
The CACNews
News of the California Association of Criminalists • Fourth Quarter 2017
CAC SPRING SEMINAR 2009
CAC 2010 Fall Seminar
October 3-7, 2010
Oakland Marriott Convention Center
1001 Broadway Oakland, CA 94607
FISHING FOR CLUES
BATTIN' ON FORENSICS
California Association of Criminalists
Spring Seminar • May 3-7, 2004
QUEEN MARY
SPRING MEETING PROGRAMME
CALIFORNIA ASSOCIATION OF CRIMINALISTS
Spring 2012 Seminar
May 7-11, 2012
Bakersfield
Double Tree Hotel
3100 Camino Del Rio Court
Bakersfield, CA 93308
Hosted by the Kern County Regional Criminalistics Laboratory
CALIFORNIA ASSOCIATION OF CRIMINALISTS
MURDER, MYSTERY AND SCIENTIFIC INTRIGUE
FALL 2013 SEMINAR
CAC FALL SEMINAR 2008
SACRAMENTO • OCTOBER 20 - 24
FIND YOUR OASIS IN FORENSIC SCIENCE
CAC & ASTEE JOINT MEETING
121ST CALIFORNIA ASSOCIATION OF CRIMINALISTS SPRING SEMINAR
MAY 20—24, 2013
PASADENA, CA
Shark Week: Taking a Bite Out of Crime
CALIFORNIA ASSOCIATION OF CRIMINALISTS
FALL 2015 SEMINAR
SAN MATEO, CALIFORNIA
SEPTEMBER 21 - 25, 2015
55TH SEMI-ANNUAL SEMINAR
MAY 7-10, 1980
FALL 2011 SEMINAR
UC DAVIS
CAC Fall 2006
The Oakland Whodunit Game
2014 Joint Fall Seminar
CAPITAL CRIMES
WHAT'S SH
In forensic

The President's Desk

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CAC President

...nothing gave me more pleasure than receiving nominations and submitting the names to the Board of Directors for approval. There are so many of us out there working diligently, participating in the criminalistics field, and contributing to the advancement of forensic science. These members deserve recognition.

And the Winner is...

Someone once said, "Feeling gratitude and not expressing it is like wrapping a present and not giving it." So, I am going to use this platform to do just that, appreciate. I appreciate the membership for voting me in as president, attending seminars and workshops, and contributing to our field of science. I appreciate my superiors for allowing me time to serve the CAC. I appreciate the agencies who volunteer to host our semi-annual meetings. And in this upcoming seminar, in particular, I cannot wait to show my appreciation to those members receiving awards.

Having served on the Awards Committee for the CAC most of my career, nothing gave me more pleasure than receiving nominations and submitting the names to the Board of Directors for approval. There are so many of us out there working diligently, participating in the criminalistics field, and contributing to the advancement of forensic science. These members deserve recognition.

Here is a list of some awards we offer in this organization:

ABC Exam Award

There are two fees an examination applicant must pay in order to take the test: an application fee (a nominal fee which the CAC will always reimburse regardless of membership status) and a costly sitting fee. The American Board of Criminalistics allows each of its member organizations to choose one individual per year to take the exam without a sitting fee. This ABC Exam Award for the CAC is open to any member. The Board chooses the recipient at random from the list of applicants. Application period: Jul. 1 - Dec. 31.

Alfred A. Biasotti Most Outstanding Presentation (MOP) Award

All CAC members presenting at the semi-annual seminars are graded by volunteer judges for content and delivery. The winner of this award receives a certificate and a $200 stipend. A Best Poster Award was also created which confers a certificate and a $50 CAC credit.

Edward F. Rhodes Memorial Award

Newly employed members (less than three years) are eligible for this award. The recipient receives a plaque and an all-expense paid attendance to any forensic or scientific meeting. The candidate should be willing to give some of him or herself to the requested event. Application period: Jul. 1 - Dec. 31.

Paul Kirk and Presidents Award

Journey-level forensic scientists (up to six years) who have had active contributions to the profession may be presented this award. This award provides travel expenses to and from England to attend

please turn to page 5

The CACNews

www.cacnews.org

FOURTH QUARTER 2017

Program artwork
A collage of CAC seminar program covers spanning four decades showcases the imagination of our event planners.

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The CAC is a private foundation dedicated to the furtherance of forensic science in both the public and private sectors.

Please direct editorial correspondence and requests for reprints to the editorial secretary.

Notice to Contributors: We publish material of interest to our readers and are pleased to receive manuscripts from potential authors. Meetings and course announcements, employment opportunities, etc. are also solicited. Advertisements are also accepted, although a fee is charged for their inclusion in *The CACNews*. Please contact the advertising editor for further information.

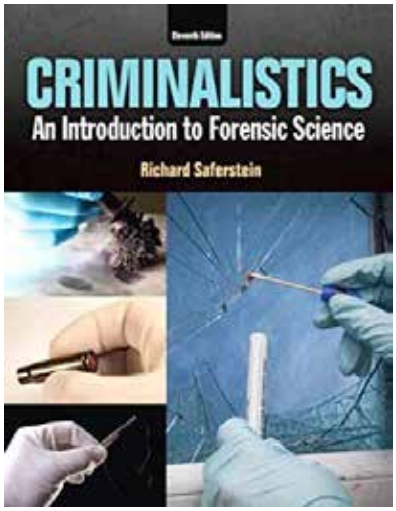
Submissions should be made in the form of Windows compatible files on CD or by e-mail. Alternatively, text files may be saved as plain ASCII files without formatting codes, e.g. bold, italic, etc. Graphics, sketches, photographs, etc. may also be placed into articles. Please contact the editorial secretary for details.

The deadlines for submissions are: December 1, March 1, June 1 and September 1.

INSIDE

CACBITS

Richard Saferstein 1941-2017



It is with great fondness that we remember Richard Saferstein, Ph.D, AAFS Retired Fellow, who passed away on July 28, 2017. Dr. Saferstein retired in 1991 from the New Jersey State Police as Chief Forensic Scientist after heading the NJSP Forensic Science Bureau for 21 years. He was a leading national expert and author in the field of forensic science and was a highly sought-after consultant, participating in a multitude of high profile cases throughout the country. Dr. Saferstein served as an expert witness over 2000 times in nearly 150 federal and state courts involving a variety of forensic issues. His areas of expertise encompassed breath and blood testing for alcohol, pharmacological effects of alcohol and drugs, detection and identification of drugs in biological fluids, arson-related analysis, and the forensic examination of blood, semen, hair, paint, fiber and glass evidence. His expertise also included review and evaluation of forensic DNA evidence.

Dr. Saferstein was a prolific writer who authored numerous papers and 14 books and laboratory manuals including five books published by Prentice-Hall. His most notable is the standard forensic science text available in the field, Criminalistics: An Introduction to Forensic Science, which continues to be the leading textbook in most forensic science academic programs in the United States. Dr. Saferstein was also the editor of the leading professional reference books in forensic science- Forensic Science Handbook Vol. I, Forensic Science Handbook Vol. II, and Forensic Science Handbook Vol. III. Dr. Saferstein has also authored the book, Forensic Science: From the Crime Scene to the Crime Lab.

Dr. Saferstein earned a Ph.D. in Chemistry from the City University of New York in 1970. He was elected a Provisional Member to the AAFS Criminalistics Section in 1975, promoted to a Member in 1976, promoted to Fellow in 1977, and became a Retired Fellow this year. He was presented with an award of merit by the AAFS in 1995 and was the recipient of the AAFS 2006 Paul L. Kirk Award for distinguished service and contributions to the

Dr. Saferstein's service to the forensic sciences extended well beyond the activities of the AAFS. His name can be found in the membership rolls of numerous professional organizations, which reflected his broad range of professional interests. He was a member of the American Chemical Society, the International Association for Identification, the Canadian Society of Forensic Scientists, the New Jersey Association of Forensic Scientists, the Northeastern Association of Forensic Scientists, the Mid-Atlantic Association of Forensic Scientists, the Society of Forensic Toxicologists, the New York Microscopical Society and the Eastern Analytical Symposium (EAS). Dr. Saferstein served as President of EAS in 1989.

Dr. Saferstein was the Rosenblatt Memorial Lecturer in Forensic Science at Northeastern University in 1994, an advisory board member for the Barnett Institute-Northeastern University, and a member of the editorial boards of the Journal of Forensic Identification (2001-2017), the Journal of Forensic Sciences (1984- 1994), the Microchemical Journal (1988-1995), and the Journal of Analytical and Applied Pyrolysis (1980-1984).

He presented numerous forensic science seminars many of which included high school teachers. He was adjunct professor at The College of New Jersey where he taught an Introduction to Forensic Science for over 10 years and also taught at Widener University School of Law.

Dr. Saferstein is survived by his wife, Gail, son, Neal, daughter Sharon and her husband, James Brophy, grandchildren, Xavier and Gabrielle Brophy; sister, Rochelle and her husband, Bernie Nicki.

— Thomas Brettell

Fisher Editorial Online

CAC member Barry Fisher recently published an editorial in *Forensic Sciences Research* entitled, "A new challenge for expert witnesses relying on subjective information."

He writes, "Forensic Scientists increasingly face challenges when testifying about pattern evidence. "Pattern evidence" here denotes fingerprint evidence, firearms, tool marks, footwear, tire impressions, handwriting, bite marks, etc. Critics question whether experts using only subjective information can provide the court with reliable information. Detractors maintain that objective data, meaning statistics, is necessary for the expert to form an opinion in court cases. Some critics have used the depreciatory term "junk science" to suggest that certain forensic science disciplines have little or no validity and should no longer be used."

Read the full article here:

http://www.tandfonline.com/doi/full/10.1080/20961790.2017.1342587

Inter/Micro 2018

Join professional and amateur microscopists from around the world as they present new research on techniques and instrumentation, environmental and industrial microscopy, and chemical and forensic microscopy. InterMicro is an international microscopy conference—since 1948!—Hosted by McCrone Research Institute, Chicago.

CALL FOR PAPERS: McCrone Research Institute cordially invites you to give a presentation of your microscopy research at the 70th annual Inter/Micro conference in Chicago. View abstract submission guidelines at www.mcri.org.

The More Things Change...

While preparing this issue's cover art, and rooting through programs from dozens of past seminars, I was struck by one abstract in particular. It's twenty-years old but could have been written today.

—John Houde

RECAPTURING THE ESSENCE OF CRIMINALISTICS

The field of criminalistics has grown dramatically over the last four decades. By most indicia the growth has been an order of magnitude or more over this span of time. Today there are many more laboratories, and the laboratories that existed then are much larger or have become systems with satellite facilities. There are certainly many more scientists employed in the field. In addition, the technological advances which have taken place have been nothing short of astounding. It is doubtful that an established criminalist who began a Rip Van Winkle experience, at the time when I entered this field, in 1960 would even recognize a modern forensic science laboratory on awaking today. The physical changes have been profound. All of these changes relating to growth and development would seem at first glance to be positive and welcome. However, in my view, there is cause for considerable concern. This paper will argue that with the growth of the field and advances in technology have come negative developments that need to be examined. The rapidity of the growth has resulted in a loss of focus. It can be argued that technology has advanced at the expense of the science of criminalistics. There has been an erosion of capability with respect to scientific problem solving. Many scientists employed in crime labs around the nation don't even agree on an operational definition of criminalistics. We need to assess where we are, articulate a vision for the future, and reinvent ourselves.

Peter R. De Forest, D. Crim.
Fall 1997 Seminar, Irvine, CA, October 8 - 11, 1997.

The President's Desk

the upcoming conference of the Chartered Society of Forensic Sciences (CSFS), formerly the Forensic Science Society, our sister organization. Application period: Jan. 1 - Jun. 30.

W. Jack Cadman Award, *(Application period: anytime)*

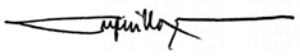
Anthony Longhetti Distinguished Member Award, *(Application period: Jan. 1 – Jun. 30)*

Roger Sherman Greene III Memorial Award *(Application period: anytime)*

These awards are for seasoned forensic scientists who have contributed significant time and influence to the Association and the field, with the Roger Sherman Greene Award being the highest award our association offers.

Article I, Section 11 of the Bylaws expresses one of the objectives of the Association: ***"Encourage the recognition of this Association and its purposes among other appropriate groups and societies."*** I believe that recognition of the Association begins with the recognition of those who comprise the Association, its members. If you believe you qualify for certain awards or know of anyone deserving of any award, please visit the Awards page on the website or discuss this matter with the Awards Committee to get more information.

