

# The Scientific Sherlock Holmes



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CRACKING THE CASE WITH  
SCIENCE AND FORENSICS

JAMES F. O'BRIEN

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*To Ted, who would have loved this book*



## Preface

Few characters in literature are more universally recognized than Sherlock Holmes. The subject of sixty stories by Arthur Conan Doyle, and countless pastiches by other authors (not to mention even a “biography” or two), Holmes is nothing short of an icon of literature. While readers are captivated by his powers of observation and deductive reasoning, somewhat overlooked in the stories is the use of science and forensic methods, long before network television made them so popular. Conan Doyle (and Holmes) blazed a new trail in this regard, adding depth and complexity to the detective genre started by Edgar Allan Poe. This book will focus on the scientific aspects of Sherlock Holmes. Essentially every one of the sixty stories has some mention of science. In some stories science is the dominant factor.

We will begin by tracing the origin of the Arthur Conan Doyle’s science oriented detective. Then, after describing the main characters in the stories, chapter three will take a detailed look at how Holmes used science to solve his cases. Since Sherlock Holmes knows more chemistry than any other science, the fourth chapter will examine Holmes the chemist. The final chapter will look at his knowledge and use of other sciences. Throughout the book we will use the terms Sherlockian and Holmesian<sup>1</sup> interchangeably to refer to someone with great interest and/or expertise in Sherlock Holmes.

<sup>1</sup> Sherlockian tends to be used in America and Holmesian in Britian (King, L. R. in King and Klinger 2011).





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## Codes

Much of the Holmesian world uses the following four letter abbreviations for the names of the sixty stories written by Sir Arthur Conan Doyle. We shall use them extensively to avoid constant repetition of the titles. Also for brevity, the words “the adventure of” will be deleted from the many titles that contain them. Collectively the Sherlock Holmes stories are sometimes affectionately referred to as the Canon.

<i>Code</i>	<i>Title</i>	<i>Publication Date</i>	<i>Story #</i>
ABBE	The Abbey Grange	Sept. 1904	39
BERY	The Beryl Coronet	May 1892	13
BLAC	Black Peter	Feb. 1904	33
BLAN	The Blanched Soldier	Oct. 1926	56
BLUE	The Blue Carbuncle	Jan. 1892	9
BOSC	The Boscombe Valley Mystery	Oct. 1891	6
BRUC	The Bruce-Partington Plans	Dec. 1908	42
CARD	The Cardboard Box	Jan. 1893	16
CHAS	Charles Augustus Mil- verton	March 1904	34
COPP	The Copper Beeches	June 1892	14
CREE	The Creeping Man	March 1923	51
CROO	The Crooked Man	July 1893	22
DANC	The Dancing Men	Dec. 1903	30
DEVI	The Devil's Foot	Dec. 1910	43
DYIN	The Dying Detective	Nov. 1913	46
EMPT	The Empty House	Sept. 1903	28

ENGR	The Engineer's Thumb	March 1892	11
FINA	The Final Problem	Dec. 1893	26
FIVE	The Five Orange Pips	Nov. 1891	7
GLOR	The "Gloria Scott"	April 1893	19
GOLD	The Golden Pince-Nez	July 1904	37
GREE	The Greek Interpreter	Sept. 1893	24
HOUN	The Hound of the Baskervilles	Aug. 1901	27
IDEN	A Case of Identity	Sept. 1891	5
ILLU	The Illustrious Client	Nov. 1924	54
LADY	The Disappearance of Lady Francis Carfax	Dec. 1911	45
LAST	His Last Bow	Sept. 1917	48
LION	The Lion's Mane	Nov. 1926	57
MAZA	The Mazarin Stone	Oct. 1921	49
MISS	The Missing Three-Quarter	Aug. 1904	38
MUSG	The Musgrave Ritual	May 1893	20
NAVA	The Naval Treaty	Oct. 1893	25
NOBL	The Noble Bachelor	April 1892	12
NORW	The Norwood Builder	Oct. 1903	29
PRIO	The Priory School	Jan. 1904	32
REDC	The Red Circle	March 1911	44
REDH	The Red-Headed League	Aug. 1891	4
REIG	The Reigate Squires	June 1893	21
RESI	The Resident Patient	Aug. 1893	23
RETI	The Retired Colourman	Dec. 1926	58
SCAN	A Scandal in Bohemia	July 1891	3
SECO	The Second Stain	Dec. 1904	40
SHOS	Shoscombe Old Place	March 1927	60
SIGN	The Sign of Four	Feb. 1890	2
SILV	Silver Blaze	Dec. 1892	15
SIXN	The Six Napoleons	April 1904	35
SOLI	The Solitary Cyclist	Dec. 1903	31
SPEC	The Speckled Band	Feb. 1892	10
STOC	The Stock-broker's Clerk	March 1893	18

STUD	A Study in Scarlet	Nov. 1887	1
SUSS	The Sussex Vampire	Jan. 1924	52
THOR	The Problem of Thor Bridge	Feb. 1922	50
3GAB	The Three Gables	Sept. 1926	55
3GAR	The Three Garridebs	Oct. 1924	53
3STU	The Three Students	June 1904	36
TWIS	The Man With the Twisted Lip	Dec. 1891	8
VALL	The Valley of Fear	Sept. 1914	47
VEIL	The Veiled Lodger	Jan. 1927	59
WIST	Wisteria Lodge	Aug. 1908	41
YELL	The Yellow Face	Feb. 1893	17





## The Sherlockian Canon: Review of the Contents

*I am the only one in the world. I'm a consulting detective.*  
 Sherlock Holmes, "A Study in Scarlet"

Early in the first adventure, Sherlock Holmes reveals his profession to his new roommate, Dr. John H. Watson. Eventually Watson describes sixty of Holmes's cases.<sup>2</sup> Murder is the most common offense, occurring in twenty-seven of the stories. Interestingly, the second most common category is no crime at all. This happens in eleven stories. The other twenty-two cases are scattered through thirteen other kinds of crime (Swift 1999, 33).

The clients that consult Holmes come from a diverse set of backgrounds. They can be classified into eight types: Business/Professional (23), Police (8), Damsel-in-Distress (8), Landed Gentry (8), Government (4), Nobility (4), Working Class (3), None (2) (Swift 1999, 33).

Of the thirty-seven times Holmes identifies the culprit, he decides to let him go free a surprising thirteen times. The other twenty-four are turned over to the police. A number of times the perpetrator dies before being caught. Interestingly, Holmes claimed to have failed four times.<sup>3</sup> Obviously the reader can't know what to expect when even the masterful Holmes sometimes fails.

The use of so many different kinds of crime, so many types of clients, and so many different results, including failure, gives us a variety that keeps the stories fresh, even for rereading.

This work is about the science in the sixty Sherlock Holmes stories. Every story mentions something scientific. Many times it is just a molecule;

<sup>2</sup> Dr. Watson mentions numerous other Holmes cases in his narrations of the stories that comprise the Sherlock Holmes Canon. We will deal with the sixty stories published by Sir Arthur Conan Doyle.

<sup>3</sup> The number of failures depends on how one defines it. See Berdan, M. S., *Baker Street Journal*, 50(3), 23–30.

sometimes a method. In some stories the science is of key importance. In others it just sets a mood. Those interested in science will nearly always find something of particular interest in a Sherlock Holmes story. Arthur Conan Doyle set out to write about a detective who actively employed science in his work. That he succeeded is not in dispute.

## Introduction

Sherlock Holmes is the most recognizable character in all of literature. The first Sherlock Holmes story, *A Study in Scarlet* (STUD), was published in 1887. Today, over 125 years later, when a deerstalker hat is seen in a book, movie, TV ad, or billboard, the public automatically thinks, “Sherlock Holmes.” Old movies run on television again and again. New movies are made with consistent regularity. Plays are done all around the country, even the world. Respectable presses publish Sherlock Holmes journals. There are even several Sherlock Holmes Encyclopedias (Tracy 1977; Bunson 1994; Park 1994). While limited to sixty original stories by Arthur Conan Doyle, Sherlock Holmes buffs eagerly seek out new Holmes stories by would-be Doyles. They call such stories “pastiche,” and are easy marks for even marginal literature. Aspiring authors frequently base their stories on one of the more than 100 cases mentioned by Doyle, but not reported in full (Redmond 1982, xv; Jones 2011). Of course, “stories about the stories” are also coveted. Numerous Holmes societies exist in the USA and around the world. In the United States the pinnacle of achievement for a Sherlock Holmes buff is invitation to be a “Baker Street Irregular,” a group apparently as odd as Holmes’s ragamuffin street urchins from whom it takes its name.

Why is all this so? One reason for Holmes’s appeal is that he is a flawed character. For instance, contrary to his image, he does not always correctly solve his cases. He admits that he failed four times. When reading a Holmes story, the reader can’t be sure he will solve it, for even the master detective sometimes fails. Another flaw is his well-known drug dependence, to be discussed later.

Also among the primary reasons for the enduring popularity of Sherlock Holmes is his ability to make brilliant deductions. Readers continue to be fascinated by the way he can reason his way to the correct solution. In the opening, STUD, Holmes’s first words to Dr. Watson are,

“How are you? You have been in Afghanistan, I perceive.” Watson thinks someone has told Holmes this fact. But Holmes later explains how he deduced it from the doctor’s appearance. *Shoscombe Old Place* (SHOS) is the sixtieth and last Sherlock Holmes story, published in 1927. In it the fact that Sir Robert Norberton has given away his sister’s beloved spaniel puzzles everyone but Holmes. He uses the fact to deduce that the sister, Lady Beatrice Falder, has died and that Sir Robert is concealing that fact. Immediately everything makes sense and the case becomes easy for Holmes to solve. Whatever else changed in the Sherlock Holmes stories, Doyle kept Holmes deducing throughout the full forty years from 1887 to 1927.

In this study, we suggest that another strong component of the character’s ongoing appeal and success is his knowledge of science and frequent use of the scientific method. Doyle himself, in an article in *Tit-bits* on December 15, 1900, described how he tried to make his detective stories more realistic than the ones he had been reading (Green 1983, 346).

“I had been reading some detective stories, and it struck me what nonsense they were, to put it mildly, because for getting the solution to the mystery the authors always depended on some coincidence.”

So he resolved to diminish the role of chance by having his detective employ science and reasoning on his way to the answer. With Poe’s Dupin in mind Doyle set out to make Holmes somewhat different. He tells us:

“Where Holmes differed from Dupin was that he had an immense fund of exact knowledge to draw upon in consequence of his previous scientific education.”

Sherlock Holmes’s knowledge of science not only provides fodder for debate among the legions of fans, it also lends credibility to his impressive powers of reasoning. Indeed, among the best-loved stories involving the detective, those that rely not just on deductive reasoning but also employ elements of science are regarded the most highly.

This book will focus on the scientific side of Sherlock Holmes. Initially we will look at how the Holmes “Canon” came to be written. Chapter two will introduce the main characters: Holmes, Dr. Watson, Professor Moriarty, and Holmes’s brilliant brother Mycroft. In chapter three we will examine how Sherlock Holmes used scientific forensic techniques in his

investigations. Chapters four and five will deal with all of the science that was not used to solve crimes. Chapter four will describe the chemistry that permeates the entire Canon. Chapter five will deal with six other sciences that come up in the stories. Finally, we will conclude with some closing thoughts on Holmes's use of science and its contribution to the enduring appeal of the stories.



## 1

## Origins of Sherlock Holmes

## Section 1.1

Arthur Conan Doyle  
*Steel True, Blade Straight*  
Epitaph of Sir Arthur Conan Doyle

One can achieve somewhat of an understanding of how Sherlock Holmes came to exist by looking at the contributions of three people: Doyle himself, Edgar Allan Poe, and Conan Doyle's mentor in medical school, Dr. Joe Bell. First we shall look at Doyle himself, focusing on those aspects of his life which led to his authoring the Sherlock Holmes stories.

Arthur Conan Doyle was born on May 22, 1859 in Edinburgh. His father, Charles Altamont Doyle, was English and his mother, Mary Foley, was Irish. His father had a drinking problem and consequently was less a factor in Doyle's upbringing than was his mother. Charles would eventually end up in a lunatic asylum (Stashower 1999, 24). Mary Doyle instilled in her son a love of reading (Symons 1977, 37; Miller 2008, 25) which would later lead him to conceive of Sherlock Holmes. Doyle's extensive reading had a great influence on the Sherlock Holmes stories (Edwards 1993). Doyle was raised a Catholic and attended Jesuit schools at Hodder (1868-70) and Stonyhurst (1870-75), which he found to be quite harsh. Compassion and warmth were less favored than "the threat of corporal punishment and ritual humiliation" (Coren 1995, 15). Next he spent a year at Stella Matutina, a Jesuit college in Feldkirch, Austria (Miller 2008, 40). Since Doyle's alcoholic father had little income, wealthy uncles paid for this education. By the end of his Catholic schooling he is said to have rejected Christianity (Stashower 1999, 49). At the less strict Feldkirch school his drift away from religion turned toward reason and science (Booth 1997, 60). At this time he also read the writings of Edgar Allan Poe, including his detective stories. So, while Sherlockians debate the "birthplace" of Holmes, a claim can be made that Holmes was conceived in Austria.

In 1876 Doyle began his medical studies at the highly respected University of Edinburgh. These years also played a large role in shaping the Holmes stories. One obvious factor was his continued exposure to science. Much of the remainder of this book will explore the presence of science in the sixty Holmes tales. The other big factor from his medical studies was his mentor, Dr. Joseph Bell. Joe Bell's deductions about patients impressed Doyle to the extent that he added similar scenes in the Holmes tales. Upon completing his studies, Doyle, now ready to set up his practice, headed to London for a meeting with his uncles. They could put him in a position to become a doctor to London's Catholic community through their many wealthy contacts. But he essentially threw that opportunity away by informing his family of his rejection of his Catholic upbringing. He was now an agnostic, a term coined only a few years earlier by Thomas Huxley (Stashower 1999, 50). Doyle knew what he was doing to his chances, but refused to pretend that he was still Catholic. As his epitaph suggests, his sense of honor would remain this strong throughout his life. His uncles now refused to help him, and his career had a difficult time getting started. Instead of London, Doyle set up his medical practice in Southsea, Portsmouth in 1882. In both his medical school thesis and other publications Doyle proved astute at understanding causes of diseases in ways not fully explained until much later (Miller 2008, 102). Although he continued to work there until 1890, he was not successful. His income the first year was £154, and never rose much above £300 (Carr 1949, 66; Stashower 1999, 63). In fact, his first year income tax return was sent back to him. The revenue inspector had written on it, "Not satisfactory." The quick-witted Doyle resubmitted it unchanged with his notation, "I agree entirely" (Booth 1997, 96).

It was while in Portsmouth that Doyle was first exposed to Spiritualism. Although he would not publicly espouse it until 1917, eventually agnosticism would be discarded and Spiritualism would come to dominate his later life. Another important event during his Portsmouth years was his meeting Louisa Hawkins, called Touie. They met when he was called upon to give a second opinion of her brother Jack's diagnosis of cerebral meningitis. Doyle took Jack Hawkins into his lodgings as a resident patient. But Jack died in a few days. The twenty-third Holmes tale would be titled *The Resident Patient* (RESI). Doyle proceeded to court Touie and they were married a few months later, on Aug. 6, 1885. Because Touie had a small income of her own, Doyle's poverty was somewhat relieved. But her health was very fragile and she died at age 49 in 1906. Doyle, in the meantime, had fallen in love with Jean Leckie, whom he had met in 1897. He is considered to have handled this problem honorably. He married Jean fourteen months after Louisa died (Stashower 1999).

Doyle finally gave up the Portsmouth practice in 1890 when he went to Vienna for advanced study in ophthalmology. Upon his return he set up



practice in London. He later wrote, “Not one single patient ever showed up.” This gave rise to the well known story about his writing the Sherlock Holmes stories while waiting in his office for the patients who never came. As enticing as this story is, there exists evidence that it might not be entirely accurate (Lellenberg, et al 2007, 291). Doyle, a natural teller of tales, had already published several items beginning with *The Mystery of Sassassa Valley* in 1879. So he now turned to writing and decided to write a detective novel. Poe’s detective C. Auguste Dupin would be his model. Holmes’s intelligence would be so superior that he could solve mysteries that baffled others. But his solutions would be deduced. Chance, so common in the “crime” stories written between Poe’s time (1841) and that of Doyle (1887), would play no role. The result, *A Study in Scarlet* (STUD), was rejected by four or five publishers before Ward, Lock & Co. bought it outright for twenty-five pounds. It was published in Beeton’s Christmas Annual for 1887. Doyle never received any additional money from this story, still in print today. He later reported that STUD was not particularly well received in England, but it did go through several printings there.

But in America, Holmes was an immediate hit. STUD was well received in the United States. It actually “created an excited audience of Holmes fans” (Lachtman 1985, 14). So, conceived in Austria and born in London, Holmes next was resuscitated in America. Thus it was that in 1889 Lippincott’s Magazine, published in Philadelphia, invited Doyle and Oscar Wilde to meet in London (Coren 1995, 56). They shared a meal at the Langham Hotel with Lippincott’s agent, Joseph Stoddart, and Irish MP Thomas Gill (Miller 2008, 119). Doyle described the event as a “golden evening” (Green, R. L. 1990, 1). The result was an agreement whereby each author would write a novel. Wilde proceeded to write his only novel, *The Picture of Dorian Gray*. Soon after the meeting Conan Doyle submitted the name of his promised novel. It would be *The Sign of the Six* (Booth 1997, 132). Doyle had thought of his detective, and decided to write the second Sherlock Holmes story. He even pays a bit of homage to Oscar Wilde by having one of the main characters, Thaddeus Sholto, resemble Wilde. The title eventually became *The Sign of the Four* (SIGN). Like STUD it was one of the four “long” Sherlock Holmes stories. It has been argued that American interest kept the Holmes saga going (Stashower 1999, 103).

With the third story, *A Scandal in Bohemia* (SCAN), Doyle began his long series of Holmes short stories published in *The Strand Magazine*. It was the first of the fifty-six short stories, and it hit London like a bombshell. The circulation of magazine soared to 500,000 whenever a Holmes story was published (Riley and McAllister 1999, 24). The publisher, George Newnes, estimated that an extra 100,000 copies were sold whenever a Holmes tale appeared (Stashower 1999, 125; Miller 2008, 141). The small income of Doctor Doyle now became a distant memory. But

Doyle tired of Sherlock Holmes quickly and considered killing him off in the eighth story. But Doyle's mother was an ardent Holmes fan, and she commanded him not to do it. She even made a plot suggestion which he turned into *The Copper Beeches* (COPP), the fourteenth story (Stashower 1999, 126). But Holmes had to go. He was interfering with Doyle's more serious literary efforts, namely his historical novels such as *Micah Clarke* (1889) and *The White Company* (1891). In addition, the task of devising new plots was becoming difficult. After borrowing from Poe in the first three stories, Doyle repeats the same basic plot of keeping a young girl unmarried in order to retain control of her money in stories #5, *A Case of Identity* (IDEN), #10 *The Speckled Band* (SPEC), and #14, COPP. We get a fearsome step-father in Dr. Grimesby Roylott in SPEC; a wimpy step-father in James Windibank in IDEN; and a conniving father in Jephro Rucastle in COPP. The "feel" of these three stories is so different that it's not even clear that Doyle realized he was repeating plots. The quality of the three is also extremely different. SPEC has been rated the best of the fifty-six short stories in every poll that has been done. IDEN, with the same plot outline, has been described thusly, "The third story, IDEN, is a rather weak one" (Redmond 1981).

By the time he would finish Doyle would also repeat the theme of missing persons and have Holmes deal with six such cases (Lachtman 1985, 51-52). Additionally, in six stories SIGN, *The Boscombe Valley Mystery* (BOSC), *The Five Orange Pips* (FIVE), *The Gloria Scott Case* (GLOR), *The Dancing Men* (DANC), and *Black Peter* (BLAC), he reuses the idea of someone returning to England only to be followed and blackmailed or threatened (Schweickert, W. P., December 1980, *Baker Street Journal*, 30(4)). So we find in December 1900, between writing stories #26 *The Final Problem* (FINA) and #27 *The Hound of the Baskervilles* (HOUN), that an article by Doyle appears in "Tit-bits" (Green 1983, 349). In it he says,

"When I had written 26 stories, each involving a *fresh plot*, I felt it was becoming irksome, this searching for plots."

That was one reason why in FINA, he has Holmes die in the clutches of archenemy Professor Moriarty as they both tumble over the Reichenbach Falls in Switzerland.

But when Doyle brings Holmes back to life in the 28th story, *The Empty House* (EMPT), the problem of devising new plots continues. Utechin (2010, 32) has pointed out that the 29th, 31st, 35th, and 40th stories all reprise themes he used in earlier Holmes tales, namely numbers 3, 24, 9, and 25:

“*The Norwood Builder* owes much to *A Scandal in Bohemia*; *The Solitary Cyclist* has the plot of *The Greek Interpreter*; *The Six Napoleons* of *The Blue Carbuncle*; *The Adventure of the Second Stain* is a doublet of *The Naval Treaty*”

When Holmes “died” at Reichenbach, the reaction in London was extreme. Black armbands of mourning were worn. Doyle received numerous critical letters. Circulation of *The Strand Magazine* plummeted. Twenty thousand subscriptions were cancelled (Stashower 1999, 149; Miller 2008, 158). Ten years later, in 1903 in EMPT, we learn that Holmes had never fallen into the Reichenbach. Sherlockians refer to the ten year period when Holmes was considered dead as the Great Hiatus. Jean Leckie, later the second Mrs. Arthur Conan Doyle, had suggested the explanation for Holmes’s escape from death (Booth 1997, 249). With the return of Holmes the circulation of *The Strand Magazine* surged, and so did Doyle’s royalties. He could not afford to leave Holmes at the bottom of the Reichenbach. Nor could he afford to remain a doctor. Never again did Doyle allow Holmes to die. Holmes was still alive and tending bees in his retirement when, thirty-three stories later, Arthur Conan Doyle died on July 7, 1930. Along the way he had done more than create the greatest fictional detective ever. He had invented the literary device known as the enigmatic clue (Carr 1949, 350) with the famous Holmes quote from *Silver Blaze* (SILV), “The dog did nothing in the nighttime.” He had written the first “fool’s errand” story,<sup>1</sup> *The Red Headed League* (REDH) (Priestman 1994, 315); and he had foreshadowed the hardboiled detective genre in *The Valley of Fear* (VALL) (Doyle and Crowder 2010, 183; Sullivan 1996, 170).

The path to the Sherlock Holmes stories then is this: maternal influence to voracious reading, strict Catholic schooling to drive him from that religion, love of science and reason acquired at school, rejection by wealthy uncles because of his agnosticism, failure of his medical practice, a natural talent for telling a story, Edgar Allan Poe’s genius, Dr. Joe Bell’s brilliance, and lucrative remuneration to keep Holmes alive.

## Section 1.2

The Influence of Edgar Allan Poe

. . . his detective is the best in fiction.

Arthur Conan Doyle, October 11, 1894, New York City

<sup>1</sup> In his continuing struggles to devise plots Doyle uses the fool’s errand theme in three stories, REDH, STOC, and 3GAR, the 4th, 18th, and 53rd published.

We've seen in section one that Doyle took to writing as he waited in his doctor's office for the patients who rarely ever came to consult him. Edgar Allan Poe had "invented" the detective story when he published *Murders in the Rue Morgue* (RUEM) in 1841 (Silverman 1991, 171; Sova 2001, 66). At that time the word "detective" was not even in existence. Its first use came in 1843 (Silverman 1991, 173; Booth 1997, 104). In the forty years between Poe and Conan Doyle there were many police stories, but they relied heavily on chance, guesswork, and death-bed confessions (Green 1987, 2). These stories "provided the bridge between Poe and the true tale of detection as created by Conan Doyle" (Cox 1993, xv). Then Doyle, who clearly had read Poe, "reinvented" the detective story in 1887. In fact, initially there was a very heavy reliance on Poe. In the very first Holmes story, *STUD*, Doyle borrows the concept of a cerebral detective with a sidekick sounding board. Thus arose the claim that Sherlock Holmes is modeled after Poe's C. Auguste Dupin, whose Watson counterpart is an unnamed narrator.

There were other influences on this first Sherlock Holmes story. The title is close to *L'Affair Lerouge*, Emile Gaboriau's 1866 story. The lengthy flashback is to be found also in Gaboriau (Edwards 1993, Introduction to *STUD*, xxiv). Mormon killers are found here just as in Robert Louis Stevenson's *The Dynamiter* (Booth 1997, 104). Doyle's concept of the American West in the second half of *STUD* drew on Mayne Reid's ideas (Edwards 1993, Introduction to *STUD*, xxv). Even William Makepeace Thackeray is cited as a factor in shaping Doyle's work (Edwards 1993, Introduction to *STUD*, xv). But Poe was easily the major influence (Edwards 1993, *STUD*, xviii).

We've seen how Doyle came to decide to write a second Sherlock Holmes story. In it, having made Holmes like a Poe character, Doyle now reworks a Poe plot. The killer in Poe's RUEM is an Orang-Outang who scales an "unscalable" wall, kills Madame L'Espanaye and her daughter, and then leaves by the same route. It was the first detective story (Silverman 1992, 174) as well as one of the earliest locked room mysteries (Murphy 1999, 356). In *SIGN* Doyle writes his own locked room story. He then has Tonga, a pygmy from the Andaman Islands, kill Sholto after matching the Orang-Outang's wall scaling feat.

With the third Holmes tale, *SCAN*, Doyle starts the hugely successful set of fifty-six Sherlock Holmes short stories. Again he reworks a Poe plot. In *The Purloined Letter* (PURL) a document belonging to a royal person is sought by the detective Dupin. The document is a compromising letter written by the queen of France. It is hidden in plain sight and recovered by the amateur sleuth using a ruse to divert attention so that he may take

the letter and leave a substitute. The ruse is to distract Minister D using a gun shot fired just outside his hotel room.

Holmes does likewise in SCAN where the “document” is an incriminating photograph of the King of Bohemia and Irene Adler. The ruse is a cry of “fire!,” plus a smoke bomb thrown in the window by Dr. Watson. Concerned about losing the photograph, Irene Adler’s actions reveal to Holmes that the photograph is in her safe. In fact Doyle pokes fun at Poe, suggesting that a mere letter can never be as incriminating as a photograph:

---

King of Bohemia:	There is the writing
Sherlock Holmes:	Forgery
King:	My private note paper
Holmes:	Stolen
King:	My own seal
Holmes:	Imitated
King:	My photograph
Holmes:	Bought
King:	We were both in the photograph
Holmes:	Oh dear

---

There were similarities other than plot lines as well. Like Dupin, Holmes has eccentricities. Both authors used these eccentricities to make their character more memorable. Once the Holmes tales became so very popular, Doyle had less need for eccentricities and he had Dr. Watson wean Holmes from the drug habit. Dupin, though, remains unchanged perhaps because in only three stories there was not enough time to evolve him away from his eccentricities. In addition, both sleuths are described as having a “dual” nature. This is another instance where Doyle borrowed from Poe. In Poe’s tales we read of Dupin’s “Bi-part soul.” In Holmes we see the man of intense action when on a case; and the bored drug user whenever his mind misses the stimulation of his work. “In his singular character the dual nature alternately asserted itself” (REDH). In the late 1800’s, when the Holmes stories were being published, the concept of the dual nature of humanity was the subject of much debate (Macintyre 1997, 222). The writings of Charles Darwin were relatively recent and society was still digesting his ideas.

Doyle also uses several literary devices found in Poe. One is the ruse just described. In addition to using such a ruse in SCAN, Doyle does so again in *The Illustrious Client* (ILLU). In *The Norwood Builder* (NORW)

a cry of “fire” along with an actual fire cause the culprit to leave the hiding place Holmes has deduced is there. Another Poe idea is using newspapers to communicate with suspects by advertisements. In RUEM, Dupin advertises in *Le Monde* that an Orang-Outang has been found in the Bois de Boulogne. The sailor responds and is apprehended. Doyle has Holmes advertise in newspapers beginning with the second story, SIGN. Sometimes he gets answers, such as Henry Baker responding to recover his Christmas goose in *The Blue Carbuncle* (BLUE). Other times there is no response as in *The Naval Treaty* (NAVA). Even then, though, the absence of a response yields useful information to Sherlock. All in all, newspapers are referred to in thirty-five of the sixty Holmes stories (Tracy 1977, 259).

Both Dupin and Holmes use disguises in their work. Twice in PURL Dupin dons green eyeglasses as a disguise, first in order to locate the Queen’s letter, and then to steal it. Again Doyle immediately follows Poe and uses disguises in SIGN. When Mr. Windibank in IDEN wants to disguise himself so that his stepdaughter will not recognize him, he too chooses a pair of glasses, thick ones in this case. Add a moustache and whiskers and Windibank is able to fool Mary Sutherland, even though she lives with him. Holmes uses disguises fourteen times in eleven different stories (Bunson 1994, 56). Conan Doyle may also have been influenced here by Emile Gaboriau’s Monsieur Lecoq who, in *L’Affaire Lerouge* (1866), uses disguises too. (Booth 1997, 106)

Another successful device that Holmes’ borrowed from Dupin was the habit of breaking in on Watson’s train of thought. Dupin does just that in RUEM.

“Being both, apparently, occupied with thought, neither of us had spoken a syllable for fifteen minutes at least. All at once Dupin broke forth with these words:

“He is a very little fellow, that’s true, and would do better for the Theatre des Varietes.”

“There can be no doubt of that.” I replied.

“Dupin, this is beyond my comprehension. I do not hesitate to say that I am amazed. . . .”

There are several instances of Holmes reading Watson’s mind. For example in DANC:

“So Watson, you do not propose to invest in South African Securities.”

“How on Earth do you know that?”

“Now, Watson, confess yourself utterly taken aback.”

“I am.”

“I ought to make you sign a paper to that effect.”

“Why?”

“Because in five minutes you will say that it is all so absurdly simple.”

“I am sure that I will say no such thing.”

Upon having Holmes’s explanation Watson does declare the deduction to be absurdly simple.

Another example of Holmes breaking in on Watson’s thoughts occurs in *The Adventure of the Cardboard Box* (CARD).

“You are right Watson. It does seem a most preposterous way of settling a dispute.”

“Most preposterous.”

Suddenly realizing how he had echoed the inmost thought of my soul.

“What is this Holmes. This is beyond anything I could have imagined.”

This time Watson confesses he is still amazed after Holmes explains how he traced Watson’s thoughts.

An oddity of Poe’s is the use of quotes from the classics at the opening of all four of his tales of ratiocination.<sup>2</sup> Doyle adopts this approach in the early Holmes stories, using such quotes at the end. But after doing so in five of the first six stories, he returns to the practice only twice more, in stories written more than ten years later.

In both Doyle and Poe the official police force is not nearly as clever or as effective as the amateur. In fact both amateurs criticize their predecessors: Dupin speaks ill of Vidocq; Holmes criticizes Dupin. Both authors have the relationship between the brilliant amateur and the official force undergo a similar evolution. In the first Dupin story, RUEM, he is resented by the prefect. In the second, *The Mystery of Marie Roget*, the prefect stops by to see Dupin, and in the third, PURL, the prefect actually gives the problem to Dupin. Initially there is hostility between Holmes and Scotland

<sup>2</sup> A term used, often in referring to Poe’s work, to describe tales wherein reasoning is a major factor.

Yard. Then follow cautious acceptance, full collaboration, and finally dependence (Dove 1997, 137).

Poe's influence on Doyle was strongest in the early Holmes stories. But some of Doyle's later Holmes tales also bear at least some resemblance to earlier Poe writings. In NAVA Doyle again returns to a missing document. As in Poe's PURL, the document could affect the government. Poe's *The Gold-Bug* (GBUG), though not a Dupin story, is often considered his fourth story of ratiocination. It appears to have influenced two of the Holmes tales, *The Musgrave Ritual* (MUSG) and DANC (Hodgson 1994, 213). These stories will be discussed in the sections dealing with mathematics and cryptograms respectively.

It should be noted that some of Poe's non-detective writings appear to be an influence in the Holmes stories. In Poe's *Imp of the Perverse* (1845) an unnamed narrator commits murder using fumes from a poisoned candle. Doyle's *The Adventure of Devil's Foot* (DEVI) involves two murders, by Mortimer Tregennis and of Mortimer Tregennis, by fumes from a root. *The Fall of the House of Usher* shares some elements with two separate Holmes stories. *Shoscombe Old Place* (SHOS) involves a brother with a dead sister and the fate of an estate (Fetherston 2006). *The Disappearance of Lady Frances Carfax* (LADY), like Usher, involves a case of premature burial (Vail 1996). So does MUSG along with Poe's *The Premature Burial* and *The Cask of Amontillado* (CASK). Finally, there also seems to be some Poe influence in Doyle's non-Holmesian work. In CASK Fortunato is lead into the wine cellar in Montresor's catacomb and sealed up by a wall, there to die. In Doyle's *The New Catacomb*, Kennedy is led into the newly discovered catacomb by Julius Burger. He is then left there to die, hopelessly lost in the pitch darkness of the cave, while Burger follows a string back to safety in the darkness. Some similarities between Poe's *The Gold-Bug* and Doyle's first published story, *The Mystery of Sassassa Valley*, have been noted (Booth 1997, 62). Conan Doyle's *The Doings of Raffles Haw*, like Poe's *Von Kempelen and His Discovery*, deals with the "science" of alchemy (Stashower 1999, 117). Doyle's Professor Challenger story, *The Poison Belt*, has been compared with Poe's *The Masque of the Red Death* (Redmond 1993, 79). And finally, we have noticed that in *The Horrors of the Heights* Doyle uses an airplane to travel to impossible elevations. A balloon does the same in Poe's *The Unparalleled Adventure of One Hans Pfaall*.

It is interesting to read how critics have responded to all of these Poe/Doyle comparisons. We will conclude this section by looking at several comments on the two authors. While all are in agreement that Poe was a large influence, we find some comments favorable to Doyle and others not.



“Dupin is of little importance either in himself or in comparison to Poe, but Sherlock Holmes is greater than Conan Doyle.” (Green 1987). Evidence for this lies in the fact that there is little or no interest in Dupin today, while Poe himself remains widely popular.<sup>3</sup> As Isaac Asimov points out, there are no societies devoted to the memory of Dupin, few people remember Dupin, whereas Holmes is “a three dimensional living person” (Asimov 1987). A number of countries have expressed the same view by issuing stamps bearing the image and name of Sherlock Holmes, but ignoring Arthur Conan Doyle (Moss 2011). Most stamps depict Holmes in the famous deerstalker hat, which is more a creation of the artists who illustrated the stories than it is of Doyle.<sup>4</sup>

“Perhaps the explanation for the immediate and lasting success is that Conan Doyle added humor and drama, both of which are lacking in Poe.”

“It is impossible to read them (the three Dupin stories) without appreciating how much Conan Doyle improved upon the original formula.” (Green 1987, 4)

“If you read Poe’s three stories carefully you will find that the ingenious Dr. Doyle has picked him all to pieces, and worked up every available fragment with curious cleverness into his own stories.” (Robert Blatchford, as cited in Green 1987, 9)

“used the same structure as Poe and virtually the same character, and that he copied, imitated, and plagiarized everything he felt was of value. The result was impressive.” (Green 1987, 2)

“Conan Doyle was hardly able to string two or three words together or to use even the simplest idea without borrowing them.” (Henri Mutrux 1977).

