INIAI

May 30, 2024
Volume 28, Issue 2

Lab & Scene

CONFERENCE SNEAK PEEK

Hello INIAI members,

The 2024 Educational Conference is quickly approaching. As we continue to prepare and book events, you should too!

This years' conference will be located in.......

Bloomington, Indiana!

On the following page, you will find links to register for this year's conference, as well as the hotel booking link for rooms that have been blocked off especially for this INIAI event.

Your INIAI board members and officers are working diligently to find the most interesting speakers and topics to present at this year's conference. Be on the lookout for information regarding who they are, in the next issue of the INIAI newsletter coming in early September.

Until then, we hope you enjoy this quarter's newsletter, and don't forget to send in your membership renewals and dues if you have not yet. More information on that, can be found on the last page of this publication.

Thank you all for your support and we cannot wait to see everyone soon!

2024 President & INIAI Editor,

FORENSIC SCIENCE TRIVIA

Answers will be revealed in the next issue!

Which prefix means "relating to blood"?

Modern DNA analysis, known as the PCR-STR process, has been around since the ________.

After death, blood pools at the lowest points of the body. What is this called?

Fingerprints that are not visible to the naked eye are called ______ prints.

Last issue's answers on page 6

INSIDE THIS ISSUE

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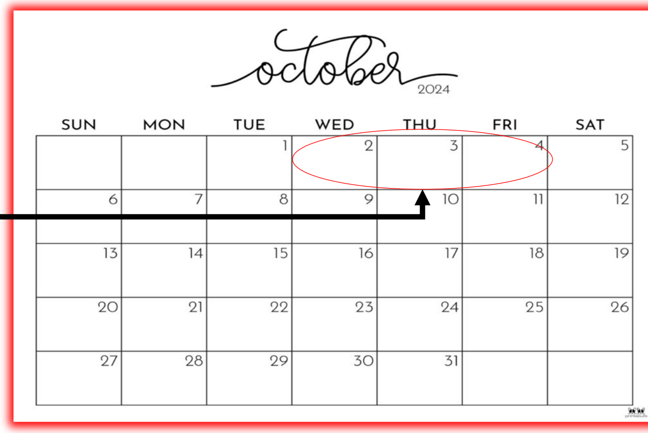
2024 EDUCATIONAL CONFERENCE INFORMATION

Dates

October 2nd-4th



Location

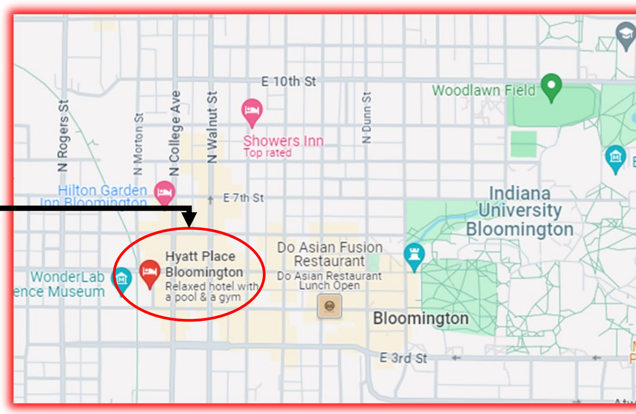
Hyatt Place Bloomington

Kirkwood I & II Conference Rooms

Hotel

Hyatt Place Bloomington

(Link Below)



Please click image above to register for this year's conference

Please click image above to book hotel rooms

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MOTHER OF BOY FOUND DEAD IN SUITCASE IN SOUTHERN INDIANA ORDERED HELD WITHOUT BOND

SALEM, Ind. (AP) — The mother of a 5-year-old Atlanta boy whose body was found in a suitcase in Indiana in 2022 was ordered held without bond Tuesday during a strange initial court appearance in which she claimed she was under federal surveillance for several months before her capture.

Dejaune Anderson, 38, is charged with murder, neglect and obstruction of justice in the death of Cairo Ammar Jordan, whose body was discovered by a mushroom hunter in April 2022 in a wooded area some 35 miles (55 kilometers) northwest of Louisville, Kentucky.

U.S. Marshals arrested Anderson arrested last month in California after she had been nearly two years on the run.

"I've been under NSA surveillance for the past eight months," Anderson told Washington County Circuit Judge Larry Medlock, "and how can that qualify me as a fugitive on the run when I've also had a detail from Space Force that was following my every move?"

"If Space Force comes forward and tells me they're willing to monitor you," Medlock replied, "we'll take up the issue of bond at a later time."