Cheers,



BLOOD RELATION

meiling
ROBINSON

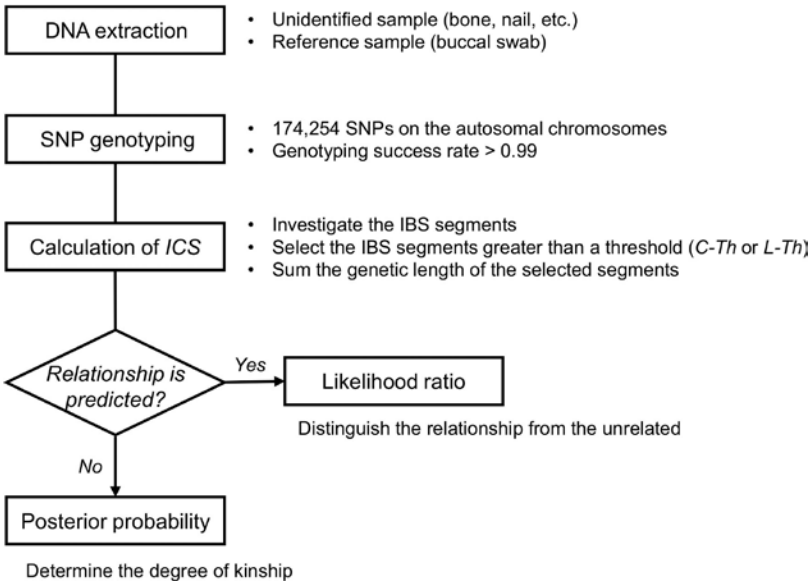
CAC Editorial Secretary

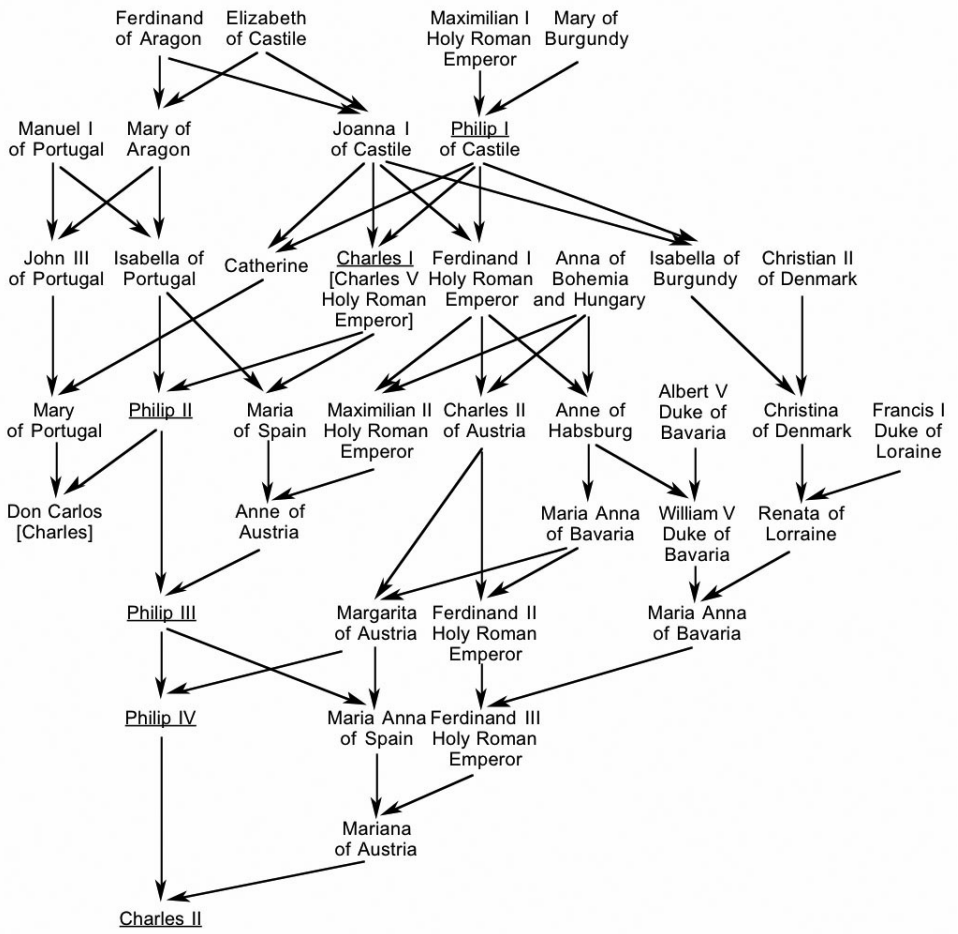
The more I thought about it, the more I realized that we are merely temporary vessels carrying our genes, which will live on in other living people long after we are dead.

Why are there so many commercials for Ancestry.com? I can't be the only one to notice this. It seems like during every commercial break, the television is telling me that I should be curious about my family history and my ancestry. And if you know me, you know that I get curious over just about anything once the seed has been planted. Just brilliant Ancestry.com! Those commercials where average people (actors) get all teary eyed or fulfilled knowing that a particular hat is the most important hat they've ever owned or that they're part Native American…yes, those commercials have me down the rabbit hole.

For me, my ancestry is pretty straightforward due to the fact that I'm a new American—first generation on my mother's side and only second generation on my father's side. Pretty easy to know what's coming from where. The curiosity stems less from knowing about geographical origin, and more from understanding gene distribution. I have a 23andMe account and basically what I've learned from it is that I have 1,224 relatives ranging from 50% shared DNA with my mother and father to 0.07% shared with a "fourth to distant cousin" (four or more generations between our common ancestor). How is it possible for me to have this many cousins? I know that there are a lot of family members that I know nothing about on both my mother and father's sides. Both of my parents are the youngest of their siblings and both sets of grandparents were long dead before I was born. There are a lot of aunts, uncles and first cousins I do not know because of the age gap between my parents and their eldest siblings. So feasibly, yes, there exists a considerable amount of people in the world who are genetically related to me. In general we're genetically linked to many people through a common ancestor, but there can't be thousands of people, right?

Let's explore. Lets go back in time about four degrees of relationships back on the Table of Consanguinity to your great-great-grandparents. Those 16 people have contributed to the collective being that is you and you've inherited, on average, 6% of your DNA from them. Those DNA remnants from generations ago, maybe approximately 100-200 years ago, depending on how old you are today, are still persisting today. The more I thought about it, the more I realized that we are merely temporary vessels carrying our genes, which will live on in other living people long after we are dead. And as far as cousins are concerned, going up the table past four degrees of relationships, it becomes apparent that it is very plausible for me (and for you) to have thousands of distant cousins, sharing miniscule amounts of





DNA. "No matter the languages we speak or the colour of our skin, we share ancestors who planted rice on the banks of the Yangtze, who first domesticated horses on the steppes of the Ukraine, who hunted giant sloths in the forests of North and South America, and who laboured to build the Great Pyramid of Khufu" (*Rohde, Olson*, and *Chang*, 565).

Now back to the topic at hand—consanguinity. Consanguinity is a term used to describe the relationship between couples that share at least one common ancestor. Canon law of the Catholic Church forbids marriage between individuals if they are within four degrees of consanguinity. Marriages are almost universally prohibited within the second degree of consanguinity. And while most jurisdictions forbid marriages between first cousins, other jurisdictions, like North Carolina and surprisingly New York, still permit it. So in terms of genetic relationship, we're talking about permitted unions between people who share about 12% of their genetic material. I know, at this point you're probably thinking, "Why is Mei writing about this?" Well, I've been thinking a lot about blood lately. I just took a bloodstain pattern interpretation course and more topically, I saw an episode of a popular television show where inheritance and succession is central to the plotline and consanguinity influences many of the decisions made by characters. (If you know what show I'm writing about, and you don't want spoilers, please skip ahead to the last paragraph). For those who are current or are choosing to read on, I started thinking about this show from a forensic kinship analysis perspective. If first cousins share about 12% genetic material, what amount of sharing on average occurs between individuals in avunculate marriages (or partnerships)? Marriages between an aunt and a nephew (or an uncle and niece) are unions between two people who are second-degree relatives. They share 25% of their genetic material. Gross. Westeros would greatly benefit from kinship analysis, but then again it would deprive viewers of cringeworthy performances.

In most societies, avunculate marriage is prohibited as incest, but in others it may be legal or more accepted as commonplace. Historically, avunculate and cousin marriages were rife among European royal families. It was common belief that through intermarrying, royal families could preserve their pedigree and maintain their royal heritage. However, Europe's royal inbreeding led to the lugubrious degeneration and ultimate end to many sovereign lineages. One tragic example is the ruination of the Spanish Habsburg line (House of Austria). After 16 generations of interbreeding, the sole heir of the Spanish Habsburg Dynasty was damaged fruit, Charles II of Spain. Charles II of Spain was physically and mentally disabled, and impotent. Thus, the Habsburg's literally bred themselves out of existence.

Back to forensic kinship analysis...which is why we really care about consanguineous relationships. Common applications of kinship analysis are paternity, identifying victims of mass disasters, missing persons cases, immigration disputes, and familial searches. Although STR DNA profiles can be used to evaluate the probability of kinship relationships, STR-typing systems are best for evaluating first-degree relatives. In cases where reference samples from first-degree

relatives are not available, references from distant relatives are used to identify a person. The statistical power for complex kinship testing significantly decreases compared to first-degree pairwise kinship analysis. Accuracy drastically decreases from about 95% with parent-child relationships, to 72% among siblings, to 5% between an aunt/ uncle, and virtually impossible for cousins and second cousins. A new technique using high-density single nucleotide polymorphisms has been developed to perform pairwise kinship analysis by calculating an "index of chromosome sharing" (ICS) between two individuals. The research by *Morimoto et al*. from Kyoto University "can determine accurate degrees of kinship in up to third-degree relationships with a probability of > 80% using the criterion of posterior probability ≥ 0.90, even if the kinship of the pair is totally unpredictable." The principle inspiration for their research was to help identify the 70+ unknown tsunami victims of the 2011 Great East Japan earthquake. This new method shows great promise for analysis of unidentified human remains, specifically in cases of disaster victim identification or missing person identification. Unfortunately, due to the current state and climate, both are applications of increasing interest in forensic laboratories.

Mei

References:

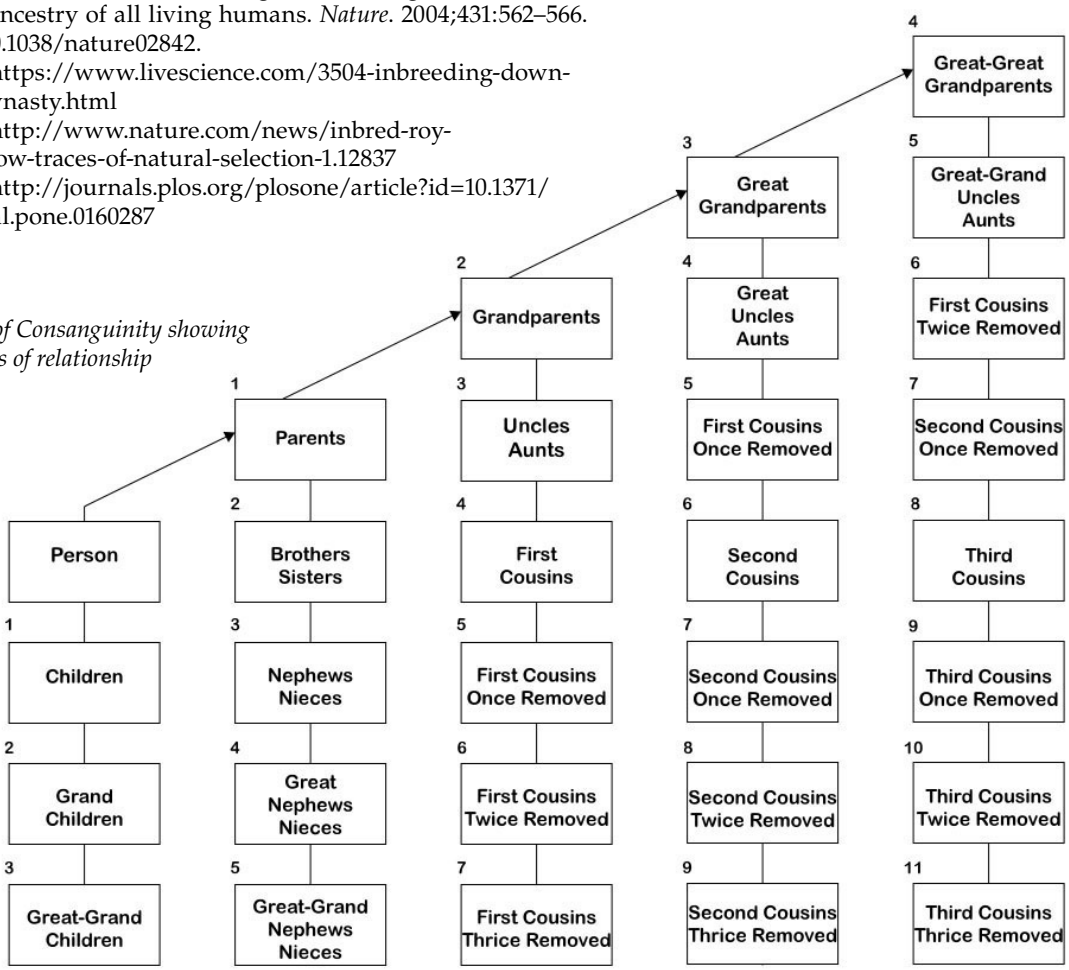
Rohde DL, Olson S, Chang JT. Modelling the recent common ancestry of all living humans. *Nature*. 2004;431:562–566. doi: 10.1038/nature02842.

https://www.livescience.com/3504-inbreeding-downfall-dynasty.html

http://www.nature.com/news/inbred-royals-show-traces-of-natural-selection-1.12837

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0160287

Table of Consanguinity showing degrees of relationship



Lindbergh Kidnapping— *The Ladder Link*

*By Donna J. Christensen**

March arrived raw, bleak and blustery in New Jersey's Sourland Mountain region. Along with the inclement weather came tragedy, horror and pain.

Wednesday morning, March 2, 1932, the headlines of the nation's newspapers announced the news —LINDY'S BABY KIDNAPPED. Early accounts were sketchy. Someone, using a homemade ladder to gain access to the second-story nursery window of the Lindbergh home near Hopewell, N. J., had stolen the 18month- old son of Charles Augustus and Anne Morrow Lindbergh.

The crime of the century aroused public interest and concern to a level unknown before. Within five weeks, the Lindbergh garage overflowed with mail—38,000 letters ar rived offering sympathy, suggestions, prayers and assistance.

One letter was from Arthur Koehler, a 46-year-old xylotomist and chief wood technologist at the Forest Products Laboratory in Madison, Wis. He wanted to help and had specific training and abilities to offer. As he had for more than 20 years, Koehler continued his work at the laboratory, pursuing research on the growth, cellular structure and identification of wood. Such was the knowledge he offered to detect clues in the abandoned ladder. No reply came.

Ten weeks passed. Hope and despair vied with one another. Was the child alive or dead? Negotiations resulted in a $50,000 ransom payment, but still no child. Then, on May 12, the body was discovered partially buried in the woods just a couple of miles from the Lindbergh home.

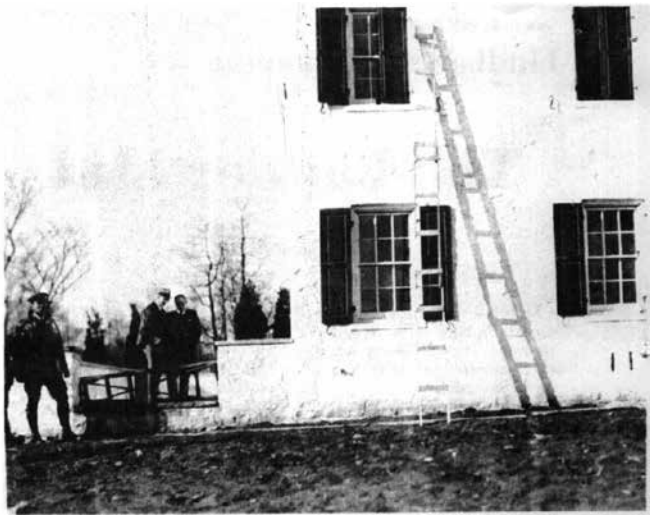
Now there was nothing more any one could do to gain the child's safe return. All that remained was the search for justice.

The mail of late May, 1932, delivered slivers from the ladder to Koehler's office for identification. Through his microscope Koehler observed anatomical features that indicated four different woods were used to build the ladder—Douglas-fir, ponderosa pine, birch and a type of southern pine known as North Carolina pine. A good first step, but examination of the entire ladder could supply further information. His report was mailed to the New Jersey state police. Again he waited. Ten months passed.

