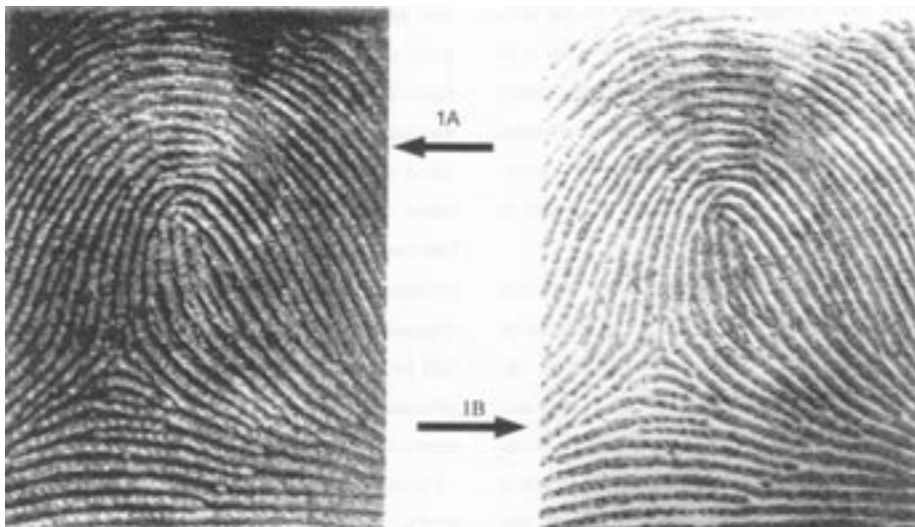


Figure 1a represents a tonally reversed print. Figure 1b represents a normal print. Photographs courtesy of Charles Parker, latent print examiner, Texas Department of Public Safety.

# Berkley Man Keeps 33-year Promise to Get Justice for His Slain Wife

*(This article is reprinted from the March 15, 2004, issue of the Detroit Free Press.)*

DETROIT (AP) -- Convicted murderer Raymond Norman Rudder rolled his shoulders in Wayne County Circuit Court as he claimed his innocence in a beating death more than 33 years ago.

"I am not a killer," Rudder said Friday. "I did not murder Mrs. Patricia Blake."

Moments later, Judge David Groner sentenced him to life in prison. A jury found Rudder, 59, guilty of second-degree murder in the Nov. 9, 1970 death of Patricia Blake, 34.

Prosecutors say Rudder tied electrical cords around her neck and ankles and crushed her skull with a souvenir Tennessee whiskey bottle the Blakes used as a decoration.

After the sentencing, Tim Blake huddled with his three sons and two friends inside a Royal Oak diner. Blake vowed he would make sure his wife's killer was brought to justice when he returned home from work to their Detroit apartment and found her beaten to death.

"We did it, damn it, we did it," The Daily Tribune of Royal Oak quoted Blake as saying. "I kept my promise."

Blake, 65, could take some solace knowing he delivered on his promise, even though it took more than half his life. He was quiet for a moment. He fought back a fleeting urge to cry then demanded that everyone pass him their breakfast checks.

"No, no," he said, waiving off any dissent. "I'm buying breakfast. Today I'm celebrating."

The key piece of evidence against Rudder was a partial fingerprint on the whiskey bottle that experts said matched Rudder's right middle finger.

The Blakes' three sons, William, 9, Michael, 7, and Richard, 2, lived with them at the apartment. The two oldest boys were at school when their mother was killed. Richard suffered a fractured skull during the attack, but made a complete recovery.

A master electrician, Blake immediately moved and raised the boys on his own, settling in Oakland County where he is a longtime Berkley resident. Blake pressed to have the case reopened more than a half dozen times over the years.

Finally, Blake two years ago asked Berkley Detective Ray Anger to put in a call to the Detroit police homicide squad. Detroit police dug up the old case and submitted the partial fingerprint into a computerized database. It matched Rudder, who was doing time for trying to hit an Ypsilanti homeowner with a beer bottle during a 1998

burglary. That data base wasn't available until almost 20 years after Patricia Blake was murdered.

