# JFI Abstracts from 2024

# Issue 4: Oct - Dec 2024

## Latent Prints Visualized by Dew

Author(s): Radford, Michael

Type: Case Report Published: 2024, Volume 74, Issue 4, Page 320

**Abstract:** Latent prints were revealed in dew on the exterior window of a vehicle in a vehicle burglary case. The latent prints were photographed by the responding officer and subsequently identified to a potential suspect by a latent print examiner. This case study provides rarely seen images of latent prints developed by dew, the result of a perfect combination of latent residue, surface temperature, atmospheric temperature, and officer arrival time.

# Stability of 1,2-Indanedione and 1,2-Indanedione Zinc Chloride Over Time

Author(s): Shipman, Joshua Type: Technical Note

#### Published: 2024, Volume 74, Issue 4, Page 324

**Abstract:** A review of latent print development policy and procedure manuals revealed a common shelf life of one month for indanedione (IND) and indanedione zinc chloride (IND-Zn). This shelf life, while seemingly common, is often not supported directly by internal performance data demonstrating the stability of the reagents over time. Using diluted samples of L-alanine, it was found that IND and IND-Zn were reactive for up to 30 weeks, even at low concentrations of the amino acid. Furthermore, this study explored the use of ninhydrin on diluted samples of L-alanine previously processed with 1,8-Diazaf luoren-9-one (DFO), IND, or IND-Zn and found that ninhydrin was generally not inhibited by the prior processing techniques.

# Altering the Composition of White Lanconide Powder for Effective Latent Print Development: A Pilot Study

Author(s): Buxa, Lydia J; Snyder, Chad A.

Type: Technical Note

#### Published: 2024, Volume 74, Issue 4, Page 333

**Abstract:** Carbon black is a common powder for latent print development on nonporous surfaces. Black powders in general have been extensively and frequently researched. However, these powders cannot always be used depending on the contrast, texture, and com-position of the surface that needs to be processed for latent prints. In these situations, a good alternative is to use a white or lighter-colored powder. One of these powders is lanconide, an inorganic mixture of zinc sulfide (ZnS), zinc oxide (ZnO), barium sulfate (BaSO4), titanium oxide (TiO2), bismuth oxychloride (BiOCI), and calcium carbonate (CaCO3). This study removed one of these six compounds per trial to create seven different lanconide compositions to preliminarily assess performance with sebum-charged latent prints deposited by one donor. Overall, the literature lanconide powder was effective for print development, but the highest quality prints resulted when TiO2 was removed. As such, this compound could be obstructing print development, possibly due to its nonhygroscopic nature. TiO2 has also been identified as a possible carcinogen when inhaled, so removing titanium oxide from lanconide recipes creates a safer composition while still effectively enhancing latent fingerprint development.

# Thinking Outside the (Glove) Box: Visualization of Latent Marks on Latex Gloves

Author(s): Rajs, Nora; Bentolila, Alfonso; Bondar, Anna; Levin-Elad, Michael Type: Article

#### Published: 2024, Volume 74, Issue 4, Page 348

**Abstract:** Disposable latex gloves are important evidence in crime scene investigations as they may identify the suspect who wore them. Unfortunately, latex gloves are also a challenging surface for the visualization of marks, usually yielding quite poor results. Approaching latex gloves as either porous or non-porous has his-torically given mixed results. The aim of this study was to explore a blended approach by sequencing porous and non-porous approaches: cyanoacrylate fuming with crystal violet dye stain (non-porous approach) and ninhydrin (porous approach). Within this study it was found that either approach worked well independently. If combined, the best approach was to process the latent gloves with ninhydrin, followed by cyanoacrylate fuming and crystal violet dye stain. Further tests demonstrated that cyanoacrylate fuming inhibited the reaction of ninhydrin on the latent gloves, while Ruhemann's purple (product of ninhydrin reaction) may act as a catalyst for cyanoacrylate polymerization or may have no inhibitory affect on crystal violet dye stain.