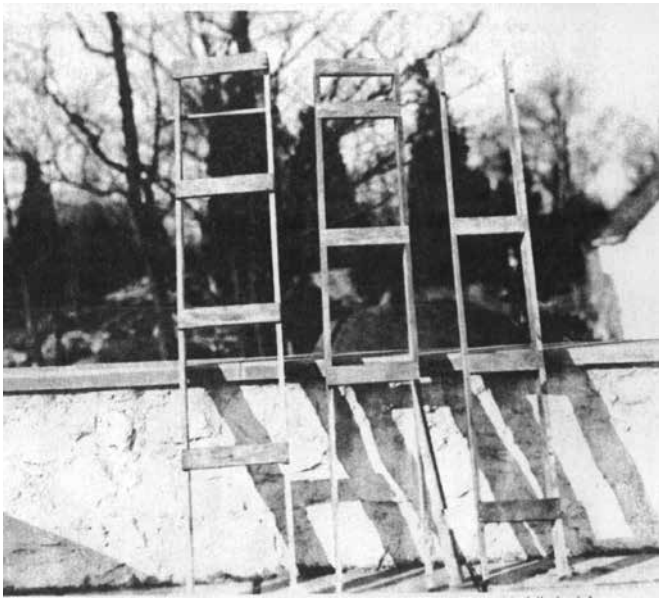
In spite of intensive investigations by several separate police units, no suspects were apprehended. The quest for leads continued. In March, 1933, Koehler was asked to come to Trenton to study the ladder. Finally, a year after the crime, the opportunity arose to "have the ladder talk. "

Koehler was right. The "wooden witness" had several clues to offer to an expert who could analyze and interpret

Arthur Koehler in his laboratory at the U.S. Forest Products laboratory in 1936.

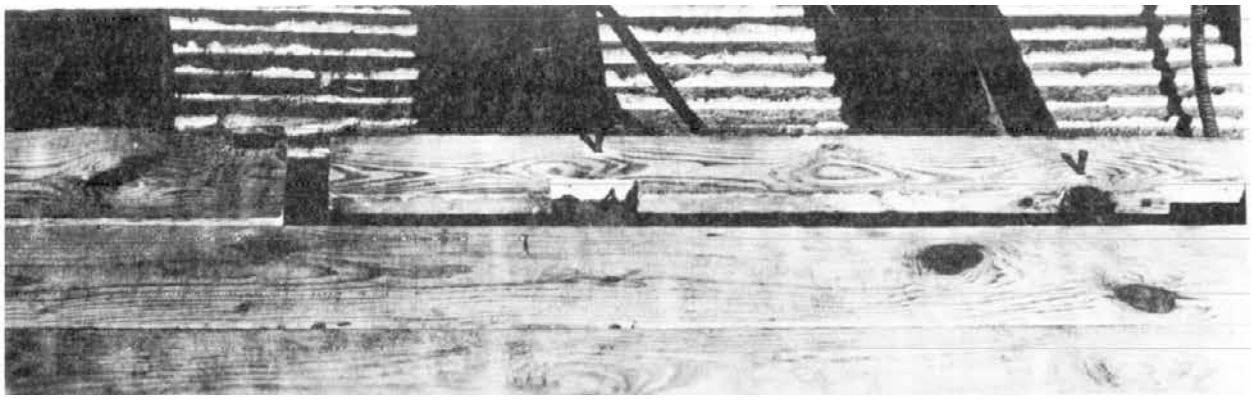


(above) The ladder found at the scene of the Lindbergh kidnapping and (below) disassembled for easy transport in a car.



*Donna J. Christensen is a botanist in the Center for Wood Anatomy Research at the Forest Products Laboratory in Madison, Wis. The wood research facility is maintained by the U.S. Forest Service of the Department of Agriculture in cooperation with the University of Wisconsin.

Reprinted by permission from *Forests & People,* Fourth Quarter, 1977. Louisiana Forestry Association

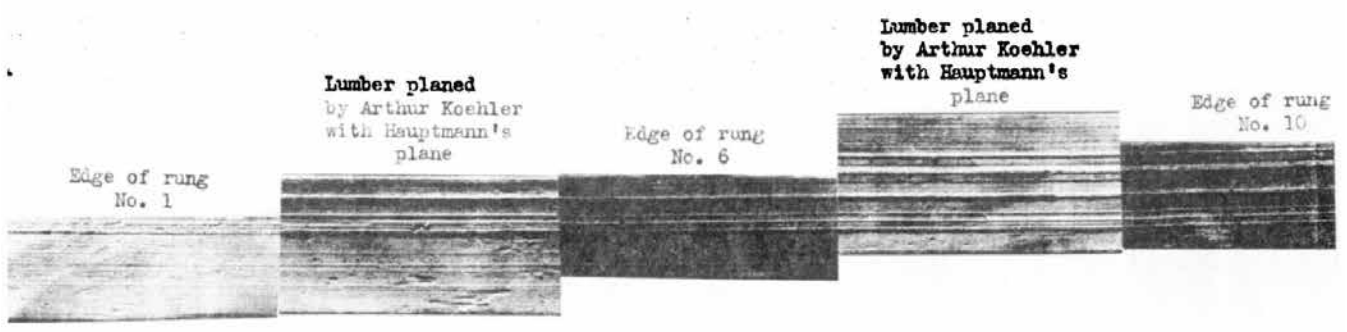


Evidence shows that ladder rail number 16 was sawed off from the attic floorboard seen at the left. The original sew cut extends a short way into the next board and sawdust found on the lath and plaster below shows that the sawing was done after the floor was laid. Cut nails taken from the attic floor and pushed through four holes found in the ladder rail fit exactly in four corresponding holes in the joists. Two of these nails are visible in the picture.

them. All of wood technology's tools, techniques and knowledge were put to work. Every dimension for each of the 19 ladder parts was measured to the nearest 1/100 inch. Oblique lighting was employed to reveal features barely discernible under ordinary light. Marks left by hand saw, hand plane, chisel and machine planer were all analyzed and measured in minute detail. Calculations were made to determine sawkerf widths and nail size and shape. Page upon page of data were accumulating. Where would it lead? What could it tell about the builder?

The ladder was one of a kind, crudely constructed, but requiring some degree of carpentry competence. It consisted

Koehler set out by writing on May 24, 1933, to 1,600 mills in the North Carolina pine region. In a page-long letter, accompanied by three pages of description and diagrams, he provided detailed information about dimensions, growth characteristics, grade and planer marks for the two bottom ladder rails from the North Carolina pine board. Only planers having six knives in the side heads and eight in the top and bottom heads, spinning at about 3300 r.p.m. and feeding lumber through at approximately 258 feet per minute could have dressed the board.



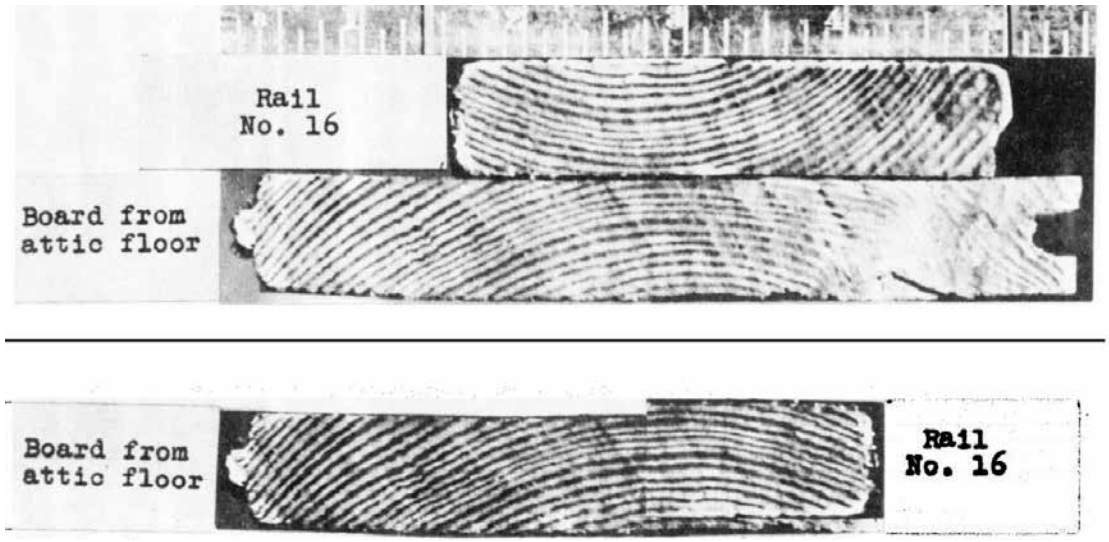
A dull hand plane, full of nicks, was found in Bruno Hauptmann's garage after his apprehension. When Koehler used the plane on a piece of pine, a peculiar pattern of ridges left by the nicks exactly matched those found on the kidnapping ladder. Koehler demonstrated this fact by actually planing wood in the courtroom.

of three sections, each 6 feet 8 inches long. When stacked on top of each other they would fit into a car; when joined together they could easily reach a second-story window. No signs of wear were visible; it had been used for a single special purpose. Someone, somewhere, took some lumber, sawed, chiseled and planed it into a tool for kidnapping, and then left it behind. A long, difficult and at times seemingly hopeless search began to locate the source of the boards and subsequently the person who purchased them.

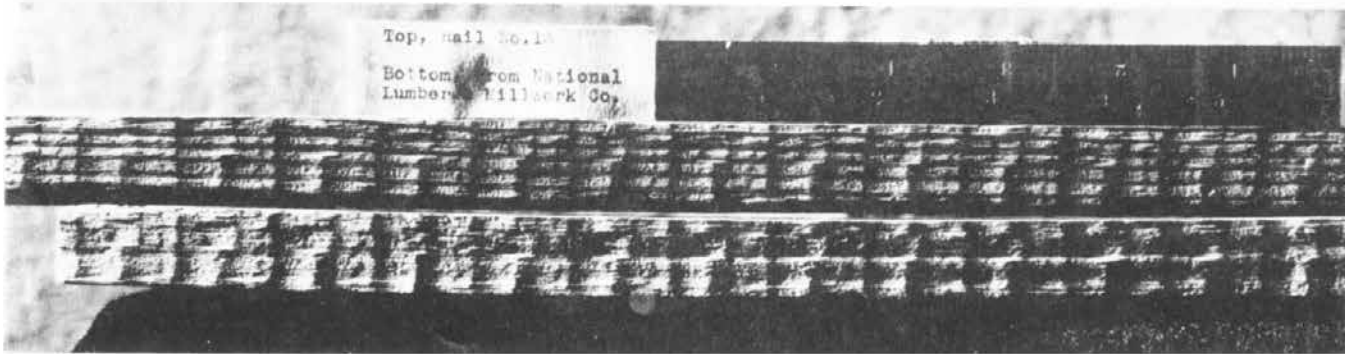
It could be determined that 10 of the ponderosa pine rungs were cut from a single 1" x 6" board. Two of the six rails had been cut from a 1" x 4" x 14' North Carolina pine board. Another of the rails was trimmed down from a wider board.

A set of peculiar, almost invisible planer marks along the edge of the board provided the clue needed to trace the lumber. For six months, on foot and via the mails, Koehler had "dogged" the piece of wood through hundreds of mills and lumberyards. Frustration, dead ends, stares of disbelief were encountered week after week. But now, finally, the search had narrowed, first to the Dorn mill in McCormick, S. C., and from there to the National Lumber and Millwork Co. in the Bronx, N.Y. The date was Nov. 29, 1933.

The itemized purchases record should include the ladder builder's name. But it was not to be. The company operated on a cash basis; there was no list of customers. After all that effort, yet another dead end. There was no choice now except to start all over trying to trace a different board from the ladder.



Two photographs, when superimposed, show that the ladder upright and attic floorboard were formerly one and the same piece, Despite the fact that 1 3/8 inches of wood are missing between the two pieces, nature's handiwork in the growth rings shows agreement as to curvature, number, variation in width and percentage of summerwood.



Mill planer marks helped to trace parts of the latter back to a single sawmill and from there to a single shipment of lumber to a yard in the Bronx, New York City. Crucial clues in tracing this lumber were a series of almost microscopic groves or gouges near one edge of the lumber.

In the meantime, police were plotting points where ransom money was being spent and were tightening the net around a suspect's neighborhood in the Bronx. Koehler had suggested to police that they watch for certain items should they locate a suspect. Any carpentry tools, especially hand planes, saws, chisels and nails, might supply important evidence. Evidence shows that ladder rail number 16 was sawed off from the attic floorboard seen at the left. The original saw cut extends a short way into the next board and sawdust found on the lath and plaster below shows that the sawing was done after the floor was laid. Cut nails taken from the attic floor and pushed through four holes found in the ladder rail fit exactly in four corresponding holes in the joists. Two of these nails are visible in the picture. Also, locations where a board seemed to be missing.

September, 1934—Bruno Richard Hauptmann, a carpenter, is arrested and charged with kidnapping and murder. Within his house and garage are found $14,000 of marked ransom money and carpenter tools with links to the ladder. Among the tools are these items:

Nine hand saws—two have 10 teeth per inch and produce a saw cut 0.0035 inch wide. Either fits exactly the scratch marks and recesses found on the ladder.

A 2 1/2" wide hand plane. The blade has acquired its own unique set of nicks and grooves which will tell their tale at the trial.

In a package are four 8-penny wire nails with a "P" imprinted on the shank. Exactly the same kind of nail used to fasten the ladder parts together.

And, in the attic of the house, part of a floorboard is missing.

The date is Jan. 24, 1935; the place is Flemington, N.J. It is the 17th day of the trial of the State of New Jersey vs. Bruno Richard Hauptmann. Arthur Koehler is sworn in as a witness for the state and sits in the witness chair. Several minutes of debate and dispute concerning Koehler's capacity to act as a "wood expert" initiate his testimony. Over the objection of the defense attorney, Mr. Pope, the court rules that Koehler be permitted to present his expert opinions.

Rail 16 from the ladder and its relationship to a floor board from Hauptmann's attic is the first evidence to be examined. Koehler declares they were originally part of the same board. Many factors contributed to this conclusion.

(1) Rail 16 was punctured by four, square, 8-penny, cut nail holes not used to construct the ladder. Even though it was used lumber, there were no signs of exposure to the weather

and no rust around the nail holes. Four nails of the proper size and shape were inserted into the board. It was taken to Hauptmann's attic. The nails fit exactly—size, spacing, angle and depth—into four corresponding holes in the joists of the attic floor. A one- in - 10,000,000,000,000,000 chance according to Koehler's calculations.

(2) With the nails in place the rail board was oriented exactly parallel to the other floorboards.

(3) A pile of sawdust on the lath and plaster between the joists indicated that part of a floorboard had been cut off and removed.

(4) Both the ladder rail and floorboard are North Carolina pine.