Assistant Prosecutor John Dakmak believes that Rudder murdered Patricia Blake in a burglary gone bad. Before the murder, Rudder already had been convicted of two burglaries, car theft, felony assault and rape.

"What we have here is a quite violent man," Dakmak said. "He is no stranger to violence."

## MINUTES OF FEBRUARY MEETING

**DATE:** February 7, 2004

**LOCATION:** Cask n' Cleaver, Fallbrook, CA

**HOST:** Lisa DiMeo

**SECRETARY:** Gina Russell-Durgin

**PROGRAM:** Stephen Plourd  
Scene Reconstruction

**CALL TO ORDER:** Business meeting, 1930 hours by  
President George Durgin.

**PLEDGE OF ALLEGIANCE:** Lead by Jim Lawson

**ATTENDANCE:**

**PAST PRESIDENTS:** Alan McRoberts (1991), Jim Lawson (1995), Clint Fullen (1998), Art Coleman (2000), Bob Goss (2001), Steve Tillmann (2002), George Durgin (2003).

**Members and guests present:** 63

**OLD BUSINESS:**

**Second Readings:**

Erinn Elmore  
Chuck Russell

Motion to accept: Susan Garcia  
Second: George Durgin

**Swear Ins by Past President Steve Tillmann**

Andrea Duncan, San Diego D.A.  
Lisa Zinn, Orange Co. Sheriff's Dept.  
Veronica Rauch, San Diego Co. Sheriff's Dept.  
Lenora Pena, Orange Co. Sheriff's Dept.

**NEW BUSINESS:**

**First Readings for Active Membership:**

Rashauna Kirkland, Dept. of Homeland Security

**Introduction of New Associate and Student Members**

Alica Cardoza, (Intern) San Diego Co. Sheriff's Dept.

**ANNOUNCEMENTS:**

Next meeting: April 3, 2004, Camp Pendleton, hosted by Chairman Durgin.

**ATTENDANCE DRAWING of \$35.00 not won by:**

Fred Burent, Janie Kasmoden, or Nicole Muller

**MOTION TO ADJOURN:**

Jim Edmunston  
Second: Dennis Uyeda

**Meeting Adjourned:** 2000 hours

## President's Message

Saturday, April 3, 2004, could not have been anymore picturesque. An afternoon day of clean air and rich blue sky, majestic! Not a cloud in sight. The air temperature was perfect in San Diego County. While parked under the shade of the pine trees I checked for the proper Building number. Yes, I said, "that's it 202850 The South Mesa Club." My destination. From my vantage point I could see the blue waters of the Pacific Ocean. I sat for a while watching, relaxing. I remember saying to myself that this is a beautiful place. I knew then the next few hours were going to be pleasurable. All my preoccupation about the SCAFO dinner meeting at Camp Pendleton Marine Corps Base seemed to go away with my every breath. I sat in my vehicle waiting for that right moment to step out on to the mesa overlooking the Pacific.

Previous to my arrival at the South Mesa Club, I entered the base through the main gate that was just off of Interstate 5 freeway. I could see traffic cones, bicycle riders and traffic police. I remember that our Sergeant At Arms, Tom Washington mentioned he was not going to be at the meeting because he had entered in the triathlon that was being held on base. Needless to say, as I approached the intersection, I was paying attention to the traffic cop and made a left turn instead of a right turn. And after a few twisting miles found myself outside the base heading toward the main gate again. So you see why I sat in my vehicle for a while watching the scenery.