# Bloodstain Pattern Analysis After a Fire: The Effect of Extreme Heat on Area of Origin Estimation

Author(s): Gordon, Drew; Elayas, Malak; Hofstetter, Robert Type: Article

Published: 2024, Volume 74, Issue 4, Page 362

Abstract: This research is the first of its kind to assess the impact of extreme heat from a fire on the area of origin estimation (AO)

for impact bloodstain patterns on surfaces commonly encountered in a domestic environment. Impact patterns were created on three replicates of drywall and metal and two replicates of glass using an impact device. Sixteen upward moving stains were selected, and the AO was calculated using HemoSpat®. The surfaces were exposed to heat from a fire, and the AO was re-calculated using the same stains. Paired t-test analysis determined that there were no significant differences between the AO calculations before and after heat exposure on different surfaces. Results indicated that extreme heat accelerates the oxidation process of oxyhemoglobin, explaining the significant colour change of bloodstains after a fire. The colour change provides insight to investigators that stains at a fire scene may appear significantly aged despite being related to the incident.

### The Influence of Cyanoacrylate Fuming on the Performance of 1,2-Indandione-Zinc Chloride and Ninhydrin

Author(s): Bouwmeester, Martine Type: Article

Published: 2024, Volume 74, Issue 4, Page 379

**Abstract:** The sequential processing of cyanoacrylate fuming with the detection techniques 1,2-indanedione-ZnCl and ninhydrin was examined. In the main study, a depletion series of fingermarks was placed on four different types of paper. The fingermarks were stored in the dark and aged for one week, one month, and two months. The results revealed that there were no major differences observed on the items tested when a treatment with cyanoacrylate fuming was per-formed prior to treatment with 1,2-indanedione-ZnCl and ninhydrin.

### **Back to Basics**

Author(s): Siegel, Sandy, CLPE Type: Article Published: 2024, Volume 74, Issue 4, Page 397 Abstract: Funny finds from all over in their own words.

## Issue 3: Jul - Sep 2024

### **Review of Da Identificacao By Galdino Ramos**

Author(s):Da Silva Gomes, Gabriel Angelo; Yukihiro Matsushita, Raul Type: Article

Published: 2024, Volume 74, Issue 3, Page 184

**Abstract:** The work Da Identificação by Galdino Ramos was one of the foundations used by Locard when developing his tripartite rule. As far as we could see, it was also Brazil's first technical-scientific work on fingerprints. Despite its relevance to forensic sciences, Ramos' study was not readily available to the interested public. In possession of a copy of Da Identificação, questions raised by scholars such as Christophe Champod and Glenn Langenburg could be clarified, and even a misunderstanding by Locard himself could be observed. So, it can be considered that rediscovering Ramos' work was found to be the last missing piece of the puzzle of Locard's tripartite rule history.

# Stepwise Multiple Regression Formulae for Estimating the Total Skeletal Height Using Patellar Measures

Author(s):Kaledzera, Thom; Alblas, Amanda; Rampf, Nadine Type: Article

#### Published: 2024, Volume 74, Issue 3, Page 201

**Abstract:** The patella is often available for biological profile estimation. However, there is a lack of information supporting the use of the patella in total skeletal height estimation. This study was thus conducted to evaluate the applicability of patellar measures in estimating total skeletal height. Fifty-two complete skeletons of known age-at-death and sex were sampled. The revised Fully's anatomical method was used to establish total skeletal height for each sampled skeleton. Additionally, six patellar measurements (maximal height, maximum breadth, maximum thickness, height of the articular facet, lateral articular facet width, and medial articular facet width) were measured using a sliding digital calliper. Pearson correlation and simple linear regression was used to evaluate the relationship between each patellar measure and total skeletal height. Stepwise multiple linear regression objectively selected combinations of patellar measures for accurate total skeletal height estimation. Each patellar measure showed a significant positive linear correlation with total skeletal height (p < 0.001). Maximum thickness showed the highest correlation for the right (r = 0.814) and left patella (r = 0.772). Stepwise multiple regression selected maximum thickness and maximum height as total skeletal height predictor variables for the left patella (SEE = 55.478 mm), whereas maximum thickness and height of the articular facet were chosen for the right (SEE = 50.478 mm). These results show that patellar measurements can be used to accurately estimate the total skeletal height. This information could be helpful to forensic anthropologists, especially when estimating the living stature in the absence of a complete skeleton.