When Medlock initially asked Anderson to identify herself, she replied with another name, beginning with "Princess," and said she was "representing the entity" of Anderson, local news outlets reported.

Anderson asked to represent herself, but Medlock said he'll ask someone from the public defender's office to represent her.

Anderson is due back in court on April 25, with a tentative trial date scheduled for August.

An autopsy found that Cairo died from vomiting and diarrhea that led to dehydration, state police said. Investigators said the boy had died about a week or less before the mushroom hunter came upon the body.

A second woman charged in the case reached a plea deal with prosecutors in November.

Dawn Coleman, 41, of Shreveport, Louisiana, was sentenced to 30 years in prison with five years suspended to probation after pleading guilty to aiding, inducing or causing murder, neglect of a dependent resulting in death, and obstruction of justice.

Continuing Education

Some helpful resources to keep updated on the forensic sciences field

The American Academy of Forensic Science

Forensic Magazine On the Scene and in the Lab

Center For Integrity in Forensic Science


ADVANCED
DWS
UV-Box
Safedevelop
Safekeeper

MICROBIAL TRACES ON CLOTHES: A TOOL FOR FORENSIC INVESTIGATIONS

When you think of a criminal investigation, you might picture detectives meticulously collecting and analyzing evidence found at the scene: weapons, biological fluids, footprints and fingerprints. However, this is just the beginning of an attempt to reconstruct the events and individuals involved in the crime.

At the heart of the process lies the “principle of exchange” formulated by the French criminologist Edmond Locard in the early 1900s, which states that “every contact leaves a trace”. The transfer of materials between the parties involved in a crime (the victim, the perpetrator, objects, the environment) forms the basis for reconstructing the events.

In Locard’s time, these traces were typically things you could see with a magnifying glass or microscope, such as pollen, sand and fibers. However, such evidence is limited because much of it is not directly associated with a specific individual.

In our latest research, we have shown how the population of bacteria on a person’s skin leaves traces on the clothes they wear – and how these traces last for months and can be used to uniquely identify the wearer.

Microbial traces

Imagine a crime scene where an investigator finds a victim and a piece of clothing that doesn’t belong to them. Pollen or grains of sand might help the investigator find out where it came from, but what about identifying the owner of the clothing?

Skin cells, hairs and biological fluids are good contenders. However, another thing very specific to an individual is the unique community of microorganisms on and within their body.

These microbes are specific to different parts of the body, can persist over long periods of time and can be transferred to other people and to the environment. This makes them useful to address a variety of questions in forensics.

“Forensic microbiology” got its start in the early 2000s, as scientists set out to find ways to defend against bioterrorism. Today forensic microbiology is used to identify individuals after death, understand what their health was like before they died, determine how and why people have died, how long it has been since they died, and where they came from.

In a nutshell, today’s update on Locard’s principle is that “every contact leaves a microbiological trace”.

The ‘touch microbiome’

While this principle has been established, we still want to know more about how much of an individual’s microbiome is transferred to their surroundings. We also need to know how long it persists, and whether certain microbes may be more useful than others for identification.

We also want to understand how microbial traces may be contaminated by

LAST ISSUE’S ANSWERS

Microscopy

The Kastle-Meyer test is used to test for blood

The idea is known as the Locard Exchange Principle

1987

other items or the environment, and how different receiving surfaces affect microbial populations.

In 2021, two of the authors (Procopio and Gino) and colleagues at the University of Central Lancashire in the UK and the University of Eastern Piedmont in Italy first described the “touch microbiome” – the unique bacterial populations on individuals’ skin. This work also studied how these bacteria could be transferred and persist for up to a month on non-porous surfaces, such as a glass slide, in uncontrolled indoor surroundings.

This team also analyzed DNA from samples belonging to dead bodies from old cases, which had been frozen for up to 16 years. They were able to identify specific populations of microbes linked to the manner of death and the decomposition stage of the bodies. This showed the microbial signature can be used to improve our understanding of cold cases when DNA extracts are still available.

Tracing T-shirts

In our most recent work, the third author (Magni) joined the collaboration to improve the potential of individual identification from clothes, items often collected as evidence at the crime scene.

In our study, cotton T-shirts were worn by two individuals for 24 hours in Australia. The T-shirts were then placed in a controlled environment for up to six months, alongside unworn items used as controls. Samples from both worn and unworn T-shirts were taken at various points in time and frozen.