“*The Murders in the Rue Morgue* may be a classic locked room mystery, it may have the mind reading episode and one of the most memorable murders in detective fiction, but it is long-winded, intricate, and dull.” (Green 1987, 4)

Asimov’s opinion of Poe is that “he is passé, and much that he wrote, however admired by some, is simply unbearable to others” (Asimov 1987).

Dorothy Sayers felt that Doyle had improved on Poe’s detective stories:

<sup>3</sup> There is even a street named after him in New York City.

<sup>4</sup> Sidney Paget and later Frederic Dorr Steele, the two best known illustrators, both showed Holmes in a deerstalker hat.

“He cut out the elaborate psychological introductions or restated them in crisp dialogue.”

“He was sparkling, surprising, and short.” (Sayers, ed. 1929).

An example of the long winded Poe compared with the “crisp” Doyle is found in Holmes famous statement from *The Adventure of Beryl Coronet* (BERY), which is derived from this tedious statement in Poe’s RUEM:

“Now, brought to this conclusion in so unequivocal a manner as we have been, it is not for us, as rational men, to reject it on account of apparent impossibilities. It is only for us to prove that these apparent impossibilities are, in reality, not such.”

Holmes’s succinct restatement in BERY:

“When you have eliminated the impossible, whatever remains, however improbable, must be the truth.”

Several conclusions are warranted. First Sherlock Holmes was based on Poe’s Dupin. Second, while Poe is generally considered the greater author, Doyle’s detective fiction surpasses that of Poe. Third, Poe’s non-detective writings are very highly regarded; Doyle’s are not.

## Section 1.3

The Influence of Dr. Joseph Bell

Sherlock Holmes is the literary embodiment of a professor of medicine at Edinburgh University.

Arthur Conan Doyle. May 1892

Dr. Joseph Bell was born in Edinburgh in 1837 and spent his entire medical career in that city. Bell was known for his talents as a poet, a naturalist, and a sportsman (Coren 1995, 22). He was a successful surgeon and editor of the *Edinburgh Medical Journal* for twenty-three years (Booth 1997, 49). Though never a faculty member at Edinburgh University Medical School, Bell did publish several textbooks. He also taught surgery at the Royal Infirmary. Doyle, along with other med students, paid to attend his classes. Every Friday he held an outpatient clinic at the infirmary. There he would proceed to amaze both the students and the patients by his deductions. He was very successful in diagnosing the patient’s conditions, and sometimes their occupation, where they lived, and how they had traveled to the clinic.

In 1878 Bell selected Doyle to serve as his outpatient clerk for the Friday sessions (Booth 1997, 50). In this capacity Doyle became familiar with Bell's ability to observe trifles and make logical deductions from them.

One example involved a woman and her small child whom Bell had never met. After greeting one another, Bell displayed his deductions in a series of questions (Stashower 1999, 20).

"What sort of crossing did you have from Burntisland?"

"It was guid."

"And had you a good walk up Inverleith Row?"

"Yes."

"And what did you do with the other wain?"

"I left him with my sister in Leith."

"And would you still be working in the linoleum factory?"

"Yes, I am."

Bell had noted her accent, red clay on her shoes, a child's coat too large for the child with her, and dermatitis on the fingers of her right hand, a common condition for linoleum workers. Doyle was impressed by this and other instances of Dr. Bell's brilliant deductions.

Another oft quoted example of Dr. Bell in action deals with his instant diagnosis of a civilian patient's condition before even examining him.

"Well, my man, you've served in the army."

"Aye, Sir."

"Not long discharged?"

"Aye, Sir."

"A Highland regiment?"

"Aye, Sir."

"A non-com officer?"

"Aye, Sir."

"Stationed at Barbados?"

"Aye, Sir."

The observations that Dr. Bell used in this case were that the man was respectful, but did not remove his hat. They didn't remove hats in the army; but had he been long discharged he would have adjusted to removing it. He had an air of authority, but not too strong. Thus he was a non-com. He was obviously Scottish and thus from a Highland regiment. His condition of Elephantiasis was more common in Barbados.

Doyle had the Holmes brothers make similar deductions in *The Greek Interpreter* (GREE).

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Mycroft:	“Look at these two men who are coming towards us.
Sherlock	“The billiard-marker and the other?”
Mycroft	“Precisely. What do you make of the other?”
Sherlock	“An old soldier, I perceive.”
Mycroft	“And very recently discharged.”
Sherlock	“Served in India, I see.”
Mycroft	“And a non-commissioned officer.”
Sherlock	“Royal Artillery, I fancy.”
Mycroft	“And a widower.”
Sherlock	“But with a child.”
Mycroft	“Children, my dear boy, children.”
Watson	“Come, this is a little too much.”

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This, of course, is the scene that serves as one of the bases for the contention that of the Holmes brothers, it was Mycroft who had the superior mind. Doyle has Sherlock Holmes make brilliant deductions in several other stories. A famous example occurs in REDH when Holmes first meets his client, Jabez Wilson.

“Beyond the obvious facts that he has at some time done manual labor, that he takes snuff, that he is a Freemason, that he has been in China, and that he has done a considerable amount of writing lately, I can deduce nothing else.”

So it not surprising that Doyle named Joe Bell as the model for Sherlock Holmes. Doyle first made this claim in an interview in May 1892. He said that Holmes was modeled after one of his teachers in medical school. In June 1892, in another interview, he named Bell as the model. When *The Adventures of Sherlock Holmes*, a book containing the first twelve short stories, was published in October 1892, Doyle dedicated it to Dr. Bell (Green 1983, 17).

It has been noted that there was no mention of Bell in 1886 when Doyle was beginning to create his detective. During these early days, as we have detailed in the previous section, Doyle relied heavily on Poe while getting Holmes started. So Green concludes that Bell played a smaller role than Poe in the Holmes phenomenon (Green 1983, 28). Sir Henry Littlejohn was another of Doyle’s medical school instructors. In addition to lecturing at the medical school, he was Police Surgeon in Edinburgh. A forensic expert, he frequently served as an expert witness at trials. In fact Dr. Bell served as an assistant to Dr. Littlejohn as official advisor to the British Crown in

cases of medical jurisprudence (Liebow 1982, 119). Littlejohn is considered by some to have been as much a factor in the birth of the Holmes stories as was Bell (Jones 1994, 28). It is notable that, years after Bell's death in 1911, Doyle himself mentioned Littlejohn as an important influence. In a speech in 1929 Doyle named both Bell and Littlejohn as important in shaping his ideas (Green 1983, 27).

So, who was the model for Sherlock Holmes? Some say Doyle himself was the real Holmes (Starrett 1930, 118). Certainly Doyle's son Adrian believed his father was the real Sherlock Holmes (Liebow 1982, 224). In the 1940's a public battle was waged in print over whether it was Dr. Bell or Dr. Conan Doyle who was Sherlock Holmes (Liebow 1982, 222–234). Dr. Bell's entertaining deductions show up in several of the Sherlock Holmes stories. But even these are foreshadowed by Poe in *The Man of the Crowd* (1840), where the unnamed narrator deduces occupations from the appearance of passers-by. The assertion that Holmes is a mixture of Poe's Dupin and Dr. Bell is undoubtedly correct (Booth 1997, 113). However, we feel that the few scenes based on Bell are hardly as influential as Poe's contributions: the very idea of a cerebral detective, the mind reading episodes in Poe and Doyle, the reworking of Poe plots from RUEM, PURL, and GBUG into SIGN, SCAN, and DANC. So, while Doyle may have wanted to compliment his old mentors Bell and Littlejohn by naming them as models for Sherlock, it was Poe who influenced Doyle most when he took up his pen to become a writer. Dr. Joe Bell's important role was giving Doyle ideas about how to make his detective seem such a genius.

## 2

## The Main Characters

## Section 2.1

Sherlock Holmes

*He was the most perfect reasoning and observing machine that the world has seen*

Dr. Watson, “A Scandal in Bohemia”

In this section we will take a look at why Sherlock Holmes is one of the most recognizable characters in all of literature. Several factors contribute to this. After describing his physical characteristics and his personality, we will look at the major feature of his fame, his brilliant deductive ability. Here it is that Arthur Conan Doyle is somewhat in debt to his mentor Dr. Joseph Bell, as described in chapter one.

In *A Study in Scarlet* (STUD), the very first Holmes tale, Dr. Watson describes Sherlock Holmes as over six feet tall, very lean, with piercing eyes and a thin hawk-like nose. Holmes’s voice was high and occasionally strident. We learn later that his eyes were gray and he had a narrow face and black hair. Most illustrators over the years have faithfully reproduced this picture of the great detective.

Very little about Holmes’s background is revealed to us. Most of what we do know is told in *The Greek Interpreter* (GREE). In this tale, number 24 of the 60, Watson is shocked to learn that Holmes has a brother named Mycroft. It turns out that neither of the roommates has told the other that they had a brother. We also learn that the Holmes brothers are from a family of country squires. The family traces itself back to the Frenchman Horace Vernet (1789–1863), a noted painter of military scenes ([www.britannica.com](http://www.britannica.com)). Clearly there was enough money in Holmes’s background for him to attend college. We know from *The Gloria Scott* (GLOR) that he did attend for two years.<sup>1</sup>

<sup>1</sup> Sherlockians have debated for over 100 years whether Holmes attended Oxford or Cambridge, or even some other institution.



Figure 2.1 Sherlock Holmes

In *The Musgrave Ritual* (MUSG) Watson describes Holmes as very untidy. Apparently he kept his cigars in a coal scuttle, his tobacco in the toe of a Persian slipper. His correspondence was transfixed to the mantel by a jackknife. In what is considered a patriotic gesture (Tracy 1977, 379) he honored his queen by using a pistol to shoot the letters VR, for Victoria Regina, into the wall of the Baker Street rooms. Though clearly not too fussy about his chambers, Holmes is described in HOUN as committed to personal cleanliness.

Sherlock Holmes rarely exercised (*The Yellow Face* YELL), but was still a good runner (*The Hound of the Baskervilles* HOUN), capable of a two mile run when pursued (*Charles Augustus Milverton* CHAS). An incident in *The Speckled Band* (SPEC) demonstrates Holmes's strength. The horrendous Dr. Grimesby Roylott bends Holmes's fireplace poker in an attempt to intimidate Holmes with a display of strength. After Roylott leaves Holmes performs the even more difficult task of straightening the poker back to normal. In *The Beryl Coronet* (BERY), Holmes claims "I am exceptionally strong in the fingers." In several of the stories we hear about Holmes the boxer. He tells Watson that he boxed in college (GLOR). Watson's opinion was that Holmes was an expert boxer (STUD and *The Final Problem* FINA). In YELL he calls Holmes "one of the finest boxers of his weight." In SIGN we hear of Sherlock in action in the ring. McMurdo

is the porter at Bartholomew Sholto's home and a prize-fighter acquaintance of Holmes. Holmes greets him, "Don't you remember that amateur who fought three rounds with you at Allison's rooms on the night of your benefit four years back." Several times his boxing talent was put to use in his detective work. He overcame a street "rough" in FINA and turned him over to police custody. He was able to "grass"<sup>2</sup> Joseph Harrison twice. It was Harrison who stole the treaty in *The Naval Treaty* (NAVA). Jack Woodley in *The Solitary Cyclist* (SOLI) had to be carted away after daring to fight with Holmes.

Doyle was very interested in prizefighting. His successful novel *Rodney Stone* is said to have helped popularize boxing. In 1895 he was paid £4000 in advance royalties, £1500 for British serial rights, and £400 for American serial rights for *Rodney Stone*. The sum, £5900, in 1895 was the equivalent of over £300,000 in 1995 (Booth 1997, 206). The wealth of Arthur Conan Doyle was due to all of his writing efforts, not just to the Holmes stories.

Some have claimed that Holmes was a cold, hard person. This is based on several of Holmes's own statements. In *The Five Orange Pips* (FIVE), Holmes says, "I do not encourage visitors." In *The Devil's Foot* (DEVI), he states, "I have never loved." In SCAN we learn that he finds emotion to be abhorrent. In fact in SIGN he says "Love is an emotional thing, and whatever is emotional is opposed to that true cold reason which I place above all things." In *The Illustrious Client* (ILLU) he proudly proclaims "I use my head, not my heart."

His personal traits, particularly the idiosyncrasies just described, make Holmes a memorable character. When his landlady, Mrs. Hudson, asks him when he would like to eat (*The Mazarin Stone* (MAZA)), Holmes responds. "7:30 the day after tomorrow." He just can't be bothered with food when there is a culprit on the loose. His most pronounced trait was this "dual nature" (Tracy 1977, 163). It is mentioned in eight of the stories. Watson describes this in the very first tale, STUD.

"Nothing could exceed his energy when the working fit was upon him; but now and again a reaction would seize him, and for days on end he would lie upon the sofa in the sitting-room, hardly uttering a word or moving a muscle from morning to night."

An often quoted example (Sweeney, S. E. in Putney, et al, 1996, 43) of Holmes's duality comes from *The Red-headed League* (REDH). Watson contrasts Holmes the sleuth with Holmes the music lover.

<sup>2</sup> Grass is an old sporting term meaning to knock down. American editions read "grasp," which makes less sense since Harrison had a knife.



“All the afternoon he sat in the stalls wrapped in the most perfect happiness, gently waving his long fingers in time to the music, while his gently smiling face and his languid dreamy eyes were as unlike those of Holmes the sleuth-hound, Holmes the relentless, keen-witted, ready-handed criminal agent, as it was possible to conceive.”

This is another aspect of Poe’s Dupin which Conan Doyle borrowed and inserted in his own creation. Dupin is described early in *The Murders in the Rue Morgue* (RUEM) as having a “Bi-Part Soul.”

Since the brilliance of Holmes is among the most important factors in the success of the stories, let us take a look at some examples that highlight this aspect of the character. In chapter one, we’ve seen how several times he was able to deduce Watson’s train of thought, just as Dupin did in RUEM. Recall that when “young Stamford” introduces Holmes and Watson in *STUD*, the very first words that Sherlock Holmes ever says to Dr. Watson are, “How are you? You have been in Afghanistan, I perceive.” Watson responds, “How on earth did you know that?” And we are off and running.

*A Scandal in Bohemia* (SCAN) is the first adventure following Watson’s marriage to Mary Morstan as described in the second story, *The Sign of the Four* (SIGN). No longer living with Holmes at 221B Baker Street, Watson stops by for a visit. Holmes remarks that he can tell that Watson has returned to practicing medicine, that he has been getting wet lately, and that he has a servant girl who is clumsy and careless. The accuracy of Holmes deductions causes Watson to respond, “You would certainly have been burned had you lived a few centuries ago.”

In *The Norwood Builder* (NORW) Holmes says to the stranger, John Hector McFarlane,

“You mentioned your name as if I should recognize it, but I assure you, that beyond the obvious facts that you are a bachelor, a solicitor, a Freemason, and an asthmatic. I know nothing whatever about you.”

There are also numerous incidences of Holmes’s ability to make amazing deductions from the most mundane of items. In *HOUN* Holmes and Watson both try to deduce what they can from the walking stick that Dr. Mortimer had left at Baker Street the previous night. Neither Holmes nor Watson knows anything about Mortimer since they missed his visit.

Watson, using Holmes’s methods to “read” the stick, concludes that Dr. Mortimer is a successful elderly man, well esteemed since the walking stick was a gift from the members of CCH. The walking stick has been



*Figure 2.2* Holmes using lens

knocked about quite a bit; for example the iron ferrule is worn. Watson also concludes that Dr. Mortimer is a country practitioner who does a lot of walking. The CCH engraved on a silver band refers to the local Hunt, whose members have given Mortimer the stick in appreciation of his medical work.

Holmes's analysis is somewhat different. "I am afraid, my dear Watson, that most of your conclusions were erroneous." Holmes agrees that Mortimer is a country practitioner who does a lot of walking. But CCH stands for Charing Cross Hospital, in London. The stick was a gift upon Mortimer's leaving London to practice in the country. Reasoning that most doctors would not give up a position at Charing Cross Hospital for one in the countryside, Holmes deduces that Mortimer actually held a lowly position in London and was probably little more than a student there. Thus he expects to meet a young doctor, not Watson's predicted elderly man. Holmes also claims that Mortimer owns a middle sized dog. This last makes Watson laugh. Naturally, when Mortimer returns we find that Holmes was right. He was able to make that deduction from the dog's teeth marks on the stick.

Holmes has another opportunity to demonstrate his deductive powers in YELL. Once again a potential client leaves an item at the Baker Street lodgings. This time it is a pipe. Holmes spares Watson the embarrassment of being out deduced and proceeds to directly interpret Grant Munro's pipe. Holmes concludes that Munro is a muscular man, left handed, careless, well to do, with an excellent set of teeth, who highly valued the pipe. The bases for these conclusions are that he was strong enough to bite through the amber pipe stem, careless in that he managed to char the pipe by holding it near a gas jet to light the expensive tobacco within. That Munro highly valued the pipe is clear by the fact that he twice repaired it, both times at a cost nearly equal to the purchase price of a new pipe.<sup>3</sup> Holmes makes an interesting statement about the amber stem. His words differ in the American and English editions of YELL. This is discussed in the Appendix (see Doyle Scams).

In *The Golden Pince-Nez* (GOLD) Holmes does a brilliant analysis of the pair of glasses found clutched in the dead man's hand. Stanley Hopkins, a Scotland Yard detective who appears in stories number 33, 37, 38, and 39, shows the glasses to Holmes. Holmes presents the amazed Hopkins with a handwritten note containing a detailed description of the owner.

“Wanted, a woman of good address, attired like a lady. She has a remarkably thick nose, with eyes which are set close upon either side of it. She has a puckered forehead, a peering expression, and probably rounded shoulders. There are indications that she has had recourse to an optician at least twice during the last few months. As her glasses are of remarkable strength, and as opticians are not very numerous, there should be no difficulty in tracing her.”

This so astonishes Hopkins and Watson that Holmes provides an explanation to them. Such delicate and expensive glasses would only belong to a well-to-do woman. Holmes deduced from repairs made to the cork linings on the clips that she had visited an optician twice recently. The width of the clips meant a broad nose. The position of the lenses indicated her eyes were close upon her nose. Holmes associated a puckered forehead, peering expression, and rounded shoulders with the need for such strong glasses.<sup>4</sup>

*The Blue Carbuncle* (BLUE) has a scene which shows Holmes at his deductive best. Petersen, a commissioner<sup>5</sup>, has retrieved a Christmas goose

<sup>3</sup> Holmes makes an interesting statement about the amber stem. His words differ in the American and English editions of YELL. This is discussed in the appendix (see Doyle Scams).

<sup>4</sup> If this sounds farfetched, recall that Doyle was an ophthalmologist.

<sup>5</sup> A uniformed military veteran employed in a variety of tasks.

and a battered felt hat following an incident in the early morning hours of Christmas day. The goose bears a tag which reads “For Mrs. Henry Baker.” The hat has the initials H. B. written on the inside. Holmes gives Watson a chance to interpret the hat. Watson’s response: “I can see nothing.” After pointing out that Watson sees exactly what Holmes does, Sherlock proceeds with his analysis of Henry Baker’s hat.

Holmes concludes that the owner is highly intellectual, was formerly well-to-do, but is no longer. He used to have foresight, but displays a moral retrogression which is probably due to alcohol. His wife has ceased to love him. He has retained some self-respect, is sedentary and middle-aged. His hair was recently cut and had lime cream applied to it. Holmes’s final flourish, “It is unlikely that he has gas laid on in his house,” causes Watson’s response, “You are certainly joking.”

The large size of the hat leads Holmes to say that Baker was intellectual. Here he is claiming that a large head means a large brain and thus increased mental capacity. Sherlock sort of refutes his own idea when he tries on Baker’s hat and it “came right over the forehead and settled upon the bridge of his nose.” Surely Sherlock Holmes has more mental capability than Henry Baker. The fact that the concept of a “brain attic” that can get full was endorsed by Oliver Wendell Holmes may have been where Doyle got the idea (Moss R. A. 1991). This idea harkens back to Holmes’s comment in *STUD* that one’s brain can get filled up. It is a size issue and he does not wish to clutter his mind with useless facts. So when Watson informs him that the earth revolves around the sun, Holmes declares he will do his best to forget that useless fact! Because Baker’s hat is an expensive one, but out of date, Holmes deduces that he formerly had money, but no longer does. The foresight is evident from the fact that Baker bought a hat securer to protect his hat against the wind. The moral retrogression is suspected because the securer is broken and has not been replaced.

In a piece of reasoning that would now be seen as sexist, Holmes concludes that Mrs. Baker has ceased to love her husband by the fact that she has not brushed his very dusty hat. The predictions of a sedentary middle aged man with a recent haircut and lime cream come from stains on the lining of the hat. That Henry Baker has retained some measure of self-respect is clear to Holmes from the fact that Baker has tried to conceal those stains. It is the presence of five tallow stains that leads Holmes to conclude that Baker has no gas “laid on in his house.” Holmes certainly wasn’t joking, and it all proved correct.

The famous Sherlockian scholar, Christopher Morley, had a strong opinion about the relative merits of Christmas stories by Doyle and Dickens. “I am quite serious when I say that, as a story, *The Blue Carbuncle* is a far better work of art than the immortal *Christmas Carol*” (Rothman 1990, 118).

As a final example of Holmes reading objects, consider the incident in SIGN, the second story, where Watson decides to test the deductive ability of his relatively new roommate. Watson's challenge: "I have a watch here which has recently come into my possession. Would you have the kindness to let me have an opinion upon the character or habits of the late owner?" Holmes examines the watch and responds:

"I should judge that the watch belonged to your elder brother. He was a man of untidy habits—very untidy and careless. He was left with good prospects, but he threw away his chances, lived for sometime in poverty, with occasional short intervals of prosperity, and finally, taking to drink, he died."

Watson reacts strongly.

"This is unworthy of you Holmes. I could not have believed that you would have descended to this. You have made inquiries into the history of my unhappy brother, and now you pretend to deduce this knowledge in some fanciful way. You cannot expect me to believe you have read all this from his old watch!"

The scene closes with a sentence that all science teachers must love:

"My dear doctor, pray accept my apology. I assure you that I did not even know that you had a brother until you handed me the watch."

"But it was not mere guesswork?"

"No, no: I never guess. It is a shocking habit, destructive to the logical faculty."

As he did with objects, Holmes could also make deductions about people. We get our first look at how he will reason his way to the solution of the sixty cases at the beginning of the first adventure, STUD. Inspector Lestrade has found the letters RACHE on the wall in blood. He is convinced that a woman named Rachel is the key to solving the case. Holmes, though, spends 20 minutes examining the room from every angle using a magnifying glass and a tape measure. As he is about to leave he informs the Scotland Yard inspectors Lestrade and Gregson that:

"The murderer was a man. He was more than six feet high, was in the prime of life, had small feet for his height, wore coarse, square-toed boots and smoked a Trichinopoly cigar. He came here

with his victim in a four-wheeled cab, which was drawn by a horse with three old shoes and a new one on his off foreleg. In all probability the murderer had a florid face, and the fingernails of the right hand were remarkably long.”

Holmes concludes,

“Rache is the German word for revenge; so don’t lose your time looking for Miss Rachel.”

At the beginning of SCAN, the third story, Holmes receives a curious note:

“There will call upon you tonight, at a quarter to eight o’clock, a gentleman who desires to consult you upon a matter of the very deepest moment. Your recent services to one of the royal houses of Europe have shown that you are one who may be trusted with matters which are of importance which can hardly be exaggerated. This account of you we have from all quarters received. Be in your



Figure 2.3 Lestrade and “Rache”

chamber then at that hour, and do not take it amiss if your visitor wear a mask.”

When Watson asks Holmes what he thinks of the note, Holmes’s answer shows his reliance on the scientific method,

“It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts.”

Another instance of Holmes’s commitment to the scientific method occurs in *The Sussex Vampire* (SUSS) when he says, “One forms provisional theories and then waits for time of fuller knowledge to explode them.”

At the beginning of SCAN, Holmes proceeds to analyze the stationary on which the king had written the note. It is obviously expensive. Holmes decides the writer must be a German because of the sentence construction. Reading “This account of you we have from all quarters received,” Holmes declares, it is only “the German who is so uncourteous to his verbs.” When he finds the letters Eg, P, and Gt woven into the texture of the notepaper Holmes deduces that Gt stands for Gesellschaft, signifying a company in German. Next P is for Papier. Then by consulting his Continental Gazetteer he finds that the Eg means Egria, a part of Bohemia. Hearing horses in Baker Street, Holmes looks out the window and notes his masked visitor arriving in a very expensive rig and horses. “There’s money in this case, Watson, if there is nothing else.”

Finally, in the fourth tale, REDH, Holmes is again confronted with curious facts at the start. Why was Jabez Wilson hired to spend the hours from 10 AM to 2 PM each day away from his pawn shop copying every word in the Encyclopedia Britannica? The £4 per week is a generous salary for such menial work. And he only got the job because of his fine red hair. When Wilson arrives at his copying job one Friday, he is distressed to find a note, “The Red-Headed League is dissolved.” Reluctant to give up the easy income, Wilson consults Holmes.

Holmes is delighted by the unusual circumstances. He tells Wilson, “I really wouldn’t miss your case for the world.” Later he says to Watson, “It is quite a three pipe problem.” Holmes has learned from Wilson that his assistant, Vincent Spaulding, spends as much time as he can in the basement of the pawn shop. Reasoning that the purpose of the “fool’s errand” is to allow Spaulding more freedom in the basement, Holmes deduces that a tunnel is being dug. He visits the premises, sharply strikes the pavement in front of the shop with his stick. The sound tells him that the tunnel is headed in another direction. When he observes the City and Suburban

bank nearby, Holmes realizes what is up. To verify his conclusion, he knocks on the door and Spaulding answers. While asking for directions Holmes peers at the knees of Spaulding's trousers. Seeing the signs of dirt that he expected, Holmes and the police are waiting that Saturday evening as Vincent Spaulding, aka John Clay, the fourth smartest man in London, tunnels into the bank's vault.

It has been over 125 years since Sherlock Holmes appeared. The stories have never gone out of print. Of all the reasons for this, it is the vivid characterization of Holmes that is most important. His brilliant deductions continue to amaze and amuse today's readers. Did Holmes use these amazing deductive powers to solve crimes? Of course he did, and his forensic methods are discussed at length in chapter 3.

## Section 2.2

Dr. John H. Watson

*Watson is Conan Doyle's great creation*

"Sherlock Holmes: Victorian Sleuth to Modern Hero," p. 124

Sherlock Holmes and Dr. Watson rank as one of the great duos in literature. They are mentioned along with such famous pairs as the Lone Ranger and Tonto and Han Solo and Chewbacca (Skene-Melvin in Putney C. R. et al 1996, 122). They surpass other detective pairs such as Nero Wolfe and Archie Goodwin, Nick and Nora Charles, and Charlie Chan and his #1 son. We will trace Dr. Watson's background to see how the partnership came to be.

Watson attended school in England, culminating in 1878 in a degree in medicine from the University of London. He then worked as a staff surgeon at St. Bartholomew's Hospital, usually referred to as Bart's. Next he joined the army medical department, and took additional training as a military surgeon. Britain was involved in what was termed the Second Afghan War (1878-80) (Klinger 2006, 10). Watson was attached to the Fifth Northumberland Fusiliers. The battle of Maiwand on July 27, 1880 was a decisive defeat for the greatly outnumbered English forces ([www.britishbattles.com](http://www.britishbattles.com)). At Maiwand Watson was struck by a jezail<sup>6</sup> bullet, and his life was saved by Murray, his orderly. In the first Holmes story, *STUD*, Doyle places the wound in the shoulder; in the second, *SIGN*, he has it in the leg.<sup>7</sup> Upon recovering from the wound he contracted "enteric fever."

<sup>6</sup> A jezail is a heavy, long-barreled musket.

<sup>7</sup> Delighted Holmesians are still arguing about the position of Watson's wound.





Figure 2.4 Holmes and Watson

Now in very poor health, he was sent back to England to recover. At this time he is described as extremely thin and well tanned.

The government funded his recovery with a wound pension of a mere 11 shillings and sixpence a day. He gravitated to London despite having no family in England (suggesting Scottish ancestry). Unemployed, he soon found his financial situation challenging. He decided that he could no longer afford to reside at a private hotel on the Strand. The very day he came to this conclusion, he chanced on “Young Stamford” at the Criterion Bar. Stamford had been his dresser<sup>8</sup> at Bart’s. When Watson mentioned that he was looking for cheaper lodgings, Stamford told him about another person who was doing the same. He then took Watson to Bart’s where Holmes was doing some research. Sherlock’s first words to Watson are a deduction, “How are you? You have been in Afghanistan, I perceive.”

So Stamford plays this vital role in the first story, *STUD*. Then we never hear of him again in the other fifty-nine tales. Before parting

<sup>8</sup> A surgeon’s assistant.

company with Stamford, Watson asks him, “how the deuce did he know I had come from Afghanistan?” With a smile, Stamford challenges Watson to “study him.” But he predicts, “I’ll wager he learns more about you than you about him.”

Not long after moving into their lodgings at 221b Baker Street, Watson gets involved in Holmes’s cases. In fact he marries Mary Morstan, Holmes’s client in the second story, SIGN. Eventually he becomes the chronicler of 56 of the 60 stories.<sup>9</sup> Holmes doesn’t always appreciate his writing efforts. In *The Abbey Grange* (ABBE) Holmes complains,

“Your fatal habit of looking at everything from the point of view of a story instead of as a scientific exercise has ruined what might have been an instructive and even classical series of demonstrations. You slur over work of the utmost finesse and delicacy, in order to dwell upon sensational details which may excite, but cannot possibly instruct, the reader.”

The irritated Watson fires back, “Why do you not write them yourself.” Again in *The Copper Beeches* (COPP), “You have degraded what should have been a course of lectures into a series of tales.” When Holmes does serve as narrator, in *The Blended Soldier* (BLAN), he learns a good lesson. “I am compelled to admit that, having taken my pen in hand, I do begin to realize that the matter must be presented in such a way as may interest the reader.”

Though we learn in the first story, STUD, that Watson is thin and tan, it isn’t long before that changes. In *The Boscombe Valley Mystery* (BOSC), the sixth story, Mrs. Watson remarks, “You have been looking a little pale lately.” He also regains his weight. In CHAS he is described as middle size, strongly built, with a square jaw, thick neck, and a moustache. Although somewhat athletic, in SIGN Watson is limping—Doyle has moved the Afghan wound to the leg. But by the time of the HOUN, Watson tells us he is fleet of foot. Indeed, at the end of CHAS, he and Holmes run for two miles after leaving Milverton’s house. Of course, they are fleeing the police and thus motivated to keep going!

In *Shoscombe Old Place* (SHOS), the very last of the sixty Holmes stories to be published (in 1927), we learn that Watson’s wound pension is still being paid. He admits that he wagers about half of it on horse races. In DANC we learn that Watson’s checkbook is locked in Holmes’s drawer. Some have speculated that Watson’s betting on the ponies was out of

<sup>9</sup> The 48th and 49th stories, LAST and MAZA, are written in the third person. Holmes narrates the 56th and 57th stories, BLAN and LION.

control at this point. So, a picture of a sporting man emerges. In *SUSS* Watson recognizes the name of former rugby star Bob Ferguson, “the finest three-quarter Richmond ever had.” Watson himself had played rugby for Blackheath, “the premier Rugby club of England (Tracy 1977, 37).

Apparently Watson is a handsome man. He boasts of “experience of women which extends over many nations and three separate continents” (SIGN). In *The Second Stain* (SECO) Holmes tells Watson, “the fair sex is your department.” And in *The Retired Colourman* (RETI number 58), Holmes refers to Watson’s “natural advantages” with women. The manner in which Holmes and Watson describe women clearly shows the difference between the two men. At the beginning of SIGN, Holmes and Watson consult with Mary Morstan, subsequently Mrs. Watson. Contrast how they respond to her. “What a very attractive woman,” says Watson. Holmes responds, “Is she? I did not observe.” But when it comes to detecting, their powers of observation are reversed. Holmes, who never misses a clue, can be very critical of Watson, “You see, but you do not observe, the distinction is clear.”

Watson is always very interested in the female shape (Nightwork, J. aka Morley, C. in Shreffler, P. 1989, 190). Here is how he describes some of the women in the tales:

Irene Adler (STUD): “Her superb figure outlined against the lights”

Mrs. Neville St. Clair (TWIS): “her figure outlined against the flood of light”

Grace Dunbar (THOR): “a brunette, tall, with a noble figure”

Isadora Klein (3GAB): “a perfect figure”

Mrs. Merrilow (VEIL): “buxom landlady type”

Eugenia Ronder (VEIL): “full and voluptuous”

Lady Brackenstall (ABBE): “I have seldom seen so graceful a figure”

Lady Hilda Trelawney Hope (SECO): “the most lovely woman in London”

and “a queenly figure”

Holmes on Lady Hilda: “Think of her appearance Watson—her manner, her suppressed excitement, her restlessness, her tenacity in asking questions”

For Holmes it is a question of a woman’s appearance giving a clue; for Watson, what kind of a body does she have.

Much has been written about Watson’s skill as a physician. It turns out that Dr. Watson often administers to people while participating in Holmes’s cases. A number of times Watson is called on to revive someone in need.

In the case of Miss Barnet in WIST, he merely used strong coffee to rouse her from opium poisoning. More often it was brandy that was administered. James Ryder in BLUE, Thornycroft Huxtable in *The Priory School* (PRIO), Victor Hatherly in *The Engineer's Thumb* (ENGR), and Mr. Melas in GREE, were all given spirits to revive them. The most dramatic use of brandy occurs in NAVA when Holmes shocks Percy Phelps with the return of the missing treaty. Lacking today's medications, brandy was a common and reasonable choice. It served as "a restorative, as a tranquilizer, as a pain reliever" and "as a means of reviving" (Scholten 1988).

There are several other instances of Dr. Watson in action. He dressed the thumb of Victor Hatherly in ENGR. He twice administered what has been described (Simpson 1934, 55) as artificial respiration: to the crook Beddington in STOC and to Lady Frances Carfax in *The Disappearance of Lady Frances Carfax* (LADY). When Kitty Winter threw sulphuric acid in the face of Baron Gruner (ILLU), Watson did what he could for the Baron, including giving him an injection of morphia.

This medical work indicates that Watson was a competent generalist. That he was more can be seen by noting that he made efforts to keep current in medicine. He is known to read the *British Medical Journal* (*The Stockbroker's Clerk* (STOC)), still today a highly respected source of medical information. In SIGN we find him reading up on "the latest treatise on pathology." In GOLD he reads on surgery; nervous lesions in *The Resident Patient* (RESI); tropical disease in *The Dying Detective* (DYIN), and French psychology in *The Six Napoleons* (SIXN).

The well-read Watson was sometimes able to make reasonable diagnoses from visual observation alone. In SUSS he can see that young Jacky Ferguson had a "weak spine." In SPEC he detects that Dr. Grimesby Roylott had what has been termed a "bilious condition" (Simpson 1934, 48). Watson could tell at a glance that Isa Whitney was a drug addict (*The Man With the Twisted Lip* (TWIS)). His diagnosis of aortic aneurism for Jefferson Hope in STUD has been criticized. But Thaddeus Sholto's anxiety in SIGN did not fool him. A brief examination allowed Watson to inform Sholto that there was nothing wrong with his heart. He was perhaps stepping outside his area of expertise when he made a diagnosis of "monomania" in SIXN. And it was based on his misinterpretation of the clues in the case. But there is at least one opinion that Watson was also capable in the area of mental problems (Kellogg 1989).