## Development of Latent Fingerprints on Surfaces Immersed in Aquatic Environments using Cyanoacrylate Fuming and Basic Yellow 40

Author(s):Rivaldería, Noemí; Rodríguez de Liébana, Inés; Blanco, Julián; Tartilán, Fernando Type: Article

#### Published: 2024, Volume 74, Issue 3, Page 226

**Abstract:** Criminals often aim to avoid leaving any traces at the crime scene, which complicates the efforts of investigators as evidence may be submerged in aquatic environments. This study evaluated the effectiveness of cyanoacrylate fuming and Basic Yellow 40 on non-porous surfaces that were submerged for varying time intervals in different aquatic environments. The study aims to provide insight into the usefulness of common friction ridge development techniques on evidence recovered from aquatic environments. Latent fingerprints were deposited on glass, aluminum, and plastic surfaces, and sub-merged in fresh water or seawater for a period of 1, 3, 7, or 14 days. In this study, identifiable latent fingerprints were recovered after 14 days of submersion in either water sample and on all three surfaces. Notably, better outcomes were found in those samples submerged in seawater.

# A Survey of Naming Conventions for Different Minutia Types in Friction Ridge Examination

Author(s):Eldridge, H.; Quigley-McBride, A.; Gardner, B.

#### Type: Article

#### Published: 2024, Volume 74, Issue 3, Page 251

**Abstract:** Latent print examiners (LPEs) consider the type and rarity of the features found within friction ridge impressions when determining the suitability of questioned impressions for comparison and when forming opinions about the source of an impression. During training, minutiae are generally grouped into basic minutiae (ridge endings, bifurcations, and dots) and combined, or compound, minutiae (minutiae comprised of combinations of basic minutiae). However, there are no standardized naming conventions for either group of minutiae, which can lead to ambiguity and confusion when communicating what features were observed and relied upon during examinations. In this study, LPEs were presented with images of 14 different basic and combined minutia types and asked to report the labels they use to describe each. A lack of consistency between LPEs in their use of labels for nearly all minutia types was observed, with consensus figures for the most-used label for each minutia type ranging from 12.1% (divergence) to 99.2% (bifurcation). Many reported labels were used by only a single respondent and other single labels were used by LPEs to describe multiple minutia types. The authors developed three desirable naming criteria (short, descriptive but unambiguous, and popular) and applied these to the survey responses, thereby selecting a single, unambiguous label for each of the 14 minutia types. It is recommended that the LPE community adopt these labels to reduce ambiguity and confusion in the communication of LPE results and opinions.

## Analysis, Comparison and Evaluation of Latent Prints: The Results of the 2021 Collaborative Exercise of the ENFSI Fingerprint Working Group

Author(s):Hefetz, Ido; Kimchi, Shimon; Zampa, Francesco; Mattei, Aldo Type: Technical Note

Published: 2024, Volume 74, Issue 3, Page 282

**Abstract:** In 2021, the Fingerprint Working Group (FIN-WG) of the European Network of Forensic Science Institutes (ENFSI) conducted a collaborative exercise (CE) on the analysis, comparison, and evaluation (ACE) of friction ridge marks. The Fingerprint Database Laboratory of the Israeli Police, in coordination with the FIN-WG Proficiency Test/Collaborative Exercise advisory group, managed the selection of the marks. The characteristics of the CE are summarized, followed by an overview of the evaluation of the performances of the participating laboratories, including lessons learned. The test proved to be quite challenging, as demonstrated by the high False Negative Rate (FNR = 13.1%). A new category of error was unexpectedly discovered. Two laboratories, while correctly identifying the donor, provided an incorrect side-by-side comparison, with non-corresponding minutiae and the identification of a different friction ridge skin area. As a result, two false positive rates were calculated, one for source (FPR-1) and one for feature set (FPR-2). FPR-1 was 1.1%, while FPR-2 was 0.7% in this exercise. Additionally, the impact of laboratory approaches to the concept of simultaneity when applied to the lack of continuity of the ridge f low was shown to impact results. Finally, there is also a discussion of the meaning of exclusion given different laboratory approaches.