The samples were then shipped (still frozen) to Italy for microbial DNA extraction. Next, sequencing was conducted in the UK, with the goal of identifying the microbial species present in the samples.

Results showed the two volunteers transferred distinct and recognizable microbes onto the clothing, each unique to the respective individual. Additionally, we could distinguish between worn and unworn items even after an extended period of time. The microbiome remained stable on the worn garments for up to 180 days.

We also observed the transfer of specific bacteria from the worn items to the unworn ones stored closest to them, showing the possibility of microbe transfer between items.

Learning more from clothes

Clothes at any crime scene can provide key evidence for the investigation process.

They can aid in profiling individuals by revealing indicators of gender, occupation, income, social status, political, religious or cultural affiliations, and even marital status.

Additionally, they can provide clues regarding the manner of death, the location of the crime, and in certain cases, even support the estimation of the time since death.

Clothes play a crucial role in reconstructing events associated with the crime and establishing the identity of individuals involved.

Our research shows clothing can provide even more evidence. The discovery of unique microbiomes capable of identifying individuals from clothing marks a significant stride forward.

THE LIAR'S PUZZLE

WE WANT YOUR FEEDBACK

Did you enjoy the last conference?

Learn anything new?

Who was your most and least favorite speaker?

Did you like the location?

What can we do better this year?

Please give your feedback!

Email: khayes@isp.in.gov

If you have any photos from past educational conferences or outings, please email them; we would love to share on our social media pages and newsletters!

Egmont VanDorn has been found dead in his apartment. From the beginning, it is pretty clear to the police that this was no accident. Before they can be separated, the four young people who found the body - Arnold, Betsy, Charles and Daisy - eagerly begin to tell their story.

"If, as the police say, Egmont was injured between four and five," said Daisy, "that must let us all out. We were all together having dinner for at least two hours before we came over here."

"But we all arrived at seven," Charles pointed out.

"Arnold said that it was six o'clock at the time, just before we opened the door. Didn't you Arnold?" said Daisy.

"I said it was just seven on the nose," said Arnold. "Sorry, honey."

"I have no idea what he said or what time we got here," declared Betsy. "The thing I remember is the gas in the hall. We rang the doorbell, and no one came and no one came, and then I smelled the gas. My heart turned over, I thought to myself, he's dead. I just know he's dead."

"Don't dramatize yourself," said Daisy coolly. "There is no way that you could have smelled the gas before we opened the door. The place was locked up, and sealed too, tighter than a drum. We'd still be in the hall if Eggy hadn't given me a key last week."

"There was gas in the hall, all right," said Charles. "I smelled it before we opened the door. You seemed to take forever getting your key out. When you finally got the door opened, the gas just streamed out."

"That was a pretty dangerous thing you did, Charles," said Arnold, "turning on the lights the way you did. Didn't it occur to you that a spark at the light switch could have blown us all up."

"The lights were already on, Arnold," Charles replied.

"For my part, I'm sorry about pulling him out of the oven - tampering with the evidence and all that," said Arnold. "Murder never crossed my mind. Locked room, you know. All I could think of was that maybe he was alive and we could still save him."

"I don't believe this," said Daisy. "You didn't pull him out of the oven. I did. You ran and opened the window. Very good move, too, I thought at the time."

"I opened the window!" cried Betsy. "I was dizzy from the fumes, and I knew I needed to do something fast."

"The only things you opened were the door to the liquor cabinet and a bottle of Scotch, Betsy." Charles laughed at her. "And I thought they were good moves."

"That was Arnold who got out the Scotch," said Betsy. "Don't you remember our sitting there after you called the police, and Arnold passing out the glasses?"

"It couldn't have been me. Must have been you," said Arnold. "I've never been here before, I didn't even know where he kept the stuff. Charles, what did you do?"

"Do you know what? I don't think I did anything. I remember quite clearly, walking over here with you after that long dinner we had together, and then seeing poor Eggy's feet through the door. But after that, I don't think I did a thing, except stand there gasping."

Who did it?

Answer on Last Page

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FORENSIC IMAGE PROCESSING

Introduction to Forensic Image Processing

Forensic image processing (FIP) involves the computer restoration and enhancement of surveillance imagery. The goal of FIP is to maximize information extraction from surveillance imagery, especially imagery that is noisy, incomplete, or over/under exposed. Although this definition is with respect to surveillance imagery, FIP techniques can be applied to other types of images, such as retinal images, shoe impression images, UAV (unmanned aerial vehicle) infrared images, and more.