(5) The knot pattern is the same in both boards. A dull hand plane, full of nicks, was found in Bruno Hauptmann's garage after his apprehension. When Koehler used the plane on a piece of pine, a peculiar pattern of ridges left by the nicks exactly matched those found on the kidnapping ladder. Koehler demonstrated this fact by actually planing wood in the courtroom. Mill planer marks helped to trace parts of the latter back to a single sawmill and from there to a single shipment of lumber to a yard in the Bronx, New York City. Crucial clues in tracing this lumber were a series of almost microscopic groves or gouges near one edge of the lumber.

(6) The planer marks are oriented in the same direction.

(7) The flat surfaces of the two boards, despite a 1 3/8" gap, display the two halves of the same grain pattern.

(8) And, the end grain of both pieces match perfectly. The annual rings are identical in number present

(12), curvature, width variation, prominence and percent of summerwood.

Koehler's testimony next concentrates on the hand plane marks observed on several parts of the ladder. He takes the 2½" hand plane found on a shelf above the workbench in Hauptmann's garage. Clamping a board in a vice attached to the judge's bench, Koehler demonstrates why he is convinced it it this plane and no other that was used to smooth the edges of several rungs and rail 16 of the ladder. Removing the board, he makes a pencil tracing of the pattern of scratch marks produced by the dull blade. The comparison to marks found on the ladder leave little doubt that the same tool made both sets.

Among other pieces of evidence presented by the state were facts that Hauptmann had worked at the National Lumber and Millwork Co. in the Bronx on several occasions and that he purchased about $9 worth of lumber late in December, 1931. That was approximately two months before the kidnapping and within a month of receiving a shipment from the Dorn mill. Throughout the trial Hauptmann declared himself both innocent of the crime and ignorant of any knowledge concerning it. But the jury found him guilty and he was executed on April 3, 1936.

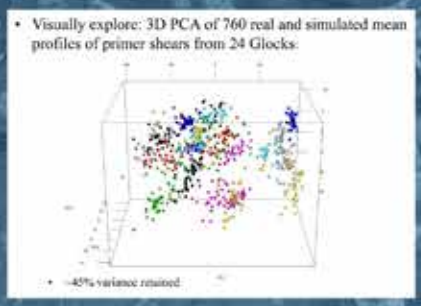
Antique Microscopes on Display

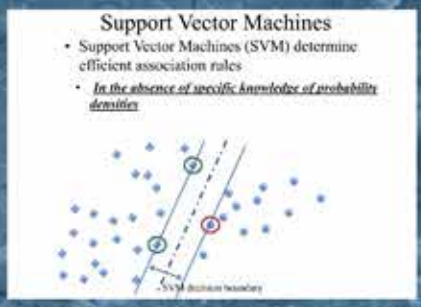
The Santa Barbara Museum of Natural History recently featured *"Insecta,"* an exhibit that included a brilliant display of what is arguably the largest private collection of antique microscopes in the world.

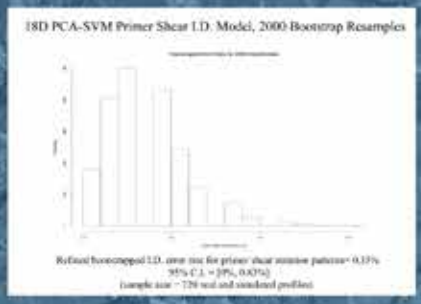
A pioneer in electronic music, painter and collector, Gil Mellé was president of the Los Angeles Microscopical Society. He passed away in 2004, but during his lifetime he held a fascination for scientific instruments, traveling throughout the world to add to his collection and researching their history. His scientific papers in the *LAMS Objective*, a monthly bulletin for its members, formed the basis for much scholarship in the field.

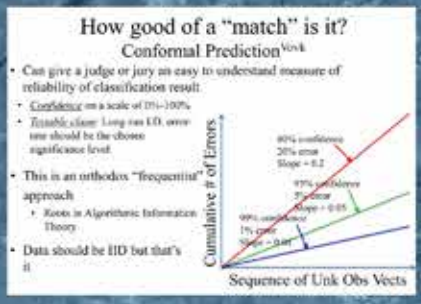
The 400+ microscopes in his collection range in date from the late 1600's up until they were mass-produced in the 1920's. Some weigh in at less than an ounce and others more than 30 pounds. The collection is a showcase for the progression of optical and mechanical science in the artistic construction of these instruments. In some examples the features of note were optical (in the glass) and in others it's in their construction (stability, flexibility, convenience, ergonomics, style).

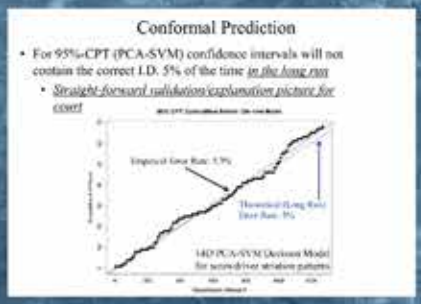
In addition to the brass and glass antiquarian microscopes, Gil's collection also contains thousands of microscopic slides, books, journals, catalogs, microtomes, illuminators, portraits, and miscellaneous items relating to microscopy. The collection was on loan from Gil's wife, Denise. Photos courtesy of CAC member Ed Jones *(pictured)* who called our attention to this fusion of science and art.

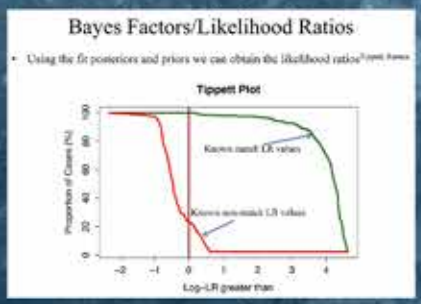












FORENSIC STATISTICS

CLASS DATE: NOVEMBER 13-16, 2017

CLASS CODE: A200

SUBJECT AREA: A-Professional Communication and Conduct Program

CLASS LOCATION: California Criminalistics Institute / Rancho Cordova

CLASS DESCRIPTION:
Class is four (4) days of lectures and hands-on exercises with the open-source R/RStudio software and custom software written in R by Dr. Petraco for the course. Course is intended for all forensic disciplines and will include: An introduction common statistical terminology; conducting or evaluating a statistical study; sampling strategies; histograms and the meaning of probability densities/distributions; common ways to summarize data; common summaries of variation, and "Frequentist" vs. "Bayesian" philosophies of probability.

INSTRUCTOR: Dr. Nicholas D. K. Petraco

OBJECTIVES: The purpose of this hands-on course is to acquaint forensic practitioners with statistical methods that are applicable to evidence they encounter, as well as issues and pitfalls to be aware of when applying these methods. The focus of the course will be on statistical methods used to analyze data derived from forensic disciplines other than DNA; e.g., firearms and impression evidence, trace evidence, controlled substances, and toxicology.

PREPARATION: Forensic scientists should have a basic knowledge of statistical methods.

TUITION: No cost to POST supported or State of California based law enforcement agencies. A $480.00 tuition fee will be required of all other public agency, private sector, or out-of-state applicants.

CONTACT COURSE COORDINATOR: Neda.Khoshkebari@doj.ca.gov
(916) 464-5599 for additional information.
Applications are available through: http://oag.ca.gov/cci

CALIFORNIA CRIMINALISTICS INSTITUTE

OFFICE OF THE ATTORNEY GENERAL · CALIFORNIA DEPARTMENT OF JUSTICE

Reasoning Through Madness:
The Detective In Gothic Crime Fiction

The greatest impacts on Gothic fiction and detective fiction were those works by Edgar Allan Poe and Sir Arthur Conan Doyle. While Gothic fiction and detective fiction are distinctly different in style and form, Poe and Doyle were instrumental in linking the two, often through the combination of horror and reasoning.

*By Michelle Miranda**

Introduction

The Gothic era is characterized by the horrific and unknown; death, psychological degeneration, and mystery are the typical elements intertwined in Gothic literature.

The concept of Gothic is ever-evolving, with prevailing social anxieties dictating what constitutes the macabre. Characterized by what "shocks the conscience", the Gothic genre is moulded by human nature and fear of the unknown, which exists on a continuum throughout history. Psychological terror, whether in the form of a monster or a madman, reflects on the atmosphere of a given time period, focusing on the public's deepest fears and anxieties and forcing the reader to face those fears through a winding maze of darkness and uncertainty. Early Gothic fiction, centered in the first half of the nineteenth century, was influenced by the Enlightenment; while the scientific and industrial revolutions of the eighteenth century brought forth advanced scientific theories and modes of reasoning, social stratification began to see a blurred division between the civilized and the barbaric. With this division, fears of social regression and degeneration were heightened. What separated the man from the beast was not a chasm, but a line not so well-defined and not so easily avoidable. Authors of early Gothic literature were able to exploit these fears while at the same time praising the advancements in science, technology, psychology and philosophy that awakened these moral panics.[1] Commenting on the link between science, crime and class structure in the Gothic era, the detective Eugene François Vidocq wrote,

> Justice! It strikes the blow! And to whom does it strike? The poor, the ignorant, the unfortunate, to

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> whom the bread of education has been denied; him in which no moral principle has been inoculated; him to whom the law has not been promulgated … Let us not be deceived, in spite of the diffusion of light, the education of the people is not yet completed … Science is abroad, and she walks alone; she advances for the privileged classes; she progresses for the rich. She illuminates only the upper regions, and the lower are still in the darkness … (1834: 364)

One can reason that the darkness was both literal and figurative; the dark and dirty streets in the recesses of the city filled with the lower classes were where deviant behaviours and sinister criminals festered—here is where Gothic fiction found its focus. The darkness was a symbol of the unknown, where the uneducated and unstable existed, inciting fear and uncertainty in the literate, distanced middle and upper classes. When that darkness made its way into the well-lit regions reserved for the upper classes, elements of horror and dread were bound to diffuse into the psyche of those citizens, causing fear and apprehension. As the Gothic Era bled into the Victorian era in the second half of the nineteenth century, Victorian Gothic fiction was born. Existing on a continuum, Victorian Gothic continued to explore the fears and anxieties of society, with attention given to the morbid and dark. While the Victorian Gothic era was characterized by epistemological[2] advancement and a romanticism of daily life, the public's fascination with horror and the morbid was still prominent. What evolved during this transition from Gothic to Victorian Gothic was knowledge obtained through developments in science, criminology and the criminal justice system. Superimposed on the rising attention to crime was the amplification of scientific thought. Psychoanalysis and evolution[3] were being scrutinized at the same time that criminologists weighed in on atavism and the born criminal.[4]

Due to the development of police and detective agencies, the public became more interested in law enforcement, crime solving with the aid of physical evidence, and the nature of the criminal.

The pioneering work of individuals like Cesare Lombroso (1835–1909), Alexandre Lacassagne (1843–1924), Hans Gross (1847–1915), Alphonse Bertillon (1853–1914), Sigmund Freud (1856–1939), Havelock Ellis (1859–1939), and Edmund Locard (1877–1966) brought about an exploration of crime and science and the utilization of science in solving crimes. Advancements in criminal identification, forensic medicine, forensic toxicology, forensic ballistics, criminal psychology and policing produced a wealth of publications and greatly expanded the accessibility of such topics to the public. A great deal of attention was paid to evolution and human nature, with atavism leading the criminologist's quest for understanding the criminal mind, isolating the born criminal, and predicting future behaviour.

Further explorations to understand the human psyche and gain insight into the causes of and cures for madness were also underway. But social stratification and anxiety still existed, and criminals now seemed to permeate every aspect of daily life, from the gentleman con artist to the serial killer of prostitutes.[5]

Investigators evaluated the nature of crime and the importance of criminal investigations while scientists began to understand the efficacy of tangible evidence on the apprehension and conviction of criminals. The walking dead were not limited to monsters created in a laboratory or vampires located in the confines of a castle in an uncharted country (for example, *Frankenstein* and *Dracula*). Instead, the feared became specters—supernatural beings and the ghosts of one's past. These ghosts were not limited to ominous, bone-chilling apparitions in a haunted house, but now were a function of the mind; directly linked to misunderstood bouts of madness and the motivations of the perverse criminal. Fear of the unknown, as well as concepts that appeared to be out of the control of the individual, created an atmosphere of moral panic, delivered through various sources— news reports, scientific treatises and Gothic fiction. Degeneration and the looming possibility of regression to a state of savagery at any given moment, even as objective views of evolutionary theory were gaining a foothold, had the power to produce sociocultural anxieties that were not easily quelled. But perhaps this is why the investigator and resultant detective fiction were successful—the detective-hero goes to great lengths to understand the criminal mind and utilize the clues to apprehend the deviant. Although surrounded by skeptics (including the reader), the detective was able to rationalize the supernatural and objectify the terrifyingly subjective narratives. The end result was hope that law and order would emerge to improve society and attenuate that which was criminal and delinquent.

The greatest impacts on Gothic fiction and detective fiction were those works by Edgar Allan Poe and Sir Arthur Conan Doyle. While Gothic fiction and detective fiction are distinctly different in style and form, Poe and Doyle were instrumental in linking the two, often through the combination of horror and reasoning. Both Poe and Doyle took cues from their own periods in history to isolate existing social anxieties to cause both fear and relief within the same tale of mystery—fear of the unknown clarified by the use of reasoning and logic, sometimes at the hands of the narrator-turned-investigator and other times at the hands of the detective.

Historical impacts

Both the Gothic era (mid 1700's to 1900) and the Victorian era (1837–1901) were overlapping historical periods in which scientific epistemology made great strides. The mid 1800's defined positivism, in which knowledge was obtained through empiricism.[6] Observation of natural phenomena, coupled with reasoning, became the fundamental basis of the scientific method[7], allowing for scientific endeavours to be pursued with rigour and analytical support. In addition to the natural sciences, empiricism led the way to the understanding of the human mind. Gradually, subjective, irrational thinking was replaced by rational thought through scientific reasoning. While knowledge and understanding allowed for objective explanations of complex phenomena, newly discovered concepts that were outside the realm of understanding with traditional testing methods led to new fears and anxieties. While literacy exposed the upper classes to these advances in science and sociology, those without access to education remained in a subjective state, holding superstition as a means of evaluating unexplainable phenomena. Social stratification, uncharted questions into the natural sciences and the decrepit status of law and order played into the general citizen's fear of the unknown and created an atmosphere of suspicion and worry, which enabled Gothic literature to flourish. As individuals became educated through exposure to advancements in science, psychology, policing and crime, yet held tightly on

to superstition and tradition, writers like Poe and Doyle were able to craft their narratives to cater to the fears and social anxieties of the general public.