Past President George Durgin hosted the luncheon meeting. It was an afternoon billed as a historical tribute to SCAFO Past Presidents and Wolford Awardees. Present was Lorraine Wolford Cacia, daughter of Charles W Wolford, 3<sup>rd</sup> SCAFO President (1949-1950), and her son Paul. Lorraine and Paul brought to the meeting a personal collection of photographs of Mr. and Mrs. Wolford circa. 1930. Charles's collection of badges. Charlie as he was called retired from the Santa Ana Police Department. His personal duty belt, holster and handcuffs. Displayed were some law enforcement pamphlets belonging to Charles W. Wolford. Those items and the Charles W. Wolford gavel displayed in its new window case made it a noteworthy event. The Wolford gavel is passed down to acting SCAFO Presidents as a tradition. Over dinner, Lorraine recalled that even after her father passed away, SCAFO members would drive to her house to escort her to SCAFOs' monthly meetings. Lorraine, I know you will be reading this, I want to say on behalf of SCAFO, thank you for that personal portrayal of your father.

Paul, a notable musician and Charles grandson, provided us with a story about how his grand father with his fortitude allowed Paul to follow his dreams to become that musician he dreamed about becoming. And I believe Charlie, through the Wolford Award is still reaching out

to each of us asking us if you want to achieve your goal you can and, your reward will be the Wolford Award.

That's not all, in attendance were ten past presidents Bob Zipple, 1969, Clarence Bales, 1972, Del Freeman, 1973, Jerry Snyder, 1981, Tim Golt, 1992, Clint Fullen, 1998, Art Coleman, 2000, Bob Goss, 2001, Steve Tillman, 2002, and George Durgin, 2003.

Each past president gave us a historical accounting, and, at times, not so historical but humorous accounts of what it was like the year they were president of SCAFO. That afternoon we heard stories that range from the times when meetings were closed meetings -no wives or guest - steak dinners at \$1.50 and dues two dollars a year. Sacks of potatoes placed in trunks of police cars and the one and only meeting held outside the United States -some where south of the border.

Well I am looking forward to next months meeting on June 5<sup>th</sup> at JT Schmidts Restaurant and Brewery, 2610 E. Ketella Blvd., Anaheim. Our presenter is Detective Paul Delhauer, LASD Homicide. This should be an interesting presentation. Don't be left out. Make sure you call in your RSVP @ 213 989-2163 or email Mari Jonson (mari.johnson@scafo.org) or Sarah Watson (watson@scafo.org).

As I make my rounds talking to members, what I have learned by asking, "what do you want to see and hear at meetings?" And the reply is that members want to hear about other members experiences during crime scene investigations. So as a reminder, if our members wish to present a case they worked in order to provide personal knowledge and experiences for other members at this year's annual training seminar, contact George Durgin (durgin@scafo.org). So if you have a case in mind, please contact George for a time slot for the next annual training seminar. After all, I think this is why we get together -to pass along experiences.

*Fraternally Yours,*

*Ed Palma, President*

# MINUTES OF APRIL MEETING

**DATE:** April 3, 2004  
**LOCATION:** NCO So. Mesa Club  
Camp Pendleton, CA  
**HOST:** George Durgin  
**SECRETARY:** Gina Russell-Durgin  
**PROGRAM:** "Past Presidents"  
and Wolford family Reflections  
**CALL TO ORDER:** Business meeting, 1430 hours by  
President Ed Palma.

## ATTENDANCE:

**PAST PRESIDENTS:** Bob Zipple (1969), Clarence Bales (1972), Dell Freeman (1973), Jerry Synder (1981), Tim Golt (1992), Clint Fullen (1998), Art Coleman (2000), Bob Goss (2001), Steve Tillmann (2002), George Durgin (2003).

## OLD BUSINESS:

### Reading of February minutes:

Motion to accept: Art Coleman  
Second: Dennis Uyeda

### Second Readings:

Charles Garcia  
Michelle Sherwood  
Rashuana Kirkland  
Elsa Mecado

Motion to accept: Susan Garcia  
Second: Bob Goss

### Swear Ins by Past President Bob Zipple

Sean Bove, San Diego Sheriff's Dept.  
Martina Borrego, Riverside Sheriff's Dept.