Often, for a variety of reasons, the quality of surveillance imagery is very low. The low imagery quality can be caused by poor lighting, poor media quality (analog systems), excessive motion of the subject, a camera in need of calibration, and noise introduced by the imaging/recording system. With digital filtering, image restoration, de-noising, and enhancement techniques, information can often be extracted from low quality imagery.

Forensic imaging processing is a method of improving a digital image (surveillance, closed circuit TV, infrared, etc.) using a variety of computer techniques. These techniques often involve digital “filters” that can suppress noise in the digital image, aid in the extraction of detail from shadow, and provide image sharpening.

Limitations of FIP

Forensic image processing cannot restore image quality beyond the original information content, i.e., it cannot add information to the image. Like any other technology, there are limitations to what can be done with forensic image processing. The most fundamental limitation is related to the information content. No amount of image processing and enhancement can add information that is not present in the image. This is different from a situation where an image is degraded by noise, for example. The desired information may be present in a noisy image and the proper sequence of forensic image processing techniques may allow the extraction of that information.

Computer Vision

Computer vision is a technology that uses computers to develop a high-level of understanding of a digital image or video. This process involves the automatic extraction, analysis, and understanding of information from an image or video. The image data can be produced by video surveillance cameras, image streams from multiple cameras, or images derived from medical scanning systems.

Computer vision applications include scene reconstruction, video tracking, object detection, object recognition, 3D pose estimation, motion estimation, 3D scene modeling, image restoration, and more. Some specialized applications of computer vision include event detection, activity recognition, learning, indexing, motion estimation, 3D scene modeling, and image restoration.

OpenCV

OpenCV (Open Source Computer Vision), initially developed by Intel, is a free computer vision library for real-time image processing. The OpenCV software is widely used for most computer vision applications, such as image processing, video capture, and object detection.

OpenCV is a large library of more than 2500 optimized algorithms that can be used for many different computer vision applications, such as:

Face detection and recognition.

Object identification.

Object tracking.

Image registration and stitching.

Augmented reality.

Image Contrast

Contrast refers to the color or grayscale difference between various image features in both analog and digital images. Images with higher contrast usually have more color or grayscale variation than images with lower contrast.

Because of sub-optimal lighting conditions, optical systems, cameras, and image capture systems may produce low contrast in a captured image. These conditions, and the resultant degraded images, can adversely affect photography, forensics, surveillance, and image analysis. Image contrast can be improved by modifying the histogram of pixel values, a technique to increase the dynamic range of pixel intensity and enhance image detail.

Figure 1 shows an example of image pixel redistribution of a digital image and the subsequent improvement in contrast using an algorithm from OpenCV.

Figure 1. Original low contrast image (left) and image with enhanced contrast by histogram modification (right).

Image Filtering

Image filtering is a process of passing or attenuating specific spatial frequency components in an image. A digital filter can be used to either suppress or eliminate spurious data or enhance features that are not visibly apparent in the image. Image filters can be classified as low-pass or high-pass filters. A low-pass filter passes low-frequency spatial features and attenuates high-frequency features, resulting in a blurring or smoothing effect on an image. A high-pass filter does the opposite, it passes high-frequency spatial components and attenuates low-frequency features. The result is an image with enhanced detail, referred to as a sharpened image.

Low-pass filtering is often used to remove high-spatial frequency noise from a digital image. This improves image quality by suppressing high-frequency noise without loss of important image detail.

Figure 2 shows an example of noise suppression using an OpenCV algorithm.

Figure 2. Image with speckle noise (left), and the result of low pass filtering to reduce noise (right).

A high-pass filter is used for image sharpening. Image detail is sharpened when contrast is enhanced between adjacent pixels that have minimal variation in brightness or darkness. A high-pass filter is designed to retain the high-frequency information in an image while simultaneously suppressing low-frequency information. As a result, high-pass filters emphasize boundary pixels between contrasting pixels and perform as an edge detector or edge enhancement filter for image features.

Figure 3 shows an example of edge sharpening with an OpenCV high-pass filter.