In addition to the impact of the scientific revolution, the development and organization of police and law enforcement agencies influenced the literary works of Poe. In general, nineteenth century law enforcement was described as disorganized and plagued with dishonest and corrupt law enforcement agents.[8] In London, the Bow Street Runners (est. 1750) made way for the Metro Police (est. 1829), followed by Scotland Yard (est. 1842). The "reformed" criminal Vidocq led France's Sûreté (est. 1810) in a series of criminal investigations into the mid-nineteenth century. During Vidocq's tenure, the Sûreté was made up of fellow "reformed" convicts intermixed with police officials. In North America, the establishment of law enforcement agencies along the east coast evolved slowly: The Philadelphia Police Department (c. 1833), the Boston Police Department (c. 1838), the New York City Police Department (c. 1845), and the Baltimore Police Department (c. 1845). In Chicago, the Pinkerton Detective Agency, considered the first detective agency in North America, was established in 1850. While Poe's detective, C. Auguste Dupin, was based in Paris, Poe himself spent his time in America travelling along the east coast, between Boston, Virginia, Maryland, New York and Pennsylvania. On the basis of the development of law enforcement agencies and detective divisions in North America during his lifetime, it is likely that the changing landscape of law and order was apparent to Poe. The establishment of structured law enforcement agencies in America, as well as those in England and France, likely influenced Poe's series of detective fiction written from 1841 through 1844.

Doyle, a physician, was influenced by the study of medicine and the utilization of "clues" (symptoms) to diagnose patient's ailments.[9] In a time when medicine and toxicology were found to have relevance in criminal investigations, Doyle was likely exposed to such developments as a medical student and practitioner. The coroner systems fared no better than that of law enforcement in the nineteenth century, with the system in America described as hopelessly defective, with substantial changes only beginning to take place well after Poe's death and during Doyle's lifetime. "The way coroners determined a cause of death by questioning witnesses frequently amounted to sheer absurdity…Since few pathologists were available [to conduct autopsies], and none of these were versed in forensic medicine, many of the findings were erroneous. Even the most basic laws of investigation were mocked" (Thorwald, 1965: 201). As such, exploiting the weaknesses in the slowly evolving systems of criminal and forensic investigations as well as those incompetent individuals making up such disjointed investigations was presumably an easy feat for Poe, and one that could be continued by Doyle.

Poe: from tales of horror and ratiocination to detective fiction

Various works of Edgar Allan Poe (1809–1849), were influenced to some degree by scientific reasoning and the evolution of law enforcement. Best known for his tales of "horror", and "terror", and the "grotesque", and "arabesque", Poe often incorporated psychological elements of fear and madness into his tales. In his works, Poe was able to superimpose the illusion of logic and fact on the tales of horror and mystery, which allowed for the presentation of prevailing thoughts on science, logic and imagination by philosophers of the eighteenth and nineteenth century. Scientific thought in Poe's time focused on the quest for epistemological theory and certainty through observation and experimentation. In his stories, especially those featuring Le Chevalier C. Auguste Dupin, Poe was able to demonstrate that when utilizing rational thought and reasoning, it was possible to discover causal links between events. In addition to causality, observation and comparison allowed scientists to identify and discriminate between objects and beings, which eventually became the corner stone of criminal investigations and the forensic sciences. Poe's knowledge of such scientific endeavours enabled him to craft tales that intermingled ideas of horror and rational thought.

In one of his later works, *Mellonta Tauta* (1839), Poe made direct reference to the debates concerning scientific method and reasoning and what he perceived to be as oversights of the scientific philosophers who had weighed in on scientific reasoning. Dissatisfied with the idea that the sole possible avenues to knowledge were based on the assertions of either Aristotle or Francis Bacon,[10] the fictional author of the letters[11] in *Mellonta Tauta* referred to the repression of imagination, a concept presented by the physicist John Tyndall (1820–1893). It is this concept of imagination that reappears in many of Poe's earlier works and is a concept that Poe attributes to separating the successful detective-investigators from "others" (usually the police). This idea of imagination was based on the ability to, "magnify, diminish, qualify, and combine experiences, so as to render them fit for purposes entirely new" (Tyndall, 1872: 6).

Tyndall asserted that, armed with knowledge and reason, imagination was the "mightiest instrument of the physical discoverer" (ibid.). When applied to studying objects and considering the myriad ways in which such objects could be observed, Tyndall reflected on the potential for scientific conclusions to mislead and the importance of guesswork,

> When, for example, the contents of a cell are described as perfectly homogeneous, as absolutely structureless, because the microscope fails to distinguish any structure, then I think the microscope begins to play a mischievous part … It cannot be too distinctly borne in mind that between the microscopic limit and the true molecular limit there is room for infinite permutations and combinations … It is not of the power of our instrument, but whether we ourselves possess the intellectual elements to which will ever enable us to grapple with the ultimate structural energies of nature. It is plain from this that beyond the present outposts of microscopic enquiry lies an immense field for the exercise of the speculative power (1872: 30).

Using this example of understanding the limitations of one's methodology, Tyndall adds that the human imagination would go beyond the details of the microscopic observations and instead try to understand the history of the cell's origin of existence. Poe believed that the true and only true thinkers are those men with an ardent imagination. Poe's beliefs were substantially moulded by Tyndall, and Tyndall's essay, *Scientific Use of the Imagination,* aligns with Poe's assertions in his tales of ratiocination.[12] Poe also captures another recurring theme from his earlier stories in *Mellonta Tauta*, that of philosophers and scientists being blinded by details, often thinking that they see better by holding an object closely to the eyes (Poe, 1994).

In addition to the references to imagination, Poe addresses the matter of logic in *Mellonta Tauta*, and refers to the work of John Stuart Mill (1806–1873). Mill asserted that logic was the science and art of reasoning, with logic being the science of proof. According to Mill, the deductive method is "the mode of investigation which, from the proved inapplicability of direct methods of observation and experiment, remains to us as the main source of the knowledge we possess or can acquire respecting the conditions and laws of recurrence, of the more complex phenomena" and consists of three operations; direct induction, ratiocination and verification (1882: 325),

> In order to discover the cause of any phenomenon by the deductive method, the process must consist of three parts: induction, ratiocination, and verification. Induction to ascertain the laws of the causes; ratiocination, to compute from those laws how the causes will operate in the particular combination known to exist in the case in hand; verification, by comparing this calculated effect with the actual phenomenon. No one of these three parts of the process can be dispensed with (Mill, 1882: 350).

Poe continues in *Mellonta Tauta* with the importance of guessing, aligning the act of guessing to that of imagining. It is here the correlation to the process of abduction proposed by Charles S. Peirce (1839–1914) is apparent. Peirce distinguished three types of reasoning: deductive, inductive and abductive. The deductive method requires making an inference from a known, general principle, which provides a certainty in reaching a conclusion. Inductive reasoning begins with observations and knowledge about the observed phenomena from which a hypothesis is developed. With induction, there is a measure of probability assigned to a given conclusion. Abductive reasoning requires creativity, intuition, and imagination to generate new ideas about observed phenomena.[13] Abduction is the process of forming hunches about the world based on observation and perception (Eco and Sebeok, 1983: 18). Peirce described the method of abductive reasoning as being based on human perception, which included an element of guesswork. According to Peirce, abduction provided the best explanation of observations, or facts, in reaching a conclusion since the majority of human reasoning was based on conjecture (see Buchler, 1955 and Eco and Sebeok, 1983).[14] Abduction is the first step in reasoning in which the significance of observation is evaluated using guesswork, experience and insight to develop an explanation for what one sees. According to Harrowitz, "abduction is the step in between a fact and its origin; the instinctive, perceptual jump which allows the subject to guess an origin which can then be tested out to prove or disprove the hypothesis" (in Eco and Sebeok, 1983: 182). Upon careful reflection of the facts, the best hypothesis, or explanation of observed phenomena could be selected based on simplicity and rationality (Buchler, 1955: 155). While validation through testing is necessary to establish support for conclusions resulting from abductive reasoning, the conclusions drawn by a detective from such reasoning methods during the preliminary stages of an investigation can prove useful in providing leads and guiding the investigation. In her essay, *The Body of the Detective Model: Charles S. Peirce and Edgar Allan Poe*, Harrowitz describes a process as moving from abduction, which suggests; to induction, which shows; and finally to deduction, which proves (in Eco and Sebeok, 1983: 181).

Ratiocination is characterized by the use of observation and analytical reasoning to develop a clear explanation of experiences and encounters. The process rests on the scientific method, which was a product of the philosophers and scientists seeking to better understand the unexplainable phenomena around them. Poe's ratiocination incorporated the logic of Mill and the imagination of Tyndall. It is likely that the deductive method, as defined by Mill, is akin to the process of deduction referenced in Poe's stories. When comparing Poe's tales of ratiocination to the works of Tyndall and Mill, the influence is striking, as will be detailed in the following section of this essay.

Poe and tales of ratiocination.

Many of Poe's stories include direct dialogue about the narrator's method of ratiocination (*Maelzel's Chess Player, 1836; A Descent into the Maelstrom*, 1841; and *The Man of the Crowd*, 1840). Poe's stories of criminal investigation and detective work are intertwined with the process of ratiocination either directly, as in the three tales featuring C. Auguste Dupin (1841–1844) or indirectly, as in *Thou Art the Man* (1844). In *The Oblong Box*, 1844, Poe explores the pitfalls of reasoning incorrectly when one too hastily draws a conclusion without considering the links between the observed evidence.

In *Maelzel's Chess Player* and *A Descent into the Maelstrom,* Poe's narrators use ratiocination in their efforts to problem solve and draw conclusions about observed phenomena. In *Maelzel's Chess Player*, the narrator undertakes the problem of determining whether or not the mechanical, automated chess player of Maelzel is a pure machine.[15] More accurately, the narrator takes the approach that, due to the definition of a pure machine and the nature of chess as a game of uncertainty, it is not really a question of whether or not the chess player is a pure machine, but the manner in which human agency is brought to bear on the automated chess player to demonstrate that it is not a pure machine. The narrator outlines a series of observations during frequent visits to the demonstration of the chess player, which provides evidence to support the ability of a man to fit inside the interior of the chess player and operate it undetected by the audience or the challenger. The narrator further draws links between these observations and the behaviour of the owners and their accomplices during the chess player's operation and when it was put out of service. In *A Descent into the Maelstrom*, the narrator describes a most powerful and violent whirlpool, from which his escape was an exercise in ratiocination. Observation and experience were key factors in his survival; by observing the objects trapped in the whirlpool and correlating their behaviour within the whirlpool (speed of descent, absorption) with their physical characteristics (size and shape), the narrator was able to grab onto something of ideal size and shape to avoid being sucked into the vortex of the whirlpool.

In *The Man of the Crowd,* the narrator of Poe's tale makes a statement that can be directly linked to the practices of Vidocq during his time as a criminal investigator for the Sûreté. In the passage, Poe acknowledges the power of observation to establish the causal links that lend themselves to identification, "At first my observations took an abstract and generalizing turn, I looked at the passengers in masses, and thought of them in their aggregate relations. Soon, however, I descended to details, and regarded with minute interest the innumerable varieties of figure, dress, air, gait, visage, and expression of countenance" (Poe, 1994: 212). The narrator lays out his ability

to detect a class of people (for example, clerks, gamblers and clergymen) based on a series of physical traits and behaviours. But to the narrator, the man of the crowd is the one that blends in no matter where he ends up; eventually determining that this man is "the type and genius of deep crime" (Poe, 1994: 217). In his *Memoirs*, Vidocq describes a career of observation similar to the narrator in *The Man of the Crowd*,

> I have been able to distinguish the character proper of each species, the physiognomy, language, habits, manners, dress, arrangement and details; I have studied all, remembered all: and if an individual pass before me, if he be a robber by profession, I will point him out, I will even tell his line of business. Frequently from inspection of a single article of clothing I would more quickly describe a thief from head to heel … There is in the garb of a rogue hieroglyphics which can be deciphered with [more] certainty … The indications I shall furnish will be more precise, and certainly more ascertained and positive, guarding carefully against the spirit in the system which only generates errors…[16] (Vidocq, 1834: 367).

This early influence of Vidocq on Poe's *The Man of the Crowd* can be seen as foreshadowing the introduction of C. Auguste Dupin. The first story featuring Dupin, *The Murders in the Rue Morgue,* was published one year after *The Man of the Crowd*. While each of the three Dupin tales differ in approach; the first a "locked door", "whodunit" mystery with no real crime actually committed; the second an "unsolved crime" based on a real case; and in the third, the perpetrator is known to the police and Dupin must outwit the individual to recover a stolen object. From the first to the last tale, there is a gradual decline in the detail provided in describing Dupin's methodology and reasoning process.[17] Poe's inability to reconcile the challenges in true crime investigations could have affected his steadfastness to the reasoning methods he so ardently believed in. In addition, there is a decline in the macabre as the Dupin series progresses. Poe begins with a violent, horrific and bloody scene in *The Murders of the Rue Morgue* and ends the Dupin series with the search for a stolen letter; a story in which no violence takes place whatsoever.

What does remain consistent in the series of Dupin tales is the attention to police ineptitude. Since organized law enforcement and a methodical approach to criminal investigations were in their infancy, Poe was able to draw attention to the weaknesses in such processes.

The Murders in the Rue Morgue begins with a treatise on analytical thinking by means of games like chess, draughts, and whist.[18] An excerpt from the portion on the card game of whist becomes critical to gaining insight into what would be Poe's views of the police as addressed throughout the Dupin series,

> Thus to have a retentive memory, and proceed by 'the book' are points commonly regarded as the sum total of good playing. But it is in matters beyond the limits of mere rule that the skill of the analyst is evinced. He makes, in silence, a host of observations and inferences. So, perhaps, do his companions; and the difference in the extent of the information obtained, lies not so much in the validity of the inference as in the quality of the observation. The necessary knowledge is that of what to observe. Our player … does [not] reject deductions from things external to the game. He examines the countenance of his partner, comparing it carefully with that of each of his opponents… (Poe, 1994: 76).

Poe further addresses the relation between the imagination and the analytic, and the reader is steadfastly moved from Poe's philosophical rhetoric to being introduced to Dupin and his "peculiar analytic ability" (Poe, 1994: 78). After explaining his method of ratiocination to his companion, Dupin and his associate begin to delve into the murders in the Rue Morgue. First, the horrific, grotesque crime of brutal ferocity is introduced; of the two victims, one is beaten severely and forced up a chimney and the other is found severely mutilated, decapitated and having been tossed out of a window. Upon learning of the details of the case from the news reports, including the statement, "To this horrible mystery there is not as yet, we, believe, the slightest clew" (Poe, 1994: 81), Dupin uses ratiocination to assess the facts as outlined in the reports. Upon the assertions that there could be no way to trace the murderer, Dupin addresses the limitations of the police and their investigatory abilities,

> The Parisian police, so much extolled for acumen, are cunning, but no more. There is no method in their proceedings, beyond the method of the moment. They make a vast parade of measures; but, not infrequently, these are so ill adapted to the objects proposed … [Their results] are brought about by simple diligence and activity. When these qualities are unavailing, their schemes fail. Vidocq, for example, was a good guesser, and a persevering man. But, without educated thought, he erred continually by the very intensity of his investigations. He might see, perhaps, one or two points with unusual clearness, but in doing so he, necessarily, loses sight of the matter as whole (Poe, 1994: 86).