### **Back to Basics**

Author(s):Siegel, Sandy, CLPE Type: Article Published: 2024, Volume 74, Issue 3, Page 318 Abstract: Funny finds from all over in their own words.

## Issue 2: Apr - Jun 2024

# **POSME Suspension Powder for Aged Latent Print Development: A Limited Replication Study and Review**

Author(s):Heaston, Genevieve Dewey Type: Technical Note Published: 2024, Volume 74, Issue 2, Page 112

**Abstract:** In a recently published JFI article [1], the Central Fingerprint Development Laboratory or Unitat Central d'Inspeccions Oculars in Barcelona, Spain detailed the development and use of a suspension powder named Powder Suspension of Mossos d'Esquadra (POSME). This suspension was designed specifically to enhance visualization of aged latent prints on a variety of surfaces. The Omaha Police Department Latent Print Examination Squad replicated two components of this study (glass and plastic) and added a new surface, a vehicle car door. The results of this performance study supports the conclusion of the original researchers that the application of POSME suspension powder solution after the use of traditional powders enhances visualization of latent print ridge detail on certain non-porous surfaces.

# Evaluation of Full Spectrum (IR/UV) Photography to Visualize Latent Fingerprints on Difficult Surfaces

Author(s):Judd, Nicole R. M.; Knaap, Wade; Lowe, Amanda Type: Article

Published: 2024, Volume 74, Issue 2, Page 128

**Abstract:** Full-spectrum (IR/UV) photography has the potential to capture and visualize infrared (IR) and ultraviolet (UV) light that traditional digital-single-lens-reflex (DSLR) photography cannot capture. The purpose of this study was to determine if IR/UV photography could visualize latent fingerprints on difficult surfaces better than traditionally used DSLR photography. IR/UV photography has been used in various subfields including forensic pathology, odontology, and anthropology with recent uses in fingerprint visualization. This study is the first of its kind to look at the efficacy of visualizing latent fingerprints using IR/UV photography on stainless steel, soft plastic, and pig skin. Four donors aged 16 to 56 years deposited six fingerprints onto three substrates; stainless steel, soft plastic, pig skin. Each fingerprint powder creating a total sample size of 360 fingerprint photographs. Each photograph was individually graded using the Bandey Scale (Home Office fingerprint evaluation scale) and results were analyzed using Kruskal Wallis and Mann-Whitney U tests. The tests showed no statistical significance in fingerprint grading between the various camera-light combinations both with and without processing.

## A 3D-Printed Portable Episcopic Coaxial Illumination Device for Fingermark Enhancement at Crime Scenes

Author(s): Williams, Zacchary; Spikmans, Val; Ebeyan, Robert; Riley, Brenden Type: Article

Published: 2024, Volume 74, Issue 2, Page 143

**Abstract:** Crime scene investigators have limited non-destructive optical techniques available for use at scenes for fingermark enhancement on flat and reflective surfaces, such as glass, metal and plastic. If standard optical techniques, such as diffused ref lection photography, fail, investigators are generally left to employ destructive techniques, including the application of fingerprint powders or chemical reagents. Episcopic Coaxial Illumination (ECI) is an alternate optical technique for flat, reflective surfaces that produces a contrasting dark fingermark impression against a light background without the need for physical or chemical treatments. ECI is a common technique employed in laboratory settings and, although commercial portable ECI devices have recently become available, they are not designed for use with generic photographic equipment that is carried by crime scene officers as part of their standard kit. This research developed a portable and cost-effective ECI device that is 3D-printed and can be attached to any camera lens. The portable ECI (pECI) device was evaluated in a proof-of-concept, pseudo-operational environment, where the pECI was compared to conventional diffused ref lection photography by photographing latent fingermarks and white powdered fingermarks. Overall, the pECI was able to record the same or more ridge detail compared to conventional diffused ref lection photography on a range of pseudo-operational substrates. The pECI device therefore shows promise for enhancing fingermarks on non-porous surfaces at crime scenes and should be considered alongside routine diffused ref lection enhancement. The developed pECI device can not only be used at routine crime scenes, but also in a laboratory environment, allowing flexibility in operation.