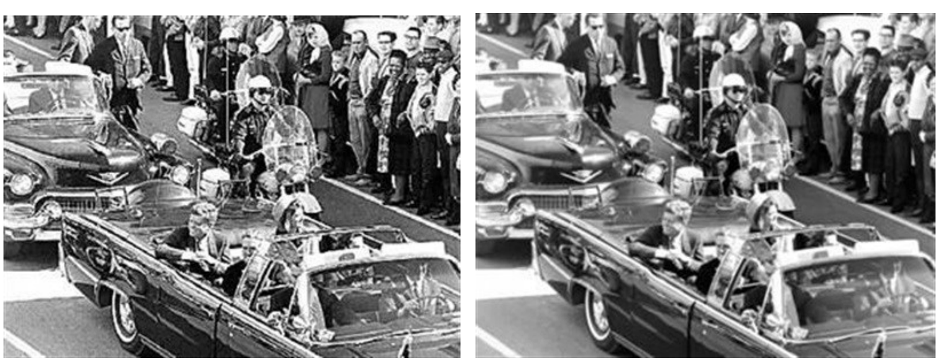

Figure 3. Frame 175 of the President John F. Kennedy motorcade, from Abraham Zapruder's Bell & Howell camera, showing before (left) and after (right) application of an edge sharpening filter.

UPCOMING TRAINING OPPORTUNITIES

Alternate Light Source Workshop —Tritech Forensics

Modesto, CA | July 11th-12th, 2024

This Alternate Light Source Workshop course begins with a discussion of the properties of light and luminescence and culminates in the use of the ALS to visualize and photograph items of evidence. A review of basic photography and the use more advanced photographic techniques to optimize image quality will be included.
This course will heavily emphasize instruction using hands-on techniques. The students will photograph realistic evidence to observe the photographic results of the techniques learned and used in class.

Forensic Ultraviolet & Infrared Photography —TriTech Forensics

Vero Beach, FL | July 31st -August 2nd, 2024

This Forensic Ultraviolet & Infrared Photography course will demystify the practice of taking reflective infrared and ultraviolet photographs with digital cameras and will provide the student with skills he or she can use in their work to assist in the investigation of criminal activity.

Basic Bloodstain Pattern Analysis —TriTech Forensics

Louisville, KY | September 9th-13th, 2024

Throughout the course, students will learn how to identify different types of bloodstain patterns, such as passive, projected, and transfer patterns. They will also learn how to interpret the size, shape, and distribution of blood-stains to determine the nature and direction of the impact that caused them.

Forensic Digital Imaging for Latent Print Examiners—RS&A

St. Paul, MN | October 29th-November 1, 2024

Based on Adobe Photoshop, relevant plug-ins and other software, this four day workshop is designed to enable the attendee to understand and explain digital theory and methodology. Through extensive hands on exercises, to make an effective image diagnosis and to decide how and when to use these valuable tools in order to extract the maximum amount of information from problem images .

Webinars offered by Evolve Forensics are approved by the IAI for Latent Print Certification and Recertification continuing education hours.

Click on the photograph below to view more training opportunities.

Find more training opportunities at the websites below:

https://www.theiai.org/training.php

https://www.tritechtraining.com/upcoming-courses.html

http://www.iniai.org/training.html

FINGERPRINT BREAKTHROUGH COULD SHED NEW LIGHT ON COLD CASES

Analytical scientists from Loughborough University have demonstrated for the first time that drug residue—namely the fast-acting sleeping pill Zolpidem that has been linked to drug-facilitated sexual assault and drink spiking—can be detected on gel-lifted fingerprints. Jim Reynolds and Ayoung Kim say the breakthrough could shed new light on cold cases and unsolved crimes since forensic gel lifters—which transfer prints onto a gelatine surface—are used globally by crime scene officers to preserve and visualize fingerprints.

“This is the first time that analysis of gel-lifted prints for a drug substance has been accomplished and shows that lifted prints and other forensic marks can be useful information,” said lead researcher Reynolds. “Since gel-lifted prints and marks can be stored for many years, the technique could be of real use in cold cases where additional information may prove useful to either link or exonerate a suspect to the investigation. Working with police forces and applying the method to cold case samples could help bring criminals to justice who may have thought they have got away with it.”

There are currently a number of tests that can detect drugs directly from fingerprints but they face limitations—they can be destructive to the fingerprint, degrade drug residues and are negatively affected by environmental interferences.

It has long been speculated that gel-lifted prints contain valuable chemical information and could offer more accurate drug detection.
However, traditional techniques used to analyze the chemicals present in a sample have previously not been suitable for gel lifters. This is because they detect all chemicals present, including those that make up the gel, making it difficult to identify specific substances.