Dupin continues his passage with a sentiment similar to Tyndall's microscope analogy, noting a "scrutiny too sustained, too concentrated, too direct" (ibid). From the passage above the reader can infer that Poe's impression of the police at the time he wrote *The Murders in the Rue Morgue* is one of disorganization, substantial inefficiency and dumb luck. It is reasonable to conjecture that there were likely many instances in this time period when cases went unsolved or criminals were caught by chance. It is also apparent that Poe is highlighting the fact that the police were unable to match wits with their adversaries with his comment that they were "ill adapted at the objects proposed" (Poe, 1994: 85).[19]

This passage also directly refers to Vidocq and his methods, which Poe felt were inadequate for such analytical, challenging cases. Finally, when discussing his methodology in *The Murders in the Rue Morgue*, Dupin indicates that he uses Bacon's *a posteriori*, or inductive, method of thinking. In addition to the critical examination of crime scene protocol, other issues addressed by Poe in The Murders in the Rue Morgue "include the subjectivity, fallacy and general unreliability of eyewitness and ear witness identifications, in addition to what is known as police tunnel vision in approaching crime scenes and developing theories on suspects without support-

ing evidence or the proper application of suspectology … Poe explores how this practice—looking at evidence subjectively and without presuppositions or theories already in place—can also obfuscate key evidence left at the scene and unnecessarily stall investigations" (Arntfield, 2016: 63)

In the sequel to *The Murders in the Rue Morgue*, *The Mystery of Marie Rogêt*, Dupin was approached by the police to look into the murder of Marie Rogêt because of his earlier success with the deaths in the Rue Morgue. Dupin describes the crime as an ordinary crime; unlike the deaths that occurred in T*he Murders in the Rue Morgue*, which were at the hands of an escaped ourangoutang. "There is nothing peculiarly outré about it. You will observe that, for this reason, the mystery has been considered easy, when, for this reason it should have been considered difficult, of solution" (Poe, 1994: 495). This statement is critical—it implies that the case was doomed from the beginning; by *assuming* that the case would be solved, the proper investigation was not conducted. The responsibility and oversight of properly conducted investigations fall on the police, who in turn, failed to conduct a proper enquiry from the start. Upon reviewing the police evidence report and copies of all newspapers and publications related to the investigation, Dupin systematically evaluates the assumptions made by the writers of the news articles. Essentially, Dupin demonstrates that, by building on a series of false premises (or a series of preconceived notions), the investigator (and in general, the "reasoner") can never arrive at a correct conclusion. In addition, Dupin laments the poor job done examining the body. Based on the coroner system in place at the time, it was not a far leap for Poe to make this assertion. Dupin also addresses the importance of causal links to accidental and seemingly irrelevant events and the importance of such events in directing the enquiry into an investigation (Poe, 1994: 506). In The Mystery of Marie Rogêt, Poe addresses the statistical significance of identification when Dupin discusses the determination that the corpse found is that of Marie Rogêt,

> The increase in the probability that the body was that of Marie would not be an increase in a ratio merely arithmetical, but in one highly geometrical, or accumulative … You augment the probability as to verge upon the certain. What, of itself, would be no evidence of identity, becomes through its corroborative position, proof most sure… Each successive one is multiple evidence—proof not added to proof, but multiplied by hundreds or thousands (Poe, 1994:502).

While Bertillon had yet to write his treatise on anthropometry, Poe noted the importance of such biometric data, especially when considering the compounding relevance of all of the physical characteristics of the body. This statement is also important because Dupin notes the transition from the probable (induction) to certain proof (deduction). Another important concept Poe delves into is that of identity, a psychological, physiological and forensic enquiry that targets the subjectivity of identification and pattern recognition, "Nothing is more vague than impressions of individual identity. Each man recognizes his neighbor, yet there are few instances in which any one is prepared to give a reason for his recognition" (Poe, 1994: 503).

In *The Purloined Letter*, the attention to the limitations of the police is central to the story. From the initial visit of the Prefect of Parisian police, Monsieur G—, up through Dupin's explanation of how he solved the crime, the narrator highlights the boundaries of police knowledge, "…the Prefect, had the fashion of calling everything 'odd' that was beyond his comprehension, and thus lived amid an absolute legion of 'oddities'" (Poe, 1994: 320). The simplicity of the case is stressed on several occasions in the story,[20] with Dupin also using the words "plain" and "self- evident" in describing the crime to the Prefect. According to Dupin, the police were unable to locate the purloined letter because their methods were not suited for the case and the perpetrator, with the Prefect having a set of resources "to which he forcibly adapts his designs…perpetually err[ing] by being too deep or too shallow for the matter in hand" (Poe, 1994: 326). The Prefect, being accustomed to thinking in a certain way and investigating in a rigid manner, is thereby unable to consider alternate options and think outside of his set police policies and procedures.[21] The police were unable to identify the perpetrator's level of intellect and cater their investigation accordingly. By failing to consider the perpetrator's ingenuity, the police lacked the ability to think of where he could have hidden the letter, only thinking of the surreptitious ways and secret places that they, the police, would hide the letter. This is consistent with what Dupin addressed in *The Murders Rue Morgue*—first, that "No secret issues could have escaped their vigilance. But, not trusting their eyes, I examined with my own" (Poe, 1994: 89); and second, the matter of studying the countenance and behaviour of one's opponents, which Poe addressed in his discussion of whist. Most importantly, once again the police were biased; they assumed the perpetrator was a fool. Here the reader can see Tyndall's impact on Poe, "As a poet and mathematician, [the perpetrator] would reason well; as a mere mathematician, he could not have reasoned at all" (Poe, 1994: 328). Dupin finds the purloined letter by first reasoning that it would be in plain sight. By observing the differences in the original letter and the letter as it had been altered by the perpetrator, specifically how such a fastidious individual would not be in the habit of mistreating and subsequently retaining such a tattered object, Dupin further reasoned that such behaviour was uncharacteristic of the perpetrator. Here, the combination of imagination and ratiocination come together to lead once again to Dupin's ability to disentangle.

The last of the Dupin series did not end Poe's pursuit of criminal investigation. In *Thou Art the Man*, Poe not only addresses reasoning, but includes a discussion of crime scene investigation and forensic evidence and their role in the narrator's crime reconstruction. In this tale, the firearms evidence becomes central to determining the murderer of Mr Shuttleworthy. After presenting a series of convincing circumstances, Goodfellow[22] uses reasoning to find the prime suspect, Mr Pennifeather, responsible for the crime, "[Goodfellow's] sincerest affection for [Pennifeather]…had induced him to make every hypothesis which imagination could suggest, by way of endeavoring to account for what appeared suspicious in the circumstances that told so seriously against Mr Pennifeather; but these circumstances were now altogether too convincing—too damning; he would hesitate no longer—he would tell all he knew…"[23] (Poe, 1994:542; emphasis in the original[24]). Shortly after, a postmortem examination of the horse of Shuttleworthy is conducted (by Goodfellow, nonetheless) and physical evidence is presented. Poe inserts the discipline of forensic firearms examination[25] in his tale upon discovery of the projectile in the horse,

> Mr Goodfellow … was enabled to detect and to pull forth a bullet of very extraordinary size, which, upon trial, was found to be exactly adapted to the bore of Mr Pennifeather's rifle, while it was far too large for that of any other person in the borough or its vicinity. To render the matter even surer yet, however, this bullet was discovered to have a flaw or seam at right angles to the usual suture; and upon examination, this seam corresponded precisely with an accidental ridge or elevation in a pair of moulds acknowledged by the accused himself to be his own property (Poe, 1994: 543).

This overwhelming evidence was not challenged, and so Pennifeather was swiftly found guilty of murder and sentenced to death. Goodfellow had successfully planted evidence, in turn deflecting suspicion from himself and setting Pennifeather up to be held accountable for the murder. But the narrator describes his suspicions, which are largely based on the narrator's understanding of ballistics and attention to detail (and of course the importance of reading one's opponent),

> I saw at once that all the criminating discoveries arose, either directly or indirectly, from [Goodfellow]. But the fact which clearly opened my eyes to the true state of the case, was the affair of the bullet, found by Mr G. in the carcass of the horse. I had not forgotten, although the [citizens of the borough] had, that there was a hole where the ball had entered the horse, and another where it went out. If it were found in the animal then, after having made its exit, I saw clearly that it must have been deposited by the person who found it (Poe, 1994: 546).

The descriptions in Poe's tale can be directly correlated to advancements in criminal investigation and forensic science in the Gothic era. In 1835, Henry Goddard of the Bow Street Runners used bullet evidence to capture and convict a murderer. Goddard had noticed that the bullet from the victim had a characteristic gouge which was later linked to a mould in the murder's residence, a mould having a flaw that corresponded to the gouge in the bullet (Thorwald, 1965: 417).

Another interesting feature about *Thou Art the Man* is the two different individuals producing two different lines of reasoning in concert throughout the story. Goodfellow's line of reasoning is logical, but of course, false. Yet the citizens involved in the enquiry had no reason to question Goodfellow (after all, he was a good fellow). Meanwhile, the narrator, using observation, reasoning and imagination, brought on by the suspicion that all of the evidence was too convincing (and entirely presented by Goodfellow), followed his own line of reasoning to uncover the true murderer. This disparity, a weakness in crime investigation, was not lost on Poe, as it was a concept he captured in the Dupin series at the hands of the Paris police. This weakness still exists in current criminal investigations, even if it is not necessarily done with malicious intent. False reasoning, brought about by cognitive biases, may result in the police detective following a chain of reasoning that is a function of tunnel vision, or of manipulating the evidence to fit the scenario preferred by the police detective.

In the final scene of *Thou Art the Man*, Poe upholds the Gothic focus on the horrific and macabre. At a festive dinner party, a large package is placed on the table and its contents are, "disemboweled" in a ceremonial "disinterring" of the treasure[26] to expose, "the bruised, bloody, and nearly putrid corpse of the murdered Mr Shuttleworthy himself" (Poe, 1994: 545). To make the scene more morbid, the corpse is rigged by the narrator to sit up upon removal of the lid and declare "thou art the man" in the face of one drunken Goodfellow, who seals his fate by dying at that moment from sheer horror and shock.

Another of Poe's tales incorporating a decomposing corpse and the perils of reasoning improperly is *The Oblong Box*. While not a detective, the narrator amuses himself with his reasoning ability only to find out his logic was flawed. By failing to submit himself to the holistic power of observation, imagination, and experience, the narrator, self-described as being "abnormally inquisitive about trifles" (Poe, 1994: 264) overlooked the obvious when drawing his conclusions by failing to recognize the links between his observations: an empty stateroom; a wife distinctly different in appearance and personality from that which was described to the narrator prior to meeting for the first time; the apparent avoidance of the wife by the husband; a distracted husband described by the narrator as morose, exhibiting signs of grief throughout the story; withdrawn family members; and a box, which the narrator describes as a 6 ft by two and a half feet, peculiarly shaped, and made of pine from which emitted a strong, disagreeable, peculiarly disgusting odour (Poe, 1994: 266). Further failure on the part of the narrator is demonstrated in his inability to link the sounds of the opening of the box with the distinct sobs of the husband during the night; and the narrator's inability to understand the significance of the salt reference made by the captain[27] when the husband risks his life to remain with the box during a shipwreck.

Much like he did in the Dupin series, Poe reminds the reader that assumptions, too much focus on trifles without recognition of the links and significance among such trifles, and impulsivity in jumping to conclusions can render one's conclusion baseless and built on a false chain of reasoning. Again, the danger of cognitive bias and effectively moudling one's observations to fit a hastily developed theory is presented. The narrator begins to force his observations to fit into his hypothesis that the box contains artwork[28]— asserting that he is "sufficiently settled" on the point as if not willing or capable of considering any alternate hypotheses (ibid.). From this point, the narrator distorts all contrary evidence to that which fits into his assertion. The smell becomes the byproduct of the tar or paint on the lid of the box; the husband's behaviour towards his wife was because of disgust from a hasty, regrettable decision to marry in which divorce was imminent; the opening of the box at night was due to the artistic indulgences of the husband and his sobbing sounds were merely ringing in the ears of the narrator. T*he Oblong Box* takes a direct trajectory towards the incorrect and draws attention to the limitations of method and man.

Crime solving, including advancements in criminological theories and investigative techniques as well as the development and organization of police, had substantial impact on Poe's works of Gothic fiction. In addition, Poe's literature was impacted by the philosophical and epistemological debates in the nineteenth century concerning thought, reasoning and scientific methodology. Although cliché, Poe's writing demonstrates that he was a progressive thinker and ahead of his time, especially with respect to criminal investigations.

Despite his lack of "success" in "solving" the case of Mary Rogers (Marie Rogêt), Poe demonstrated an ability to evaluate and dispute alternate theories posited about the events surrounding Mary's disappearance and death. It would be more than forty years between the end of Poe's Dupin and the introduction of Doyle's consulting detective, Sherlock Holmes. Evidence of Poe's impact on Doyle's works of fiction are apparent, from his detective stories to Doyle's tales of the supernatural.

Doyle: following the footsteps of Poe

Poe's influence on the works of Sir Arthur Conan Doyle (1859–1930) is readily apparent in not just his detective stories featuring the famous fictional detective, Sherlock Holmes, but also Doyle's works of terror, mystery and the supernatural. While Doyle's Sherlock Holmes series from 1887–1927 was a great success, Doyle's other works included lesser-known tales of horror and the supernatural. Many of these stories share a direct correlation to the works of Poe, establishing Poe's influence on a variety of Doyle's stories. Oftentimes, Doyle demonstrated that theories of the supernatural could be unraveled through scientific reasoning. By shifting perspective and applying science and reasoning, Doyle was able to utilize Sherlock Holmes to disprove those instances of the unexplainable. Like Poe, Doyle has two premises: the rational scientific idea that events are linked in an unaccidental chain, and the individualistic notion that a single enquirer can—and should—establish the links (Knight, 1980: 68).

Doyle's tales of horror and the supernatural.