All of this speaks well of Watson's medical competence. Some have said his knowledge of first aid shows him "at his best" (Simpson 1934, 54). Others have said his knowledge of first aid was "nil" (Suszynski 1988, 15). Perhaps his greatest medical achievement was weaning Holmes from his drug habit. It has been pointed out that it took Watson 8 years to achieve

(Suszynski 1988, 13). But altering the behavior of such a forceful personality as Sherlock Holmes would always be a formidable challenge. In the opening scene of SIGN Watson asks with disgust, “Which is it today, morphine or cocaine?” It was the famous 7 percent solution of cocaine.<sup>10</sup> In the first Holmes story, STUD, Watson suspects that Holmes is “addicted to the use of some narcotic.” This is immediately confirmed in the opening paragraph of the second story, SIGN.

“Sherlock Holmes took his bottle from the corner of the mantelpiece, and his hypodermic syringe from its neat morocco case. With his long, white, nervous fingers he adjusted the delicate needle and rolled back his left shirtcuff. For some little time his eyes rested thoughtfully upon the sinewy forearm and wrist, all dotted and scarred with innumerable puncture-marks. Finally he thrust the sharp point home, pressed down the tiny piston, and sank back into the velvet-lined armchair with a long sigh of satisfaction.”

Watson had watched this ritual three times a day for many months. Cocaine had debuted as a “wonder anaesthetic” in 1884, only three years before Holmes and Watson first met (Smith 2011, 69). Sigmund Freud began treating patients with cocaine that same year (Riley and McAllister 1999, 88). Both morphine and cocaine were perfectly legal at the time (Doyle and Crowder 2010, 45). However, Watson was among those who, early on, saw the danger in cocaine usage. Watson determines to “wean” Holmes from the habit. In *The Missing Three-Quarter* (MISS) (#38 of 60 stories) we learn that he succeeded.

We’ve looked at Watson’s background, his appearance, and his medical skills. We conclude by examining the feature that makes him the beloved character he has become, his loyal service to Holmes. One obvious aspect of his devotion to Holmes is his willingness to put his own interests aside and do Holmes’s bidding no matter what. In *The Creeping Man* (CREE) Holmes implores Watson,

“Come at once if convenient—if inconvenient come all the same.”

In ABBE,

“Come, Watson, come.” “The game is afoot. Not a word! Into your clothes and come!”

And Watson always responds favorably—“Count me in, Holmes” (MAZA).

<sup>10</sup> It’s fame is due mainly to Nicholas Meyer’s 1974 book, “The Seven-Per-Cent Solution.”



Figure 2.5 Watson, “Come”

In at least five instances Watson agrees to go alone to work on one of Holmes’s cases. In HOUN it is initially Watson who goes to Baskerville Hall to investigate the death of Sir Charles Baskerville. In SOLI, Holmes sends Watson to check on Violet Smith’s story. When Lady Frances Carfax disappears, Watson willingly heads off to Switzerland to seek her in Lausanne. In another instance (ILLU), Watson studies Chinese pottery for a week. Then, posing as an expert, he visits Baron Gruner, a collector, in order to distract him. Gruner recognizes that Watson is a fraud. But no matter, the baron is occupied long enough for Holmes to steal his diary. The goal is to prevent the marriage of the unsuspecting Violet de Merville to the evil baron. In RETI, the 58th story published, Holmes is still sending Watson on missions. This time, upon hearing Watson’s report on his trip to visit Josiah Amberly in Lewisham, Holmes remarks, “It is true that you have missed everything of importance.” In LADY Holmes says, “I cannot at the moment recall any possible blunder which you have omitted.” So the good doctor is always willing to help, but not always so able or appreciated.

In a number of other cases Watson willingly accompanies Holmes to a great variety of places. In PRIO he goes with Holmes to the north of England. In 3STU he spends some weeks with Holmes in a “university town.” In GOLD Watson takes the train to Chatham. In FINA he accompanies Holmes to the continent as they flee from Professor Moriarty. In

SHOS he goes with Holmes to the Green Dragon Inn in Berkshire. At the end of BLAC he even heads off with Holmes to Norway for a few weeks. When Holmes sends a telegram in BOSC, Watson's wife urges him to go join Holmes in Herfordshire. In CHAS he is so determined to be the faithful helper that he threatens to inform the police of Holmes's plans to burgle Milverton's house—unless he too can be in on the burglary. No more faithful helper can be imagined.

The Milverton burglary is just one example where Watson is willing to face danger on Holmes's behalf. In SIGN the poison darts of Tonga, the Andaman Islander, endanger both Holmes and Watson. In SPEC there are the cheetah and baboon roaming the grounds at Stoke Moran. Watson pulls Holmes away from the fumes that threaten both their lives in DEVI. There are several cases where he carries his revolver for fear that the situation may turn dangerous. Consider Holmes's note to Watson sent in *The Bruce-Partington Plans* (BRUC).

“Am dining at Goldini's Restaurant, Gloucester Road, Kensington. Please come at once and join me there. Bring with you a jimmy, a dark lantern, a chisel, and a revolver.”

In some cases, such as REDH, SPEC, and *The Problem of Thor Bridge* (THOR), Watson doesn't use his gun. In COPP he shoots and kills Carlo, the mastiff who has his owner, Jephro Rucastle, by the throat. In SIGN



Figure 2.6 Watson kills Carlo

he fires at Tonga, the pygmy/murderer. In BLAC the revolver is held to the temple of Patrick Cairns. In *The Empty House* (EMPT) Watson hits Colonel Sebastian Moran, Professor Moriarty's chief of staff and the "second most dangerous man in London," with the butt of the revolver.

The opening quote for this chapter is clearly wrong. It is Sherlock Holmes who is Doyle's great creation. Time after time Holmes has been voted fiction's greatest detective. Holmes, not Watson, revived the genre after forty years of languishing following Poe's stories. Initially Watson exists in the Sherlock Holmes tales to fill the role played by the unnamed narrator in Poe's three Dupin stories. But, just as Holmes surpasses Dupin, Watson is also a more vivid character than his counterpart in Poe's work. He is presented as loyal helper, friend, and chronicler. If Conan Doyle intended Watson to be Holmes's "rather stupid friend" (Smith 2011, 33), then here is an instance where the author failed. As we've seen the result is a complex character of substance. Though Holmes dominates, the Canon would be a lesser work if there were no Dr. Watson.

## Section 2.3

Professor James Moriarty  
*He is the Napoleon of crime, Watson*  
 Sherlock Holmes, "The Final Problem"

Sherlock Holmes's greatest enemy was Professor James Moriarty, who has been called the first great fictional master criminal (Smith 2011, 122), one of the most memorable anti-heroes in all of literature (Macintyre 1997, 222), and the greatest villain in all of detective literature (Doyle & Crowder 2010, 128). Conan Doyle manages to provide the professor with an air of malevolence. Part of that is due to his eerie appearance. Moriarty is described as tall, thin, and pale, with sunken grey eyes and a domed forehead. His face protrudes and oscillates in a reptilian fashion.

After years as a consulting detective, Holmes has sensed a central force dominating the London crime scene. "He is the Napoleon of crime," he tells Watson (FINA). He has finally decided it is Moriarty at the center of a large crime organization. Holmes has become so familiar with Moriarty's devious ways, that he can recognize his crimes.

"You can tell an old master by the sweep of his brush.





Figure 2.7 Professor Moriarty

I can tell a Moriarty when I see one.” (*The Valley of Fear* (VALL))

Before Holmes meets the professor, he three times has visited Moriarty’s rooms (VALL). But he finds nothing incriminating. Continuing his efforts Holmes finally is ready, in *The Final Problem* (FINA), to spring a trap on the Moriarty organization.

The professor’s dominant feature is his great mental capacity. His brilliance is such that Sherlock Holmes admits to Watson that Moriarty is his intellectual equal. In his first appearance, in FINA, Moriarty has the audacity to show up at Holmes’s lodgings at 221b Baker Street. He has sensed Holmes’s trap. The vivid scene that results shows the two great minds dueling.

Holmes “I can spare you five minutes if you have anything to say.”

Moriarty “All I have to say has already crossed your mind.”

Holmes “Then possibly my answer has crossed yours.”

Moriarty “You stand fast?”

Holmes “Absolutely.”

That Holmes considers Moriarty his greatest challenge is made evident at the end of their interview. Moriarty warns that if Holmes brings him down, he will in turn destroy Holmes. Sherlock’s response:

“if I were assured of the former eventuality, I would cheerfully accept the latter.”

Moriarty’s name comes up in only seven of the Holmes stories. In four of those, NORW, MISS, *His Last Bow* (LAST), and ILLU, it is a mere mention. In FINA, after confronting Holmes in his Baker Street lodgings, Moriarty chases Holmes to Switzerland where he locates him at the Englisher Hof in Meiringen. They then have their famous struggle at the top of the Reichenbach Falls,<sup>11</sup> both toppling over to apparent death. London erupted with dismay when FINA was published in the Strand magazine. There would be no Sherlock Holmes stories for the next eight years. In EMPT, Holmes tells how Moriarty tracked him to Switzerland and describes their struggle at Reichenbach. Thus we learn how he came to survive. And, finally in VALL, Holmes, after cracking Fred Porlock’s code (see section 3.6), suspects that Moriarty is behind the probable murder of John Douglas.<sup>12</sup>

Doyle gives us some background on Professor Moriarty. We learn that he initially had great success as a mathematician. By age 21 he had written a successful treatise on the binomial theorem. The expansion of  $[a + b]^n$  seems to have been first mentioned by Euclid around 300 BC. A number of other mathematicians contributed to the concept, including Isaac Newton who generalized the expression for fractional and negative values of  $n$ . Finally, in the 1820’s, the Norwegian Niels Henrik Abel gave a proof for all values of  $n$  (Anderson 1989, 278). Note that all of this occurred well before Moriarty’s time. What was Moriarty doing with this old problem? Whatever it was, we are told in FINA that his treatise enjoyed a “European vogue.” Its success led to Moriarty earning a chair in Mathematics at a small university in England.

Later, in VALL, we learn that Moriarty also published the mathematically difficult “Dynamics of an Asteroid.” Some Holmesians, ignoring the word “an” in the title, have speculated that Moriarty’s work dealt with a general approach to the motions of all asteroids. The famous chemist/

<sup>11</sup> Multiple plaques mark the spot.

<sup>12</sup> He disappeared at sea.

author Isaac Asimov, an avid Sherlockian, felt that the title did imply that Professor Moriarty was discussing one particular asteroid (Schaefer 1993, 10). Asimov's candidate was the one that shattered to give the "asteroid belt."<sup>13</sup>

With his academic career off to such a good start, it is puzzling why the professor turned to crime. But "dark rumors" caused him to resign his chair at the university. He became an "army coach" in London, hardly a high paying job. Yet he had funds in six different banks (VALL). Eventually Holmes determines that he is at the center of a vast organization that controls most of the crime in London. Moriarty's organization deals in forgery, robbery, and even murder. Part of Sherlock's evidence for Moriarty's illicit doings is the fact that he owns a painting by Greuze.

Jean Baptist Greuze (1725-1805) was a French painter who specialized in the "sentimental narrative in art" (Tansy and Kleiner, 1996, 902). His most famous picture, "The Village Bride" (1761), hangs in the Louvre. It drew large crowds when exhibited at the 1761 Salon de Paris (Tansy and Kleiner, 1996, 903). Greuze's paintings became very popular again in the time of Doyle, drawing record prices at auction (Doyle & Crowder 2011, 126). How could a professor making only £700 per year afford such an expensive work of art? Obviously, he either stole it or had some other source of income.

It should be noted that in VALL, Holmes likened Moriarty to Jonathon Wild, a London crime lord hanged in 1725 (Smith 2011, 124). One of Wild's strategies was to return goods he had stolen to the original owner—and collect a "finder's" fee. But Conan Doyle himself reportedly identified the more contemporary Adam Worth as the model for Professor Moriarty (Macintyre 1997, 223). Like Wild and Moriarty, Worth also had an extensive network of London thieves. He was actually labeled the Napoleon of the criminal world by Sir Robert Anderson, the head of Scotland Yard's criminal investigation (Macintyre 1997).

Worth was born in Prussia in 1844 (Doyle and Crowder 2010, 131). His family moved to America when he was five, and he eventually became a union soldier. Although he survived the first major battle, at Bull Run, he was listed as killed in action. He took this as an opportunity to disappear. He now began a career of theft, initially in the Boston area. His major haul came in November 1869 when he robbed the largest bank in Boston, Boylston National Bank. Using the alias William A. Judson, Worth rented the building adjacent to the bank. Then, having calculated the position on

<sup>13</sup> My own take on this issue, Baker Street Journal 33(1), 1983, p. 37, is that the professor's book dealt with one asteroid, the one that collided with the Earth near Yucatan. One result of this collision was the extinction of the dinosaurs.

the wall of the bank's steel safe, he drilled at night until he could remove the back of the safe. The haul was reported to be between \$150,000 and \$200,000 (Macintyre 1997, 38). Conan Doyle uses a similar ploy in REDH where the crooks tunnel into a bank vault.

The bank hired the Pinkerton agency to pursue Worth (Doyle and Crowder 2010, 131). Feeling the pressure, Worth fled to Europe. He then assumed the name Henry J. Raymond, possibly taken from the recently deceased founder and editor of the *New York Times* (Macintyre 1997, 40). He used this alias for the rest of his life. In London he set up the crime network that got Doyle's attention and earned him the title, Napoleon of the criminal world.

Worth's most sensational crime was his theft of the Thomas Gainsborough painting, *The Duchess of Devonshire*. The Duchess was a woman of great beauty. Her sexual life has been termed "raunchy in the extreme" (Macintyre 1997, 90). She allowed her husband's mistress to live with them so they could all enjoy *ménage à trois*. Public interest in her was augmented when her portrait was painted, in 1787, by the famous Gainsborough. The portrait, which had an interesting history itself (Macintyre 1997, 62), came up for auction at Christies in May 1876. Art dealer William Agnew bought the painting for £10,605. It was, at the time, the highest price ever paid at auction for a portrait. Almost immediately Agnew sold the painting to J. S. Morgan. It was to be a present for his son, the wealthy industrialist J. P. Morgan. Before transfer took place, Worth broke into Agnew's gallery on May 27, 1876, and stole the famous work of art.

Immediately Worth began writing a series of letters to Agnew, offering to return the painting for a fee. Perhaps Worth, like Doyle, was familiar with Jonathon Wild's tactics. His initial demand was for \$25,000 (he was writing from America). Negotiations failed, and Worth would keep the *Duchess* for almost 25 years. In 1901, with the Pinkertons acting as intermediaries, Worth returned the painting. He reportedly received \$25,000, the exact figure he had sought 25 years earlier (Smith 2011, 125; Macintyre 1997, 253). The exact amount Worth received is uncertain, other sources citing different amounts. Agnew soon sold *The Duchess of Devonshire* to the 64 year old J. P. Morgan. The Morgan family eventually put the painting up for auction at Sotheby's in London on July 13, 1994. It was sold for £265,500—to the Duke of Devonshire!

The similarity of the two master criminals, Moriarty and Worth, is obvious. Both were at the center of an extensive crime ring in London. Both possessed an expensive work of art by a prestigious painter. The title of the fictional Greuze possessed by Professor Moriarty has been termed "one of Conan Doyle's most delicious puns" (Macintyre 1997, 225). The painting's

title, *Jeune Fille a l'agneau*, means “Young girl with a lamb.” But most Holmesians would quickly point out the resemblance of the French word “agneau” to the name of the dealer from whom Worth stole the *Duchess*, Agnew (Macintyre 1997, 225).

Professor Moriarty is another excellent example of the dual person in detective fiction. We saw in the section on Poe in chapter one that the dual nature of humanity was featured in his Dupin stories. Recently there has been a study of the duality, or the bi-part soul, described in early detective fiction (Craighill 2010). Craighill traces this duality from its inception in Poe’s *Murders in the Rue Morgue* (1841), through Inspector Bucket in Charles Dickens *Bleak House* (1853) and Sergeant Cuff in Wilkie Collins’s *The Moonstone* (1868), to Robert Louis Stevenson’s *Dr. Jekyll and Mr. Hyde* (1886). Moriarty, an obvious addition to Craighill’s list, has his bad side, the criminal mastermind, based on master criminal Adam Worth. Moriarty the scientist, the good part of the man, is based on the astronomer Simon Newcomb.

In addition to his work on the binomial theorem and on asteroids, Moriarty was interested in the motions of other celestial bodies as well. In VALL, he explains eclipses to Inspector MacDonald. The Canadian-American astronomer Simon Newcomb had exactly the same interests as those attributed to Moriarty. Newcomb, born in Nova Scotia in 1835, spent his working career in the United States. He was appointed Professor of Mathematics and Astronomy at the U. S. Naval Observatory. He stayed there until his retirement in 1897 (Dictionary of Canadian Biography Online). Starting in 1884 Newcomb also had a half-time appointment as a math professor at the then “small” Johns Hopkins University. But, like Moriarty, he was forced to resign, though there were no “dark rumors.”

His early research work focused on two of Moriarty’s interests. He wrote an early unpublished work on the binomial theorem, and his first published paper dealt with a method of dynamics (Schaefer 1993, 11). His obituary in *The Times* noted an early paper on the orbits of asteroids. In the 1860’s Newcomb published several papers on the dynamics of individual asteroids. He is honored by having asteroid 855, Newcombia, named in his honor (Wikipedia). Newcomb led eclipse expeditions in the 1860’s and 1870’s (Schaefer 1993, 11). So both Moriarty and Newcomb were interested in the binomial theorem, the motions of asteroids, and eclipses. It has been noted that paragraphs describing the scientific careers of the two would be nearly identical (Schaefer 1993, 11).

It was the genius of Arthur Conan Doyle that was able to make Professor Moriarty, with so few appearances in the Holmes stories, such a vivid, malevolent character.

## Section 2.4 Other Important Characters

### 2.4.1 Mycroft Holmes

*Occasionally he is the British government.*

Sherlock Holmes, “The Bruce-Partington Plans”

It is in the 24th story, GREE, that we, along Dr. Watson, learn that Sherlock Holmes has a brother seven years his senior. Remember in the second story, SIGN, Watson informed Holmes that he had a brother. Now, a mere two stories before Doyle kills off Sherlock Holmes, in FINA, we get a glimpse of Mycroft Holmes. And what a treat it is! Mycroft Holmes is surely one of best characters in the Holmes tales.



Figure 2.8 Mycroft Holmes

Physically the brothers are greatly different. Mycroft is described as corpulent, heavily built and massive. We've seen that Sherlock was full of energy when on a case. He roams all over London and much of England as well. Mycroft, Sherlock tells us, "has no ambition and no energy." He "would rather be considered wrong than take the trouble to prove himself right." Mycroft is so unsociable that he is one of the founders of the Diogenes Club. It is "the queerest club in London." Its members are the "most unclubable men in town." No member is allowed to even take notice of other members, let alone actually talk to them. In fact, there is no talking permitted at the Diogenes Club, except in the Strangers Room. There members may chat quietly with guests.

One thing the Holmes brothers have in common is amazing deductive ability. Mycroft, it seems, has even better powers of observation than Sherlock. We've seen him outdo Sherlock in the scene with the billiard marker in GREE in section 1.3. When Holmes brings Watson to the Stranger's Room at the Diogenes Club to meet his brother, we quickly get another look at Mycroft's genius.

"By the way, Sherlock, I expected to see you round last week to consult me over that Manor House case. I thought you might be a little out of your depth."

"No, I solved it."

"It was Adams, of course."

"Yes, it was Adams."

What is this? Does the brilliant Sherlock Holmes need someone with a higher intellect to consult when the case is too difficult? Indeed he does, as Sherlock admits in GREE.

"Again and again I have taken a problem to him, and have received an explanation which has afterwards proved to be the correct one."

When Watson remarks that Holmes's talent for deduction is due to training, Sherlock declares there is some heredity in it, and acknowledges that Mycroft is the superior intellect.

"But how do you know it is hereditary?"

"Because my brother Mycroft possesses it in a larger degree than I do."

Yet the two are more partners than competitors. When Sherlock disappears after throwing Professor Moriarty over the Reichenbach Falls, it is Mycroft alone who knows that Sherlock is still alive. Despite drawing a modest salary of only £450 per year, he is able to supply the money that

allows Sherlock to wander through such places as Tibet, Persia, Mecca, and France during the ensuing “Great Hiatus.” In all of the sixty tales, only Mycroft is on a first name basis with his brother. Even long-time roommate Watson only addresses him as Holmes. This is so sacred to Sherlockians that author Laurie King<sup>14</sup>, in her ongoing series, does not even have Sherlock’s wife, Mary Russell, call him anything but Holmes!

If Mycroft Holmes is so lazy, what does he do? It turns out that he is a government employee. When we first meet him in *GREE*, published in 1893, we are told that he “audits the books in some of the government departments.” Fifteen years later, in *The Bruce Partington Plans* (*BRUC*), Mycroft is rather more vital to England. Now Sherlock claims that “occasionally he is the British government.” And, “Again and again his word has decided the national policy.” It seems Mycroft’s “specialism” is omniscience.

Despite his reputation for lethargy, in cases of extreme danger, Mycroft is capable of physical action. When Holmes is fleeing Professor Moriarty in *FINA*, he says to Watson,

“In the morning you will send for a hansom, desiring your man to take neither the first nor the second which may present itself.”

The driver of the third hansom is Mycroft, who has overcome his indolence to help his brother in this emergency. In *GREE* he rouses himself to make the effort to come, for the first time, to the Baker Street lodgings to seek Sherlock’s help.

Arthur Conan Doyle is at his best when writing about Mycroft Holmes. The use of Mycroft as a first name remains a rarity. Doyle most likely took it from the well-known cricketer William Mycroft (1841-1892). He played mainly for Derbyshire, but also for the Marylebone Cricket Club. Doyle himself was a talented cricketer who also played for Marylebone (Miller 2008, 241). Mycroft is mentioned in only four stories, *GREE*, *BRUC*, *FINA*, and *EMPT*. Yet he is one of the most memorable of all the characters in the Canon. Proof of this is the frequency with which he appears in all kinds of spin-off works, such as movies and books. For example in Robert A. Heinlein’s *The Moon is a Harsh Mistress* (1966), there is an omniscient computer named Mycroft (Redmond 1993, 42). There has even been a suggestion that it was Mycroft and not Sherlock who was modeled after Poe’s detective. Sherlock is just much more active than Dupin or Mycroft (Propp

<sup>14</sup> Laurie King has written about 12 stories featuring Sherlock Holmes and his wife Mary Russell.



1978). Most readers leave the Holmes stories wishing that Mycroft had appeared more often.

#### 2.4.2 Mrs. Hudson

*. . . a long suffering woman*

Dr. Watson, “The Dying Detective”

Holmes and Watson were fortunate to have Mrs. Hudson as their landlady at 221b Baker Street. She never is physically described, save as having a “stately” tread (STUD). So the matronly picture that persists is due more to drawings and movies than to Conan Doyle. But, since she appears in about a quarter of the sixty stories, we do get a good “picture” of her.

Due to her position in the household, Mrs. Hudson was frequently a conduit through which both clients and Scotland Yard inspectors reached Sherlock Holmes. In *The Three Garridebs* (3GAR) she brings the card of John Garrideb, aka Killer Evans, up to Holmes on a tray. In *DANC* she brings Holmes a telegram from New York with important news about Abe Slaney, the most dangerous crook in Chicago. It was Slaney who was writing to Elsie Cubitt using the “dancing men” code (see section 3.6). Of course Mrs. Hudson generally conducted visitors up the 17 steps to Holmes’s lodgings. A great variety of people came to Baker Street to see Holmes. Among them were some sailors in *BLAC*, Inspectors Gregson and Baynes in *WIST*, Cecil Barker in *VALL*. The King of Bohemia also visited the Baker Street rooms. Probably the most important visitor that Mrs. Hudson introduced was Mary Morstan in *SIGN*. Mary, of course, was to become Mrs. Watson.

Meals were served at Baker Street, so Mrs. Hudson is shown in this role also. In *NAVA* Holmes says, “Her cuisine is a little limited.” Offers like “green peas at 7:30” (3STU) make this criticism understandable. On the other hand, Holmes is willing to request dinner for two at the end of *MAZA*. She also serves curried chicken in *NAVA* and woodcock in *BLUE*. Holmes is actually enthusiastic about Mrs. Hudson’s “excellent” breakfasts (*BLAC* and *NAVA*). Apparently her specialties were ham and eggs with toast and coffee (Starrett 1934, 100). As cook Mrs. Hudson was rather tolerant of Holmes’s answer when, in *MAZA*, she asked, “When will you be pleased to dine, Mr. Holmes?” The snippy answer came, “Seven-thirty, the day after tomorrow.”

Fortunately for Sherlock Holmes, tolerance was Mrs. Hudson’s strong suit. We’ve noted in Section 1.3 that Doyle deliberately made Sherlock eccentric in an attempt to increase his appeal to readers. Mrs. Hudson then had to deal with some strange behavior. Holmes was called “the very worst tenant in London” (*DYIN*). He was very untidy, kept his cigars in a coal-scuttle and his tobacco in a Persian slipper. He kept correspondence

“transfixed by a jack-knife” to the center of the wooden mantelpiece. At one point, he attempted to honor the queen by shooting bullets into the wall so that the holes formed the letters VR, for Victoria Regina (MUSG). Mrs. Hudson constantly had to deal with “throng[s] of singular and often undesirable characters” (DYIN). An atmosphere of violence and danger was not rare. On a number of occasions his chemical experiments (see chapter 4) filled the rooms with malodorous vapors.

Mrs. Hudson was also tolerant of the Baker Street Irregulars (BSI). They were a group “street Arabs,” a phrase used in Holmes’s day to indicate homeless children (Doyle and Crowder 2010, 120). They appear in the first two stories, *STUD* and *SIGN*. Holmes pays them a pittance to gather information for him. He claims the Irregulars can “go everywhere, see everything, overhear everybody” (*SIGN*). The reason they tended to be overlooked about London was that the city then had some 30,000 deserted children. Many of them “lived by stealing” (Doyle and Crowder 2010, 121). Mrs. Hudson’s distaste for the group is understandable. Despite Holmes’s belief in them, their performance record is mediocre. The first time we see them, in *STUD*, they succeed in locating Jefferson Hope’s cab. But in *SIGN* they are assigned to find Mordecai Smith’s boat, the steam launch *Aurora*. They fail and Holmes himself has to track it down. The dramatic boat chase down the Thames, pursuing Jonathon Small and Tonga, follows.



Figure 2.9 Percy Phelps

Mrs. Hudson expresses disgust over the BSI in *STUD*; and dismay in *SIGN*.

To her they are a noisy mob of dirty kids. It's obvious they are an unruly crowd. Not even Holmes, their benefactor, can control them. The first time we meet them, in *STUD*, Holmes tells their leader Wiggins that only he should come to Holmes to report. There is no need for the whole noisy crowd to come up to his flat. In the very next adventure, *SIGN*, Holmes has to make the same point as 12 eager youth crowd into his room. Mrs. Hudson was undoubtedly glad when they disappear after the second story. Only once in the remaining 58 tales are they mentioned. That time they are not a problem. In *The Crooked Man* (*CROO*) one of the BSI trails Henry Wood, the crooked man whose appearance caused his former commander, Col. Barclay to faint. So in this last case there is only one "street Arab," he doesn't come to Baker Street to bother Mrs. Hudson, and he is successful in his task. Perhaps the BSI improved with age.

Why didn't Mrs. Hudson evict Holmes, her problematic tenant? One reason might be the "princely payments" mentioned by Watson (*DYIN*). We're also told that she was in awe of him. And she was fond of him as well. We clearly see that in her concern for his health. "I am afraid for his health," she tells Watson. When the supposedly dead Holmes shows up at Baker Street in *EMPT*, Mrs. Hudson is thrown into "violent hysterics." She never had need of the professional services of her brilliant lodger. Mrs. Hudson is never directly involved in a case. We may wish that Doyle had written a tale about some problem of hers. In fact he did write two stories which involve landladies. But, alas, these cases are not about Baker Street and do not involve Mrs. Hudson. Doyle creates a different landlady in each case, Mrs. Warren in *The Red Circle* (*REDC*) and Mrs. Merrilow in *The Veiled Lodger* (*VEIL*).

In just a few stories does Mrs. Hudson do something other than introduce someone or cook something. In *NAVA* she goes along with the joke Holmes wishes to play on Percy Phelps. She serves Mr. Phelps his covered dish, but with no food under the cover. Instead the recovered treaty is what Percy finds when he lifts the cover. But Mrs. Hudson's crowning moment comes in *EMPT*. Here she plays a vital role, and one that puts her in danger. We can imagine that she is pleased to be able to so serve Holmes in this way. Col. Sebastian Moran, "the second most dangerous man in London" and formerly chief of staff to the late Professor Moriarty (*EMPT*), arrives in the vacant house opposite 221b Baker Street. His goal is to kill Holmes using his high powered air gun. Moran was known to be "the best heavy-game shot that our Eastern Empire has ever produced" (*EMPT*). But Holmes has had a bust of his head made. To Moran it seems that Holmes is visible through the window. But Holmes, along with Watson, is in the

Empty House too. As they wait, Watson is amazed to find the bust has moved. Holmes responds, “Of course it has moved. Am I such a farcical bungler, Watson, that I should erect an obvious dummy.” Mrs. Hudson has crawled out to the bust every fifteen minutes to make a small adjustment. Given that a high powered rifle is in play, she has placed herself in danger to assist Holmes. Then when Moran fires and shatters the bust, Mrs. Hudson retrieves the spent bullet for evidence.

It is likely that when Holmes purchased a villa in Sussex with “a great view of the Channel” (*The Lion’s Mane* (LION)), Mrs. Hudson went along. He tells us that his “old housekeeper” lives there with him. Since we only know of him living in Baker Street, many have claimed that this is Mrs. Hudson. Because of her service and loyalty to Sherlock Holmes, Mrs. Hudson generally ranks as one of the favorite persons in the entire Canon. One scholar has done her the honor of referring to her as *the* woman, a title usually reserved for Irene Adler of *STUD* (Cooke 2005).

#### 2.4.3 Scotland Yard

*Now, in my opinion, Dupin was a very inferior fellow*  
 Sherlock Holmes, “A Study in Scarlet”

Doyle’s aim was to make the brilliance of Holmes the selling point for his stories. So in the first story (*STUD*) he has Holmes criticize his fictional predecessors Dupin and Lecoq. Then throughout the stories he makes Watson the unaware chronicler. As Holmes says in *BLAN*,

“one to whom each development comes as a perpetual surprise and to whom the future is always a closed book, is indeed an ideal helpmate.”

Then in addition to contrasting Holmes with Dupin, Lecoq, and Watson, Doyle also uses the official police force to reinforce the idea of Holmes, the genius. Right from the start, in *STUD*, Holmes is at odds with the Scotland Yard detectives, Lestrade and Gregson. When he arrives at the crime scene, Holmes complains that the police have obscured clues on the pathway. “If a herd of buffaloes had passed along, there could not be a greater mess.”<sup>15</sup> Then Holmes tells Watson that he is superior to the Scotland Yarders, and bemoans the fact that they will take the credit after he solves the case. Holmes actually laughs at Inspector Lestrade’s conclusion that the “RACHE” written on the wall in blood refers to a woman named Rachel. Still Holmes is willing to assist them by giving the

<sup>15</sup> Holmes uses the same phrase in *The Boscombe Valley Mystery*, the 6th story.

description of the culprit cited earlier. But as we've seen he can't resist that parting shot about not wasting time looking for the non-existent Rachel.

Things go much the same way in the second story, *SIGN*. Inspector Athelny Jones denigrates Holmes's methods (Doyle and Crowder 2010, 113), and tells him there is no room for theories in the case, "facts are better than theories." Jones comes to an erroneous conclusion and arrests the wrong man. Yet, at the end Watson remarks that he has found a wife, Jones has gotten the credit, and Holmes has nothing. That is when Sherlock Holmes returns to the "cocaine-bottle."

In the fourth story, *REDH*, Inspector Peter Jones is dismissive of Holmes's methods. And Holmes refers to Jones as an imbecile. In the sixth story, *BOSC*, Holmes calls Lestrade an imbecile; and Lestrade tells Holmes that he is ashamed of him. Lestrade accuses the wrong man of the murder of McCarthy. Holmes, believing that Turner was justified in killing the blackmailing McCarthy, decides to give Lestrade only a detailed description of the murderer instead of his name:



Figure 2.10 Holmes and Lestrade

“. . . a tall man, left-handed, limps with the right leg, wears thick-soled shooting boots and a gray cloak, smokes Indian cigars, uses a cigar holder, and carries a blunt pen-knife in his pocket.”

The befuddled detective is slow to catch on.

Lestrade: “Who was the criminal, then?”

Holmes: “The gentleman I describe.”

Lestrade “I really cannot undertake to go about the country looking for a left-handed man with a game leg.”

Twenty-one different Scotland Yard detectives appear in 42 of the 60 stories (Doyle and Crowder 2010, 107). We find Lestrade in fourteen stories, Gregson in five, and Stanley Hopkins in four. Most of the others are in one story only. As time goes on Holmes’s profession as the world’s only “consulting detective” becomes more established. The Scotland Yard inspectors become convinced he is an ally. Thus we find the relationship mellows. Holmes no longer frets about not getting credit. In *The Cardboard Box* (CARD), number 16 of 60, he says, “I’d prefer not to be mentioned.” In NAVA, number 25, Inspector Forbes of Scotland Yard accuses Holmes of seeking credit at the expense of the Yard. Holmes responds,

“On the contrary, out of my last fifty-three cases my name has only appeared in four, and the police have had all the credit in forty-nine.”

Forbes immediately changes his approach and says,

“I’d be very glad of a hint or two.”

The verbal insults stop too. In NORW Lestrade admits that, “we owe you a good turn at Scotland Yard.” By the time of SIXN, Lestrade has become a friend. Watson records, “It was no very unusual thing for Mr. Lestrade, of Scotland Yard, to look in upon us of an evening, and his visits were welcome to Sherlock Holmes. . .” At the conclusion of the case Lestrade says,

“We’re not jealous of you at Scotland Yard. No, sir, we’re very proud of you, and if you come down tomorrow, there’s not a man, from the oldest inspector to the youngest constable, who wouldn’t be glad to shake you by the hand.”

Holmes's comments about the Scotland Yard detectives become kinder with time. In HOUN, he calls Lestrade "the best of the professionals." In BRUC he praises one of Lestrade's observations, "Good Lestrade, very good." In CARD he praises Lestrade's tenacity. In REDC Watson talks of Gregson's courage.

In the later stories Scotland Yard is sending business Holmes's way. In MISS, Stanley Hopkins advises Cyril Overton to consult Holmes. In RETI, the Yard refers Josiah Amberly to Holmes. Holmes, in turn, is willing to point the police in the right direction. For example, in VALL he advises Inspectors MacDonald and Mason to forget about the cyclist. In BLAC he suggests Hopkins focus on the tobacco pouch. The only time he refuses to help is in CHAS. Lestrade is seeking the two men seen, and almost caught, fleeing the scene of Milverton's murder. The two men, of course, were Holmes and Watson.

At the start the Scotland Yard detectives were used as a contrast to Holmes's deductive approach. As Holmes became more closely associated in the public mind with brilliant reasoning, Doyle let his relationship with the official force change. He no longer needed them to be fools. The whole tone of the Holmes/Scotland Yard interaction evolves to something more realistic.

## 3

## Sherlock Holmes, Pioneer in Forensic Science

### Section 3.1

#### The Method of Bertillon

His conversation, I remember, was about the Bertillon system of measurements, and he expressed his enthusiastic admiration . . .