# The Use of Unmanned Aerial Vehicles(UAV/Drone) in Scene Investigations

Author(s):Pertsev, Roman; Tychyna, Dmytro; Goz, Sergey Goz Type: Article

Published: 2024, Volume 74, Issue 2, Page 168

**Abstract:** The investigation of a crime scene is an interrelated system of procedural actions aimed at the detection, fixation, seizure, and examination of traces of an offense. This investigation may ultimately lead to the prosecution of offenders. As new digital technology emerges, law enforcement and emergency responders must care-fully deliberate the introduction of new equipment and software to ensure scientific integrity and legal admissibility of the technology. The usability of drones has increased dramatically over the past two decades, making them an effective tool in various areas of public activity and leading to a significant number of scientific developments. Such technologies have become an everyday and integral part of society due to rapid techno-logical development, computerization, mobility, safety, ease, reliability, affordability and economic benefits. Despite these attractive benefits, drones are characterized by operational limitations due to several critical issues in terms of autonomy of f light, trajectory planning, battery life, f light time, and payload capacity. Thus, the main purpose of this study is to provide practical recommendations for the use of unmanned aerial vehicles (drones) in the investigation of offenses. The provisions and practical recommendations presented in this article are relevant in the context of the use of modern technology for inspecting crime scenes.

### **Back to Basics**

Author(s):Siegel, Sandy, CLPE Type: Article Published: 2024, Volume 74, Issue 2, Page 181 Abstract: Funny finds from all over in their own words.

# Issue 1: Jan - Mar 2024

### The Law Enforcement Agency Forensic Anthropologist

Author(s):Friedlander, Hanna; Kim, Jaymelee J. Type: Technical Note

Published: 2024, Volume 74, Issue 1, Page 1

**Abstract:** Recent scholarship has emphasized professionaliza-tion within anthropology specific to forensic anthropology. In these debates, issues of certification, expertise, training, compensation, and job placement have been underscored. As research expands in biological, archaeological, and cultural issues pertinent to forensic anthropological work, the abilities and potential areas of specialization continue to rapidly expand. Yet, in the United States, many medical examiner's offices contract forensic anthropologists or individuals trained in a related field on a part-time basis. Here, this paper draws on existing literature and professional experience to put forth an alter-native area of employment specifically for anthropologists – the law enforcement anthropologist. This paper argues for the use of full-time, civilian forensic anthropologists in law enforcement agencies that can collaborate with anthropological training to increase success in search and recovery operations, securing fragile crime scenes (e.g., fatal fires), processing remains, consider biocultural issues, and assist in the identification process. Having an anthropologist situated within law enforcement not only provides another avenue of professional employment, but streamlines communication between law enforcement and the medical examiner's office, sensitizes law enforcement to the vital contributions of forensic anthropologists, and enhances the identification process.

## **Fingerprint Transfer Mechanism to Adhesive Tapes Through Latex Gloves**

Author(s): Aronson, Ayal; Grimberg, Ziv; Cohen, Yaron; Levin-Elad, Michal

Type: Technical Note

#### Published: 2024, Volume 74, Issue 1, Page 17

**Abstract:** Abstract: In forensic science, latex gloves are used to prevent law enforcement personnel from contaminating crime scenes or evidence with DNA or marks from the hands. Law enforcement personnel, how-ever, are not the only people who want to avoid leaving DNA or latent marks at a crime scene. Perpetrators of crimes may also wear latex gloves. Alas, several forensic scientists reported that in certain cases even while wearing latex gloves, fingerprints transferred to adhesive tapes while attempting to process the tape for latent marks. Pressure sensitive tapes tend to be ideal surfaces for recovering latent marks and are commonly encountered in criminal cases involving drug pack-aging, explosive devices, or violent crimes (e.g., binding a victim's hands and feet). When a latent mark is developed on the adhesive sur-face of the tape, it may not be obvious if the latent mark was made by a bare finger or a gloved finger. Knowing that a suspect wore gloves could sometimes discourage the investigation unit from performing fingermark development procedures, as the odds to recover evidence successfully are limited. This study examines the feasibility of the transfer of friction ridge details through latex gloves to different types of adhesive tapes and uncovers the required conditions and a possible mechanism for the occurrence of this phenomenon. The findings of this work show that it is possible to develop and identify fingermarks transferred originally by gloved fingers. This study also shows that visualization of ridge details on adhesive tapes surfaces contain unique characteristics, which aid differentiating between bare or gloved hands.