## NEW BUSINESS:

### First Readings for Active Membership:

Melan Hoans, Los Angeles Sheriff's Dept.  
Clint Harris, San Diego Sheriff's Dept.

### Introduction of New Associate and Student Members

Jessica Johnson, (Intern) San Diego Co. Sheriff's Dept.

## ANNOUNCEMENTS:

An appreciation letter from the Dr. Henry Faulds - Beith Commemorative Society was read. It expressed the society's appreciation for the \$500 donation.

## ATTENDANCE DRAWING of \$40.00 won by:

Jeannie Cascaden from Beverly Hills PD.


## DOOR PRIZES:

Provided by Ed Palma and Gina Russell-Durgin

## MOTION TO ADJOURN:

Art Coleman  
Second: George Durgin

**Meeting Adjourned:** 2000 hours



**Upcoming  
SCAFO Meeting**

**June 5, 2004**

Detective Paul Delhauer  
LASD Homicide

**JT Schmid's Restaurant and Brewery  
Anaheim**

For additional information contact:  
Mari Johnson or Sarah Watson  
(213) 989-2163  
mari.johnson@scafo.org / watson@scafo.org

**"Every man owes a part of his time and money to the business or industry in which he is engaged. No man has a moral right to withhold his support from an organization that is striving to improve conditions within his sphere."**

For subscription or membership information, or address corrections contact:

**- President Theodore Roosevelt, 1908**

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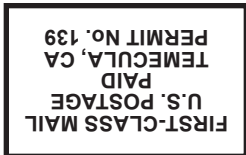
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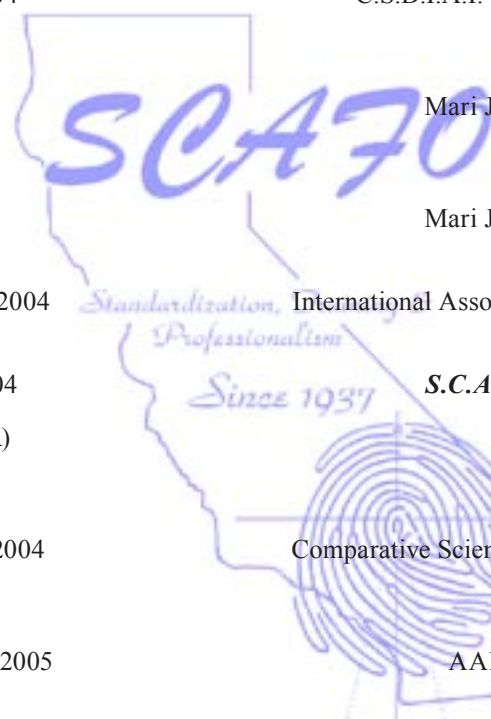
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- 5 Berkley Man Keeps 33-year Promise to Get Justice fo His Slain Wife
- 5 Minutes of February Meeting
- 6 President's Message
- 7 Minutes of April Meeting

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SCAFO Members  
get "yourname@scafo.org".  
See instructions on the  
website's email page.

*-- Upcoming Events/Schools/Seminars--*

- May 10 - 13, 2004 C.S.D.I.A.I. 88th Annual Conference  
Sacramento, CA
- June 5, 2004 **S.C.A.F.O. Meeting**  
Mari Johnson & Sarah Watson  
LASD
- August 7, 2004 **S.C.A.F.O. Meeting**  
Mari Johnson & Sarah Watson  
LASD
- August 22 - 26, 2004 International Association for Identification  
St. Louis, MO
- October 1-2, 2004 **S.C.A.F.O. Training Seminar**
- December (TBA) **S.C.A.F.O. Meeting**  
Dennis Uyeda  
CAL-DOJ
- October 26-30, 2004 Comparative Science in the Daubert World  
Las Vegas, NV  
ABFDE
- February 21-26, 2005 AAFS 57th Annual Meeting  
New Orleans, LA



*Southern California Association of Fingerprint Officers*  
*An Association for Scientific Investigation and Identification Since 1937*