John H. Watson, “The Naval Treaty”

Holmes may have admired Bertillon’s work, but that did not prevent him from being resentful about it in *The Hound of the Baskervilles* (HOUN). When Dr. James Mortimer told Holmes that Bertillon was the highest expert in Europe, Holmes admitted he was offended by the ranking. So who was this man held in such high regard?

Alphonse Bertillon was a French anthropologist born in 1853. His poor academic record was followed by difficulty holding a job. In 1879 his influential father Louis, a famous physician and anthropologist, obtained a job for him as a clerk with the Parisian police (Wagner 2006, 97-98). He started work on March 15, 1879 (Wikipedia) and became interested in the problem of identifying recidivists,<sup>1</sup> i.e. repeat offenders. It was French policy to exile recidivists to their colonies (Cole 2001, 33). But there was no procedure for identifying them. Fingerprinting did not exist and even mug shots were not yet used. Upon a second arrest recidivists would merely use a pseudonym. Bertillon set out to develop such a system based on ideas mentioned in 1840 by a Belgian statistician named Quetelet (Wagner 2006, 98). Bertillon found his job with the police to be very boring as he collected and filed much information, most of it never used again and worthless. So, on October 1, 1879 (Cole 2001, 49), he submitted a report proposing a method of identification using body measurements. The report was ignored (Wagner 2006, 98).

<sup>1</sup> The word recidivism entered the English language in 1886 (Cole 2001, 53).



Louis Bertillon liked his son's suggestion. Louis had in fact attempted to classify people, not identify them, by measuring the length of their bones. So he was naturally attracted to Alphonse's idea to use such measurements to identify criminals (Cole 2001, 34). In 1882, with help from his influential father, Alphonse Bertillon was given two assistants and some funding. He was given three months to identify a repeat offender. He succeeded with one week remaining. A man convicted of a crime and using the name DuPont was found to have the exact same measurements as a previously convicted man named Martin. Confronted with the evidence, DuPont confessed.

The measurement system Bertillon devised at this point had three parts. The first part involved eleven body measurements using calipers; each measurement being done three times and averaged.<sup>2</sup> The second part consisted of a precise physical description of the person with emphasis on the ear. Finally any peculiar marks on the body were recorded. Two photos completed the characterization of the prisoner (Cole 2001, 37).

By 1880 the Paris police had 75,000 photos of criminals, catalogued in alphabetical order. This unproductive arrangement proved entirely unsatisfactory. Bertillon's method was used to arrange cards according to his measurements. Soon there were 120,000 cards in groups of about 12 (Cole 2001, 45). Now the system could actually locate people. In the first full year of using Bertillon's system, 1884, Paris police identified 241 recidivists (Cole 2001, 49). Continued success led, in 1888, to formation of Department of Judicial Identity, with Alphonse Bertillon as head. The system, referred to as Bertillonage, swept the world. The USA adopted it in 1887 and Great Britain did so in 1894 (Cole 2001, 51).

In the meantime the use of fingerprints as a means of identification was taking hold as well. Bertillon resisted the use of fingerprints, though not totally (Wagner 2006, 105). In fact, Bertillon was the first European, in October 1902, to solve a murder using fingerprints. There ensued a forty year battle between Bertillonage and fingerprinting for ascendancy in identification (Cole 2001, 32). Bertillon's errors in the Dreyfus Case in 1894 and the theft of the Mona Lisa in 1911 were factors in the ultimate demise of his method.

Bertillon's confused testimony about handwriting was a definite factor in the conviction of Alfred Dreyfus in 1894 (Wagner 2006, 163). Dreyfus was accused of treason for giving French military secrets to the Germans. He was sent to the penal colony at Devil's Island. The author Emile Zola published a public letter, "J'accuse," to the French President Felix Faure. Zola's spirited defense of Dreyfus was a big factor in shaping French public

<sup>2</sup> For a list of the 11 measurements see Wagner 2006, p. 98 or Cole 2001, p. 37.

opinion in Dreyfus's favor. Because the evidence against him was flimsy, an outcry resulted in a retrial in 1899. Most were amazed that Dreyfus was again found guilty. But he was eventually exonerated in 1906 and reinstated. The case damaged Bertillon because he had stepped outside his area of expertise. He had injured his reputation as the French people, nearly all of whom had come to believe Dreyfus was innocent.

Then when the Mona Lisa was stolen in August 1911, Bertillon suffered another humiliation. Surely he would be able to match the fingerprint of the thief's left thumb found on the glass case in which the Mona Lisa was displayed. He failed to do so. The thief, Vincenzo Perugia, had an arrest record in France. Bertillon did have a print—but only of his right thumb (Wagner 2006, 105). These setbacks were the beginning of the demise of Bertillonage. Ultimately fingerprints proved to be more reliable than Bertillon's system. Alphonse Bertillon died in 1913.

## Section 3.2

### Fingerprints

You are aware that no two thumb-marks are alike?

Inspector Lestrade, "The Norwood Builder"

Despite Sherlock Holmes's "enthusiastic admiration" for Bertillon's system, he never used it. He did, however, make use of fingerprints. They are mentioned in seven of the sixty Sherlock Holmes tales.

### A BRIEF HISTORY OF FINGERPRINTING

It is known that very long ago the Chinese considered the impression of a fingerprint on a document to be a unique signature. They were taken as identifying seals on Chinese bills of sale in the 3rd century BC. About 2000 BC, fingerprints were used by Babylonians to seal contracts (Bigelow, 1957). Modern use of fingerprinting may have begun with Govard Bidloo, a Dutchman, and Marcello Malpighi, a professor of Anatomy at the University of Bologna (Kaye 1995, 13). In 1685 and 1687, respectively, they recognized the importance of fingerprints. The English engraver Thomas Bewick in 1804 and 1818 made wood engravings of the patterns of his fingerprints for use as his trademark (Kaye 1995, 13).

The Tichborne case in England in the 1870's brought great publicity to the need for a reliable identification system. Arthur Orton from Australia claimed to be the British heir Roger Tichborne, missing at sea for over ten

years. It took three years to settle the case. This case generated much publicity and resulted in a feeling that a faster method of identification was needed. Prior to the use of fingerprints, identity was established by letters of reference, official papers, and photographs. We've seen that use of the system known as Betillionage or Anthropometry preceded fingerprinting in criminal detection.

The use of fingerprints to identify criminals in Britain, and eventually much of the world, can be traced to a letter to the editor of *Nature*, October 28, 1880, P. 605. It was written by Henry Faulds, a Scottish medical missionary at Tsukiji Hospital in Tokyo. There a thief had left a fingerprint on a wall. It did not match the print of the main suspect. It did match another suspect, who then confessed. Faulds noted that monkeys have fingerprints that are similar to humans. He claimed that heredity plays a role in influencing the form of fingerprints. He described one of the common features of fingerprints by means of the term, still used today, whorl. He remarked that fingerprints might be useful in identifying criminals, and noted that he had knowledge of two cases of such use. Faulds also made the important assertion that fingerprints are unchanged throughout one's life, calling them "the for-ever-unchangeable finger-furrows" (Wagner 2006, 102). He even whimsically pointed out that when Dr. Jekyll transformed himself into Mr. Hyde, his fingerprints would remain unchanged (Cole 2001, 3). Henry Faulds would eventually argue against the idea that no two fingerprints are alike (Cole 2001, 188).

A response to Faulds' letter was published on page 76 of the November 25, 1880 issue of *Nature* by W. J. Herschel. Sir William, a British official in Bengal, India, reported that he had been taking fingerprints there for more than 20 years. He had started in 1860 in order to identify government pensioners. Some were showing up twice to collect their pension. As soon as Herschel began fingerprinting as a form of signature, the attempts at double collection ceased. He then extended the practice to criminals in jail. Herschel disagreed with Faulds idea that fingerprints could be use to suggest ethnicity or genetic relationship. He had observed wide differences in fingerprints within families. He did not believe that fingerprints could distinguish ethnicity or sex.

In 1880 Faulds wrote a letter about his fingerprint work to Charles Darwin. Darwin forwarded the letter to his cousin Francis Galton (Cole 2001, 74). Galton, impressed by the discussion of fingerprints, asked the editor of *Nature* for the address of the discoverer of fingerprinting and was given Herschel's name. He visited Herschel, who willingly handed over all of his materials. A German anatomist named J. C. A. Mayer claimed in 1788 that a person's fingerprints were unique. Galton, in a three year study, proceeded to verify Mayer's claim (Klinger 2006, 207; Bigelow 1957, 91). In the

early 1900's an article in *Scientific American* reported that the probability of two fingerprints being alike was 1 in  $10^{60}$  (Cole 2001, 177). For all practical purposes this is a probability of zero. This uniqueness is still today the bedrock of criminal identification by fingerprints. Galton then made an extensive collection of fingerprints in the late 1800's. He was initially studying inheritance, but eventually wrote the first textbook on fingerprints, asserting that they are never duplicated and remain unchanged for life (Klinger 2006, 207). He even made repeat measurements of one person's fingerprints over a period of 50 years. After over 100 years of unchallenged use in the courtroom, fingerprints have recently come under renewed scrutiny. Galton's conclusions have been questioned. Has their uniqueness been sufficiently tested? Should a study be done to put fingerprinting on a firmer basis? (Cho 2002; Specter 2002). On January 7, 2002 Judge Louis H. Pollak, a former dean of law schools at Yale and the University of Pennsylvania, issued a ruling limiting the use of fingerprints in a murder case in Philadelphia. Then, on March 13, 2002 Judge Pollak vacated that order and fingerprints were allowed. So far this seems to be the end of that battle.

In 1892 Galton's influential book entitled *Finger Prints* led to the establishment of a committee to consider the advisability of adopting fingerprinting as a method of identifying criminals. The committee's system of classification of fingerprints, adopted in 1901, was known as the Henry system after a committee member Sir Edward Richard Henry who was later director of Scotland Yard (Kaye 1995, 14). At the time Henry was a British civil servant in Calcutta and he made substantial contributions to the method of classifying fingerprints. In July 1897 he persuaded the Governor-General of India to adopt fingerprints as the sole means of identifying criminals. By August 1897 Henry had solved a number of crimes by use of fingerprints, and in 1900 he published his system. Henry's work was greeted with such acclaim that he was appointed Commissioner at Scotland Yard on May 31, 1901. He had instituted the Central Fingerprint Branch by July 1901. In 1905 the Stratton case became the first instance of conviction in England for murder based on fingerprint evidence (Rennison 2005, 224). By 1910 the Henry system had been adopted throughout Europe. Despite this, Oscar Slater was wrongfully convicted in 1909 of the murder of Marion Gilchrist, even though a bloody hand print had been left on a chair at the scene of the murder. So as late as 1909 Scotland Yard was not fully using fingerprinting. Arthur Conan Doyle had been personally involved in demonstrating Slater's innocence (Miller 2008, 292). Doyle attempted to show his innocence by publishing *The Case of Oscar Slater*. Doyle's demand for a new trial was denied and Slater was imprisoned for 18 years.

In the US, the International Association of Chiefs of Police started fingerprint files in 1896. New York state authorities began collecting fingerprints of

prisoners in 1903; but it was not until 1928 that New York required all offenders be fingerprinted. On November 2, 1904 the warden of the US Penitentiary at Leavenworth, KS, was authorized to take fingerprints of federal prisoners. In 1911 the Supreme Court of the state of Illinois upheld the legality of the use of fingerprints for identification of criminals. By the early 1970's US security authorities had over 200 million fingerprints on file. Eventually the FBI was receiving thousands of fingerprint requests each day.

However, in the early days of using fingerprints for identification, the near futility of finding a match by means of a manual search of existing fingerprint files proved to be a tremendous hindrance. With millions of fingerprints on file the time required to find the right print was enormous. In addition, the recorded prints were often of mediocre or poor quality. The development of Automated Fingerprint Identification System (AFIS) made fingerprint identification much swifter and thereby more useful. Success in identifying criminals increased by a factor of five when AFIS supplanted manual searches.

Much of the credit for the change is due to a San Francisco police inspector named Ken Moses. He was enraged by the 1978 murder of a 47 year old San Francisco woman who had survived Nazi concentration camps. The only evidence was a set of three fingerprints left on an upstairs windowsill. Moses was faced with the task of matching these prints with those in a file of 400,000 people taken in San Francisco over a 45 year period. He began in 1978 and six years later was still hunting whenever he could find time from his other assignments. He estimates that he still had 100,000 people to go. Back in 1978 Moses had read about computerized fingerprint identification systems. He requested such a system and succeeded in getting his request put into the departmental budget. It was not purchased, however, due to budget restraints. Moses then received permission to attempt to raise the money in the community. His efforts, which involved lecturing to civic groups on the issue, did not succeed in raising money but did increase community awareness. Thus when his group was able to get the issue on the ballot in 1982, it passed with 80 percent approval and funds became available. In 1984 San Francisco's AFIS went on line. Moses had a match within 60 seconds of entering his prints into AFIS. Two days later the killer was arrested, and in 1985 pleaded guilty to 1st degree murder (Fincher, J., 1989, 201).

#### HOLMES'S USE OF FINGERPRINTING.

In Arthur Conan Doyle's Sherlock Holmes stories, there are several cases where a fingerprint is noted, but is not used to apprehend anyone. The first of these is *The Sign of the Four* (SIGN). Holmes notes that a thumb mark

was on the envelope mailed by Thadeus Sholto to Mary Morstan. Holmes suspects that it was made by the postman. It turns out that he does not need to investigate the print because Sholto reveals his identity to Mary Morstan. In *The Man with the Twisted Lip* (TWIS), there is a greasy thumb print on the envelope containing the note from Neville St. Clair to his wife. It is eventually of no use since it belongs to his acquaintance who posts the letter. Meanwhile, Holmes solves the case by other means. In *The Cardboard Box* (CARD) Holmes notes two “distinctive” thumb marks on the cardboard box sent by Jim Browner to Susan Cushing. These prints are not used as again Holmes solves the case by other means. In another story, *The Three Gables* (3GAB), the inspector assigned to this case keeps a page from Douglas Maberly’s novel because it may have prints on it. In all of these stories Holmes and the official police are looking for fingerprint evidence, but no helpful prints are found.

There are two cases where the absence of fingerprints is noted by Holmes. In *The Three Students* (3STU) Holmes observes that there are no fingerprints on the proofs of Hilton Soames’ exam papers. In *The Red Circle* (REDC) a corner has been torn from the instructions sent to Mrs. Warren. Holmes surmises that it was done to eliminate a print.

In *The Norwood Builder* (NORW) Inspector Lestrade finds the thumb print of the main suspect, John Hector McFarlane, on a wall in blood. He triumphantly asks Holmes,

“You are aware that no two thumb-marks are alike?”

Holmes is aware of the uniqueness of fingerprints, but he knows that the print was placed there *after* McFarlane had been taken into custody. Only Holmes had done a thorough examination of the wall the day before. The print had been placed there during the night by Jonas Oldacre in order to incriminate John Hector McFarlane. Oldacre had obtained it from Macfarlane by having him press a wax seal on his will. Jonas Oldacre also must have known about fingerprints. Otherwise he would have placed anyone’s print on the wall and not bothered to get McFarlane’s in wax.

This use of the thumbprint in NORW may have occurred to Doyle upon his reading in the June 27, 1903 issue of the magazine *Tit-Bits* an article entitled, “Criminals Convict Themselves.” That article reports on a case in Yorkshire where a burglar took time to read a book and left a dirty thumbprint in it. NORW was published in November 1903 (Edwards, O. D., 1993, *The Return of Sherlock Holmes*, 338). It is likely that this is the first time in literature that the idea of a false fingerprint is used.

## SUMMARY

Arthur Conan Doyle was one of the very first authors to make use of the emerging technique of identification by fingerprints. The publication of NORW in 1903 preceded by two years the first successful use of fingerprints by the police. The Stratton case of 1905 was the first time a murderer had been convicted on the basis of fingerprints (Rennison 2005, 224). But Mark Twain's writings referred to fingerprints even earlier than did those of Doyle. Twain first mentions prints in *Life on the Mississippi* (1883). Here a man identifies the killers of his wife and child using a bloody thumbprint. Again in his *Pudd'nhead Wilson* (1894), Twain makes very extensive use of fingerprints for identification, well before agencies had adopted the method. In this story, Wilson is considered an eccentric partly because of his hobby of repeatedly collecting the fingerprints of everyone in Dawson's Landing, a town on the Mississippi river. But Wilson is able to use his fingerprint collection to show that his Italian clients are innocent of a murder charge. In a more significant usage, Wilson also proves that the slave baby, Chambers, was exchanged in the cradle with the master's son Tom. Thus, the real Tom was raised as a slave. Meanwhile Chambers, only 1/32 black and resembling his half-brother, became the heir. Wilson's fingerprint collection corrects all of this. One of the main points of Twain's story is that the slave baby turned master treats the black slaves cruelly.

Doyle's seven references to fingerprinting in the Holmes stories is an indication of the voracious reading habit that kept him so well informed.<sup>3</sup> By the time Scotland Yard had adopted fingerprinting for identification in 1901 Doyle had already written three stories mentioning the method. He would make it the centerpiece of another Holmes tale, NORW, published in 1903. His preference for fingerprints over Bertillonage (7 mentions versus 2) shows him to be on the side of the winner in the 40 year competition between the two methods.

## Section 3.3

Footprints

Footprints? Yes, footprints. A man's or a woman's?

Mr. Holmes were the footprints of a gigantic hound.

The Hound of the Baskervilles

<sup>3</sup> For a contrasting view see "Death at Dartmoor," R. Paige, p.39.

## INTRODUCTION

In the first Holmes story *A Study in Scarlet* (STUD), published in 1887, we see that Sherlock was already using footprints in his work. His description of Constable Rance's movements is so precise that Rance blurts out, "Where was you hid to see all that." In *The Lion's Mane* (LION), published in 1926, Holmes is still using footprints. Here he observes that Fitzroy McPherson's footsteps are the only ones on the path down to the beach. So, for over 40 years Conan Doyle has Sherlock Holmes use footprints in his investigations. Footprints were held in such high regard as a forensic tool that about 1890 a letter to *The Times* suggested that fingerprints might be *almost* as good as footprints (Fido 1998, 89).

## A BRIEF HISTORY OF FOOTPRINTING

In the Book of Daniel, (part of the Bible or the apocrypha, depending on one's personal belief), the King of Persia leaves enormous quantities of food out each night for the idol, Bel (or Baal). The priests of Bel have persuaded the king that Bel comes every night and takes the food. But Daniel spreads ashes on the floor one night and is able to show the king that the priests themselves are taking the food. Despite this early example of the use of footprints, there has never developed a "science" of footprinting for identification (Moenssens 1995, 614).

In the 1980's Professor Louise Robbins from the University of North Carolina Greensboro tried to put footprint analysis on a scientific basis, even publishing a book aimed at that goal (Robbins 1985). She served as an expert witness on footprints in at least twenty trials. Her testimony was a factor in several cases when she was able to testify to identities even when the state's own crime laboratories were unable to confirm identification. Her methods, fully described in her book, have since been severely criticized (Moenssens 1995, 619). One website, referring to her as an "infamous charlatan," reports that the American Academy of Forensic Sciences judged in 1987 that her work had no scientific basis (Zerwick 2011). A law professor described her work: "It barely rises to the dignity of nonsense." So, although footprints are not as definitive as fingerprints, they are "probably the oldest of all detection techniques." (Fisher 1995, 277).

An interesting case of footprint evidence occurred in the O. J. Simpson criminal and civil trials. Footprints at the crime scene were shown to be size 12 Bruno Magli shoes, Lorenzo style. At his 1994 criminal trial, Simpson denied ever owning a pair of these somewhat rare, expensive shoes. The prosecution was not able to demonstrate that he did own Bruno Magli shoes. But by the time of his subsequent civil trial a number of



photographs showing him wearing such shoes on September 26, 1993, were found. These photographs were admitted into evidence at the civil trial. Mr. Simpson was acquitted at the criminal trial and convicted at the civil trial (Murray). This is not to say that the footprint evidence was the determining factor in the different verdicts. However, one does wonder.

Apparently the Unabomber, Ted Kaczinski, was concerned about footprint evidence. Fox News reported on November 29, 2006 that he had affixed smaller soles to the bottom of a pair of shoes found in his Montana cabin. His hope was to use these shoes to evade authorities who were chasing him. Foot impressions have long been permitted as evidence on a case by case basis. Sherlock Holmes made good use of footprints in his detective work, as shown in the next section.

## HOLMES'S USE OF FOOTPRINTS

In solving his cases, Sherlock Holmes made more use of footprints than fingerprints. We've seen that the then emerging science of fingerprinting for identification is mentioned in only seven of the sixty Holmes tales. Footprints are mentioned in twenty-six of the sixty cases (Tracy 1977, 128). Clearly they were one of his major investigative tools. Arthur Conan Doyle chooses a number of different materials upon which footprints are left: clay soil (STUD), snow (*The Beryl Coronet* BERY), carpet (*The Resident Patient* RESI), dust (Tonga in SIGN), mud (Jonathon Small in SIGN), blood (REDC), a curtain (the mongoose in CROO), and ashes (GOLD) (Vatza 1987, 17). Holmes uses all of them.

Let's look at a few cases where Holmes produces some results using footprints. In the first two tales, STUD and SIGN, Holmes is able to trace movements of people so accurately that he startles them. In SIGN, just as in STUD, the movements of Jonathon Small and Tonga are as accurately determined by Holmes as were John Rance's in STUD. In fact, Jonathon Small is so surprised by Holmes's that he remarks, "You seem to know as much about it as if you were there." Of course Holmes is aided here by the fact that one of them, Tonga, is a pygmy from the Andaman Islands and the other has a wooden peg leg. When Holmes reveals Tonga's footprints on the dusty floor, the shocked Watson says, "Holmes, a child has done this horrid thing." Holmes, of course, has a different interpretation.

Holmes' luck in SIGN, to have two such distinctive footprints, is repeated in BERY. Here four people leave footprints: Sir George Burnwell's boot, Lucy Parr's shoe, Arthur Holder's naked foot, and Francis Prosper's wooden leg. Holmes declares, "A very long and complex story was written in the snow in front of me." Holmes proceeds to sort out the movements by these footprints left in the snow. He observes that both Lucy Parr

and Arthur Holder ran. The servant girl Lucy Parr was meeting her beau, Francis Prosper. She ran when discovered. They have nothing to do with the theft of the Beryl Coronet. Sir George Burnwell stole the jeweled coronet and Arthur Holder hastily chased him. The innocence of the accused Arthur Holder is established by Holmes's reconstructing the crime scene based largely upon footprint evidence. This idea of running footprints is seen again in the opening scenes of HOUN. In addition to the *footprints of a gigantic hound*, the yew alley at Baskerville Hall had the footprints of Sir Charles Baskerville. Holmes deduces that the change in Sir Charles's footprints halfway down the alley was due to his running, not tiptoeing as had been suggested.<sup>4</sup>

In *The Devil's Foot* (DEVI) Holmes once again encounters two footprints of very different character. Holmes is able to distinguish the normal footprint of Mortimer Tregennis from the ribbed tennis shoe worn by Leon Sterndale. Footprints are part of the evidence that enables Holmes to deduce that Mortimer Tregennis murdered his sister Brenda. In revenge for the loss of his secret love, Dr. Leon Sterndale causes the death of Mortimer Tregennis. This case is one of several which Holmes solves but allows the culprit to go free. He decides that Sterndale's actions are justified.

In RESI he amazes Watson by using footprints on the carpet to deduce the order in which the perpetrators ascended the stair. Holmes then proceeds to precisely describe their movements in Mr. Blessington's room before they hang him.

There are two cases wherein Holmes acts to "develop" a footprint. In DEVI, Holmes kicks over a water pot in order to get an impression of Mortimer Tregennis's shoeprint. In GOLD, borrowing from the Book of Daniel, he uses tobacco ashes dropped on a carpet to show the presence of Anna Coram. His furious smoking of cigarettes makes him seem nervous and embarrasses Watson who doesn't realize the ploy being worked. When Holmes leaves and quickly returns to Professor Coram's room, he is able to see Anna's footprints in the ashes he had just left on the carpet. In this manner she is forced to emerge from her hideout. It is notable that the absence of Anna's footprints upon the path outside is also part of Holmes's evidence. That absence is why he suspects and then proves she is concealed behind the hinged bookcase in her husband's chamber. The absence of footprints is a factor in other cases as well: *Black Peter* (BLAC), *The Five Orange*

<sup>4</sup> Sir Charles's death by heart attack while fleeing the Hound of the Baskervilles down the yew alley has given rise to a medical term. The Baskerville Effect refers to heart attacks brought on by extreme emotional stress. Doyle first describes a death by heart attack due to fear in SIGN. There Captain Morstan, Mary Morstan's father, undergoes a similar fate. See Phillips, D. P. et al, *British Medical Journal*, 2001, 323 (7327), 1443–1446.

*Pips* (FIVE), *The Reigate Squires* (REIG), *The Naval Treaty* (NAVA), and 3STU (Tracy 1977, 129).

The *Boscombe Valley Mystery* (BOSC) is one case which Holmes solves almost entirely by use of footprints. In this case John Turner has killed the blackmailing Charles McCarthy. But suspicion has fallen on McCarthy's son, James. The McCarthy's maid has provided Holmes with boots belonging to both McCarthys. After measuring them very precisely Holmes heads to Boscombe Pool, the scene of the murder. Once there he must deal with the extraneous footprints of a number of people including Inspector Lestrade.

Holmes: "What did you go into the pool for?"

Lestrade "I fished about with a rake. I thought there might be some weapon or other trace. But how on earth.."

Holmes "Oh, tut, tut, I have no time. That left foot of yours with its inward twist is all over the place."

Holmes is able to trace the movements of both McCarthys as well as Turner. He deduces that James McCarthy left three sets of footprints, one set when he was running. This agrees entirely with his contention that he



Figure 3.1 Maid and Boots

ran back to help his father after hearing an outcry. Persuaded that the younger McCarthy did not kill his father, Holmes uses the third distinct type of footprint to gather evidence against the true killer, John Turner. “What have we here? Tiptoes, tiptoes. Square too, quite unusual boots. They come, they go, they come again.” Turner had to return to retrieve a cloak he had left behind at the scene.

Lestrade, contemptuous of Holmes’s theories and still convinced that James McCarthy killed his father after an argument, is reluctant to accept Holmes’s description of the murderer cited in chapter two:

“. . . a tall man, left-handed, limps with the right leg, wears thick-soled shooting boots and a gray cloak, smokes Indian cigars, uses a cigar holder, and carries a blunt pen-knife in his pocket.”

Despite all of this information, Lestrade fails to capture Turner. This is one of the cases where Holmes decides, after giving Lestrade the above detailed clue, to let the culprit go free. He is in sympathy with the terminally ill Turner.

One last set of footprints must be mentioned. In *Charles Augustus Milverton* (CHAS) Inspector Lestrade finds footprints outside the residence of Charles Augustus Milverton, “the worst man in London.” Little does he know that the prints belong to Holmes and Watson who were inside and witnessed the murder of Milverton. It is another case where Holmes lets the perpetrator, this time Lady Eva Brackwell, go free.

## SUMMARY

It is a tribute to Sherlock Holmes that he was able to so brilliantly solve crimes despite the lack of modern methods. His forty year use of footprints is particularly impressive. He got so adept at reading them that in *Wisteria Lodge* (WIST) Holmes was able to tell the size of a print at a glance: “A number twelve shoe, I should say.” In *SIGN* we learn that he even wrote a monograph on the use of footprints for identifying criminals. However, footprints are just not as useful as, for example, fingerprints or DNA analysis. The episode “Ho’opa’I,” of the CBS television series “Hawaii Five-0,” that first aired on April 18, 2011, made this point. Commander McGarrett collects a large plastic bag filled with shoes of suspects. Nothing comes of this effort to match a footprint at the crime scene. Today’s mass produced shoes are difficult to distinguish from each other. In Holmes’s era shoes were individually made and thus more distinctive (Wagner, 2006, 142). This no doubt helped Holmes to put them to such good use for so many years. Now because of limited utility, footprints are nearly absent from modern

books on crime detection methods (Saferstein, R. 1995; Moenssens, A. A. et al 1995).

## Section 3.4

### Handwritten Documents

*You may not be aware that the deduction of a man's age from his writing is one which has been brought to considerable accuracy by experts*

Sherlock Holmes, "The Reigate Squires"

### INTRODUCTION

Alexander Cargill published an article entitled "*Health and Handwriting*" in 1890 (Cargill 1890, 627-631). In it he made claims that handwriting could be used to determine age, character, and perhaps gender. He sent a copy of this article to Arthur Conan Doyle in December 1892. In June 1893 Doyle published *The Reigate Squires* (REIG), the story in which Holmes makes his



Figure 3.2 H & W and Handwriting

greatest use of handwriting. There, as we shall see, Holmes's deductions exceed what even Cargill claimed could be done with handwriting. In *The Red Circle* (REDC) Doyle shows that he accepts Cargill's claim about gender and handwriting. Emilia, the hidden lodger, prints messages to the landlady out of concern that her gender would be revealed by her writing. She wants to conceal the fact that she has replaced the original renter, her husband Gennaro. Holmes uses his knowledge of handwriting analysis to deduce what is going on. Cargill's claim about telling age from handwriting has been disputed (Rendall 1934, 79).

A number of actual cases have involved handwriting evidence, including one in which Doyle himself played a major role. As we've seen, the reputation of Alphonse Bertillon suffered greatly when he used handwriting to pronounce that Captain Dreyfus<sup>5</sup> had written the controversial memorandum in 1894 (Wagner 2006, 162). So, we will look at a few well known real cases before going on to Holmes's usage.

## REAL CASES

### *New York Zodiac Killer*

In New York City in the early 1990's Heriberto Seda sent notes to the police announcing himself as the new Zodiac Killer. The original Zodiac Killer had claimed to have murdered 37 people in San Francisco between 1966 and 1974. He had never been apprehended. Seda stated that he would kill one person from each of the twelve signs of the zodiac. His first note was sent on November 17, 1989. His first attack occurred on March 8, 1990. He then set a pattern of attacking every 21 days or a multiple thereof. When that pattern became clear, police flooded the Brooklyn and Queens areas of New York on July 12, 1990. Seda must have been alarmed by this, and no further attacks happened until August 1992. After just a few more attacks, the New York Zodiac Killer disappeared.

Then, on June 18, 1996, Seda shot his half sister, Gladys Reyes, in the buttocks. She managed to get to a neighbor's apartment and police were called. Seda was arrested and his numerous weapons collected. Seda wrote out a confession to the shooting of his half sister. It was at this point that his handwriting was recognized by Detective Joseph Herbert. "the t's curving to the left, the i's dotted to the right of the stem, the frequent underlining. I knew right away it was him."

Seda's fingerprints were visually matched to those on several of the taunting zodiac notes he had sent to the police. Without the handwriting evidence the police may never have even looked at the fingerprints.

<sup>5</sup> Numerous books have been written about this famous case.

One of his zip guns was shown to have been the weapon that killed one of his victims. Seda was convicted of three murders and sentenced to 83.5 years. Subsequently, in July 1999, he was given an additional 152.5 years for 8 attempted murders. He was imprisoned in Attica, NY. Without the use of handwriting the New York Zodiac killer may never have been apprehended.

### *Lindbergh Baby Kidnapping*

When the O. J. Simpson case of the 1990's was termed the "crime of the century," it was taking over a term that had earlier been applied to the Lindbergh baby kidnapping of March 1, 1932. A huge investigation followed the disappearance of Charles Lindbergh Jr. in New Jersey. A variety of evidence was used to convict Bruno Richard Hauptmann. Handwriting experts were involved. Footprints found under the nursery window were impossible to measure (some mud had been found in the nursery). There were no fingerprints.

When Hauptmann appealed his conviction, he was rejected due to three types of evidence: concealed in his garage was \$13,760 of the ransom money (Behn 1994, 215)—serial numbers had been recorded on the \$50,000 delivered; wood from his attic matched that in the homemade ladder used to reach the second floor nursery, see the figure (Use Fig 7, p.199 of Saferstein); and handwriting analysis of the more than a dozen ransom notes sent to various people.

The handwriting experts were certain that the same person had written all of the notes because later notes referred to statements made in earlier ones. In addition the second note was written on paper torn from the first note and the torn edges matched. Similarities and misspellings were consistent throughout the notes. For example, money was spelled mony, boat was boad, anything was anyding. Finally, the handwriting was the same with "i's" rarely dotted, "t's" rarely crossed. All experts were unanimous that the same "German" had written all of the ransom notes. A strong statement on the handwriting evidence was given by Charles Appel at Hauptmann's grand jury hearing. Appel was the first full time employee at the new FBI laboratory which had opened on November 24, 1932 (Fisher 1995, 9). He testified that he had examined fifteen hundred handwriting samples and never found any of the peculiarities that were present both on Hauptmann's handwriting sample and the ransom notes. Appel's conclusion was that it was "inconceivable that anyone but Hauptmann could have written the ransom notes" (Fisher 1995, 242). At Hauptmann's trial in 1935, Albert Osborn's testimony on the handwriting in the ransom notes "proved devastating for the defense" (Wagner 2006, 167). Osborn was the author of the most influential reference book on the identification of handwriting.

*Howard Hughes*

In 1924, at age 18, Howard Hughes inherited a fortune that his father had made mainly by patenting a drill bit for the Texas oil fields. Hughes went on to even greater wealth as a movie producer and director, beginning in 1927. He had a great interest in aviation and was a first class pilot. He formed Hughes Aircraft in 1932 to build airplanes.<sup>6</sup> In 1939 Hughes acquired Trans World Airlines, which later merged with American Airlines. In 1948 he gained control of RKO Studios (Wikipedia). In his later life he got into the casino business in Las Vegas. When Howard Hughes died on April 5, 1976 his estate was estimated at \$2 to 3 billion dollars (Freese 1986, 342). At the time of his death Hughes had no wife, no children, no siblings or living parents. Soon a will emerged, but under suspicious circumstances with a suspicious provision. In this will Melvin Dummar, a gas station owner from Gabbs, NV, was left one sixteenth of Hughes's estate. This would amount to about \$156,000,000 for someone never previously connected to Hughes. Needless to say this will was examined for authenticity. Handwriting analysis by FBI agent Jim Lile led to the conclusion that the will was a forgery (Fisher 1995, 250). One of Lile's points dealt with the flow of natural handwriting. The will contained a number of instances where the writing was interrupted. This is often the case in forgeries due to the need to refer to a writing sample being followed. Dummar was attempting to copy Hughes's writing as found in a handwritten memo and reproduced in the January 1970 issue of Life magazine. This memo contained 13 capital letters of the alphabet. Dummar faithfully reproduced those letters in the "will." But he used 9 others (E, J, K, O, P, S, U, V, and W). Only two of these resembled Hughes's writing (Harris 1986, 375).

In addition to the handwriting evidence, Dummar was betrayed by fingerprints (Freese 1986, 347) and by being caught in a number of lies. He eventually confessed to writing the fake Howard Hughes will. This incident was the second time in the 1970's that someone had tried to impersonate the handwriting of Howard Hughes. Clifford Irving had previously tried to obtain a contract for an "autobiography." He managed to fool handwriting experts, but was found guilty of forgery on the basis of voiceprint evidence (Saferstein 1995, 474 & 493).

*Arthur Conan Doyle and George Edalji*

Once his reputation as the author of the Sherlock Holmes stories became established Doyle began to be contacted for advice in actual cases (Stashower 1999, 255). Most often people asked him for help in finding a relative or loved one who had disappeared (Booth 1997, 261). Sometimes jewels were

<sup>6</sup> Recall the "Spruce Goose" now housed in Oregon.



involved (Booth 1997, 262). Once he even helped clear a dog accused of killing sheep (Stashower 1999, 255).