### Forensic Iris Recognition: A Survey

Author(s): Bhuiyan, Rasel Ahmed; Czajka, Adam

Type: Technical Note

#### Published: 2024, Volume 74, Issue 1, Page 38

**Abstract:** Iris recognition is a biometric technology that utilizes the feature sets in an individual's iris for identification purposes. Iris recognition is a non-invasive technique that does not require physical contact with the identified individual. Post-mortem iris recognition refers to using iris images from a deceased person to identify or verify their identity. It has several potential applications, such as forensic investigations and disaster victim identification. However, biological changes after death can cause significant differences between the post-mortem and ante-mortem iris data, which presents challenges for iris-capturing sensors, feature extractors, and iris matchers. This paper surveys existing research on using iris images for post-mortem identification, including a comprehensive review of the state-of-the-art and a summary of the latest results and observations. This survey has several unique elements, which provide a valuable resource for researchers and practitioners seeking to understand the capabilities and limitations of post-mortem iris recognition technology. Firstly, we discuss the post-mortem iris recognition steps and biological changes in the iris texture after a person's death from a medical standpoint. We then present the approaches to address the post-mortem iris recognition problem, including traditional iris recognition techniques, deep learning-based strategies, and interpretable methods. Furthermore, we provide the potential confounding factors that might impact the recognition performance. We also offer a comprehensive review of the publicly available post-mortem iris databases and the evaluation metrics used to assess the performance of post-mortem iris recognition systems. Finally, we conclude the paper by providing a constructive discussion and emerging future research directions.

# Fraudulent Latent Prints: A Discussion on Their Implications in Forensic Casework

Author(s):Werner, Hilary; Hudman, Rachel Type: Article

Published: 2024, Volume 74, Issue 1, Page 63

**Abstract:** This article reviews a selection of cases involving forged or fabricated friction ridge impressions. Definitions and methods of forged and fabricated friction ridge impressions are described. Although the detection of fraudulent friction ridge impressions by a latent print examiner may be difficult in casework, notable distortion factors from known cases are summarized. Further research regarding methods of forgery and fabrication and formal training of examiners should raise alertness and benefit the criminal justice process.

# Recovery of Footwear Impression Evidence Using Portable Three- Dimensional Scanning Technologies: A Pilot Study

Author(s): Harvey, Julia; Liscio, Eugene; Lowe, Amanda; Stotesbury, Theresa Type: Article

Published: 2024, Volume 74, Issue 1, Page 90

**Abstract:** Current methods used to document and collect foot-wear impression evidence are destructive and lack high-resolution three-dimensional detail. This study explored the use of non-invasive three-dimensional scanning technologies to document and collect the three-dimensional characteristics of footwear impression evidence. Footwear impressions created in sand and garden soil using a sneaker and a boot (n=4) were documented and collected using a digital single-lens ref lex (DSLR) camera using the photogrammet-ric method, a Polyga Compact L6 structured light scanner, and an Artec Space Spider structured light scanner. The Polyga Compact L6 acted as the high-resolution baseline that most closely represented the actual footwear impressions. Point clouds and meshes were compared in CloudCompare to determine the level of intra-variability between the Artec Space Spider and photogrammetry technologies. The Artec Space Spider was the most accurate of the methods for documentation and collection for all impressions with a mean absolute distance of 0.148 mm or less. Photogrammetry had a mean absolute distance of 0.176 mm or less. It was found that three-dimensional scanning technologies are viable as a compliment for two-dimensional photographs and casting when collecting footwear impression evidence.

### **Back to Basics**

Author(s):Siegel, Sandy, CLPE Type: Article Published: 2024, Volume 74, Issue 1, Page 108 Abstract: Funny finds from all over in their own words.