The method used by Reynolds and Kim—called sfPESI-MS—overcomes this issue using a rapid separation mechanism that distinguishes the drug substance from the background of the gel. The process involves sampling the chemicals from the gel lifters into tiny liquid droplets. The chemicals extracted into the droplets are then ionized. The drug substance chemicals are more surface active than the chemicals originating from the gel, which enables them to be separated from the mixture. This separation method enables the direct detection of a drug substance using mass spectrometry.

“By linking chemical information to the fingerprint, we can identify the individual and link them to the handling of an illicit substance, which may prove useful in a prosecution,” said Reynolds. “This could also be useful in detecting individuals who have been spiking drinks. For example, if the drug they are using gets onto their fingertips, they will leave evidence at the scene.”

According to the published study in Drug Testing and Analysis, the researchers have demonstrated successful testing of the technique using Zolpidem-laced fingerprints lifted from glass, metal and paper surfaces in a laboratory setting.
They now hope to work with police forces to analyze stored gel-lifted prints, and use the method to identify other substances.

“Zolpidem was the focus of our research, but the method could just as easily be applied to other drug substances a person may have been handling and could be applied to other chemicals such as explosives, gunshot residues, paints, and dyes,” said Reynolds.

INIAI

The Indiana Division of the IAI was chartered July 29, 1994. This organization was established as a not-for-profit organization to associate persons working in the fields of forensic investigation, examination, and identification for the following purposes:

- ◊ To encourage communication and the sharing of ideas and information among the forensic science and criminal justice communities.
- ◊ To keep members advised of the latest developments in the forensic and identification sciences.
- ◊ To encourage research into new methods and techniques of forensic investigation, examination and identification.
- ◊ To encourage professionalism and high standards in the fields of forensic investigation, examination and identification.

MEMBERSHIP APPLICATIONS AND RENEWLS

If there is anyone you may know who would be interested in joining the Indiana Division of the IAI, all membership information can be found here.

New members will need to fill out an application and send a payment of $20 in the form of check, money order, or through the Division's PayPal.

Please send any and all questions regarding membership, applications, and renewals to MWebb@isp.in.gov.

To submit physical applications, renewals, or payments please send them to:

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Read the constitution.

INIAI

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Kaitlin Hayes
khayes@isp.in.gov

The Liar's Puzzle Answer:

Each innocent person had one fact wrong, and the killer lied all the time. Who did it?

Charles?

Charles and Daisy agree that they all had a long dinner and arrived together. If Charles is the killer, he is lying about this, and Daisy is mistaken. If Daisy is mistaken about this, she must be right that Arnold opened the window. If Arnold opened the window, then Charles must be telling the truth that Betsy didn't open it. But if Charles is telling the truth, he can't be the killer.

Daisy?

If Daisy is the killer, she lied about their having arrived together after the long dinner, and Charles is mistaken there. If Charles is mistaken there, he must be right in everything else. But Charles disagrees with Betsy twice - about whether Betsy opened the window and whether she opened the Scotch. That would make Betsy mistaken twice, and that can't be.

Betsy?

If Betsy is the killer, Charles is mistaken about whether there was gas in the hall, and right about everything else. So when Arnold and Charles disagree about whether the latter turned on the lights, it must be Arnold who is mistaken. Arnold would be right about everything else. But Arnold disagrees with Daisy twice: about what time Arnold said they arrived, and about who pulled poor Eggy out of the oven. If Arnold is right about both, Daisy is wrong twice and that can't be.

Arnold?

So is Arnold the murderer? Yes. Let's take it from top to bottom.

Charles and Daisy are both right about the long dinner and everybody's arriving together. Arnold lies when he quotes himself as saying they had arrived at seven on the nose - and Daisy is right that he had said six. Charles is also right, however, in claiming that they had arrived at seven (which would need to be true for anyone to have done the crime, according to the police estimate).

Betsy and Charles are both right about the smell of gas in the hall. Daisy had made a mistake.

Arnold lies about Charles' turning on the lights and Charles is right that they were already on. Arnold lies about pulling Eggy out of the oven, and Daisy is right that she did it. Daisy is right that Arnold opened the window; Charles is right that Betsy did not open the window; and in thinking that she did, Betsy is mistaken.

Arnold lies about Betsy's opening up the Scotch; Betsy is right that Arnold opened it; and in thinking that in was Betsy who did it, Charles is mistaken.

Note that although it is NECESSARY to show a logical possibility of Arnold being the killer, it is not SUFFICIENT to simply show this possibility to prove that it was Arnold. To demonstrate that it was truly Arnold, you must show that Arnold could be the killer, and also that the other three could not be.