But Doyle's most famous real life case involved handwriting evidence. The involvement of Arthur Conan Doyle in the George Edalji case has been fully described in several Doyle biographies (Miller 2008, 257–272; Stashower 1999, 254–263; Carr 1949, 268–290). Here we will take a brief look at Edalji's case, focusing on the handwriting evidence.

George Edalji's father had emigrated to England from Bombay, India (Miller 2008, 257). He became vicar of St. Mark's Church in Great Wyrley. In 1888 the Edalji family began receiving hate letters that were probably racially motivated (Miller 2008, 258). The Edaljis were considered a "black" family. A family servant was accused, based on handwriting, of writing these letters. She confessed and the letters stopped. In 1892 letters started arriving again, this time written by a different hand. In December 1895 the letters again stopped.

Between February and August 1903 sixteen animals were killed or mutilated in the Great Wyrley area, near Birmingham (Miller 2008, 261). Letters accusing George Edalji, a lawyer, of these crimes were received by police. The Edalji family again got hate mail. Local authorities decided that George Edalji had written the very letters which identified him as the culprit. He also, they claimed, wrote the hate mail to his own family. On the basis of this fantastic conclusion, Edalji was arrested. He was accused of writing the letters and of maiming a pony on the night of August 17, 1903. His trial started on October 20, 1903 (Carr 1949, 274). Despite having an alibi for the night of the pony maiming, and despite being present in the house when letters were slipped under the door of the Edalji home, George was convicted. "The police case rested on the testimony of a handwriting expert." (Stashower 1999, 256). Graphologist Thomas Gurrin had already helped convict an innocent man, Adolf Beck, in 1896 (Booth 1997, 264). George Edalji was sentenced to seven years of hard labor, and spent his time breaking stones in a quarry (Booth 1997, 264).

The animal attacks continued for twenty five years after Edalji was imprisoned (Miller 2008, 272). The authorities were unmoved. When this news spread, public interest resulted in the Home Office receiving a petition signed by 10,000 people protesting Edalji's conviction. With no appeal process in the legal system, a committee was appointed to look into the matter. They concluded that Edalji was not guilty of the animal attacks, but that he had written the letters (the ones accusing himself!). Edalji was not pardoned, but he was released from prison in October 1906. However, as a convicted felon he was unable to practice law. Doyle was not yet involved. When he did learn of what he considered an obvious injustice, Sir

Arthur sprang into action. George Edalji had written a letter in November 1906, asking Doyle for help (Miller 2008, 263). After reviewing all the evidence and meeting with George Edalji, Doyle wrote articles and lectured to packed halls about his innocence (Coren 1995, 124). As a result of his efforts Parliament asked the Home Secretary if a new inquiry would be made into the question of the handwriting in the anonymous letters (Miller 2008, 271). Soon Edalji was allowed to resume his work as a solicitor. George Edalji was one of the guests at Doyle's marriage to Jean Leckie on September 18, 1907 (Stashower 1999, 260). In 1934 Enoch Knowles, "a labourer at an iron works," admitted to writing the letters. No one was ever arrested for killing and mutilating the animals.

### *Holmes's Usage*

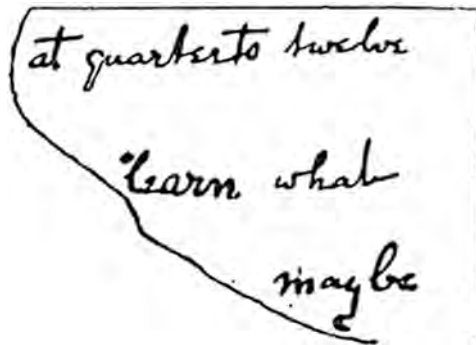
Handwriting issues arise in a number of the sixty stories. Several times Holmes uses the stylistic features of handwriting to date or identify it. For example in HOUN, a mere glance enables him to correctly date the manuscript describing the Baskerville legend. He points out to Dr. Watson the alternating shape of the letter "s." In *A Case of Identity* (IDEN) Mr. Windibank is afraid his writing will be recognized by his step daughter, Mary Sutherland. So he corresponds with her by typed letters only. In *The Stockbroker's Clerk* (STOC), the Beddington brothers need to be able to duplicate Hall Pycroft's writing. So they get him to write a note accepting a position at the Franco-Midland Hardware Company in Birmingham. They then send him off to his new overpaid job, the fool's errand mentioned in section 1.2. Meanwhile one of them assumes his job in London, emulates his writing, and attempts an inside robbery there. In *The Valley of Fear* (VALL), Holmes receives a note which has the Greek "e" with a flourish at the top. Recognizing this feature of Porlock's hand, he knows it was written by his spy within Professor Moriarty's organization. Holmes then trusts the information about the danger to Mr. Douglas, and knows that Moriarty is behind Douglas's subsequent death. In SIGN Holmes verifies that all the notes Mary Morstan has received are from the same person. Thaddeus Sholto also uses the Greek "e" (epilson, ε) and has twirls on his esses.

Ink blotters, so rarely used today, play a role in two of Holmes's cases. In TWIS Holmes observes that the writer did not know the address to be put on an envelope. He cleverly deduces this by noting that the ink has dried without blotting in some places and not in others. The writer must have left the envelope to check on the address. Upon return there was no need to blot as the ink had already dried. So we find in this case that the interrupted writing found in the Howard Hughes will was used over fifty

years earlier by Holmes. In *The Missing Three-Quarter* (MISS), Holmes realizes that blotting paper has been used. He reads the writing backward and obtains more information on the disappearance of Godfrey Staunton, the rugby player who has gone missing.

There are three cases where Doyle appears to have been influenced by his reading of the Cargill article. In NAVA he recognizes that the letter from Percy Phelps was written by a woman, and one of “rare character” at that. In CARD he deduces that a man had addressed the package which contained the two severed ears. Cargill claimed that gender and moral character could be discerned from handwriting analysis.

Handwriting plays its largest role in REIG. Holmes makes amazing deductions from the torn corner fragment of the note found clutched by the dead William Kirwin. Pushing well beyond what Cargill claims (Cargill 1890, 627-631), Holmes concludes that it was written by two persons of whom one had a “strong” hand and was the leader. Additionally the strong person was younger, and the two people are related! Holmes bases this fantastic assertion of shared family on similarities in their writing, such as use of the Greek “e.” This goes well beyond his use of the Greek “e” in SIGN and VALL where he uses it merely to recognize someone’s writing.



That Holmes’s other conclusions have some merit can be seen by examining the above figure. He notes the “t’s” in “at” and “to” are what he terms strong, while those in “quarter,” “twelve,” and “what” are weak. Holmes decides that the younger of the two authors had the strong hand and was the leader. Looking at the gaps between words he sees that this man wrote his words first and left gaps for the other, thus “quarter” is squeezed. Using these conclusions, the Cunninghams, father and son, are made suspects. When the full note is recovered it only serves to verify Holmes’s conclusions.

If you will only come round (at quarters twelve to the east gate you will learn what will very much surprise you and maybe be of the greatest service to you and also to Anne Morrison. But say nothing to anyone upon the matter

Attempts have been made to identify the other twenty three deductions Holmes makes about the writing in the note (Baring-Gould 1967, Vol. 1, 343).

Finally, in NORW Sherlock brilliantly discerns that Jonas Oldacre has written his will on the train coming it to London. The bases for this conclusion are that most of the document is written in a very shaky hand, because the train ride was bumpy. But at two points the writing is smooth. This happens when the train stops at a station. In two other places in the will the writing is completely illegible. Here the train is crossing “switches.” Realizing that a serious will would never be done in this way, Holmes is immediately suspicious of Jonas Oldacre.

## SUMMARY

Handwriting analysis has played a significant role in crime detection for many years. The FBI has had a documents section right from its opening day in 1932 (Fisher 1995, 242). We’ve looked at cases ranging from the time of Doyle up to the Zodiac case. Corporations use handwriting analysis during the hiring process. Analysts then attempt to determine the character, traits, and personality of the writer. The hope is that this process will lead to “good” hires. This is particularly true in Europe, especially in France (Rafaeli & Klimoski 1979) where job applicants are required to supply a handwritten letter of application. In the past the French government has used this process. The use of handwriting to deduce things about people was pioneered by some monks in France in the 1880’s (Edwards 1993, *The Oxford Sherlock Holmes*, London: Oxford University Press, *The Sign of the Four*, 125). One of them, Abbe Jean Michon founded the French Society of Graphology in 1881. Despite the fact that graphology has been shown to be only 2 percent reliable

(Schmidt 1998, 265), approximately 80 percent of companies employ graphologists to analyze the writing in cover letters on job applications. These cover letters are required to be handwritten—for this purpose. Even the French Government has been willing to pay a fee to graphologists. One such graphologist has stated “the angle of the pen and the depth of the imprint can be used to detect the energy and libido” of the candidate.

There are stories of French people taking steps to get around the handwriting analysis of job applicants. An unemployed engineer having trouble getting an interview had his wife start writing the cover letters. He immediately started getting calls for jobs. In another case 40 year-old Michel Malat had been rejected over 250 times. So he hired a graphologist to help him alter his handwriting (New York Times, October 19, 1993, D1).

In the US those who claim to be able to discern personal qualities and character via handwriting are generally considered charlatans. The reason for this is that no scientific study has produced results establishing the validity of predicting personal traits from handwriting analysis (Blinkhorn 1993, 208). As one researcher stated, “We have tried our utmost but have failed to produce evidence to support the use of graphology for personal assessment.” In a series of publications in *The Southern Literary Messenger* in 1836 and *Graham’s Magazine* in 1841 (Sova 2001, 17 & 48), Edgar Allan Poe poked fun at those who attempted to determine traits or character from handwriting. He presented fake handwriting samples of various people, such as Henry Wadsworth Longfellow, and then “analyzed” the person’s traits. As recently as 2005 graphologists were embarrassed by their analysis of British Prime Minister Tony Blair (Wagner 2006, 167). They didn’t realize the writing was that of Microsoft founder Bill Gates.

## Section 3.5

### Printed Documents

*It is a curious thing that a typewriter really has quite as much individuality as a man’s handwriting. Unless they are quite new, no two of them write exactly alike.*

Sherlock Holmes, “A Case of Identity”

## INTRODUCTION

Sherlock Holmes was a very early user of the idiosyncrasies of a typewriter as an aid in his work. Even brand new typewriters have unique features

that allow forensic investigators to assign documents to a specific typewriter (Wagner 2006, 166). Usage only increases the individuality of a typewriter. Letters can and do get bent, worn, and chipped.

What Mr. James Windibank did in IDEN may not have been a crime, but it surely was despicable behavior. Holmes's brilliant deductions which exposed Windibank still echo today in the cases of Alger Hiss and the Unabomber. The Alger Hiss case is yet another that has been termed the "trial of the century" (Hiss 1999, 15). This leaves us with at least three contenders for the most sensational crime of the twentieth century: the Lindbergh Baby Kidnapping, the Alger Hiss perjury case, and the matter of O. J. Simpson. Take your pick. This century's title may have already been taken by the World Trade Center incident of 9/11/2001.

## REAL CASES

### *Alger Hiss*

The first famous case involving typewriter evidence was that of Alger Hiss (1950). So much has been written about the case that we shall only briefly describe it, emphasizing those aspects that deal with his typewriter. Hiss graduated from Harvard Law School where the famous Felix Frankfurter was his mentor. He then took a job as secretary to Supreme Court Justice Oliver Wendell Holmes (Jacoby 2009, 46). With such an outstanding pedigree Alger Hiss was soon working for the US government and advancing up the ladder of success. He moved from the Department of Agricultural to the Justice Department. Soon Hiss took a position in the office of the Assistant Secretary of State. Some have claimed that he was willing to move to the State Department, and take a 25 percent salary cut, so as to have access to materials that were of more interest to the Soviet Union (White 2004, 41). Hiss began copying classified documents and passing them on to his contact, Whittaker Chambers. Some of these documents were handwritten and others were typed.

In 1948 Chambers, having left the Communist Party that he had joined in 1925 (Jacoby 2009, 41), testified before the House Committee on Un-American Activities. He stated that Alger Hiss had been a Communist agent in the 1930's. As evidence Chambers produced copies of some of the documents that Hiss had given him for delivery to the Soviets. Hiss's handwriting was obvious. The typewritten documents matched a typewriter that the Hiss family had owned. Documents experts, using the distinctive "e" and "g" (Wagner 2006, 168), were able to sufficiently prove that classified documents had been written on this typewriter. That the typewriter belonged to Hiss was established by comparison with correspondence from



**The Woodstock typewriter used as an exhibit at both of Hiss's perjury trials. It was first produced by the Hiss defense.**

*Figure 3.3* The Hiss typewriter

him to an insurance company and a school (White 2004, 65). Experts from both prosecution and defense stated that the typewriter was the “most sensational” piece of evidence against Alger Hiss (White 2004, 70). Hiss himself always considered the typewriter to be the big piece of evidence against him (Jacoby 2009, 140).

In 1950 Hiss was convicted of two counts of perjury for lying to the grand jury. A charge of espionage was not possible because the statute of limitations had run out on that offense. Alger Hiss spent 44 months in jail (Hiss 1999, 6). After his release Hiss was able to regain his law license. He spent the rest of his life trying to disprove the charges against him. In a 1978 motion his lawyers suggested that the FBI had built a typewriter to match the one on which the State Department documents had been typed (White 2004, xv). Fisher's book on the FBI lab claims that it “proved impossible” to duplicate the Hiss typewriter (Fisher 1995, 266). It has even been claimed that the defense was able to build a typewriter that could not be distinguished from Hiss's typewriter (Koppenhover 2007, 50). The obvious implication is that typewriters are not necessarily unique. Following his death in 1996 new information has seemed to suggest that Hiss was indeed an agent for the Soviet Union (White 2004, xvii).

### *Unabomber*

Ted Kaczinski was born in 1942. His IQ was higher than 160 (Douglas 1996, 82). He was given a scholarship to Harvard and graduated in three years. He next earned an M.S. and a Ph. D. in Mathematics from the

University of Michigan. He accepted an appointment as Assistant Professor at the University of California—Berkeley. But after this fast start, Kaczinski abruptly left the academic world in 1969 (Douglas 1996, 90). In 1971 he moved into a remote area of Montana. There he eventually built a one room shack, 10 feet by 12 feet. Having no electricity, he used a typewriter to write his messages to newspapers when he started his bombing rampage.

Beginning in 1978 the Unabomber killed 3 people and injured 23 others (Wikipedia). His initial targets were university professors and airlines, and hence the name (Fisher 1995, 110). In 1995 he sent his “Manifesto” to the New York Times, which published it on June 28, 1995. Kaczinski’s brother David recognized some of the phrasing from letters Ted had written to their mother. Eventually David had the FBI notified. When they arrested the Unabomber at his Montana shack they found three typewriters. One of them matched the idiosyncrasies found in his letters to newspapers. This evidence was considered some of the most useful in the case that led to his conviction.

## HOLMES’S USAGE

Only in IDEN does Sherlock Holmes utilize the idiosyncrasies of typewriters in his work. The bizarre story of Mary Sutherland sparks his interest by its uniqueness. Miss Sutherland had a nice inheritance from an uncle. But she lived on what she earned typing and just gave the inheritance money to her mother and step father, Mr. Windibank. Needless to say, Mr. Windibank was anxious to keep Mary unmarried and thereby retain use of her money. So when she begins to show some interest in socializing, he devises the scheme which sends her to consult Holmes.

When Mary Sutherland insists upon attending the gasfitter’s ball, Windibank also attends disguised as Hosmer Angel. There he courts his own stepdaughter. Afraid that Mary will recognize his writing, Windibank continues the relationship by means of typewritten letters. After making her fall in love with him, Windibank has Angel disappear. The heartbroken Miss Sutherland consults Holmes. The circumstances she describes, including that Hosmer Angel’s letters even bear a typed signature, make Holmes suspect Windibank immediately. He corresponds with Windibank, seeking an appointment. When he receives a typed response, Holmes has his case. By the idiosyncrasies of his typewriter Holmes determines the truth. He gives Windibank the sternest of warnings, but has no legal cause for arrest.

## SUMMARY

The usefulness of typewriter comparisons as evidence was not yet established when Doyle published IDEN in 1891 (Wagner 2006, 166). FBI





Figure 3.4 Hosmer dancing

typewriter analysis began in 1933 and immediately led to the capture of a woman who had mailed poisoned fudge to a veteran's hospital (Fisher 1995, 266). Foreshadowing the Unabomber was the 1989–1990 VANPAC case (Fisher 1995, 4). In this case homemade bombs were mailed to the intended victims. The name of the case was derived from the fact that a Judge *Vance* had been mailed an explosive *package*. Again a typewriter flaw found by the documents section of the FBI was the initial discovery on the way to arrest of Walter Leroy Moody. Likewise the conviction of Alger Hiss was due largely to typewriter irregularities (Fisher 1995, 266). If the well-read Hiss had only read Holmes's quote about the individuality of typewriters, he may have been more careful in his espionage.

Even though the typewriter has been largely replaced by the laser printer and photocopier, documents still have distinctive features. Laser printer drums often have imperfections which confer telltale marks onto

documents (Hudson 1994). The same applies to photocopiers. An FBI agent warned, “People believe photocopies are not traceable, and that’s just not true” (Fisher 1995, 267).

## Section 3.6

Cryptology

*One if by land and two if by sea*

Henry Wadsworth Longfellow 1861, “Paul Revere’s Ride”

### INTRODUCTION

Edgar Allan Poe had a lifelong interest in cryptograms. In *The Gold Bug* (GBUG), a story for which Poe won a \$100 prize in 1843 (Silverman 1991, 205), he made the solution of a cipher the key plot element. Doyle does the same thing in *The Dancing Men* (DANC). Both authors employ a substitution code and have their protagonist use frequency analysis to solve the problem.

Even prior to GBUG Poe had published cryptograms as a challenge to his readers. The first of his several cryptology articles appears in the December 1839 issue of Alexander’s Weekly Messenger (Sova 2001, 61). Then, in 1842 in Graham’s Magazine, Poe published two coded texts to further challenge his readers. He never published the answers and they were not solved for 150 years. The ciphers published by Poe in 1842 were not simple. The first and easier one was not solved until 1992. It had probably been forgotten until a graduate student and Poe expert at Duke University named Terence Whalen solved it. The cryptogram had the message backward. Each letter corresponded to just one letter of the alphabet. The answer turned out to be a quote from a 1713 play “Cato” by Joseph Addison.

The more difficult second Poe cipher required several more years and a computer before giving up its secret. In 1996 Shawn Rosenheim, a Poe scholar from Williams College, established a prize for the person who solved it. The prize of \$2500 was won in 2000 by Gil Broza, a computer programmer from Toronto, Canada.<sup>7</sup> In this complicated cryptogram the letter “e,” for example, has fourteen different meanings; “z” has two different meanings. Broza started with the hypothesis that three letter words were either “the,” “and,” or “not.” This enabled him to get four of the letters of the word afternoon, which he then guessed.

<sup>7</sup> New Yorker magazine Nov. 27, 2000, p. 38.

## REAL CASES

Codes have always been used in wars. Doyle employs two such codes, both from the American military. In the Revolutionary War (1775–1783) the American general Benedict Arnold made himself the everlasting symbol of perfidy to Americans by passing information to the British. He would send coded messages to a Tory<sup>8</sup> friend in Philadelphia. The simple code employed had been used for many years. Both users had a copy of the famous law book, *Blackstone's Commentaries on the Law of England*. The messages consisted of a series of numbers which led to words in that book. Each word was described by three numbers: page, line, and word number in that line (Butler 2001, 68). Such codes are very difficult to break since the book being used is generally unknown to anyone but the users.

Here is an actual example of a Benedict Arnold message dated July 12, 1780:

120.9.7, W----- 105.9.5's on the.22.9.14.---/of 163.8.19 F-----  
 172.8.7s to 56.9.8 |30.000| 172.8.70 to 11.94. in / 62.8.20. If  
 179.8.25, 84.8.9'd, 177.9.28. N---is 111.9.27'd on / 23.8.10. the  
 111.9.13, 180.9.19 if his 180.8.21 an.179.8.25., 255.8.17. for /  
 that, 180.9.19, 44.8.9—a—is the 234.8.14 of 189.8.17. I ---/44.8.9,  
 145.8.17, 294.9.12, in 266.8.17 as well as, 103.8.11, 184.9.15.---  
 -/80.4.20.---I149.8.7, 10.8.22'd the 57.9.71 at 288.9.9, 198.9.26,  
 as, a / 100.4.18 in 189.8.19—I can 221.8.6 the 173.8.19, 102.8.26,  
 236.8.21's---/and 289.8.17 will be in 175.9.7, 87.8.7---the 166.8.11,  
 of the.191.9.16 / are.129.19.21 'of--266.9.14 of the.286.8.20, and  
 291.8.27 to be an---163.9.4 / 115.8.16 -'a.114.8.25ing---263.9.14. are  
 207.8.17ed, 125.8.15, 103.8.60---/from this 294.8.50, 104.9.26—If  
 84.8.9ed—294.9.12, 129.8.7. only / to 193.8.3 and the 64.9.5,  
 290.9.20, 245.8.3 be at an, 99.8.14 . / the.204.8.2, 253.8.7s are  
 159.8.10 the 187.8.11 of a 94.9.9ing / 164.8.24, 279.8.16, but of  
 a.238.8.25, 93.9.28.

The decoded result:

*General W[ashington]---expects on the arrival of the F[rench]---Troops  
 to collect / 30,000 Troops to act in conjunction; if not disappointed,  
 N[ew]. York is fixed / on as the first Object, if his numbers are not  
 sufficient for that Object, / Can-a- is the second; of which I can inform  
 you in time, as well as of / every other design. I have accepted the*

<sup>8</sup> An American sympathetic to the British cause.

*command at W[est]. P[oint]. As a Post in which / I can render the most essential Services, and which will be in my disposal. / The mass of the People are heartily tired of the War, and wish to be on / their former footing—They are promised great events from this / year's exertion— If—disappointed—you have only to persevere / and the contest will soon be at an end. The present Struggles are / like the pangs of a dying man, violent but of a short duration—*  
(Wikipedia)

In 1780 Arnold's British contact, a Major Andre, was captured and papers exposing Benedict Arnold were found. Arnold fled and spent two years fighting with the British army. He eventually retired to London and died there a few years later.

During the Civil War, a Union sympathizer, J. O. Kerbey, managed to gain employment with the Confederacy as a telegrapher. He proceeded to use a courier to send coded messages containing military information to Washington. In his code every fifth word was to be read (Butler 2001, 120). This same type of code was the basis for the Captain Midnight decoder rings that were popular with young viewers of the TV show in the 1950's. Each week young members of the Secret Squadron would receive a message that would reveal hints about the plot of the upcoming episode. They would be told to use their decoder rings and then read, for example, every tenth word in order to decode the message.

Another military coding strategy was the World War II use by the US military of the Navajo Code Talkers. This ingenious code merely used Navajo, a spoken and not a written language. Almost no one outside the tribe knew the language. About 200 young Navajo men were employed in this effort. During training a group of 32 men developed words for military things that were not even in their regular language. It is thought that not even Navajo speakers could have understood them (Butler 2001, 77). The Navajo code was declassified in 1968 (Nez 2011). The code had a few hundred Navajo words for common terms, and spelled out any other words needed. For example, the letter "a" was represented by any of three Navajo words whose English meaning was a word starting with "a" (Nez 2011, 103). The Navajo code talkers were active in the Pacific theater. They sent messages about troop locations, calls for ammunition, food, medical supplies, and any other information deemed important enough for coding. In at least one operation the command declared that only Navajo code would be used (Nez 2011, 189).

An interesting case of a code resulting in a criminal conviction is that of Patty Hearst in 1974. She was kidnapped by the so-called Symbionese Liberation Army (SLA). Later she was photographed participating in a bank

heist with SLA members. Coded messages were used by this group. Hearst was convicted of armed robbery because she had been given access to the SLA code. This was taken as proof that they trusted her. Therefore her participation was considered to be voluntary (Fisher 1995, 272). Her original sentence of 35 years was commuted, and she was released in February 1979, having served 22 months. In 2001, she received a full pardon from President Bill Clinton.

## HOLMES'S USAGE

Doyle first uses a cipher in a Holmes case in his nineteenth effort, *The Gloria Scott* (GLOR). This is also Holmes's first code to solve, as he tells us that this is his first case, solved while he was a college student.<sup>9</sup> Victor Trevor, the only friend Holmes made during his two years in college invites Holmes to spend the long vacation at the Trevor estate. Victor's father, Old Trevor, is so amazed by what Holmes can deduce about him that he tells Holmes,

"I don't know how you manage this Mr. Holmes, but it seems to me that all the detectives of fact and of fancy would be children in your hands. That's your line of life sir."

Soon things go bad for Old Trevor. A colleague from the past, Hudson, turns up and blackmails him, staying for weeks. After Victor drives Hudson away, a coded note from Old Trevor's friend Beddoes soon arrives:

"The supply of game for London is going steadily up. Head-keeper Hudson, we believe has been now told to receive all orders for fly-paper and for preservation of your hen-pheasant's life."

After reading the coded note, Old Trevor, aka James Armitage, has a stroke and dies.<sup>10</sup> Holmes quickly solves the cipher, realizing that the code merely consists of instructions to read only every third word, ala Captain Midnight. This converts the nonsensical wording into the message to: "The game is up. Hudson has told all. Fly for your life."

Armitage had been convicted of embezzling from the bank where he was employed in London. Sent to Australia aboard the *Gloria Scott*, he escaped by participating in a mutiny. Now having his freedom, he changed his

<sup>9</sup> Sherlockians have amused themselves by trying to construct a chronology of Holmes's cases. This is made difficult and thus more enjoyable, by the fact that Doyle was careless in this regard.

<sup>10</sup> Is Armitage's death another example of the Baskerville Effect?

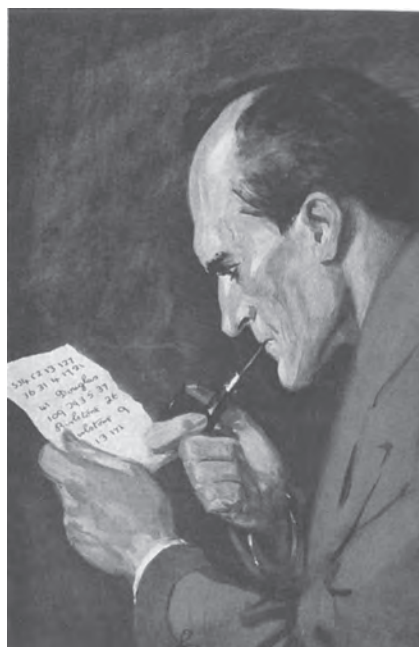


Figure 3.5 Holmes and Cipher

name to Trevor, returned to England, and prospered. Hudson was the lone seaman who had survived when the *Gloria Scott* sunk at sea. He eventually found Trevor and extracted money and support in return for his silence about his past as James Armitage.

In VALL, Holmes is getting information from within the Moriarty organization. He receives a coded message in Fred Porlock's handwriting:

534 C2 13 127 36 31 4 17 21 41 Douglas 109 293 5 37 Birlstone  
26 Birlstone 9 127 171

Holmes deduces that Porlock is using page 534 and column 2 of a book. Unlike Benedict Arnold, Holmes did not know which book was being used. But he is able to brilliantly deduce the title. The book must be common enough that Porlock would be sure Holmes had a copy. It must be large enough to have at least 534 pages and 2 columns. The numbers then tell the word. Since the words Douglas and Birlstone do not appear on page 534 in the book, they are written out. Using an old version of Whitaker's Almanac, Holmes soon learns that Douglas is in danger from Professor Moriarty.

"There is danger may come very soon one Douglas rich country  
now at Birlstone House Birlstone confidence is pressing"

Alas it is likely that it wasn't only Douglas who was in danger. We never hear of Porlock again.

The cipher used in VALL is of the type known as an Arnold cipher, or sometimes an Abner Doubleday cipher. Doubleday, a Union general in the American Civil War, is considered by many to be the inventor of the game of baseball. A recent biography of Abner Doubleday (Barthel 2010, 1) denies he had anything to do with baseball. He did, however, use a cipher system very similar to that employed by Benedict Arnold.

Abner Doubleday was stationed at Fort Sumter just before the first shot in the American Civil War was fired there. He and his brother Ulysses, a New York banker, feared that their correspondence was being intercepted and read. So Abner proposed that they code their messages using the exact same edition of a dictionary (Barthel 2010, 57). Then 3 numbers would define a word: page number, column number, and word number from the top. The Doubledays used this code from September 1860 to March 1861. The use of a dictionary and multiple pages pretty much allowed the brothers to find exactly the words they wanted. In VALL Porlock is hampered by being restricted to one single page of the almanac. Thus the phrase "confidence is pressing" is as close as Porlock could come to conveying a sense of urgency to his message.

Abner Doubleday described their cipher in his 1876 book entitled "Reminiscences of Forts Sumter and Moultrie" (Klinger, L. S. 2006, Vol. III, 637). Was the well-read Doyle aware of the Arnold Cipher and Doubleday's book? Doyle does mention the American Civil War in three Holmes stories. But if he was aware, why didn't he use the more flexible approach of allowing multiple pages to be cited?

In REDC Doyle employs a code almost as simple as Paul Revere's. The Red Circle is a secret Italian political terror organization (Bunson 1994, 208). Gennaro, regretting that his membership in the Red Circle has put himself and his wife Emilia in danger, has hidden her in Mrs. Warren's boarding house. The landlady is alarmed by the fact that her new tenant never leaves the room, even for meals. So she consults Holmes. Gennaro communicates with Emilia by means of the agony column<sup>11</sup> in the Daily Gazette.<sup>12</sup> Holmes is an ardent reader of the agony column. He uses it in several cases, and in *The Noble Bachelor* (NOBL) he even remarks that all he reads in a newspaper is the criminal news and the agony column. Soon, Holmes is reading Gennaro's messages to Emilia. In one of his newspaper messages Gennaro tells Emilia the code and when and where he will use it to send her an important message. In Gennaro's code one flash of light

<sup>11</sup> Today's personals.

<sup>12</sup> REDC is one of 14 Holmes stories where advertising in newspapers is mentioned.

means A, two means B, etc. Holmes is there to intercept the message and soon solves the case.

Here is one of many instances where Doyle is less than careful with details. Since the Italian alphabet has no letter “k,” the signal sent by Gennaro does not actually spell the warning “attenta” (beware). For example 20 flashes is then not “t,” but “u.” The result is a nonsensical message. But Sherlockian scholars are always ready with an (ingenious?) explanation. One suggestion (Yates, D. A. 1956) is that Emilia and Gennaro, in order to confuse the Red Circle (but not Sherlock Holmes!), agree to use the English alphabet to spell Italian words.

Doyle’s most extensive use of cryptology occurs in DANC. Here Poe’s strong influence on Doyle is again evident. In fact Doyle stated that “all cryptogram solving yarns trace back to” Poe’s GBUG (Fowler 1994, 363). Both authors use a substitution cipher that is solved using frequency analysis. The two ciphers provide another example of the relative clarity of Doyle’s writing. Poe’s presentation of the code in GBUG is confusing to the reader. Here it is:

53†††305)6\*;4826)4†.)4†);806\*;48†8¶(60))85;1†(;†\*8†83(88)5\*†;46  
(;88\*96\*?;8)\*†(;485);5\*†2.\*†(;4956\*2(5\* — 4)8¶8\*;4069285);)6†8)  
4††;1(†9;48081;8:8†1;48†85;4)485†528806\*81(†9;48;(88;4(†?34;48  
)4†;161;:188;†?;

When decoded the message contained directions telling where on Sullivan’s Island to dig for a hidden treasure. William Legrand followed the instructions and successfully recovered a great fortune in gold and jewels.

Doyle’s dancing men are much easier on the eye and add allure to the tale.

In GBUG, Legrand assumed that the most common character in the coded message, the number 8, represented the most common letter, “e.” He then found no less than seven instances in the message where the three character sequence “;48” appeared. Assuming this to be the word “the,” Legrand was well on his way to the solution. He was then able to find the hidden treasure.<sup>13</sup>

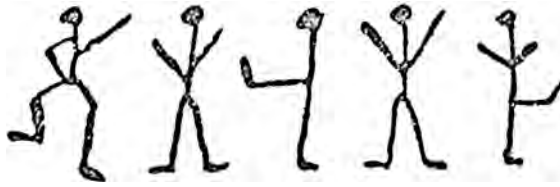
Holmes uses a very similar approach. Initially he is hampered by lack of data. In GBUG the single coded message contained 193 characters. Initially Holmes has only the 15 characters of the first message from Chicago gangster Abe Slaney to his former fiancé, Elsie Cubitt, “Am here Abe Slaney.”

<sup>13</sup> In *The Musgrave Ritual* Holmes also solves a cryptic message and recovers a treasure (Hodgson 1994, 213).



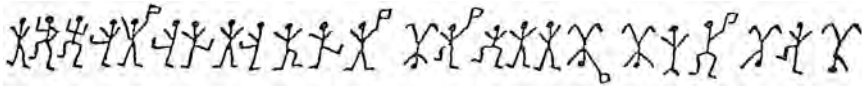


Holmes applies his knowledge of statistics and waits for more data. Finally after five messages totaling 62 characters, he solves the cipher. Like Legrand, Holmes also assigns the most frequent of the 62 characters to the letter “e.” There are fully 17 e’s in the 62 letters in the five messages. He deduces that a man holding a flag is the last letter in a word. Then he notices that the fourth message is just a five letter word with “e” in both the second and fourth positions.



N E V E R

He considers the word “never” to be more likely than “sever” or “lever.”<sup>14</sup> Next Holmes realizes that Elsie’s name might very well be included in a message. When the fifth message contains a five letter word beginning and ending with “e,” Holmes has the l, s, and i.



Soon Holmes has the solution.<sup>15</sup> But the fifth message sounds ominous,  
“Elsie, prepare to meet thy god.”

Rushing to the Cubitt home, Holmes is too late to prevent the death of Hilton Cubitt. Though Holmes solved the cipher, this case can hardly be considered a

<sup>14</sup> On the other hand Doyle has Holmes ignore a number of other words that have “e” second and fourth, including such promising ones as seven and jewel.

<sup>15</sup> It was noticed long ago that the dancing men used for the letter V in message four and that used for the letter P in message five are identical. Recently it has been determined that the print shop faithfully reproduced what they were given. This error can now be attributed to Arthur Conan Doyle. Of course Sherlockians would say Watson wrote it down wrong. (Klinger, L. S., 2011, *Baker Street Journal*, Vol. 61, #4, p. 24).

success. Abe Slaney kills Hilton Cubitt. Elsie Cubitt, in despair over her husband's death, shoots herself in an unsuccessful attempt at suicide. Holmes apprehension of Abe Slaney is somewhat anti-climatic. But there is some poetic justice in that Holmes lures Abe Slaney to come to him by leaving a message in Slaney's own code, where the flags held by the stick men signal the end of a word.



C O M E H E R E A T O N C E

Slaney, thinking the message is from his beloved Elsie, walks right into the trap and is captured.

Those who lament Doyle's lack of attention to detail should take note that he has Holmes state the order of the frequency of letter usage to be E, T, A, O, I, N, S, H, R, D, L. This exactly matches the true list of the first eleven letters. Poe, however, is way off. His list in GBUG is: E, A, O, I, D, H, N, R, S, T, U (Fowler, A. in Hodgson 1994, 358).