A selection of Doyle's tales focused on horror and the supernatural, with little to no reference to reasoning. Likely influenced by Poe's tales, Doyle also crafted stories of the "locked room" mystery style. Doyle's tale *The New Catacomb* (1898), parallels Poe's *The Cask of Amontillado* (1846), where one man is effectively "buried alive" on purpose by his trusted acquaintance after following the friend on a seemingly innocent venture. In these stories, both Doyle and Poe rely on trust and vengeance to stir the anxiety of the reader.[29]

In *The Haunted Grange of Goresthorpe* (1877), Doyle tells a tale of two friends who stay overnight in a suspected haunted house and encounter blood dripping from the ceiling and two frightening ghosts. In a tale with a similar name, *Selecting a Ghost: The Ghosts of Goresthorpe Grange* (1883), Doyle takes the tale from a lighthearted, almost humorous attempt at one man's quest to acquire a ghost for his mansion to his frightening encounter with a series of specters vying for the position. In this tale, Doyle also begins to demonstrate how science and reasoning can explain the real cause for the visions of haunting specters. After enlisting the help of a "professional spiritualist" who goes through a series of rituals,[30] a progression of ghosts presents themselves to the owner of the mansion, each more haunting than the previous: the invisible entity; the fiendish old woman; the cavalier; the leaver of footsteps and the spiller of gouts of blood; a murderer and ruffian, the American blood-curdler; and the beautiful woman, forsaken and betrayed. Doyle writes, "I am the American blood-curdler…I am the embodiment of Edgar Allan Poe. I am circumstantial and horrible. I am a low-caste spirit- subduing spectre. Observe my blood and my bones. I am grisly and nauseous. No depending on artificial aid. Work with grave clothes, a coffin-lid, and a galvanic battery.[31] Turn hair white in a night…"[32] (1982: 141). Doyle reorients the tale from that of the unknown to a rational, scientific explanation. The "professional spiritualist" was really an experienced burglar, and the grotesque visions of the supernatural are due to the liquid ingested by the owner at the direction of the spiritualist; he was drugged. This drug "reduced him to a partial state of insensibility" in which "circumstantial and bizarre visions [will] present themselves" (Doyle, 1982: 143). Doyle rectifies the supernatural by providing a logical, scientific solution based on advancements in toxicology.

In *The Silver Hatchet* (1883), the reader again sees scientific explanation eliminate any semblance of the unknown in a tale of violence and the supernatural. After a series of brutal murders in which the first victim's head was "literally split in two halves by a tremendous blow which, it was conjectured, must have been struck from behind" and the second victim "so mutilated that he was hardly recognizable, with his head cloven open similar to the first victim with numerous deep gashes indicating the fury with which the murderer continued to hack the lifeless body" (Haining, 1987: 61), it is apparent that some "savage" is committing these crimes.[33] The forensic examination, specifically wound pattern analysis, conducted by an "eminent medico-jurist" enabled the crimes to be linked by the weapon employed. Upon discovery and direct observation by a group of individuals of the effects of a cursed silver hatchet, the narrator states, "against all reason, science, and everything else though it be, there is a charm at work" (Haining, 1987: 68) But alas, the eminent medico-jurist presents a reasonable hypothesis that a diffusible poison may have been placed on the hatchet to bring on sudden and acute attacks of homicidal mania (Haining, 1987: 70). Doyle again refers to the advancements in forensic toxicology to reason that a poison, not an ancient curse, is responsible for the behaviour of the individual wielding the silver hatchet.

Doyle and reasoning.

In three of Doyle's mysteries, *The Fate of the Evangeline* (1885), *The Lost Special* (1898) and *The Man with the Watches* (1898), subtle references to the reasoning methods applied to solving the cases are present. In *The Fate of the Evangeline*, which was published prior to the introduction of Sherlock Holmes and which features the tale of a ship and its female passenger who have disappeared under mysterious and unexplained circumstances, a direct reference to Dupin and his methodology of reasoning is presented, "It would be well … if those who express opinions upon such subjects would bear in mind those simple rules as the analysis of evidence laid down by Auguste Dupin. "Exclude the impossible", he remarks in one of Poe's immortal stories, 'and what is left, however improbable, must be the truth'" (Doyle, 1982: 203).[34]

Furthermore, the commentator laments that in the solutions presented concerning the fate of the Evangeline, "conjecture is so rife" (ibid.). What is important in reading this story is to appreciate that the solution put forth by the commentator who referenced the methodology of Dupin, who posits a series of impossibilities to support his conclusion, is wrong. In fact, the "doubly impossible" scenario presented by the commentator ends up being the solution to the mystery. Much like the narrator's reasoning in Poe's *The Oblong Box*, Doyle recognizes and exploits Poe's assertion that there is always a chance that one's reasoning is flawed. This, in the mind of Poe, can be the case if the reasoner has limited experience and imagination or fails to utilize these concepts when problem solving.

In *The Lost Special*, in which a train appears to vanish without a trace, the narrator describes that various newspapers and

private individuals are coming forth with explanations for the vanishing train, "One…attempted to deal with the matter in a critical and semi-scientific manner … It is one of the Elementary principals of practical reasoning … that's when the impossible has been eliminated the residuum, however improbable, must contain the truth …" (Doyle, 1977: 118). The narrator continues the explanation, peppered with phrases such as "it is certain", "it is the highest degree unlikely, but still possible", "it is obviously impossible" and "it is improbable, but it is not impossible" (ibid.), and a directive to focus the investigation on observation. This line of reasoning is a direct nod to that of Sherlock Holmes, the series which Doyle had been writing for more than ten years when *The Lost Special* was published. Published the same year, *The Man with the Watches*, a case in which a train passenger is found dead while two other passengers have disappeared from a moving train, presents a mystery of which the process of reasoning must intervene,

> Whatever maybe the truth … it must depend upon some bizarre and rare combination of events so we need to have no hesitation in postulating such events in our explanation. In the absence of data we must abandon the analytic or scientific method of investigation, and must approach it in the synthetic fashion. In a word, instead of taking known events and deducing from them what has occurred, we must build up a fanciful explanation if it will only be consistent with known events. We can then test this explanation by any fresh facts which may arise. If they fall into their places, the probability is that we are upon the right track, and with each fresh fact this probability increases in a geometrical progression until the evidence becomes final and convincing (Doyle, 1977: 153).

This statement of reasoning is very critical for several reasons. First, Doyle's "fanciful explanation" can be directly correlated with Poe's (or more correctly, Tyndall's) concept of imagination, as opposed to the analytic.[35] Second, the reference to the dependence on a combination of events implies the importance of causality and understanding the links between occurrences. Third, the statement walks the reader through the path of reasoning, which is similar to the process of moving from abduction, to induction, and finally to deduction presented by Harrowitz. The "synthetic fashion" (in lieu of the analytic or scientific method) along with the incorporation of the fanciful explanation implies abduction, or guesswork. This is followed by testing and probability, which is induction, and the progression to the "final and convincing" is deduction. Finally, Doyle's reference to a "geometrical progression" is a direct nod to the compounding significance of evidence referenced by Poe in *The Mystery of Marie Rogêt*. Moreover, Doyle subtlety addresses the limitations of law enforcement in *The Man with the Watches*, with the narrator remarking, "The police had little difficulty in showing that such a theory would not cover the facts, but they were unprepared in the absence of evidence to advance any alternate explanations" (Doyle, 1977: 152).

Doyle's *A Pastoral Horror* (1890) shares much in common with Poe's *Thou Art the Man*; a murder mystery set in an isolated town with a conclusion being made with the assistance of forensic evidence and crime scene reconstruction. In addition to the brutality and violence of the murders, madness is to blame, which fulfills the horror and social anxiety elements prominent in Gothic fiction. The narrator, John Hudson, takes the reader through a series of crimes occurring in the spring of 1866 in an idyllic, isolated village. Upon hearing of the first murder, Hudson partakes in an examination of the body and its injuries, Doyle's homage to wound reconstruction and forensic pathology,

> [On] the back of the heads a singular triangular wound was found, which had smashed the bone and penetrated deeply into the brain. It had evidently been inflicted by a heavy blow from a sharp pointed pyramidal instrument… [The Pastor] suggested probability of the weapon in question having been a short mattock or small pickaxe, such as are to be found in every Alpine cottage. The Intendant, with praiseworthy promptness, at once obtained one and striking a turnip, produced just such a curious gap as was to be seen in [the victim's][36] head (Doyle, 1982: 278).

An investigation committee is formed and, after interviewing witnesses, Hudson and his committee "gathered and connected a series of facts" (ibid.). Here, the process of criminal investigation is coupled with crime scene investigation to begin the process of reconstruction. Shortly thereafter, another crime is committed in which the victim "had met his death by an exactly similar wound to which had proved fatal" (Doyle, 1982: 281) to the first victim. Upon the suspect's third attempt at murder, he is unsuccessful, and the intended victim is able to leave deep scratches in the assailant's wrist. This proves to be an important clue, as the marks are revealed and the assailant is determined to be the Pastor. It is determined that the Pastor is apparently suffering from a "terrible and insidious form of insanity" of which Hudson, upon retrospection, realizes the symptoms and behaviour of the Pastor were indicative of such insanity that would induce homicidal mania (Doyle, 1982: 289).[37]

Sherlock Holmes' power of perception and problem solving rests on abductive reasoning. Although Doyle refers to deduction as Holmes' reasoning methodology, abduction is the primary means by which Holmes develops his initial hypotheses. Although Holmes occasionally asserts that he does not guess, he is actually doing so in the initial stages of his investigations.[38] In their essay, Sebeok and Umiker-Sebeok write, "What makes Sherlock Holmes so successful a detective is not that he never guesses, but that he guesses so well" (in Eco and Sebeok, 1983:22). Throughout the narratives in his adventures, Holmes verifies his hypotheses through observation, experiential knowledge, the collection of clues, and testing (induction), ultimately arriving at a conclusion with a measure of certainty (deduction).[39] Holmes' references to the importance of observation and the utilization of imagination, intuition and speculation, demonstrate that the actual methods he applies to problem solving are based on abductive reasoning. Like Poe's ratiocinative-abductive narrator in *A Descent into the Maelstrom*, Holmes "has specific scientific knowledge gained through previous [experience] and a keen power of observation … which allow him to make conjectures… He then postulates a rule which would explain certain … facts …" (in Eco and Sebeok, 1983: 186).

Sherlock holmes and horror.

While the Sherlock Holmes series was more aligned with detective fiction and advances in forensic science, some of the tales had remnants of those elements of classic Gothic fiction. Specifically, *The Hound of Baskervilles* (1902), *The Adventure of the Devil's Foot* (1910), *The Adventure of the Creeping Man* (1923), and *The Adventure of the Sussex Vampire* (1924). In the latter story, upon hearing of the possibility of the "suspect" being a vampire, Holmes asserts, "What have we to do with walking corpses who can only be held in their grave by stakes driven through their hearts? It's pure lunacy" (Baring- Gould, 1967: 463). As expected, Sherlock is able to dispose of the supernatural hypothesis and arrive at a conclusion based on science, reason and causality. It is not the sucking of blood occurring for thirst of a vampire, but the sucking of a wound from an arrow impregnated with poison to save the life of the injured, who is helpless at the hands of the perpetrator. Using observation and confirmation to support his hypothesis, Holmes declares, "It has been a case for intellectual deduction, but when this original intellectual deduction is confirmed point by point by quite a number of independent incidents, then the subjective becomes the objective and we can say confidently that we have reached our goal …" (Baring-Gould, 1967: 472). In this statement, it appears that the reference to deduction is more in line with that of Mill. Here, Holmes' observation and ratiocination are supplemented by verification, which brings about a certainty in results. Holmes' linking of a series of independent incidents provides the element of causality.

In *The Adventure of the Creeping Man*, parallels exist between the behaviour of the creeping man and that of the character in *The Strange Case of Dr Jekyll and Mr Hyde*[40] (Baring-Gould,1967: 765), with the underlying premise being that an elixir taken by the creeping man imbued upon him strange, animal like behaviours. The "evil" causing the creeping man's behaviour is due to a serum from a climbing and creeping monkey. Here again, the degeneration, or reversion from man to monkey correlate to the prevailing scientific debates in the nineteenth century concerning atavism and evolution. In *The Adventure of the Devil's Foot*, what appears to be human possession by the devil, leading to insanity and death, ends up being the effects of exposure to a powerful poison. This is another instance of the advancements in forensic toxicology (as well as the exponential use of poisons to commit murder) in the nineteenth century having a decided impact on the story lines presented by Doyle.

The Hound of the Baskervilles includes several elements characteristic of Gothic fiction. The ominous Baskerville estate and the eerie moor, a hound representing death and evil, and the supernatural elements of the hound haunting the Baskerville estate, "A creature upon the moor which corresponds with the Baskerville demon, and which could not possibly be any animal known to science…A huge creature, luminous, ghastly and spectral" (Baring-Gould, 1967:15). Further described as a "dreadful apparition" and a "hell hound" (Baring-Gould, 1967:16), the hound has a thirst for blood and a desire to kill. Using science, Doyle is able to explain the seemingly supernatural qualities of the beast; when Holmes and Watson encounter the creature, the bluish flame dripping from its mouth that provided the spectral glow is declared as being "a cunning preparation" of phosphorous (Baring-Gould, 1967: 101). Reflecting the sentiments of Poe's Dupin, Holmes states, "The more outré and grotesque an incident is, the more carefully it deserves to be examined, and the very point which appears to complicate a case is, when duly considered and scientifically handled, the one which is most likely to elucidate it" (Baring-Gould, 1967: 109)

Doyle's stories of reasoning and the supernatural demonstrate that the influence of early Gothic fiction from Poe, as well as the scientific, philosophical, and criminological progress of the nineteenth century greatly influenced Doyle's work. These factors provided insight into the effects of criminal justice, scientific discourse and epistemological enquiry on society in the second half of the nineteenth century. In addition, although fictional, Sherlock Holmes and his methods of reasoning became the cornerstone of modern criminal investigation and forensic science.

Conclusions

Although considered Gothic fiction, the works presented by Poe and Doyle blur the real with the imaginary. Gothic society was fearful of many intrusions, from disease and poverty to crime and degeneration. These fears, compounded by advances and enquiry in science, technology and epistemology, were exploited by many Gothic writers—from the walking dead and lab-created monsters to madness and evil specters. Successful authors found ways to make their fictional tales horrific by weaving in elements of moral panic and socio-cultural beliefs to give their macabre tales an air of reality. Degeneration, criminological theories of atavism and psychological theories of madness sparked fears that Poe and Doyle were able to capture in their stories.

The Gothic/Victorian Gothic eras brought forth the development of policing and the advancement of the natural sciences to criminal investigation, which Poe and Doyle were able to superimpose on their tales of mystery. While scholars and practitioners weighed in on epistemology and reasoning, Doyle and Poe were able to exploit the weaknesses in law enforcement and the limitations of knowledge on the ability to solve crimes. For a society that feared violent crime and needed law and order, the state of policing left much to be desired. Fear and horror were driven by the madman, loose on the streets, committing violent acts without fear of impunity. The police, corrupt and disorganized, did not have the mental faculties to apprehend such savages, allowing them to diffuse from regions of poverty to those of the elite classes.

An important recurring theme on the stories by Poe and Doyle is the inherent weakness in application of reasoning to investigations. With the intersection of law and science coming to the forefront of crime investigation in the nineteenth century came the necessity to utilize proper methods of reasoning to guide methods of investigating and problem solving. Poe and Doyle recognized this, and carefully crafted tales to include horror, crime, science and philosophy. Since the development of what was known as police science,[41] the term criminalistics[42] has been developed to capture the integration of science, criminal investigation and reasoning. What is important about Poe's and Doyle's detective stories is their recognition of the importance of having an individual with the capability to apply scientific reasoning to an investigation, specifically at the crime scene and when evaluating evidence.