## SUMMARY

Just as in the case of footprints, Doyle uses a diverse array of ciphers in the Holmes stories. As we have seen, the codes used by Doyle in the Holmes stories are relatively simple ones. Holmes however, is certainly capable of solving more complicated ciphers. He informs us in DANC that he has written a monograph in which he analyzed 160 different ciphers.

## Section 3.7

Dogs

*Dogs never make mistakes*

Sherlock Holmes, "Shoscombe Old Place"

## INTRODUCTION

The most famous dog to appear in the Holmes stories is, of course, the Hound of the Baskervilles. In 1742 Hugo Baskerville had his throat torn

out by a dog “larger than any hound that ever mortal eye has rested upon.” The family is then plagued by the Hound of the Baskervilles for more than 150 years. This unrealistic time-span makes attentive readers question whether there is a dog in the story at all. But not for long, at the end of chapter two we’re told of those footprints of a “gigantic hound.” In Holmes time Sir Charles Baskerville is chased by the hound until he dies of fright. A number of other dogs appear as well. Several of them play a role in Holmes’s work: Toby in SIGN, Pompey in MISS, Roy in *The Creeping Man* (CREE), Carlo the poisoned spaniel in *The Sussex Vampire* (SUSS), Mrs. Hudson’s terrier in STUD, Lady Beatrice Falder’s spaniel in *Shoscombe Old Place* (SHOS), and the unnamed hound in *Silver Blaze* (SILV). In CREE we learn that Holmes considered writing a monograph on the use of dogs in detective work.

## WORKING DOGS

Dogs have been used in forensic investigations as long ago as 400 B.C. (Gerritsen & Haak 2007, 20). After some eighteenth century police dog activity in Belgium, their use was banned in 1793. More than a century passed before the use of dogs for police work resumed (Gerritsen & Haak 2007, 23). Police dogs generated a lot of favorable publicity beginning with an identification of a murderer in Germany in 1903. There followed a number of other successful cases in the next decade (Gerritsen & Haak 2007, 26). A good candidate for most famous police dog is Rex III who, in 1950’s England, made more than 130 “arrests” (Lane 2005, 55). Originally German Shepherds were the breed of choice for police work. In fact the Royal Canadian Mounted Police Dog Section, formed in 1935, still uses only German Shepherds (Burke 2007). The first police dog for the Canadian Mounties was named Dale. Upon being put into service, he immediately tracked and caught a car thief. In 1910 the Rottweiler was named the official breed for police work in Germany. In recent times the Malinois has become preferred (Gerritsen & Haak 2007, 117). Since 1960 identification by a police dog has been taken as acceptable proof in Scotland (Putnam 1991, 24). The Dutch Supreme Court has made a similar ruling.

In the United States the use of police dogs is governed by the individual states. For example, Connecticut started its canine corps in 1937 (Police Chief, January 1991, p. 50), while Virginia began its in 1961 (Police Chief, October 1991, p. 60). In recent years police dogs have provided assistance in locating drugs. Their sense of smell is a thousand times more sensitive than humans (U. S. Public Television, “Dogs That Changed the World,” *Nature*, October 2011). Their sniffing ability has been employed by U. S. Customs where beagles have been used. Police in Ohio have even used

chihuahuas to detect marijuana (Jackson, J. 2007). The evolution of police dog responsibility in Connecticut has been typical. Initially the dogs were used for criminal detection and perhaps crowd control. In 1967 the dog's duties were expanded to include narcotics detection. Starting in 1971 detection of explosives was added to their expertise. In 1979 the dogs started doing body searches. Finally, in 1986 they began detecting accelerants used in arson, where they exceeded the success rate of the mechanical device they replaced (Police Chief, October 1991, p. 60–65).

New York City has two kinds of police dog. Patrol dogs are generally German shepherds or Malinois; detection dogs are usually Labrador retrievers. A study done in Michigan in 2000 showed that the success rate of detection dogs was 93 percent. They far outperformed the teams of two to four police officers who only managed a 59 percent rate (Bilger 2012, 55). The dogs also were five to ten times faster than the humans.

Working dogs have frequently been used by the military. In World War I Germany used over 30,000 dogs (Bilger 2012, 48). The most famous dog helping the American soldiers in World War I was Stubby. He served mainly in France where his acute hearing and sense of smell frequently aided the soldiers. In 2006 Stubby was again honored, this time with a brick in the Walk of Fame at the World War I museum in Kansas City. Stubby's World War II counterpart was Chips. He also served in Europe where he reportedly captured enemy soldiers on his own (America Comes Alive website). In World War II over 10,000 dogs, most of them Doberman Pinschers, were employed by the US military in the Pacific theater. There no camp guarded by a dog was ever subject to a surprise attack (Gerritsen & Haak 2007, 196). Very recently, a Belgian Malinois named Cairo accompanied the US military mission into Pakistan that resulted in the death of the terrorist Osama bin Laden (Smidle 2011, 35). Cairo's assignment was two-fold. He would help deter any curious neighbors around the perimeter of the bin Laden compound. Secondly, he would search inside for false walls and hidden doors should that prove necessary. Cairo participated in all the training drills in North Carolina and Nevada (Schmidle 2011, 39). Cairo's work earned him an introduction to the President of the United States. The American military services now have about three thousand active-duty dogs (Bilger 2012, 48).

## HOLMES'S USAGE

In SIGN Holmes sends Watson to fetch Toby, "half spaniel and half lurcher." Given the task of tracking Tonga, who has stepped in the odiferous creosote, Toby soon shows that he is no bloodhound. Instead of Tonga, Toby



Figure 3.6 Holmes and Watson and dog

leads Watson to the creosote factory.<sup>16</sup> But Holmes's faith in dogs never wavers. In *MISS*, Holmes tries again. This time he uses Pompey, who is part foxhound and part beagle.<sup>17</sup> Pompey's job is to find the missing Godfrey Staunton. Holmes has used a syringe to squirt aniseed onto the back wheel of Dr. Armstrong's carriage. Pompey is up to the task and follows the aniseed odor directly to the cottage where the distraught Staunton is found with his recently deceased wife. Perhaps aniseed is easier to track than creosote.

*The Creeping Man* (CREE) is the story where Holmes and Watson discuss the use of dogs in detective work. Holmes tells Watson that he is considering writing a monograph on the subject. Professor Presbury is the creeping

<sup>16</sup> Toby does better work tracking Professor Moriarty in Nicholas Meyer's *The Seven Percent Solution*.

<sup>17</sup> Has Toby been fired?

man, and when his wolfhound, Roy<sup>18</sup>, attempts to bite the professor on several occasions, Holmes is consulted as to the cause. He bases his conclusions partly on the dog's ability to detect a significant change in his master. Courting a woman much younger than he, the professor was taking a serum which conferred great strength and agility, but altered his personality (and perhaps his odor) as well. His taunting of Roy nearly cost the professor his life as the chained dog got loose and in his rage almost killed Presbury. A similar event occurs in *The Copper Beeches* (COPP) when the starving mastiff, Carlo, attacks and nearly kills his owner, Jephro Rucastle.

Another case of a dog detecting a change in his master occurs in the sixtieth and last story written, SHOS. The role of the dog is of such importance that the story was originally called *The Adventure of the Black Spaniel* (Holroyd 1959, 49). Here a spaniel belonging to Lady Beatrice Falder is lonely for its mistress. Holmes, suspecting that Lady Beatrice is dead, uses her spaniel to verify that the veiled passenger in the carriage is someone else. First elated at the sight and perhaps the odors from the approaching carriage, the dog snarls upon getting close and realizing that Lady Beatrice is not within. In this way Holmes verifies his hypothesis and the solution to the case soon follows.

In SUSS there is the reverse instance of Holmes detecting a change in a dog. The other Carlo in the Canon belongs to Robert Ferguson. Holmes deduces instantly upon seeing Carlo drag his rear legs that the spaniel has been used as a test case for the administration of poison. This poison will be discussed in chapter five.

In LION the death of Fitzroy McPherson's dog is the clue that leads Holmes to realize the true meaning of the phrase Lion's Mane. Why did the Airedale die in the same manner and at the same place as his master? And when Ian Murdock nearly meets a similar fate at that same dangerous spot, Holmes finally, belatedly recalls the dangerous poisonous *Cyanea capillata*. Slow to act, Holmes nearly fails in this case. But eventually he solves the crime and exonerates all humans from blame.

In STUD another dog, Mrs. Hudson's terrier, dies. Holmes, in accordance with the landlady's wishes, administers a poison pill that kills the sickly dog. In doing so he demonstrates the method by which Jefferson Hope murdered Enoch Drebbler. Hope let Drebbler choose one of two pills and then took the other pill himself. When it was Drebbler who died, Hope's beloved Lucy Ferrier was avenged. In a similar way Carlo in SUSS is administered poison too. The unbalanced, deformed teenaged Jacky is filled with hate for his healthy new half-brother. He wants to administer curare to kill the toddler and uses Carlo as a test case to help figure out the needed

<sup>18</sup> Doyle himself had a dog named Roy.

dosage of the poison. Carlo survives. Holmes is able to unravel the facts and demonstrate that Mrs. Ferguson is in fact a loving mother and innocent of the attack on the baby.

Finally, in SILV, Holmes immediately realizes the importance of the silence of the hound during the night. Scotland Yard's Inspector Gregory is baffled by the facts of the case. His request for help from Holmes gives rise to this famous exchange:

Inspector Gregory: "Is there any point to which you would wish to draw my attention?"

Sherlock Holmes: "To the curious incident of the dog in the night-time."

Inspector Gregory: "The dog did nothing in the night-time."

Sherlock Holmes: "That was the curious incident."

Later Holmes reveals that the dog quietly let itself be taken out on the moor in the middle of the night because it was John Straker himself, Silver Blaze's trainer, who led him out. There Straker tried to snip his own horse's tendon. That was when Silver Blaze rose up and struck Straker on the head with his hoof, instantly killing him. Straker had bet heavily on the opposition horse.

## SUMMARY

Doyle provides us an interesting array of dogs. In SIGN the dog fails to track the person. In MISS the dog succeeds in finding the person. In CREE the dog detects a major change in the person, his master. In SHOS the dog demonstrates the absence of the person. Two dogs, in CREE and COPP, attack their masters, but for different reasons. Two other dogs are poisoned in SUSS and STUD, both helping Holmes to solve the case. Perhaps the most interesting dog of all is the nameless hound in SILV. He did nothing in the night-time, and thereby gave rise to the most famous lines in the entire Sherlock Holmes Canon. Holmes, a believer in dogs right to the end, claims in SHOS that dogs *never make mistakes*. Apparently he has forgotten Toby's failure, so long ago, in SIGN.

It is notable that once again Holmes is a pioneer in a forensic technique. As we have seen, canine corps in police departments are a rather recent innovation with most formed in the twentieth century, long after Holmes used Toby.

## Section 3.8

### CONCLUSION

The material presented in this chapter suggests that, when it came to forensic science, Arthur Conan Doyle was an innovative thinker. That his contemporaries believed so is evident from this quote published in the *Illustrated London News* on February 27, 1932, nineteen months after Doyle's death:

“Many of the methods invented by Conan Doyle are today in use in the scientific laboratories. Sherlock Holmes made the study of tobacco ashes his hobby. It was a new idea, and now every laboratory has a complete set of tables giving the appearance and composition of the various ashes.

Mud and soil from various districts are also classified much after the manner that Holmes described.

Poisons, handwriting, stains, dust, footprints, traces of wheels, the shape and position of wounds, the theory of cryptograms:— all these and other excellent methods which germinated in Conan Doyle's fertile imagination are now part and parcel of every detective's scientific equipment.”

Doyle's son Adrian claimed that his father was the first to come up with the idea of using plaster of Paris to preserve footprints. This is, of course, based on Holmes's remark in *SIGN*,

“Here is my monograph upon the tracing of footsteps, with some remarks upon the uses of plaster of Paris as a preserver of impresses.”

And perhaps there is truth in the claim that the French police studied the methods of Holmes by reading the 1906 volume *L'Ouvre de Conan Doyle et la police scientifique au vingtieme siecle* (Green 1983, 109), or that the Egyptian police also studied Holmes's methods (Booth 1997, 208; Fido 1998, 100).



## 4

## Sherlock Holmes: Chemist

## Section 4.1

Introduction: Profound or Eccentric?

*He is a first-class chemist*

Young Stamford, “A Study in Scarlet”

The previous chapter discussed Sherlock Holmes as a scientifically oriented detective. He was also knowledgeable about science in general. Practically every story contains at least some mention of one of the sciences. Having seen how Holmes used science in his detective work, we will now look at his interest in research and his love of things scientific. In *The Gloria Scott Case* (GLOR), one of just two of the sixty stories narrated by Holmes instead of Watson, he says, “during the first month of the long vacation. I went up to my London rooms where I spent seven weeks working out a few experiments in organic chemistry.”<sup>1</sup> Watson tells us in *The Three Students* (3STU) that without his chemicals Holmes was “an uncomfortable man.” So there are clear indications that Holmes was devoted to science, and that his first love was Chemistry.

Commentators disagree about the chemical ability of Holmes. Most praise Sherlock Holmes as a chemist (see Cooper 1976, Gillard 1976, Graham 1945, Holstein 1954, Michell 1946). The most notable critic of Holmes’s chemistry is Isaac Asimov. His objections will be discussed in section 4-4. Dr. Watson even disagrees with himself about Holmes the chemist! Before Watson even meets Holmes, at the very outset of *A Study in Scarlet* (STUD), he is told by “Young Stamford” that Holmes is “a first class chemist.” Stamford then performs his historic role of introducing Holmes and Watson. It doesn’t take Watson long to realize his new roommate is a unique mixture of knowledge and ignorance. But when he learns, in STUD,

<sup>1</sup> This quote has caused me to wonder for years about my own students scientific efforts, or lack thereof, over Christmas break.



Figure 4.1 SH doing chemistry

that Holmes is unaware of the Copernican Theory and the composition of the solar system, Watson is stunned.

Holmes: “you say we go round the sun. If we went round the moon it would not make a pennyworth of difference to me or to my work.”

Watson: “But the Solar System.”

Holmes: “What the deuce is it to me?”

Holmes believes the brain has a limited capacity. Therefore useless facts like the nature of the solar system should be forgotten, lest they crowd important things.<sup>2</sup> Other fictional detectives don’t necessarily agree. Rex Stout’s detective Nero Wolfe, possibly modeled after Mycroft Holmes, believes the opposite. In *Might As Well Be Dead* he says “The more you put in a brain,

<sup>2</sup> Rex Stout’s fictional detective Nero Wolfe, possibly modeled after Mycroft Holmes, believes the opposite. In *Might As Well Be Dead* he says “The more you put in a brain, the more it will hold.”

the more it will hold.” Holmes himself appears to change his mind by the time of the 47th story, *The Valley of Fear* (VALL). In that case he discusses Professor Moriarty’s painting by Greuze with Inspector MacDonald. When MacDonald gets impatient with this tangent, Holmes remarks,

“All knowledge comes useful to the detective.”

But the early Holmes believes that anyone with a large head may have a larger than average brain and more mental capacity. He expressed this idea about Henry Baker in *The Blue Carbuncle* (BLUE), the ninth story (see section 2.1). He also remarks in *The Five Orange Pips* (FIVE), the seventh story, about his concept of a “brain-attic” that can hold only so much. Doyle let Holmes accept the ideas of phrenology, the creation of the physiologist Franz Joseph Gall in the late eighteenth century (Smith 2009, 51). One of the tenets of this now discredited theory was that the larger a brain, the more information it could hold. Thus intelligent people were those with the largest brain sizes. When the sizes of the brains of well known brilliant people, such as Albert Einstein, were measured, they were not overly large. Phrenology began to lose credibility. Phrenology also claimed that size and shape of the head could be used to deduce the character traits of a person. When this aspect of Gall’s theory was used to infer racial superiority, phrenology “came to be reviled” (Smith 2011, 52).

Surprised by Holmes’s early opinion on “brain attics,” Watson decides to enumerate his abilities. The resulting document is extraordinary.

#### Sherlock Holmes—his limits

1. Knowledge of Literature - Nil.
2. Knowledge of Philosophy - Nil.
3. Knowledge of Astronomy - Nil.
4. Knowledge of Politics - Feeble.
5. Knowledge of Botany - Variable.

Well up in belladonna, opium, and poisons generally.

Knows nothing of practical gardening.

6. Knowledge of Geology - Practical, but limited

Tells at a glance different soils from each other.

After walks has shown me splashes upon his trousers, and told me by their colour and consistence in what part of London he had received them.

7. Knowledge of Chemistry - Profound.

- 8. Knowledge of Anatomy - Accurate, but unsystematic.
- 9. Knowledge of Sensational Literature - Immense.

He appears to know every detail of every horror perpetrated in the century.

- 10. Plays the violin well.
- 11. Is an expert singlestick player, boxer, and swordsman.
- 12. Has a good practical knowledge of British law.

Holmes seems to be interested only in things that will be of practical use to him in his profession.

“Well, I have a trade of my own. I suppose I am the only one in the world, I’m a consulting detective.”

Seen in this light, Watson’s list makes sense. It explains why he knows about poisons but not gardening. It explains the interest in sensational literature. What it does not explain is his willingness, even eagerness, to spend his time doing chemical experiments that have no relation to detection or crime. Watson has already confirmed Young Stamford’s assessment of Holmes and chemistry. Holmes knows a lot about science in general. But his best science is clearly chemistry. Only chemistry can lure him from one of his cases. In *The Dancing Men* (DANC) Holmes wants to take a train back to London in the middle of the case because he has “a chemical analysis of some interest to finish.” So, we will look at the chemistry in the stories first. In the book’s final chapter, we will examine Holmes and the other sciences.

As time goes on, Watson will discover that Holmes is more well-rounded than this early list suggests. No updated list is ever made. But we know that Watson changed his opinion in later adventures. One of the first things he changed was his view of Holmes the chemist. In FIVE, he recalls that his early rating of Holmes’s knowledge of chemistry was “eccentric,” not “profound.” Most readers feel that this false recollection indicates his new opinion of Holmes the chemist. So, by the time of the seventh story, FIVE, written four years after his initial list in STUD, Watson has downgraded Holmes’s chemical abilities. This chapter should allow us to form our own opinion of profound vs. eccentric.

At this point it might be well to mention the issue of the chronology of the sixty cases chronicled by Dr. Watson. For example, GLOR is the eighteenth story, published in March 1893. In it we are told that Holmes worked on it as a college student. Thus it happened earlier in his life than any other story. There is a considerable literature which attempts to

assign dates during which the action in each story occurs. At least fifteen chronologies have been published (Dirda 2012, 128). Jay Finley Christ, a well known Holmesian chronologist, claims that GLOR took place in late September of 1876. His date for FIVE is Tuesday September 24, 1889. He chooses 1889 over 1890 because Watson remarks on the “hard rain.” Christ checked the actual records of the Weather Office and found that hard rain could only have been in 1889. For those interested in such detail<sup>3</sup>, Christ’s work is a good place to start (Christ 1947).

## Section 4.2

Coal Tar Derivatives and Dyes

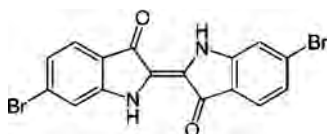
*I spent some months in a research into the coal-tar derivatives  
Sherlock Holmes, “The Empty House”*

In Holmes’s time, and well before, London’s streets were illuminated by gas lamps. The gas being burned was derived from the distillation of coal. Millions of tons of coal were processed every year to supply the gas. The coal was heated in closed vessels in the absence of oxygen. There were by-products in this process and they were initially considered useless. One of the by-products was a large amount of oily tar, called coal tar. It was deemed so worthless that anyone could have it for free (Garfield 2001, 23). Gradually though, chemists were able to extract useful chemicals from the coal tar. A major step occurred in 1856 when William Henry Perkin was able to isolate a beautiful purple molecule from coal tar. The very large synthetic dye industry arose in the years following Perkin’s discovery

During the Great Hiatus following *The Final Problem* (FINA), Holmes worked on coal-tar derivatives in Montpellier in southern France. We’re never told what aspect of coal-tar derivatives was the object of his research. Moss has proposed that Holmes was attempting to isolate carcinogens from coal-tar (Moss 1982, 41). Clark suggests that Holmes was active in the development of radiation technology (Clark 1964). Caplan, Inman, and the Michells disagree. They suggest that synthetic dyes were Holmes’s topic (Caplan 1989; Inman 1987; Michell and Michell 1946). Stinson also supports the idea of dyes and I agree with the majority (Stinson, R. 2003).

<sup>3</sup> Doyle wasn’t.

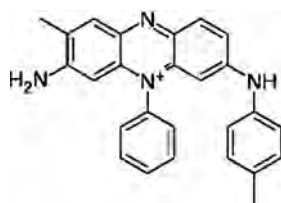
At that time of Holmes's Great Hiatus, 1893–1903, England was losing the industrial battle for pre-eminence in dyes. Caplan's suggestion is that Holmes was involved in a patriotic attempt to revive the English dye industry. William Henry Perkin had started the "world's first high-tech science-based industry" (Travis 2007, 43) when he accidentally made mauve, a brilliant purple dyestuff. Perkin did this in 1856 in London. It is well known that he was trying to find a synthetic route to quinine. Failing that, he pushed forward to see what was in the "reddish" and "perfectly



black" powders that he had obtained instead of quinine (Garfield 2001, 36). When he extracted a beautiful purple color from the black powder, Perkin switched gears. The 18 year old student, with financial backing from his father, built a dye factory. Perkin initially called his dye Tyrian Purple (Garfield 2001, 43). That was the name of a well known, natural, expensive purple dye long harvested from mollusks, particularly *murex branderis*, from the Mediterranean Sea. It was very expensive because it took 8000 snails to produce one gram of Tyrian Purple. Such expense gave rise to the word "porphyriogenatos," literally "born in the purple." The word was an indicator of great wealth. Julius Caesar decreed that only the emperor and his family could wear purple garments (Garfield 2001, 39). "The mighty of the world all coveted this rare commodity" (Born 1937, 115).

Until Perkin's discovery, clothes could only be colored using natural dyes extracted from plants (indigo) or animals (Tyrian Purple). In 1856 England was spending over £2,000,000 importing dyestuffs (Saltzman and Kessler 1991, 7). Synthetic dyes like mauve were much cheaper. Soon natural dyes would be priced out of existence. The Tyrian Purple molecule is dibromoindigo,  $C_{16}H_8Br_2N_2O_2$ . Replacing the two bromine atoms with hydrogen atoms gives the indigo molecule,  $C_{16}H_{10}N_2O_2$ . Indigo has the wavelength of light shifted so that it is a blue dye. Natural indigo is extracted from a plant. Here we have one of only a handful of examples where an animal, *murex branderis*, and a plant, *indigofera*, produce essentially the same molecule (Hoffmann 1990, 309). Because Great Britain was importing over a million pounds of indigo each year, chemists considered the laboratory synthesis of indigo to be the "Holy Grail" (Garfield 2000, 124). No wonder chemists were hard at work on coal tar colors. A commercial synthesis was guaranteed to be very profitable. A method for producing the dye in the

laboratory went commercial in 1897. In that year nearly two million acres in India were used for growing indigo plants (Roberts 1989, 72). Within twenty years the indigo crop was of no importance (Garfield 2000, 126). It could not compete with the inexpensive commercial version which produced exactly the same molecule. In the United States indigo plants were harvested beginning in 1747, mainly in South Carolina. By the time of the



American Revolution South Carolina was exporting a million pounds of indigo per year to Europe (McKinney 2011, 4). But the American indigo crop was neglected during the war. Afterwards it could not compete with India's crop and it slowly went out of business. It finally totally disappeared after the U. S. Civil War. ([sciway3.net/proctor/state/sc\\_rice.html](http://sciway3.net/proctor/state/sc_rice.html)). Today indigo production continues to be a big business, with over 34 million pounds produced worldwide in 2002.

Empress Eugenie of France, a fashion setter, began to wear clothes colored by Perkin's purple in 1857. Then, when Queen Victoria also chose purple to wear to her daughter's wedding in 1858, the popularity of the dye soon to be called mauve exploded.

Perkin swiftly became wealthy and retired from the industry at age 36. Now, "for the first time, people realized that the study of chemistry could make them rich" (Garfield 2001, 48). It didn't take long for people in other countries to start their own dye industry. The British scientific establishment had a great aversion to commercial aspects of their craft (U.S. News & World Report, April 30, 2001). But the Germans eagerly pursued the profits to be had from dyes. Soon the German dye industry surpassed that of England. The nature of patent law in the two countries favored German advances (Saltzman and Kassler 1991, 10). Fully 80 percent of dyes sold in England were being made in Germany (Garfield 2001, 146). The noted British educator and chemist, Henry Enfield Roscoe, lamented in 1881 (Saltzman and Kessler 1991, 9),

"To Englishmen it is a somewhat mortifying reflection that whilst the raw materials from which all these coal tar colours are made

are produced in our country, the finished and valuable colours are nearly all manufactured in Germany.”

The German view was different and perhaps overly enthusiastic. We can read about it in the preface to Theodore Weyl’s 1885 book on coal tar colours (Caplan 1989, 30).

“Thanks to the cooperation of theory and practice, the coal tar industry of Germany has conquered the world, and inasmuch as new and improved methods are continually being devised, will be able to maintain its pre-eminent position.”

Arthur Conan Doyle would have been aware of this decline in the English dye industry. When he had Holmes work on coal-tar derivatives in France, it is likely that he had German dominance in dyes in mind. The ever practical Holmes was doing research on dyes in an effort to stem the tide of German industry.

## Section 4.3

Chemical Poisons

*I dabble with poisons a good deal*

Sherlock Holmes, “A Study in Scarlet”

### GASES, CO AND CO<sub>2</sub>

Today carbon monoxide, CO, is not generally thought of as a murder weapon. It is still used to accomplish suicide. A closed garage with an automobile running will take only about five to ten minutes to kill anyone in the garage (Blum 2011, 134). In the early twentieth century it was sometimes used to murder. The victim’s lungs would end up being filled with CO. A convenient source was illuminating gas, a mixture of CO, hydrogen gas (H<sub>2</sub>), and some hydrocarbons. Illuminating gas was initially made by gasification of coal, leaving behind the coal tar discussed in the previous section. The first house to be lighted by burning illuminating gas was that of William Murdoch in Cornwall, in England in 1792. Soon streets in cities were being lighted. Baltimore was the first American city to have lighted streets. They did so with illuminating gas beginning in 1821. With this deadly mixture of gases being available in houses a number of deaths were bound to occur. Accidents, suicides, and murders were the result.



There are four deaths by asphyxiation in the Canon. One is the hanging of Blessington in *The Resident Patient* (RESI). The other three involve oxygen deprivation. The most clear-cut of these occurs in *The Greek Interpreter* (GREE). Paul Kratides is being held by Harold Latimer and Wilson Kemp who are attempting to get him to sign over valuable property. Since Kratides speaks no English, the crooks bring Mr. Melas to ask questions in Greek of their captive. Melas is a well-known linguist who is frequently hired to interpret, particularly his native tongue, Greek. Shortly into the interview with Kratides, Melas devises a way to find out about the situation. He begins to add his own questions to those of the criminals. He asks their question immediately followed by one of his own. Kratides answers both. Since everything is being said in Greek, Latimer and Kemp don't realize what is happening.

Melas: "You can do no good by this obstinacy. *Who are you?*"

Kratides: "I care not. *I am a stranger in London.*"



Figure 4.2 Charcoal

Melas: “The property can never be yours. *What ails you?*  
 Kratides: “It shall not go to villains. *They are starving me.*”

At the end of the interview they set the interpreter free. Having learned that a crime is in progress, Melas consults his acquaintance from the boarding house where he lives, Mycroft Holmes. The lazy Mycroft takes the case to Sherlock, and a surprised Watson learns that Sherlock has a brother. When Holmes gets a lead of the whereabouts of Kratides, he goes to collect Melas to help interpret again. But Melas has been kidnapped by the thugs. Then Melas is left with Paul Kratides as Latimer and Kemp run off with Paul’s sister Sophy who has fallen under the influence of Latimer.

Holmes, Watson, and inspector Gregory find Melas and Kratides tied up in a room with charcoal burning in a small brass tripod. The incomplete combustion has resulted in production of carbon monoxide. Soon the amount of CO was sufficient to kill the weakened Paul Kratides. Melas just barely survives due to the timely arrival of Watson, who administers first-aid. The killers escape, but soon meet their end in Hungary.

The mechanism of carbon monoxide poisoning is due to the fact that the Fe in hemoglobin bonds 200 times stronger to CO than it does to O<sub>2</sub>. Thus when both gases are present, it is mainly CO that attaches to the Fe in hemoglobin (Blum 2010, 137). In this way the blood circulating to the brain carries too little oxyhemoglobin and too much carboxyhemoglobin. The result is suffocation due to lack of O<sub>2</sub>. The skin turns cherry-red due to the carboxyhemoglobin (Curjel 1978, 155). The case is not one of Holmes’s great successes. It may not have been one of Doyle’s either. Kratides and Melas are described as “blue-lipped,” a coloration associated with cyanide poisoning, not with carboxyhemoglobin.

Though GREE has an entertaining plot, the story is overwhelmed by the appearance of Mycroft Holmes. The surprise of his existence, not revealed until this 24th story, and the vivid characterization that Doyle presents, tend to divert the reader’s attention from the story at hand. We learn much of Mycroft’s fascinating background and character from this story. We quickly realize that only Mycroft could have this exchange with Sherlock:

“By the way, Sherlock, I expected to see you round last week to consult me over that Manor House case. I thought you might be out of your depth.”

“No, I solved it.”

“It was Adams, of course.”

“Yes, it was Adams.”

Unlike the situation in GREE, the other suffocations take place in confined spaces, i.e. places where the replenishment of oxygen is hindered or stopped. In such spaces deprivation of oxygen necessarily results. In *The Retired Colourman* (RETI) murder is committed by suffocation using an unnamed gas in a “hermetically sealed room.” Perhaps it too was carbon monoxide (Campbell 1983, 19). Illuminating gas could have been the source of the CO. Josiah Amberly kills his young wife and her lover. He then consults Holmes to solve the “disappearance” of his wife. This is a big mistake. As Holmes says, “He felt so clever and so sure of himself that he imagined no one could touch him.” Fittingly the smell of another chemical shows Sherlock the truth. Amberly is the “colourman” mentioned in the story title. Even so, why would a distraught husband be painting the inside of his house at this time? Holmes deduces that Amberly wasn’t distraught, he was covering up the smell of the gas.

The third suffocation occurs in *The Musgrave Ritual* (MUSG), a case brought to Holmes by one of his few college friends, Reginald Musgrave. It involves recovery of the long-lost ancient crown of the King of England. The location of the crown is described by the ritual. It is first solved by Richard Brunton, the Musgrave’s butler for twenty years. When Brunton is discovered inappropriately looking at family materials at 2 AM one Friday morning, the enraged Reginald Musgrave fires Brunton and gives him a weeks notice. Brunton disappears the next Sunday morning. Holmes is called in to investigate the following Thursday. He also unravels the cryptic directions to the location of the crown hat are given in the ritual.

“Whose was it?”

“His who is gone.”

“Who shall have it?”

“He who will come.”

“Where was the sun?”

“Over the oak.”

“Where was the shadow?”

“Under the elm.”

“How was it stepped?”

“North by ten and by ten, east by five and by five, south by two and by two, west by one and by one, and so under.”

“What shall we give for it?”

“All that is ours.”

“Why should we give it?”

“For the sake of the trust.”



*Figure 4.3 Brunton's dead body*

Following the directions given in the Musgrave Ritual (see section 5.1) leads Holmes to a small cellar room, 4 feet square and 7 feet high. The large stone slab covering the top of the room must be larger than 4 feet by 4 feet. Holmes needs help from a burly policeman to remove such a heavy stone. But now the room contains no crown, just Brunton's dead body instead.

Brunton's accomplice in this caper is Rachel Howells, the Musgrave's maid to whom he was formerly engaged. Inexplicably Brunton has turned to the woman he has scorned for help in his plan to steal the goods. After they leverage the slab up and support it with a three foot long billet of wood, Brunton descends into the chamber and passes the treasure up to Howells. Once he has handed up the crown she kicks the support away. The large stone falls back in place and Brunton is left to suffocate. Presumably this occurs in the early AM hours of Sunday since Brunton's absence begins Sunday morning. There are no indications of foul play. Brunton died from CO<sub>2</sub> poisoning.

The scorned Howells, “of Welsh blood, fiery and passionate,” killed Brunton, threw the treasure in the nearby lake, and disappeared three days later. When Doyle wanted to use the stereotype of a hotheaded woman he usually turned to those of “tropical blood,” such as the Brazilians Maria Gibson in *The Problem of Thor Bridge* (THOR) and Isadora Klein in *The Three Gables* (3GAB), the Peruvian Mrs. Ferguson in *The Sussex Vampire* (SUSS), or Beryl Stapleton from Costa Rica in *The Hound of the Baskervilles* (HOUN) (Jann 1995, 109). After all, “Englishwomen, particularly those of the higher classes, exercise more control” (Jann 1995, 109). Apparently not Welshwomen though.

Upon finding the body Holmes immediately declares that he had been dead for “some days.” He does not indicate how he arrived at this estimate. We shall do a calculation to see if Holmes’s statement is even reasonable. We can compute the amount of oxygen in the room, how much Brunton would consume per hour by breathing, and then how long it would take him to reduce the percent O<sub>2</sub> to dangerous levels. One source, the North Carolina Department of Labor ([www.nclabor.com/osh/etta/inguide/ig1.pdf](http://www.nclabor.com/osh/etta/inguide/ig1.pdf)), states that oxygen levels of 16 percent or less are dangerous to life. Several other sources claim that at 6 percent oxygen death quickly follows. The approximate calculation below assumes that once he slab of rock is in place no additional oxygen enters the chamber. Thus it computes the shortest time Brunton could have survived in the small cellar before the O<sub>2</sub> level reached 16 percent and 6 percent.

Step 1. The volume of the room.

$$4 \text{ feet} \times 4 \text{ feet} \times 7 \text{ feet} = 112 \text{ cubic feet or } 112 \text{ ft}^3$$

Some air will be displaced from the room by Brunton’s body and anything else in there. So we will estimate this to reduce the volume of air to 110 ft<sup>3</sup>.

The computation is simpler<sup>4</sup> if the volume is in liters. So we will convert ft<sup>3</sup> to L.

$$(110 \text{ ft}^3)(12 \text{ inches} / 1\text{ft})^3(2.54 \text{ cm} / 1 \text{ inch})^3(1 \text{ L}/1000\text{cm}^3) \sim 3115 \text{ L.}$$

Step 2. The amount of oxygen in the room when Rachel Howells seals it.

To compute how much oxygen is in the room we will use the Ideal Gas Law, a very good approximation for normal conditions.

<sup>4</sup> For simplicity we shall ignore the number of significant figures in this calculation.

$$PV = nRT$$

Where P is the pressure in atmospheres

V is the volume of the room in liters

n is the number of moles of the gas

R is the gas constant, 0.0821 l-atm/mole degree

T is the temperature in degrees Kelvin

The ambient pressure will be the normal everyday value of 1 atmosphere.

But oxygen is 21 percent of air, so the pressure of O<sub>2</sub> at the start will be 0.21 atmospheres.

We'll use a typical summertime value for the temperature of 293°K, or 68°F.

Then

$$n_{O_2} = (0.21 \text{ atm.})(3115 \text{ L}) / (0.0821 \text{ L-atm/mole deg K})(293 \text{ deg K})$$

$$n_{O_2} = 27.2 \text{ moles}$$

Brunton has 27.2 moles of O<sub>2</sub> when Howells seals him in the room. Now his breathing starts converting the oxygen to carbon dioxide, CO<sub>2</sub>.

Step 3. How many moles of O<sub>2</sub> are left in the room when it gets unhealthy.

When O<sub>2</sub> was down to 16% of the 3115 liters in the room, we find:

$$n_{O_2} = (0.16 \text{ atm.})(3115 \text{ L}) / (0.0821 \text{ L-atm/mole deg K})(293 \text{ deg K})$$

$$n_{O_2} = 20.7 \text{ moles}$$

If we subtract this amount from the number of moles of O<sub>2</sub> present at the beginning of his confinement, we find that when 27.2-20.7 = 6.5 moles of O<sub>2</sub> is consumed, Brunton's life is in danger.

When O<sub>2</sub> was down to 6%

$$n_{O_2} = (0.06 \text{ atm.})(3115 \text{ L}) / (0.0821 \text{ L-atm/mole deg K})(293 \text{ deg K})$$

$$n_{O_2} = 7.8 \text{ moles}$$

Thus when 27.2-7.8 = 19.4 moles of O<sub>2</sub> had been consumed, Brunton is surely dead.

Step 4. How much O<sub>2</sub> is consumed by each breath.

The average human breath is about 0.5 liters. As stated above the air inhaled is 21 percent oxygen, at least at the start. We must take into account that exhaled air is 15 percent oxygen.

The number of moles of O<sub>2</sub> inhaled is

$$n_{O_2} = (0.21 \text{ atm.})(0.5 \text{ L}) / (0.0821 \text{ L-atm/mole deg K})(293 \text{ deg K})$$

$$=$$

$$0.00437 \text{ moles O}_2 / \text{breath}$$

The number of moles of O<sub>2</sub> exhaled back out is

$$n_{O_2} = (0.15 \text{ atm.})(0.5 \text{ L}) / (0.0821 \text{ L-atm/mole deg K})(293 \text{ deg K}) =$$

$$0.00312 \text{ moles O}_2 / \text{breath}$$

Thus each breath consumes approximately  $0.00437 - 0.00312 = 0.00125$  moles of O<sub>2</sub>

Step 5. How many hours before the danger levels of 16 percent O<sub>2</sub> and 6 percent O<sub>2</sub> are reached?

To consume 6.5 moles of O<sub>2</sub> would take

$$(0.00125 \text{ moles/breath})(12 \text{ breaths/ minute}) = 0.015 \text{ moles/minute}$$

$$6.5 \text{ moles}/0.015 \text{ moles/minute} = 430 \text{ minutes or 7 hours 15 minutes}$$

Brunton would be in danger by 9 or 10 o'clock Sunday morning.

To consume 19.4 moles of O<sub>2</sub> would take

$$(0.00125 \text{ moles/breath})(12 \text{ breaths/ minute}) = 0.015 \text{ moles/minute}$$

$$19.4 \text{ moles}/0.015 \text{ moles/minute} = 1300 \text{ minutes or 21 hours 40 minutes}$$

Brunton would be dead by midnight Sunday night.

This approximate calculation can be improved by taking into account the fact that as the oxygen in the cellar chamber diminishes Brunton may very well consume less of it per breath. Doing this pushes the time of reaching the dangerous 16 percent level back at most to 1PM Sunday. The 6 percent level would surely be reached by noon Monday at the latest. So Holmes's assertion that Brunton had been dead for "some days" is accurate.

## PRUSSIC ACID, HCN

Prussic acid is the historical name for hydrogen cyanide, HCN. It is a deadly liquid which is most poisonous when its vapor is inhaled. It acts on a victim by interrupting cellular respiration. Thus the cyanide ion  $\text{CN}^-$ , like CO, also deprives the victim of oxygen,  $\text{O}_2$ . But the much greater toxicity of  $\text{CN}^-$  is due to its action by a mechanism different than that of CO (Greenwood and Earnshaw 1984, 1279). The result in the case of cyanide poisoning is characterized by a blue tint to the skin and the well-known odor of almonds. At the end of *The Veiled Lodger* (VEIL) Eugenia Ronder gives a bottle of prussic acid to Sherlock Holmes. He is pleased that he has dissuaded that “brave woman” from suicide.

Eugenia Ronder and her lover Leonardo the strongman worked in her husband’s wild beast show. Their plan to kill Mr. Ronder went awry when the lion, Sahara King, escaped his cage. The lion’s claws left Eugenia with a face that Watson described as “a grisly ruin.” In the seven years since the attack this formerly beautiful woman has worn a veil to cover her ruined face. Leonardo deserted her immediately, as she was no longer beautiful. Now that Leonardo has died she confers with Holmes to clarify the events of that night. He senses that she might be considering suicide and encourages her, “Your life is not your own.” Holmes is gratified when she sends him her bottle of prussic acid.

## CHLOROFORM, $\text{CHCl}_3$

Chloroform is viewed today as an early anesthetic. It was not always so. *The Poisoner’s Handbook* (Blum 2010) recounts the early history of chloroform as a poison and even a murder weapon. In 1911 on Long Island a father used it to kill his son and two daughters, and then walked out into Atlantic Ocean to his own death. Another early gruesome use of chloroform to kill occurred in 1915 in Yonkers, New York. Frederic Mors used the readily available  $\text{CHCl}_3$  to deliberately kill elderly pensioners at the German Odd Fellows home. Mors willingly carried out the wishes of the superintendent of the facility to perform these “mercy killings.” He would administer whatever dose of chloroform was necessary (Blum 2010, 7).

But the designed purpose of the use of chloroform was as an anesthetic. James Simpson in Edinburgh deliberately inhaled chloroform to see if it had anesthetic properties. He and two assistants spent the evening of November 4, 1847 inhaling such molecules as acetone and benzene to check their anesthetic properties. None did until they tried chloroform. It was so effective and they recovered so well that Simpson thought, “This will change the world” (Blum 2010, 10). However, by the start of the



twentieth century the British Medical Association called chloroform “the most dangerous anesthetic known.” Still its use as an anesthetic persisted for years after this.

Doyle employs  $\text{CHCl}_3$  in three Holmes stories. Its use never results in a death. In 3GAB Barney Stockdale is hired by Isadora Klein and uses chloroform to subdue Mrs. Maberly in order to steal a manuscript written by her son Douglas. Isadora Klein is intent on obtaining the manuscript because its publication will reveal her past and surely result in cancellation of her upcoming marriage to the young Duke of Lomond. By the time Holmes arrives at her home she has burned the manuscript. This prevents Holmes from returning the manuscript to Mrs. Maberly. Instead, as recompense, he persuades Isadora Klein to bankroll a first class trip around the world for Mrs. Maberly.



Figure 4.4 Von Bork gets chloroformed

In *His Last Bow* (LAST) Holmes plays the role of a double agent. He appears to be working to obtain British naval secrets for the German spy Von Bork. He has convinced Von Bork that he is an American named Altamont. He arrives driven by his chauffeur to deliver the material. Watson is the chauffeur and the two of them subdue the German. Von Bork is chloroformed and captured. LAST was written in 1917 near the outset of World War I.

The most dramatic use of chloroform is in *The Disappearance of Lady Frances Carfax* (LADY). This is an instance where the loyal Watson travels to investigate the facts. Five weeks have passed since Lady Frances last wrote home from Lausanne, Switzerland. Watson tracks her to the Englisher Hof in Baden. Henry Peters of Adelaide steals the Lady's jewels, carries her off to his London home and then tries to bury her alive in a doubly occupied coffin. She is chloroformed and kept that way. Holmes picks up the trail when Lady Frances's jewels are pawned. He arrives in time to figure out the double coffin trick, but not in time to catch Peters.

Other poisons are mentioned throughout the sixty Holmes stories. Despite the fame of arsenic and its nickname "inheritance powder," Doyle never involves it in any Holmes case. Aqua Tofana, an arsenic concoction of seventeenth century Italy, receives a brief mention in the first story, STUD. In seventeenth century Naples (Klinger Vol. 3, 2006, 93) a woman named Tofana or Teofania di Adamo (Wagner 2006, 47) used it to commit over six hundred murders. When she came under suspicion Teofania took refuge in a convent. Subsequently expelled by the sisters, she confessed under intense questioning to the murders. It is said that she soon died of strangling (Wagner 2006, 47). Most other poisons in the Holmes stories are what Doyle calls "vegetable alkaloids." We shall discuss them in the biology section in the final chapter.

## Section 4.4

Asimov's View: Holmes the Blundering Chemist.

*A remarkable worm, unknown to science*

Isaac Asimov's Investiture in the Baker Street Irregulars

Isaac Asimov was a chemistry professor, a prolific writer, a hugely popular speaker, and a Sherlockian scholar. In 1980 he attacked the chemical knowledge of Sherlock Holmes, calling him the blundering chemist (Asimov 1980). In a 1983 introduction to "Sherlock Holmes on Medicine

and Science” (Simpson 1983), Asimov tried to shift the blame for what he deemed was Holmes’s chemical deficiencies first to Dr. Watson and then to Arthur Conan Doyle. I intend to show that perhaps there is no blame to be shifted. It may just be that Asimov missed a point or two in his analysis. Perhaps Holmes the chemist made no blunders. I will discuss three major points of Asimov’s criticism: acetones, gemstones, and the Sherlock Holmes Blood Test.

## ACETONES

In *The Copper Beeches* (COPP), Violet Hunter is offered a position as a governess at a country estate named The Copper Beeches. Before accepting she consults Sherlock Holmes because several factors have aroused her suspicions. First, her salary is to be two and a half times larger than her previous position. Also, her employer, Jephro Rucastle, will provide an “electric blue” dress which she is to wear when asked. And, most of all, she must cut short her “luxuriant” chestnut hair, of which she is very fond. Holmes confesses it “is not the situation which I should like to see a sister of mine apply for.” When Miss Hunter reminds him of the salary, he says,

“the pay is good,—too good.”

Violet Hunter resolves to accept the position of governess to six year old Edward Rucastle. Holmes tells Watson, “I am much mistaken if we do not hear from her before many days are past.” As he waits to hear from the governess, Holmes settles down “to one of those all night chemical researches.” But when Violet Hunter’s telegram arrives late one night Holmes says,

“Perhaps I had better postpone my analysis of the acetones.”

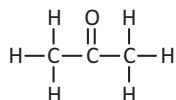
Asimov points out that there is just one molecule named acetone. It is not the name of a class of molecules. Every chemist knows this. So the fact that Holmes doesn’t suggests that he is incompetent in chemistry.

Acetone belongs to the class of molecules called ketones. All ketones have the structure<sup>5</sup>



<sup>5</sup> In general chemical structures, including the ones we’ll discuss, are not planar.

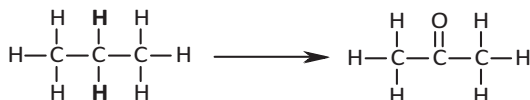
Ketones differ from one another by having different molecular fragments  $R_1$  and  $R_2$ . These fragments are generally hydrocarbon pieces containing different numbers of carbon atoms, such as  $\text{CH}_3$ ,  $\text{C}_2\text{H}_5$ ,  $\text{C}_3\text{H}_7$ , and larger. Acetone is the simplest, i.e. the smallest, ketone because both  $R_1$  and  $R_2$  have only one carbon atom, both are methyl groups,  $\text{CH}_3$ . Thus the chemical formula of acetone is  $\text{CH}_3(\text{CO})\text{CH}_3$  and its chemical structure is



Asimov is certainly correct that in today's usage the word "acetone" is not used as the name of a class of molecules. But it was different in Holmes's time. In "Adolph Strecker's Short Textbook of Organic Chemistry" (cited in Redmond 1964) one finds that the usage was different then. We read,

"By replacement of two hydrogen atoms of a paraffin on one and the same carbon atom, there result derivatives . . . whose oxygen compounds are termed ketones or acetones."

A paraffin is a molecule containing only hydrogen atoms and carbon atoms, i.e. a hydrocarbon. It is the type of hydrocarbon in which all the chemical bonds in the molecule are single bonds. For that reason it is said to be "saturated," and it has the maximum number of hydrogen atoms for the number of carbon atoms. Following the prescription in the above quote, if the two hydrogen atoms on the central carbon atom of the "paraffin" propane,  $\text{C}_3\text{H}_8$ , are replaced by an oxygen atom (which, unlike hydrogen, can form a double bond to carbon) the result is acetone.

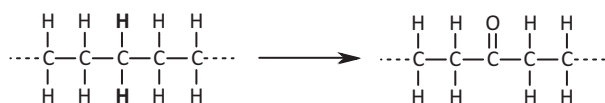


That an entire "class" of molecules can be formed this way is clear if we consider the next larger paraffin or hydrocarbon, butane  $\text{C}_4\text{H}_{10}$ . The ketone that would result upon replacement of two hydrogen atoms by one oxygen

atom has one methyl group,  $\text{CH}_3$ , and one ethyl group,  $\text{C}_2\text{H}_5$ . It is called methyl ethyl ketone (MEK),  $\text{CH}_3(\text{CO})\text{C}_2\text{H}_5$ .



The series continues for hydrocarbons with more carbon atoms.



The entire class of molecules used to be referred to as “ketones or acetones” (Wislicenus 1885, 275). So in Sherlock Holmes’s world of chemistry it was perfectly acceptable to say “acetones” to indicate the whole set of molecules we now term ketones. All chemists of Holmes’s era would have understood him perfectly. Asimov apparently didn’t research old time chemical nomenclature.

As to Violet Hunter’s problem, Holmes answers her summons and arrives in Hampshire with “seven separate explanations, each of which would cover the facts as we know them.” Violet Hunter then describes her experience as a governess at The Copper Beeches. In addition to the blue dress and the shorn hair, she must sit with her back to a picture window and listen to the normally taciturn Jephro Rucastle tell “uproariously funny jokes.” During one such session she manages to discern a young man in the street watching this performance. Armed with this additional information Holmes chooses one of his seven theories and says,

“there is only one feasible explanation. You have been brought there to personate someone.”

That someone is Alice Rucastle who has not gone to Philadelphia, as Violet was told, but is imprisoned in the attic. Jephro Rucastle wants to discourage Mr. Fowler, Alice’s suitor in the street, from coming round by showing him that Alice (actually her look-alike Violet Hunter) is quite happy without him. In this way the Rucastles hope to keep Alice unmarried so that they will retain control of her money. Fortunately both Violet Hunter

and the imprisoned Alice Rucastle escape the plans of Jephro Rucastle and go on to better things.

It has been noticed that COPP has a host of similarities to Charlotte Brontë's *Jane Eyre* (Duyfhuizen 1993). These stories, both with governesses as the main character, and both with a woman imprisoned in an attic, are about the independence and empowerment of women. This theme "was still largely atypical for 1891" (Duyfhuizen 1993, 143). Surely the well-read Doyle was familiar with Brontë's 1847 novel, and it may well have influenced the plot of COPP.

## GEMSTONES

Isaac Asimov considered Sherlock Holmes's knowledge of gemstones to be deficient. He based this conclusion on several Holmes comments in *BLUE*. When Watson asks if the gemstone that has come into their possession is the Countess of Morcar's missing blue carbuncle, Holmes responds,

"Precisely so. I ought to know its size and shape."

Asimov rightly points out that any competent chemist should know that carbuncles are never blue. The red almandine garnet has the chemical formula  $\text{Fe}_3\text{Al}_2(\text{SiO}_4)_3$  (Rutland 1974, 185). It is the stone that is also known as a carbuncle (Sinkankas 1962, 99). Then Holmes makes it worse by referring to "the precious stone" as "crystallized charcoal." Now Asimov claims that Holmes is confusing a carbuncle and a diamond.

There have been several attempts to explain Holmes's statements. For example, Redmond mentions that Watson, the chronicler, may have deliberately misnamed the gem (Redmond 1964, 151). This seems like an unsatisfactory explanation. Bigelow refutes Beckemeyer's claim that the gem was a blue sapphire. He says it is a blue diamond (Bigelow 1961, 212), and that the countess called it a carbuncle out of ignorance or whim. Kasson (1961) agrees with Bigelow and identifies exactly which blue diamond, the famous Hope Diamond! So does Hunt (2011), except he says the carbuncle is actually the Brunswick Blue diamond. Redmond considers the Hope as a plausible candidate. Waterhouse (2004) opts for "a large flawless cobalt blue spinel." Blank (p. 237) supports Asimov and states that Holmes had a "deplorable lack" of knowledge when he said the countess's carbuncle was crystallized charcoal. Confusion reigns. Is the "blue carbuncle" a diamond, a sapphire, a spinel, a carbuncle, or some other gemstone? All of these explanations require that someone, Watson, Holmes, or the Countess of Morcar, made a mistake.

Another explanation is that no one erred. The gem was most likely a doublet. Doublets, made since Roman times, were encountered extensively in Victorian jewelry (Rutland 1974, 56). The purpose of creating a doublet was to enhance the size and appearance of a stone, or to imitate a more valuable gem. Doublets consisted of a gemstone, most often a garnet, fused to the top of a stone that was generally of lesser value, frequently glass. Garnets were the gem of choice for the top of doublets because they retained their luster and durability, and did not crack upon fusion. By adding a thin portion of red garnet “any colored gem could be simulated.” (Matlins and Bonanno 1993, 138). By adjusting the thickness of the garnet on top, the red color would not be seen. Thus we begin to see how the confusion arose. If a carbuncle was used in a doublet to produce a blue color, it would be easy enough to refer to it as a “blue” carbuncle.

The most reliable way of detecting the presence of a doublet is to immerse it in rubbing alcohol. However, this method does not work with garnet topped doublets (Matlins and Bonanno 1989, 176). Knowing that the refractive index varies from one gemstone to the next, a person might very well decide to measure this property. This is a physical test which shines light on the substance being tested. Light goes more slowly when traveling through materials, particularly solids and liquids. This gives rise to the phenomenon of a fishing line appearing to bend as it enters the water, even though it is actually straight. The effect can be measured quantitatively and each substance has its own value. The refractive index, RI, is the ratio of the speed of light in a vacuum over its speed in the substance. The value of the RI of carbuncles is 1.76 to 1.83 (Matlins and Bonanno 1989, 108). In testing a doublet, if the test light was shone on the thin carbuncle layer, the resulting RI value would be that of the carbuncle. Thus a stone that appeared blue and had a refractive index in the range 1.76–1.83

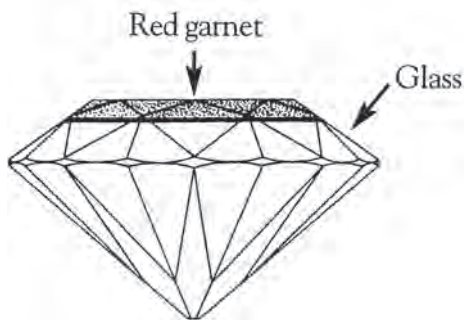


Figure 4.5 Garnet topped doublet

might well be called a blue carbuncle, even though the bulk of the stone was not a carbuncle but some other substance.

But what are we to make of Holmes's remark about crystallized charcoal? Someone as wealthy as the Countess of Morcar would have no need to attach her garnet to glass. Remember, we have Holmes's word that "It is absolutely unique." So we must consider the possibility that he was right again, and that the bottom of the doublet was actually diamond. Diamond doublets are not often encountered, but they do exist (Matlins and Bonanno 1989, 171). They usually consist of two small diamonds glued together to make a larger stone. It appears that Holmes is telling us that the Countess of Morcar's famous gemstone is indeed unique, diamond bottom and carbuncle top. We cannot call Sherlock Holmes a blundering chemist when so logical an explanation of his comments is available.

## THE SHERLOCK HOLMES BLOOD TEST

Recall that in *STUD*, Young Stamford takes Watson to the laboratory at St. Bart's Hospital in order to introduce him to Sherlock Holmes. As they enter the lab, before any introduction, Holmes is calling out,

"I've found it! I've found it! I have found a re-agent which is precipitated by haemoglobin, and by nothing else."

After being introduced to Dr. Watson and perceiving that he'd been in Afghanistan, Holmes asks him what he thinks of the Sherlock Holmes blood test. Watson responds,

"It is interesting chemically no doubt, but practically. . . . ."

The excited Holmes interrupts before Watson can finish his criticism,

"Why, man, it is the most practical medico-legal discovery for years. Don't you see that it gives us an infallible test for blood stains?"

Asimov does not question the existence or the effectiveness of The Sherlock Holmes Blood Test. But he doubts that it is as sensitive as Holmes claims. Using Holmes's description, Asimov computes that the relative volumes of blood and water in his test are 1 to 50,000 (Asimov 1980, 12). Yet Holmes states, "The proportion of blood cannot be more than one in a million." A good chemist, says Asimov, would get closer to the truth than that and "could not possibly make this mistake."



A potential source of error in Asimov's calculation is that in Europe quantities were, and still are, calculated in terms of weight rather than volume. This is particularly true for recipes, but used to be somewhat true for scientists ([wikipedia.org/wiki/Apothecaries](http://wikipedia.org/wiki/Apothecaries)).

Is the proportion of blood in water anywhere near one in a million as Holmes claims? Using the same dilution factor as Holmes and Asimov, one can compute a weight/weight ratio close to 1 in a million. The calculation uses the fact that one gram of water is also 1 milliliter. It also assumes that there are 5 grams of hemoglobin (Hb) in 100 milliliters of blood. This is not quite right. The amount of hemoglobin in 100 milliliters of blood is closer to 15. But for a calculation done in his head 125 years ago, Holmes did well.

Asimov [1 in 50,000]

0.02 ml blood/ 1000 ml. H<sub>2</sub>O = 1 ml. blood/ 50,000 ml. H<sub>2</sub>O

O'Brien [1 in 1,000,000]

[5 g.Hb/100ml blood][.02ml blood/1000 g. H<sub>2</sub>O] = 1g. Hb/10<sup>6</sup> g.

H<sub>2</sub>O

It is clear that Asimov was certainly overly harsh on Sherlock Holmes, the chemist.

Holmesian scholars have written numerous times on the Sherlock Holmes Blood Test. A good review of the history of blood testing in the nineteenth century has been given by McGowan (McGowan 1987). There we learn that a variety of chemicals had been used prior to Holmes's time to detect blood. The early nineteenth century tests of Barruel (1829) and Bryk (1858) used concentrated sulfuric acid as the test reagent. Teichmann's test of 1853 used glacial acetic acid and sodium chloride. The Van Deen test (1861) used guaiacum followed by turpentine or hydrogen peroxide. This is probably the test Holmes refers to when he tells Watson at their first meeting,

“The old guaiacum test was very clumsy and uncertain.”

Other blood tests that existed before Holmes's time were the Zahn test (1871) which used hydrogen peroxide, and Sonnenschein's (1872) with sodium tungstate and acetic acid as test reagents. Even in 1911 Britain was using a test with turpentine and benzedrine or guaiacum to look for a blue coloration (Fido 1998, 100). So it seems that his test was not enough of an improvement to be put into general use.

Huber has produced the best candidate for Holmes's test and shows that it was still in use a full century after Holmes made his discovery in *STUD* (Huber 1987). Her candidate for the Sherlock Holmes Blood Test is addition

of sodium hydroxide followed by saturated ammonium sulfate.<sup>6</sup> She notes that this test does not distinguish human blood from animal.

## Section 4.5

### Other Chemicals

Watson: “Well, have you solved it?”

Holmes: “Yes. It was the bisulphate of baryta.”

Watson: “No, no, the mystery.”

“A Case of Identity”

### BARIUM BISULPHATE

There were a number of other chemicals which played a lesser role in the Holmes saga. In *A Case of Identity* (IDEN) Watson, now married to Mary Morstan and no longer living with Holmes, returns to Baker Street and finds that Holmes has spent the day working on a chemical analysis. He is so intent on his chemical results that when Watson asks if he'd solved the mystery, Holmes mistakes inquiry for a question about his chemical work. Once again, as in the case of the “acetones,” Holmes uses old nomenclature. Baryta is a now unused term for barium oxide, BaO. Thus the “bisulphate of baryta” is barium bisulphate, Ba(HSO<sub>4</sub>)<sub>2</sub>. Asimov has mild criticism for Holmes's use of the term, stating that he should merely have said barium bisulphate. He also claims that it is not particularly difficult to analyze. That's certainly correct. But the problem with Ba(HSO<sub>4</sub>)<sub>2</sub> is not in the analysis. The problem is obtaining it in the first place. Barium bisulfate is rare enough to have been called a “curiosity” (Klinger 2006, Vol. 1, 92). In fact the very existence of the compound has been called into question (Tracy 1977, 27).

The famous Swedish chemist Berzelius first claimed to have isolated it in 1843 (Berzelius 1843). He mixed sulfuric acid, H<sub>2</sub>SO<sub>4</sub>, with barium sulphate, Ba<sub>2</sub>SO<sub>4</sub>, and by cooling the mixture detected Ba(HSO<sub>4</sub>)<sub>2</sub>. But the molecule continued to be elusive. A 1921 study of the freezing points of mixtures of H<sub>2</sub>SO<sub>4</sub> and Ba<sub>2</sub>SO<sub>4</sub> showed no signs of the bisulphate (Kendall and Davidson 1921). Finally in 1931 solubility and conductivity studies firmly established the existence of Ba(HSO<sub>4</sub>)<sub>2</sub> (Trenner and Taylor 1931). Additional studies over the years have verified that barium bisulphate definitely does exist (See Hammett and Lowenheim for example). Once again

<sup>6</sup> Saturated means that one has dissolved the maximum amount possible of ammonium sulfate in water.

we find Holmes at the forefront of nineteenth century chemistry, working with a substance that chemists were struggling with.

## HYDROCARBONS

In *The Sign of the Four* (SIGN) Holmes spends time in the middle of the case doing some chemistry, “When I had succeeded in dissolving the hydrocarbon which I was at work at.” Asimov dismisses this as a trivial experiment (Asimov 1980, 16). Other Sherlockians agree as evidenced by their efforts to think of some way this work could be chemically significant. One suggestion is that Holmes had a mixture of hydrocarbons (Redmond 1964, 145). That Holmes does not name any particular hydrocarbon lends credence to this suggestion. Still, a mixture would not be significantly more difficult to dissolve than a single hydrocarbon. Redmond tries to increase the importance of Holmes’s hydrocarbon work by suggesting that it was a preliminary step in a more important task, most likely forensic in nature.

Two other scholars claim that Holmes was working on a specific hydrocarbon. Cooper states that he was not particularly trying to dissolve the hydrocarbon, but was characterizing it by measuring its physical characteristics (Cooper 1976, 71). Walters (1978, 223) actually identifies which hydrocarbon was the subject Holmes’s efforts, a hydrocarbon-like molecule, carbazol(e). The claim is made that Holmes succeeded in dissolving it in sulfuric acid,  $H_2SO_4$ , an unusual solvent for hydrocarbons.

The best conclusion is that Holmes was not doing important chemistry in dissolving a hydrocarbon

## ACIDS

There are a number of acids mentioned in the sixty stories. Several times we hear of Holmes leaving acid stains in the Baker Street rooms. But he did not often use acids in his forensic work. Watson tells us about one important case where an acid test is used to prove a man’s guilt. It happens in *The Naval Treaty* (NAVA),

“You come at a crisis, Watson. If this paper remains blue, all is well. If it turns red, it means a man’s life.”

When the litmus paper goes red the unsurprised Holmes fires off several telegrams to the authorities. Alas, this is one of the untold tales. It is not a part of Holmes’s investigation of the theft of the naval treaty. We know nothing else at all about the case, or the chemistry used to prove guilt.

Another acid we encounter is carbolic acid. It has the chemical formula  $C_6H_5OH$ , and is also called phenol. It was discovered in 1834 when it was extracted from coal tar. The famous Sir Joseph Lister made use of its anti-septic properties (Klinger 2005, Vol. 1, 267). These same properties are why Doyle mentions it in two Holmes cases, *The Cardboard Box* (CARD) and *The Engineer's Thumb* (ENGR). In ENGR it is Watson who uses carbolic acid to dress Victor Hatherly's mutilated thumb. The carbolic acid plays no significant role in the case. We did discuss it when examining Watson's skill as a physician in section 2.2.

CARD has been termed "easily the darkest tale in the entire Canon." (Klinger 2006, Vol. 1, 422). Jim Browner is married to Mary Cushing. But her sister Sarah has designs on Jim. When he rejects her Sarah proceeds to turn Mary against her husband. When he catches his wife with another man the hot-headed Jim follows them, kills them both, and cuts off an ear of each. He then mails the two severed ears to Sarah just to show her what she has caused. Early on Inspector Lestrade mentions the possibility of a medical student prank. But Holmes realizes that the fact that carbolic acid was not used to preserve the two ears means that they were not sent by a medical person.

Sulfuric acid is also employed in two stories, BLUE and *The Illustrious Client* (ILLU). Both instances involve a vitriol throwing. Vitriol is an old alternate name for sulfuric acid,  $H_2SO_4$ . In BLUE we learn nothing except that a vitriol throwing incident is part of the unhappy history of the Countess of Morcar's blue carbuncle.

In ILLU the acid does play an important part of the plot. Baron Adelbert Gruner, termed by Holmes "the Austrian murderer," has won the heart of the beautiful Violet de Merville. An unnamed "illustrious client" engages Holmes to convince Violet of the Baron's true character. She is immune to persuasion despite all the evidence that Gruner has cast a number of women aside after cruelly using them. One of his past mistresses, Kitty Winter, is full of hate for the handsome Gruner. Holmes takes Kitty to talk to Violet. That strategy also fails. But Kitty Winter has her own plan for revenge. She brings some sulfuric acid and throws it in the face of the evil Baron Gruner. The handsome face is ruined. One author sees an analogy here with Oscar Wilde's *The Picture of Dorian Gray* (Lachtman 1985, 134).

Another time we hear of Holmes using acid is in IDEN. Watson remarks upon returning to the Baker Street rooms that the odor of hydrochloric acid HCl, told him that Holmes had spent the day working with his chemicals. Of course there are the well-known stains that Watson reports. They are discussed in the concluding section of the chapter.

## PHOSPHORUS

“Its muzzle and hackles and dewlap were outlined in flickering flame.” Watson’s description of the Hound of the Baskervilles reflects the fact that Stapleton had applied some chemical to make the animal even more fearsome than his enormous size would warrant. The dog chasing Sir Henry Baskerville was “not a pure bloodhound and not a pure mastiff; but it appeared to be a combination of the two—gaunt, savage, and as large as a small lioness.”

Watson concludes that phosphorus was put around the mouth of the hound to produce the fearsome glow. That element, when exposed to air, glows in the dark. Phosphorus takes its name from the Greek for “light bringing” (Greenwood and Earnshaw 1984, 546). Yet Holmes seems dubious that phosphorus was used. He notes that there is no odor from the chemical, so that nothing would interfere with the hound’s sense of smell. Therefore, says Holmes, it must be, “a cunning preparation of it.” Phosphorus produces its glow by reacting with oxygen in the air. When



Figure 4.6 *The Hound*

emission of light is produced by a chemical reaction the process is called chemiluminescence, not phosphorescence.

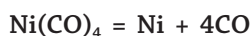
Should we believe the physician who claims it is phosphorus or the chemist who is doubtful? When it comes to a chemical phenomenon Holmes the chemist probably is a more reliable source than Watson the physician. It probably was not phosphorus. What dog could stand to have phosphorus rubbed around its mouth? It would certainly make a killer of the Hound. Sherlockians have suggested other materials that Stapleton could possibly have used rather than the unlikely phosphorus. For example, Redmond suggests barium sulfide, BaS (Redmond 1964, 150). Whatever was the chemical on the hound's muzzle, it resulted in a terrifying appearance and caused Holmes not to hesitate before firing five shots to kill the mammoth dog.

## AMALGAMS

If one would trust the chemist on glowing materials like phosphorous, then one should also believe he knows about amalgams. But it is not clear that Holmes does know amalgams. In ENGR some "coiners" are making counterfeit coins. Holmes talks about an amalgam that they've used to replace the silver used in genuine coins. This is yet another instance where Asimov points out Holmes's error (Asimov 1980, 14). An amalgam is an alloy of mercury (Hg) and any other metal. Since Hg is an unlikely metal to be used making coins, even counterfeit ones, Holmes may have misspoken.

In today's usage "amalgamation" has come to mean any combination of things or even ideas. Perhaps Holmes was using the word in that sense. That does seem unlikely since he says the amalgam has been used to replace silver in the coins, thus making an inexpensive substitute. On the other hand, when the counterfeiters flee they leave behind "large masses of nickel (Ni) and tin (Sn)." There two elements, especially Ni, have been used in coinage. But the crooks leave no Hg. So were they using mercury at all? The absence of mercury in the house does make it possible that Holmes was using the mixture meaning of amalgam rather than the chemical term for "any alloy of mercury." I think, though, the verdict on this issue must be that of Asimov. Holmes the chemist has made an error.

It is interesting to note that one of the counterfeiter's metals, Ni, is purified by use of one of the "poisons" discussed in section 4.4, carbon monoxide, CO. When impure Ni is reacted with CO (at 50°C) the metal carbonyl compound  $\text{Ni}(\text{CO})_4$  is formed. It is a toxic gas that can be collected, thus pulling the Ni metal away from the impurities. Then  $\text{Ni}(\text{CO})_4$  is heated to 230°C which breaks it back down to metal and CO yielding 99.95 percent pure Ni metal:



This procedure for purifying nickel was developed in 1899 by L. Mond and is called the Mond process (Greenwood and Earnshaw 1984, 1330).

## Section 4.6

Conclusion: Profound or Eccentric?

*I gave my mind a thorough rest by plunging into a chemical analysis*

Sherlock Holmes, “The Sign of the Four”

Anyone who finds a chemical analysis restful is clearly devoted to the science. There is no doubt that Sherlock Holmes loved his chemistry. He often got so engrossed in his experiments that he worked late into the night. Listen to Watson in SIGN:

“Up to the small hours of the morning, I could hear the clinking of his test-tubes.”

Or in COPP:

“Holmes was settling down to one of those all night researches which he frequently indulged in, when I would leave him stooping over a retort and a test-tube at night and find him in the same position when I came down to breakfast in the morning.”

These odd hours are reminiscent of a university researcher (Gillard 1976, 10). Even his detective work sometimes was put aside so he could do chemistry,

“If there is an afternoon train to town, Watson, I think we should do well to take it, as I have chemical analysis of some interest to finish.”

Holmes and Watson proceed to leave Norfolk in the middle of a case so that the chemistry can be completed.

Holmes was dedicated to his chemical work, but what is the verdict on his chemical ability? There are certainly indications of knowledge and skill. Graham (1945) has divided his chemical efforts into two groups depending on whether they were related to crime detection or not. We’ve already looked at his “pure,” i.e. unapplied, chemistry earlier in this chapter. Rather

than being the focus of a case his forensic chemistry was sometimes just mentioned by his chronicler, Dr. Watson. In *Shoscombe Old Place* (SHOS) Holmes remarks on a case never narrated by Watson:

“Since I ran down that coiner by the zinc and copper filings in the seam of his cuff they have begun to realize the importance of the microscope.”

Holmes has convinced Scotland Yard that the microscope is a useful investigative tool. He shows Watson the next objects he is examining by microscope,—tweed threads, dust, epithelial cells, and glue.

“Is it one of your cases?”

“No; my friend, Merivale of the Yard, asked me to look into the case.”