Notes

1 Here, moral panic is defined as a condition that emerges and becomes identified as a threat to societal values and inter-

ests, whose nature is presented in a stylized fashion by authors of Gothic fiction. For more on the theory of moral panic and its relationship to criminology, see Cohen, S (2002). *Folk Devils and Moral Panics*, 3rd ed. Routledge: London.

2 Pertaining to study of knowledge and understanding.

3 Such as the work by Sigmund Freud and Charles Darwin, respectively.

4 Atavism, synonymous with degeneration, or man's reversion to a more primitive, savage form of existing. See, for example, works by Cesare Lombroso, including Criminal Man. [Gibson, M & Rafter, ed. (2006). *Criminal Man*—Cesare Lombroso. Duke University Press: Durham].

5 The unsolved murders of Jack the Ripper in 1888 struck fear in London society and reminded all citizens that not every crime could be solved and not all perpetrators would be brought to justice. It is plausible that, while this resulted in fear and horror, it also fostered intrigue that resulted in the upsurge of a macabre interest in criminal behaviour, law and order.

6 Positivism being that knowledge is based on natural phenomena verified by the empirical sciences; Empiricism being the practice of using observation and experimentation to acquire knowledge.

7 The scientific method is characterized by the process of stating a problem, developing a hypothesis, collecting data through observation and experimentation, and either refining the hypothesis or developing a theory; it includes all principles and procedures utilized throughout the entirety of the process. For a discussion of developing reasoning and problem solving skills, see Konnikova's *Mastermind: How to Think Like Sherlock Holmes* (2013).

8 For historical overviews of the development of law enforcement agencies and forensic investigations, see Thorwald (1965), Wagner (2006), Kurland (2009).

9 For more information on semiotics and the relationships between clues, signs and symptoms, see Eco and Sebeok (1983).

10 Referring first to one 'Aries Tottle', who "propagated what was termed the deductive or *a priori* mode of investigation; starting with axioms of self-evident truths and thence proceeded logically to results" and then referring to 'Hog', who preached a system of the "a posteriori, or inductive" type, which "proceeded by observing, analyzing, and clarifying facts—instantiœ naturœ—into general laws" (Poe, 1994: 406).

11 Identified only as Pundita.

12 In this work, Tyndall credits Darwin with being successful in his approaches to evolutionary theory due to his combined use of observation, imagination and reason.

13 Intuition is knowledge without proof or evidence, often synonymous with insight, which is the understanding of someone or something.

14 In his writing on abduction and induction, Peirce challenges some of the assertions of Mill (Buchler, 1955).

15 According to the narrator, a pure machine performs its operations without any immediate human agency and is characterized by fixed, determinate calculations and subsequent movements resulting from that limited, certain data set (Poe, 1994).

16 Throughout this assertion, Vidocq compares his skills to those of scientists and doctors of the time, including phrenologists, which had influenced Poe's philosophical beliefs in science, as written in his original introduction to reasoning in *The Murders in the Rue Morgue*, a passage which was later removed, likely when phrenology became discredited and found to be lacking in scientific rigour. Vidocq also refers to the 'Father of Forensic Toxicology,' Mathieu Orfila. For a historical overview of Forensic Toxicology and Dr Orfila, see Thorwald (1965). For a reproduction of Poe's original first paragraph, see Hurh, P (2012). "The Creative and the Resolvent": The Origins of Poe's Analytical Method. *Nineteenth Century Literature*. 66(4), p. 473.

17 This could be perhaps, because of Poe's problems with resolving the unsolved murder of Mary Rogers that laid the groundwork for his second tale.

18 Draughts being likened to checkers and whist being a card game.

19 A sentiment that will be expanded upon in the discussion of *The Purloined Letter*.

20 Perhaps this is a reference to Marcus Aurelius' statements on simplicity in his Meditations (170-190 AD): "Of each particular thing ask: What is it in itself? What is its nature?" The influence can be traced through William Whewell to John Stuart Mill. Whewells' *History and Philosophy of the Inductive Sciences* texts, written in the mid-1800's, may also have influenced Poe's thoughts on reasoning, either directly or indirectly through Mill. Considering the simplicity of a letter, a paper, it is just that— one would expect it to be found on a desk or in a document-holder, possibly with other documents of similar kind. The concept of simplicity can be directly correlated to Sherlock Holmes' occasional reference to "elementary" in arriving to his conclusions through methods of reasoning.

21 This indicates a slight evolution in policing from Poe's first Dupin story to the last; In *The Murders in the Rue Morgue*, there was indication of little organization with no methods, whereas in *The Purloined Letter*, the police are described as "forcibly adapted to his designs," likely a product of improved structure and organization of existing police agencies, training of the police investigators, and the development of standardized procedures within that time frame.

22 The irony was not lost on Poe. The was the case in many of his tales.

23 Note Poe's use of imagination in playing a role in the process of reasoning.

24 Likely this was not lost on the narrator of the tale—perhaps this is the turning point in which the narrator begins to have some doubts as to Goodfellow's intentions.

25 For a historical overview of Forensic Ballistics, see Thorwald (1965),Wagner (2006), Kurland (2009).

26 Poe is using these words to foreshadow what the narrator is about to uncover upon opening the package at the request of the host, Mr Goodfellow, and likely demonstrating Poe's perverse sense of humour.

27 This may require a knowledge of science on part of the narrator—an understanding that the salt served to impede the process and signs of decomposition. Interestingly, Mill, in providing examples of causality and the laws of nature, refers to the laws of putrefaction, noting "the strong attraction of salt for water and the necessity of the presence of water as a condition of putrefaction" and "flesh … kept in a dry atmosphere does not putrefy …" (Mill, 1882: 340). This is another indication that Poe was exposed to, and influenced by, the work of Mill.

28 A hypothesis so conclusive that the narrator has even determined the title and artist of the work stored in the oblong box.

29 Similar tales of horror and suspense in which the corpse of the victim is hidden in close proximity to the murderer include Poe's *The Tell-tale Heart* (1842) and *The Black Cat* (1842-3). In Doyle's *The Story of the Sealed Room* (1898), the corpse is in close proximity to a family member who lives many years without knowledge of the body's existence.

30 Including providing a clear transparent fluid that the owner must ingest before interviewing the ghosts.

31 Doyle's nod to the walking dead, vampires, and Mary Shelley's 1818 novel, *Frankenstein*.

32 A correlation to Poe's *A Descent into Maelstrom*, into which the ratiocinative survivor of the whirlpool suffers a whitening of the hair from his near-death experience.

33 The use of the term "savage" can be correlated to the idea of degeneration and atavism promulgated by scientists like Lombroso in the Victorian Gothic era as well as the debates concerning evolution and Darwinism throughout the nineteenth century.

34 Described as one of the most famous maxims of Sherlock Holmes, this expression is stated twice by Holmes in *The Sign of the Four* (1890): "Eliminate all other factors, and the one which remains must be the truth" (Baring-Gould, 1967: 613); "…when you have eliminated the impossible, whatever remains, however improbable, must be the truth" (Baring-Gould, 1967: 638); and repeated in several other stories featuring Holmes (see annotation, Baring-Gould, 1967: 614).

35 In the treatise at the start of *The Murders of the Rue Morgue*, Poe explains, "Between ingenuity and the analytic there exists a difference far greater, indeed, than that between the fancy and the imagination, but of character very strictly analogous. It will be found, in fact, that the ingenious are always fanciful and the truly imaginative are never otherwise than analytic" (Poe, 1994).

36 Lending itself to a sense of irony, the name of the victim so viciously attacked in the

story is named Maul. Perhaps Doyle intended this much like Poe's 'Goodfellow' character in *Thou Art the Man*.

37 Recall this was the diagnosis in *The Silver Hatchet* upon interaction of the handler with the suspected poison that was believed to have impregnated the handle.

38 When Holmes is 'accused' of guesswork in the *Hound of the Baskervilles,* Holmes asserts, "[Such determinations enter] into a region where we balance probabilities and choose the more likely. It is the scientific use of the imagination, but we have always had some material basis on which to start our speculations. Now, you would call it a guess, no doubt, but I am almost certain …" (Baring-Gould, 1967: 24). Although much more brief than the reasoning presented in Doyle's *The Lost Special*, Holmes' statement about guessing addresses imagination, guessing (abduction), probability (induction), and a certainty (deduction).

39 Here again we see the process described by Harrowitz; moving from abduction (guesses which suggest), to induction (which shows with a measure of probability) and ultimately to deduction (which proves with a certainty) (in Eco and Sebeok, 1983).

40 Written in 1886 by Robert Louis Stevenson.

41 Utilization of natural sciences to aid in criminal detection.

42 Criminalistics is the scientific discipline directed toward the recognition, identification, individualization and interpretation of physical evidence using forensic science; it involves applying scientific methodology and reasoning to civil and criminal investigations.

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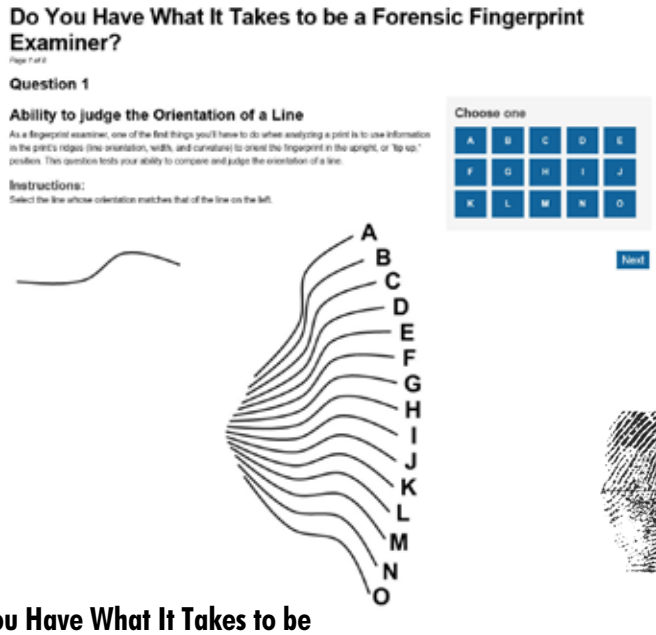

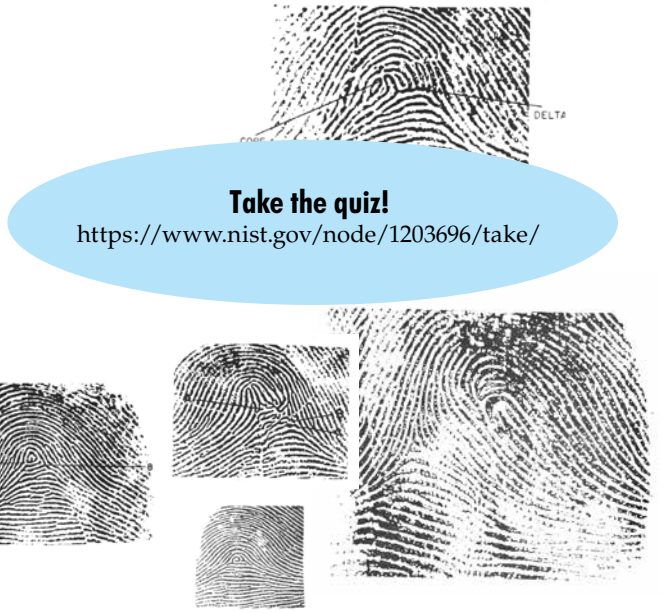

Do You Have What It Takes to be a Forensic Fingerprint Examiner?

With support from NIST, experts are developing tests to help identify people with the pattern-matching skills needed for analyzing fingerprints. Try your eye on a few of the questions by clicking on the button at the end of this article.

Being a forensic examiner seems glamorous on TV. But working in a crime lab requires long hours of intense focus that are anything but action-packed. This is especially true for fingerprint examiners, who must focus on minute visual details that would leave most people cross-eyed. It's not a job for everyone.

Finding the right people to fill these jobs is critical because they help ensure that criminals are brought to justice and that innocent people are not wrongly accused. Especially as forensic science degree programs produce an increasing number of jobseekers, crime lab managers need tools to identify the most promising among them.

Do you think you have the right mix of skills and temperament to be a high-performing fingerprint examiner? If so, read on, and take the interactive quiz by clicking on the button at the bottom of this article.

The questions in that quiz were developed by experts, with support from NIST, to test visual pattern-matching abilities. As part of this effort, in the fall of 2016, NIST sponsored a Workshop on Personnel Selection in the Pattern Evidence Domain of Forensic Science(link is external). This workshop, which brought together forensic professionals, cognitive scientists and industrial psychologists, was hosted by the National Academy of Sciences Board on Human Systems Integration.

"The goal is to identify individuals who are better at pattern recognition tasks than your average Joe," said Melissa Taylor, a research manager at NIST who focuses on reducing the potential for errors and bias in forensic analysis. Taylor's program is part of a larger NIST effort to strengthen forensic science in the United States.

Currently, Taylor says, when lab managers fill entry-level positions, they base their hiring decisions on college transcripts, job interviews and writing samples. Those are important, but they don't shed light on pattern-matching skills specifically.

NIST does not administer tests to applicants, but hopes to provide lab managers with testing tools.

In addition to helping lab managers, such tests can also help aspiring forensic examiners know if the field is right for them. "If applicants only know about the job through television shows like "CSI," they might not have a realistic picture of what's involved," Taylor said.

Forensic science has come under increased scrutiny lately, most recently in a report from the President's Council of Advisors for Science and Technology (PCAST). Among other things, the PCAST report called on research scientists to develop automated, computer-based methods that can efficiently and accurately analyze fingerprints and other pattern evidence.

So, if the field is heading toward automation, why bother creating a test for human examiners?

For one, it will take several years before scientists develop fully automated systems, and in the meantime, human examiners will be doing the work.

In addition, fingerprints collected at crime scenes are often distorted, degraded, or have complicated backgrounds. "There will always be difficult cases that require human analysis," Taylor said. "In the future, automated systems may be able to handle the straightforward comparisons, allowing human examiners to focus on the most complex cases."

The next step for this project, Taylor said, is to develop an online test with input from industrial and organizational psychologists. She also hopes to pilot a testing program in partnership with a large laboratory.

You might be one of the people that those laboratories are looking for. If you're a potential job applicant with an interest in forensic science, or even if you're just interested in testing out your pattern-matching skills, take the quiz by pressing the start button below.

The eight sample questions get progressively more difficult as you go. At the end, you'll see the correct answers with explanations. Your answers are not recorded; this quiz is just for fun.

Rich Press
NIST

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