Holmes is assisting Merivale in the “St. Pancras” case. Sherlockians have debated whether Holmes could positively identify glue in this way. But the main point is that Holmes, and Scotland Yard, are beginning to use the microscope to identify chemicals. Given that the first use of the microscope in chemistry occurred in the 1700’s, and that several books on the subject were published in the 1860’s (Welcher 1957), it is high time both Holmes and the Yard got going with microscopes.

And so a picture emerges of a devoted chemist working long hours on chemical analyses, interested in research into coal-tar derivatives, and capable of devising an important test for blood. In addition we’re told in *STUD* that Holmes had “extra-ordinary delicacy of touch” when manipulating his “fragile philosophical instruments.” In *FINA*, as Holmes prepares for his confrontation with Professor Moriarty, he tells Watson of his plans to continue his chemical work in retirement.

“I could continue to live in the quiet fashion which is most congenial to me, and to concentrate my attention upon my chemical researches.”

The Michells assert that Holmes was planning to continue his work on coal-tar chemistry. They even claim, without much justification, that he did so (Michell and Michell 1946, 250-251). Holmes shows many signs of a good chemist, and if this were the entire story of his chemistry, we might agree on profound as the appropriate descriptor.

However, on the other side of the ledger there is evidence for poor chemical technique in his work, and not just once. At their first meeting



Watson (STUD) observes that Holmes's hands are "discoloured with strong acids." After sharing rooms with Holmes for awhile Watson notes that his hands were invariably "stained with chemicals." Gillard (1976) notes "the cross-contamination of reagent bottles" that is described in NAVA, the 25th story. So Holmes has a long history of poor lab technique.

"He dipped into this bottle or that, drawing out a few drops of each with his glass pipette."

There is even a report that Watson initially described another instance of poor technique in RESI, but deleted it from his final version (Cooper 1976, 70).

Holmes was delicate with his instruments, but dreadfully sloppy with chemical reagents. Watson also describes in SIGN one of his experiments which ended "in a smell which fairly drove me out of the apartment." In *The Empty House* (EMPT), the 28th story, Holmes's chemical working area at Baker Street is described as acid-stained. By the time of the 49th story, *The Mazarin Stone* (MAZA), it has become acid-charred. Holmes continually spilled his chemicals.

But the most damning point against Holmes being profound in his chemistry is that he lost interest in the subject long before his retirement. Holmes himself describes his change of interest in *The Abbey Grange* (ABBE).

"I propose to devote my declining years to the composition of a text-book, which shall focus on the whole art of detection in one volume."

So, in FINA the 26th story written in 1893, Holmes is planning his retirement to be taken up with chemistry. By the time of ABBE, the 39th story written in 1904, he has changed his mind. Additionally, in *The Creeping Man* (CREE), the 51st story written in 1923, we directly hear about what interests Holmes now.

"He was a man of habits, narrow and concentrated habits, and I had become one of them. As an institution I was like the violin, the shag tobacco, the old black pipe, the index books"

There is no mention of chemistry. Holmes now looked elsewhere for diversion. He chose to tend his bees rather than work on his waning chemical interests. Ellison points out that in the last two compilations of short stories totaling nineteen tales there is no mention of Holmes doing chemistry (Ellison 1983, 36). In Tracy's encyclopedia we find thirteen references

to chemistry in stories 1 to 30, and only two references in the last thirty stories (Tracy 1977). We find that the last thirty Sherlock Holmes stories have much less chemistry than the first thirty stories. It is notable that the first half of the Canon is much more highly rated than the second half. When Holmes was depicted as a man of science, the stories worked much better than when the science was absent.

It is entirely logical that Sherlock Holmes should move away from chemistry. His creator had done so. In his later life Arthur Conan Doyle became one of the world's leading proponents of spiritualism. Spiritualism is defined as the belief that the spirits of the dead can communicate with the living. Generally debunked today, spiritualism enjoyed a period of wide acceptance. It began in America in 1848 in Hydesville, NY. There the young Fox sisters, Margaret and Kate, began séances and levitations that they forty years later admitted were fraudulent (Miller 2008, 354). The movement took hold and claimed ten million American adherents by 1859. Its spread to England was aided by Queen Victoria attending séances there (Miller 2008, 353). In 1883 Doyle wrote a story, *Selecting a Ghost*, which poked fun at the occult. But by 1885 he was attending sessions, though still harboring doubts. Hunting for a belief system to replace his rejected Catholicism, Doyle examined telepathy, mesmerism, Buddhism, theosophy, and others (Miller 2008, 355). Gradually spiritualism gained ascendancy with him. In October 1917 Doyle "crossed a Rubicon" (Lellenberg, et al, 2007, 634) when he gave a public lecture which made clear his belief in Spiritualism. Doyle had a brief relationship with the world famous magician Harry Houdini, a debunker of spiritualist phenomena. Both were desirous of convincing the other. Neither did and it ended badly. Much of Doyle's late life was spent writing about and lecturing on spiritualism.

Doyle's non-Holmesian work included enough short stories to justify an anthology entitled "The Best Horror Stories of Arthur Conan Doyle" (McSherry, et al, 1989). But we can be thankful that he kept things supernatural out of the Sherlock Holmes Canon. Toward the end he did write a Holmes story entitled *The Sussex Vampire*. It was the 52nd of the 60 stories, published in 1924. But it has no vampire in it. And in discussing the possibility of vampires being involved in the case Holmes tells Watson,

"Rubbish, Watson, rubbish! It's pure lunacy."

We shall conclude this chapter with an answer to the question twice posed, is Holmes's chemistry profound or eccentric? Even after having defended Holmes against most of Asimov's criticisms, I find that Watson's first opinion of Holmes's "Knowledge of Chemistry—Profound" cannot be sustained. We've seen that his blood test was not adopted by Britain.

He tells us in EMPT that his work on coal-tar derivatives was finished to his satisfaction. That work then may have been his only chemical success. Had he remained interested in chemistry and had more success with it, his reputation might have warranted “profound.” But his modest record requires that we rank Holmes the chemist somewhere between Watson’s profound and Asimov’s blundering. Eccentric sounds just about right. After all, everything about Sherlock Holmes was eccentric.

## 5

## Sherlock Holmes: Other Sciences

## Section 5.1

Mathematics

*It's a simple calculation enough.*

Sherlock Holmes, "A Study in Scarlet"

## INTRODUCTION

Sherlock Holmes knew more chemistry than any other science. For that reason the entire previous chapter was devoted to it. In this chapter we shall find that he was well informed in a number of other sciences as well. Since mathematics contributes to several sciences we will first examine the Canon for instances of mathematical knowledge. We will find a number of references to and uses of math, nearly all in the early stories. Holmes and Moriarty supposedly went over the Reichenbach Falls in *The Final Problem* (FINA), the 26th story. When Holmes returned after Reichenbach he rarely used math again.

In *A Study in Scarlet* (STUD) Watson scoffs at a magazine article that claims that the conclusions of a trained observer are as "infallible as so many propositions of Euclid." He soon learns that his new roommate, Holmes, is the author of the article. So here, very early on, we have Holmes drawing a mathematical analogy to his deductive work. He invokes Euclid<sup>1</sup> again in the second story, *The Sign of the Four* (SIGN). This time he chides Watson about his writing style. Holmes accuses Watson of allowing romanticism to creep into his narration of the previous case, STUD. According to Holmes this awkward technique produces "much the same effect as if you worked a love-story or an elopement into the fifth proposition of Euclid." The fifth proposition states that if two sides in a triangle are equal, then the angles opposite those two sides are also equal. Note that

<sup>1</sup> A Greek mathematician living around 300 BC.

Holmes makes no calculation using Euclid's proposition, but he depends on Watson's knowledge of math to make a point about the way the narrative of *STUD* was written. This is the first time, but not the last, he criticized Watson the chronicler.

Also in *SIGN* Holmes's conversation again assumes his listener is acquainted with mathematical terms. When he sees that Tonga has left a footprint in creosote, he claims that tracking him will be as easy as using the "rule of three." The rule states that if three of the four terms in a proportion are known, then the fourth may be calculated. It may be expressed

$$ad = bc \quad \text{or} \quad a:b::c:d \quad \text{or} \quad a/b = c/d$$

Knowing  $a$ ,  $b$ , and  $c$  allows  $d$  to be calculated from  $d = bc/a$ . The equation can be arranged so that any of the terms can be computed. In nineteenth century England this rule was afforded enough stature to be given a name. Today it is considered so mathematically trivial that one hardly ever hears of "the rule of three." Instead the operation performed is described as "the product of the means equals the product of the extremes"; or cross multiplying. As with Euclid's proposition, Holmes does not use the rule of three to make a calculation in *SIGN*.

These mathematical references set a tone in the first two stories, *STUD* and *SIGN*. Here we have two learned men whose everyday conversation reflects a superior English education. Watson may later be befuddled by some of Holmes's deductions, but he is certainly no fool. Holmes uses mathematical terms as late as the fifty-seventh story, *The Lion's Mane* (*LION*), which is one of the two stories which he himself narrates. In *LION* he describes the math teacher Ian Murdock as living "in some high abstract region of surds and conic sections." Holmes certainly has a high opinion of his readers. He feels sure they will know that a surd is a sum which contains one or more irrational roots of numbers (*Webster's New Collegiate Dictionary*, 1999).

## HEIGHT FROM THE LENGTH OF A STRIDE

As noted in the opening quote for this chapter, Holmes does perform a calculation which he describes as simple. It is not considered simple today. So let's take a look at his determination of a suspect's height from the length of his stride. In *STUD* Holmes examines the crime site where Enoch Drebber's dead body was found. He then gives Inspectors Lestrade and Gregson a number of clues. One of them is that the murderer is taller than

six feet. Not only are the Scotland Yarders skeptical, Watson is too. Later he asks Holmes to explain how he had deduced the man's height.

“Why, the height of a man, in nine cases out of ten, can be told from the length of his stride.”

This remark has been hotly debated in the Sherlockian literature. Many consider the calculation to be meaningless. They note that the length of a person's stride will vary with conditions. Yet even today, one hundred and twenty-five years after Holmes was doing this calculation, it is not difficult to find online sites where a formula for the “simple” calculation is given. Formulas for the calculation can be found ([www.livestrong.com/article/438560-the-average-stride-length-in-running](http://www.livestrong.com/article/438560-the-average-stride-length-in-running)). Some sites will do the calculation for you. ([www.preventdisease.com/healthtools/article/stride\\_length\\_m.shtml](http://www.preventdisease.com/healthtools/article/stride_length_m.shtml))

Height = 2.41(Stride)	Males
Height = 2.42(Stride)	Females

Even these sites admit variability and provide an alternate formula for a person running:

Height = 0.741(Stride)	Males running
------------------------	---------------

Campbell (1983, 15) gives a somewhat different formula, Height = 2.09(Stride)

Holmes again makes the claim to be able to use the length of Jonathon Small's stride to calculate his height in SIGN. In *The Boscombe Valley Mystery* (BOSC), Holmes claims the murderer is “a tall man.” He tells Watson it is a rough estimate from stride length. So already by the sixth story Holmes moderates his claim about the stride/height relationship. After mentioning it in three of the first six stories, Holmes never uses it again.

Today the American Federal Bureau of Investigation doesn't use a stride/height relationship, believing it unreliable (Fisher 1995, 281).

“Contrary to the plotting of detective fiction, it isn't possible to estimate someone's height by the distance between steps—his gait—because during the commission of a crime, a suspect is usually moving very fast; he is running or backing up or moving sideways or struggling, attacking or defending, even sneaking around. The thing he isn't doing is moving normally.”

Modern forensics attaches more relevance to foot size than to stride length in estimating heights (Ozden, et al 2005).

## PROBABILITY

The only adventure from the second half of the Canon that contains any math is *The Six Napoleons* (SIXN), the 35th story. The tale involves six plaster of Paris busts of Napoleon. Someone is breaking into houses, stealing them, and then just smashing them to bits. Such bizarre behavior leads to Watson's failed attempt at psychoanalysis. He suggests that the culprit, Beppo, suffers from monomania. Here Holmes uses an elementary calculation of probabilities. When only two of the six busts remain Holmes states that there is a two-thirds probability that the burglar will strike again. Why two-thirds?

Inspector Lestrade consults Holmes because the case is so "outré." Although there are hundreds of busts of Napoleon in London, the thief Beppo is only interested in the Six Napoleons that were made at the same time about a year ago. When the fourth bust is stolen from Horace Harker, a journalist, a dead body is found with it. At this point Lestrade loses interest in the busts. He has a murder to solve.

"After all, that is nothing; petty larceny, six months at the most.

It is the murder that we really are investigating."

Of course Holmes sees a connection and continues to focus his interest in the plaster of Paris images of Napoleon. Holmes mentions to Lestrade that all four stolen busts were immediately smashed where there was enough light to examine the pieces. Lestrade fails to see the significance of this, and continues to seek information about the dead man. Holmes's knowledge of past crimes enables him to unravel this mystery. Recall Watson's earlier assessment:

"Knowledge of Sensational Literature—Immense."

"He appears to know every detail of every horror perpetrated in the century."

Holmes, the student of crime, again has an edge on the Scotland Yard official force. Only Holmes recalls that the theft of the black pearl of the Borgias had happened about a year ago, just as the busts were being cast at the firm of Gelder & Co. He deduces that the missing jewel is in one of the busts. Beppo, formerly employed at Gelder's, had hidden the stolen pearl in one of the Napoleonic busts as it was being made. He did this while being pursued by police for knifing another man. Now he has finished a year in prison and wants to regain the pearl.

Holmes's theory explains why the fourth bust was smashed under a street lamp. Lestrade doesn't care where the busts were broken. Having murdered a competitor at the fourth theft, Beppo must act swiftly. Thus Holmes concludes he will strike again the next night. In order to convince Beppo that the police are on the wrong track, Holmes tells the journalist, Harker, that he agrees with Lestrade's opinion that this is the doing of a Napoleon-hater. Harker publishes that idea in the newspaper.

There remain two busts. One is nearby in Chiswick. The other is thirty-five miles away in Reading. Holmes persuades Lestrade to accompany him to Chiswick the next night by proclaiming there is a two to one chance they'll apprehend the thief/murderer. Since there are only two busts left, why are the odds two to one? Holmes knows that the pearl wasn't in any of the first three busts because a fourth one was stolen. But he doesn't know if Beppo had success with the fourth. Perhaps the pearl was in the fourth bust. If not it is in one of the last two. Thus there is one chance that Beppo has the pearl, and two chances that it remains encased in plaster. Thus Holmes's comment that the chances are two to one they'll make an arrest in Chiswick.

Holmes is pretty certain that if Beppo still doesn't have the pearl, he will strike the next night at Chiswick. He will not go to the distant Reading. Thus gauging the probability of an arrest to be  $2/3$ , Holmes coaxes Lestrade to join him in Chiswick. In making the statement that he has a two thirds chance of nabbing Beppo, Holmes makes two very good assumptions. He presumes Beppo will strike the very next night. This is likely because with murder now involved the police will be expending more effort of the case. So Beppo is likely to make haste with his next attempt to recover the black pearl of the Borgias. Holmes also reasons that the nearby Chiswick will be Beppo's next target, not the distant Reading. Sherlock's reasoning proves correct and Beppo is apprehended in Chiswick. Lestrade looks to be a real bungler in this story. He misses key points and goes off on a tangent.

## GEOMETRY AND THE RULE OF THREE

In chapter four we saw that Holmes was able to follow the directions of the Musgrave Ritual to find the small cellar room where the ancient crown of the King of England had been concealed. There, instead of the crown, he found the body of Brunton the butler who had followed the ritual before Holmes. Here we will look at the geometric calculations required to follow the ritual.

The directions are simple to follow.

“How was it stepped?”



“North by ten and by ten, east by five and by five, south by two and by two, west by one and by one, and so under.”

Holmes’s problem was: where to start? Both Holmes and Brunton conclude that the starting point was the tip of the shadow of the elm tree at a certain sun position. But the elm tree is gone, having been felled by a lightning strike ten years earlier. But Reginald Musgrave knows that the elm was sixty-four feet high. His geometry tutor years earlier had him do a number of such calculations. To be able to use the elm’s height to calculate the length of its shadow, Holmes erects a six foot fishing pole at the site of the elm stump. Its shadow, when the sun was “over the oak” is nine feet high. This permits him to set up the proportion below and thereby compute the length of the elm’s shadow to be ninety-six feet:

$$\begin{aligned} \text{Shadow Pole/Ht Pole} &= \text{Shadow Elm/ Ht Elm} \\ 9/6 &= \text{Shadow Elm}/64 \\ \text{Shadow Elm} &= 96 \end{aligned}$$

Unlike SIGN, Holmes actually uses the “rule of three” in this story to make a computation. He then locates his starting point at a distance of 96 feet from the stump in the same direction as the shadow of the pole. Following the commands of the Musgrave Ritual he then locates the cellar room where Brunton’s body is found.

The entire calculation involving the elm tree is dependent on the height being the same as years ago when the crown was concealed. That was two hundred and fifty years before Holmes got involved. Elm trees can grow higher than 64 feet. Climate and soil are important factors in any tree’s mature height. Did this tree stay at that height for 250 years? It must have been lucky to avoid lightening or damaging winds all that time until just ten years ago. As we’ve seen Holmes is very much aware that the length of his stride depends on his height. He would also know that human heights were shorter when the crown was hidden over 200 years ago. So, though we’re not told that he adjusts his stride as he follows the paces described in the ritual, we can be confident that he did.

## MENTAL MATH

In section 3.7 we noted that *Silver Blaze* (SILV) contains the most famous words written in all of the sixty Sherlock Holmes stories: “the dog did nothing in the nighttime.”<sup>2</sup> This is the famous “enigmatic clue.” Holmes makes

<sup>2</sup> There are about 800,000 words in the Canon (Swift, W. and Swift, F. 1999, 37).



Figure 5.1 Holmes and his watch

another notable statement in *SILV*, a mathematical one. At the beginning of this adventure, when Holmes and Watson take the train to Dartmoor, he remarks that,

“Our rate at present is fifty-three and a half miles an hour.”

Then, by way of explanation Holmes says,

“The telegraph posts upon this line are sixty yards apart, and the calculation is a simple one.”

At first glance the reader will not see an easy route from 60 yard gaps between posts to 53.5 in miles per hour. How did Holmes do this calculation in his head? His watch was the only device used.

Sherlockians have proposed a several methods for this mental math. All of them start by constructing an equation with three unknown quantities: the time, the number of gaps traversed in that time, and the train’s speed. Holmes then measures the time and number of gaps, allowing him to com-

pute the speed. But can it be done in such a way that the calculation is simple? Here is Bengtsson's explanation (Bengtsson 1989).

Let's begin our analysis by establishing the equation that relates our three quantities. First, speed is distance divided by time:

$$S = D/t$$

The total distance traveled will be  $N$  gaps times 60 yards per gap

$$D \text{ (yards)} = 60N$$

To convert this to miles requires dividing it by 1760 yards per mile

$$D \text{ (miles)} = 60N/1760$$

To convert this to a speed we must divide distance by time,  $t$ (sec).

$$S(\text{miles/second}) = D/t = 60N/1760t$$

To convert this to hours we must multiply by 60 sec/min and also by 60 min/hour

$$S(\text{miles/hour}) = [60N/1760][60 \cdot 60/t] = (N/t)[60 \cdot 60 \cdot 60/1760] = (N/t)[6 \cdot 60 \cdot 60/176]$$

It still isn't the least bit simple; until Holmes has the mathematical insight to note that  $176 = 11 \cdot 16$ .

$$S(\text{miles/hour}) = (N/t)[6 \cdot 60 \cdot 60/176] = (N/t)[6 \cdot 60 \cdot 60/11 \cdot 16]$$

Then it gets easy. He sees that making  $N = 11$  will eliminate that awkward factor from the equation. So he does that by measuring the time to travel 11 gaps. Then

$$S = (11/t)[6 \cdot 60 \cdot 60/16 \cdot 11] = [6 \cdot 60 \cdot 60/16t] = [6 \cdot 60 \cdot 60/4 \cdot 4 \cdot t][6 \cdot 15 \cdot 15/t]$$

$$S(\text{miles/hour}) = 1350/t$$

It turned out that the train's speed was such that as they approached the twelfth pole (11 gaps), Holmes saw that the time was nearing 25 seconds. It is relatively simple, particularly if you're good at math, to see that  $1350/25 = 54$  (four 25's in a hundred, thus fifty-two 25's in 1300. Then

add two more 25's for the 50 bringing the number of 25's in 1350 to 54). That meant that if the train reached the 12th pole in exactly 25 seconds, the speed would have been 54 mph. When the train didn't quite reach the last pole in 25 seconds, Holmes merely gave a good estimate that somewhat a little less than 54 could be described nicely as the 53.5 mph that he reported to Watson. Some agonizing discussions exist claiming that the number of significant figures he gave, three, denotes a more exact calculation than the one just described. Today's students, who often report as many figures as their calculator will give, will realize that in this setting, i.e. not a research lab, it is not an important issue. The main point is that Holmes's remark that the speed is 53.5 mph illustrates his facility with mental calculations.

## Section 5.2

Biology

*Which is it today, morphine or cocaine?*

Dr. Watson, "The Sign of the Four"

### ANATOMY

In his rating of Holmes's abilities in *STUD*, Watson rates Holmes separately on two areas of biology, botany and anatomy. As was the case with mathematics, more than two-thirds of the biological references occur in the first half of the Canon. According to Watson, Holmes's knowledge of anatomy is "accurate, but unsystematic." This probably refers to the fact that, per usual, Holmes's has learned only what anatomy he felt could help him as a consulting detective, "the only one in the world." We learn in the second story, *SIGN* that Holmes has already authored a monograph with a rather lengthy title.

"The Influence of Trade Upon the Form of the Hand, With Lithotypes of the Hands of Slaters, Sailors, Cork-cutters, Compositors, Weavers, and Diamond-polishers"

Holmes actually uses this ability in some cases. In *A Case of Identity* (*IDEN*) his first words to Mary Sutherland are,

"Do you not find that with your short sight it is a little trying to do so much typewriting?"

He later explains to Watson that he could see an impression above her wrist where it rested on the typewriter. This type of observation is reminiscent of Dr. Joe Bell. Recall from section 1-4 where Bell deduces a woman is a linoleum worker from the dermatitis on the fingers of her right hand. The fact that Mary Sutherland is a typist does play a role in the plot. But it does not help Holmes arrive at a solution to the case. IDEN is the story which Holmes solves using the idiosyncrasies of a typewriter. The culprit is Mary's stepfather, James Windibank (see section 3.5)

In *The Solitary Cyclist* (SOLI) Holmes looks at the anatomical features of Violet Smith's hands and deduces that she is a musician. He admits he almost thought that she too was a typist because musicians and typists have similar hand types. But he eventually got it right. The problem in SOLI is that Violet Smith is not a solitary cyclist. She is being followed by another cyclist. This alarms her and she consults Sherlock Holmes. Again the fact that Holmes could deduce her profession plays no role in solving the case. Holmes sends Watson to investigate the second cyclist. When he receives Watson's report the unsympathetic Holmes tells the good doctor,

“You really have done remarkably badly.”

But Holmes is able to stop the plans of Jack Woodley and Bob Carruthers to get at Violet's fortune by forcing her to marry Woodley.

Another part of human anatomy that Holmes studied was the human finger. He saw the potential use of fingerprinting in crime solving before Scotland Yard did. In chapter three we discussed several stories where fingerprints are mentioned, with the only significant usage occurring in *The Norwood Builder* (NORW) when John Hector MacFarland's right thumbprint is found on the wall.

A third part of human anatomy that drew Holmes's interest is the ear. In *The Cardboard Box* (CARD) Holmes claims to have authored two monographs on ears in the *Anthropological Journal*. He believes that “Each ear is as a rule quite distinctive and differs from all other ones.”<sup>3</sup>

It is an unusual detective story in which the shape of an ear plays a significant role. But that is exactly the case in CARD. Susan Cushing receives a cardboard box through the mail. In it are two severed human ears. One is a woman's ear; the other is that of a man. Holmes's solution is hastened when he notices the strong ear resemblance between the severed female ear and that of Susan Cushing. Soon he has shown that the murderer is Jim Browner, husband of Susan Cushing's youngest sister Mary. In a fit of rage Browner has killed his wife and her lover Alec Fairbairn. He then sends the

<sup>3</sup> Are they?

severed ears to the third sister, Sarah Cushing. It was Sarah who coveted Jim and then sabotaged his marriage when he rejected her. But Susan Cushing mistakenly receives the ears, consults Holmes, and justice is done.

The ham, the region behind the knee, is mentioned in two stories. In *The Musgrave Ritual* (MUSG) the body of Brunton the butler is found “squatted down upon his hams.” The ham plays a more significant role in SILV. John Straker was killed by Silver Blaze while attempting to “make a slight nick upon the tendons of a horse’s ham,” i.e. the hamstrings. Holmes is delighted that his inquiry about sheep reveals that three had recently gone lame. His reasoning was that the culprit would want to practice his tendon snipping skill. And why would the trainer sabotage his own horse’s chances? Straker planned to bet heavily on the opposition horse. He wanted Silver Blaze to be able to run, just not too fast.

In the sixtieth story published, *Shoscombe Old Place* (SHOS), Sir Robert Norberton has concealed the fact of his sister’s death by placing her body in the church crypt in a coffin previously occupied by an ancestor. He has some of the ancient bones burned at night. But one of the stable lads finds an old femur before it is burned. He takes it to John Mason, the head trainer of Norberton’s horse Shoscombe Prince. Mason consults Sherlock Holmes, who asks Dr. Watson:

“What do you make of it, Watson?”

“It’s the upper condyle of a human femur.”

“Exactly!”

Tracy defines a condyle as “a protuberance on the end of a bone serving to form an articulation with another bone” (Tracy 1977, 82). The human femur has just such a thing at the lower end of the femur, i.e. the knee. But there is no such thing as an upper condyle of a human femur, where it joins the hip. Note that it is Watson who first makes the mistake. But Holmes enthusiastically agrees. We could let them share the blame for the scientific error. Or perhaps Arthur Conan Doyle deserves the blame.

Sir Robert’s motive is his desire to avoid bankruptcy. He must prevent news of his sister’s death from reaching his creditors until Shoscombe Prince wins the derby. The condyle, no matter whether it be upper or lower, is just a minor clue to the proceedings. The behavior of the spaniel is much more important (see section 3.7).

We talk more about the condyle in “Doyle Scams” in the Appendix.

## BOTANY

Watson, in *STUD*, rates Holmes’s botany as “variable.” Furthermore, Holmes is

“well up in belladonna, opium, and poisons generally.  
Knows nothing of practical gardening.”

We will first examine Watson’s opinion of Holmes the gardener. One instance of Holmes displaying his mediocre botanical skills is his behavior in *Wisteria Lodge* (WIST). The case takes Holmes to the village of Esher in Surrey. Holmes needs some kind of cover while he keeps a nearby house under surveillance. He tries to divert attention by reading an elementary book on botany and collecting botanical samples while he keeps watch on the house. But, according to Watson, “it was a poor show of plants which he would bring back of an evening.” Watson’s assessment of Holmes and gardening is accurate.

Because they directly impacted his work, Holmes had much greater interest in poisons. We looked at chemical poisons in chapter four. There is also frequent mention of biologically based poisons in the Canon. Such substances began to replace inorganic poisons around the middle of the nineteenth century. These molecules were discovered or isolated starting with morphine, a derivative of opium, in 1804. Others soon followed: nicotine (1807), strychnine (1819), and cocaine (1860). When the Marsh test and then the Reinsch test of 1842 (Wagner 2006, 51) made detection of arsenic reliable, poisoners looked to abandon this “inheritance powder.” They started to use biological poisons with greater frequency. In this way they were able to stay ahead



Figure 5.2 Cocaine

of law enforcement detection capabilities. In the middle of the nineteenth century authorities in France ruefully reported that (Blum 2010, 2),

“Henceforth let us tell would-be poisoners; do not use metallic poisons for they leave traces. Use plant poisons. Fear nothing; your crime will go unpunished.”

By 1851 when “the potent poison” nicotine (Wagner 2006, 56) was first detected in a corpse, bio-poisons were being used regularly in murders. Interestingly one such case was solved by Dr. Henry Littlejohn (see section 1.3) in 1878. He was able to get a conviction by showing that opium was the cause of murder (Wagner 2006, 55). The Holmes stories start off with biological poisons being used for murder in the first two stories. In *STUD*, the Mormon Enoch Drebbler is killed by what is probably curare. Jefferson Hope gets his revenge on Drebbler by using an alkaloid extracted from a South American arrow poison. Curare is the most famous of these arrow substances (Tracy 1977, 94). In *SIGN*, Tonga kills Bartholomew Sholto using a “strychnine-like” substance, resulting in a very unpleasant death (Cooper 2008, 41). Presumably the dart from Tonga’s blow gun that just misses Holmes and Watson during the concluding high-speed boat chase down the Thames has the same deadly compound on the tip.

Bio-poisons were used in several other Holmes cases, without leading to death. In *The Sussex Vampire* (*SUSS*) the jealous Jack Ferguson fails in his effort to kill his young half-brother with curare. In *SILV* the stable boy Ned Hunter is drugged with powdered opium. Doyle’s description of the tranquilizing effect of opium is accurate. Thus, with Ned Hunter in somewhat of a stupor, John Straker is able to remain undetected as he leads Silver Blaze out onto the nearby moor. Then as Straker attempts to snip a tendon, the frightened horse rears up and strikes the trainer with a hoof, killing him.

Sherlock Holmes’s cocaine issues were introduced in chapter two. It has been pointed out that Doyle’s description of Holmes’s reaction to drugs doesn’t match reality. He describes cocaine as a tranquilizing drug when actually it tends to stimulate (Pratte 1992). In several stories we see Holmes’s need for mental stimulation. In *The Hound of the Baskervilles* (*HOUN*) he tells Watson that his afternoon was spent consuming “two large pots of coffee and an incredible amount of tobacco.” We saw earlier that in *The Red-Headed League* (*REDH*) that the case caused him to turn to nicotine to help him solve that “three pipe problem.” In *The Missing Three-Quarter* (*MISS*), he complains of stagnant days.

In *SIGN*, after injecting himself with the famous seven per-cent solution, Holmes says that his mind rebels at stagnation.



“I crave mental exaltation.”

Watson’s emotional response:

“Count the cost!”

“Why should you, for a mere passing pleasure, risk the loss of those great powers with which you have been endowed?”

Watson talks (MISS) of how he has weaned Holms from the drug habit “which had threatened once to check his remarkable career.” But even as he thinks he has gotten Holmes’s off the cocaine, he tells us,

“I was well aware that the fiend was not dead but sleeping.”

The treatment of poisons and drugs in the stories is, of course, shaped by Doyle’s attitude toward them. On September 20, 1879 he wrote a letter to the *British Medical Journal*. The title of the letter was “Gelseminum as a Poison” (Gibson and Green 1986, 13). In order to test the poisonous properties of Gelseminum, he administered a small amount to himself. He kept increasing the amount everyday until he could no longer stand it.

“The diarrhea was so persistent and prostrating, that I must stop at 200 minims. I felt great depression and a severe frontal headache.”

This same concept appears immediately in the very first Holmes story, *STUD*. In the opening chapter Young Stamford warns Watson:

“I could imagine his giving a friend a little pinch of the latest vegetable alkaloid, not out of malevolence, you understand, but simply out of a spirit of inquiry.”

Stamford adds that Holmes would also readily take some alkaloid himself in order to learn about its effects.

The most interesting aspect of the Holmes/cocaine scene is how Doyle has Watson condemn its use. *SIGN*, where Watson tells Holmes to count the cost, was published in 1890. The prevailing view of cocaine was rather positive at that time. In 1884 Sigmund Freud wrote a review article on cocaine which he described as “a song of praise to this magical substance” (Musto 1968, 128). He tells us about experimenting on himself with

cocaine. Perhaps Freud helped shape Doyle's view of testing substances on oneself.

Freud's final article on cocaine was published in 1887. It still speaks positively about cocaine, but somewhat less so. In it Freud cites supporting statements by William A. Hammond (Musto 1968, 129). Hammond was the U. S. Surgeon General during the Civil War. Following that war he was a very successful physician in New York City (Sartain 2008). He announced that cocaine was a harmless tonic which cheered the melancholy while having no adverse side effects and it was not addictive (Musto 1988, 215). Hammond felt that a cocaine habit was very much like a coffee habit (Musto 1968, 130). Indeed, Musto tells us that "Cocaine as Holmes used it was in accord with the advice of leading physicians." Despite all the praise from these two respected authorities, Arthur Conan Doyle was early in his negative appraisal of the effects of cocaine. Note that, contrary to Hammond's view, he describes it as addictive. Watson has to wean Holmes from it, and still feared the "fiend" would return. In this instance Conan Doyle the physician was ahead of his time. Cocaine would be universally condemned for many years.

## Section 5.3

Physics

*He threw himself down upon his face with his lens in his hand*

"The Speckled Band"

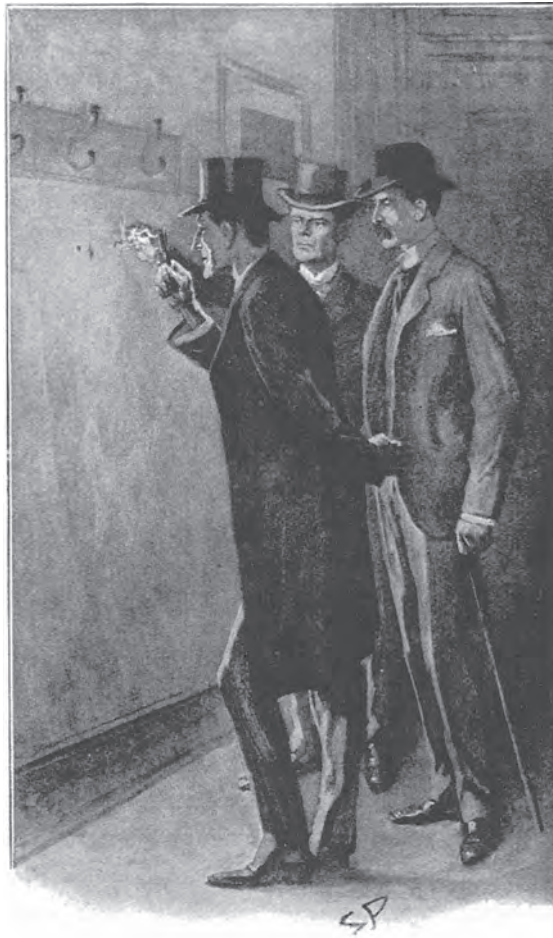
### OPTICS

The public often connects Sherlock Holmes with the magnifying lens. No wonder since it has been called "the very first tool of deduction" (Capuzzo 2010, 14). It is one of several optical devices that are used in the Holmes stories, being mentioned in twenty of the sixty stories (Coppola 1995, 110). In the first story, *STUD*, Holmes spends twenty minutes examining the room where the dead body of Enoch Drebbler was found. Watson describes him as "sometimes stopping, occasionally kneeling, and once lying flat upon his face." In the next adventure, *SIGN*, Holmes makes even more use of his lens. His deductions about Watson's brother's watch (see section 2.1) follow his examination of it with a convex lens. Holmes next uses his lens to examine the rope which Jonathon Small used to climb into Bartholmew Sholto's room. His third use of a lens in *SIGN* is to study the room where the murder was committed.

“He whipped out his lens and a tape measure and hurried about the room on his knees, measuring, comparing, examining with his long thin nose only a few inches from the planks.”

Isn't that the Holmes we love, so intent when he is hot upon the trail? Here's Watson's description in BOSC:

“His face flushed and darkened. His brows were drawn into two hard black lines, while his eyes shone from beneath them with a steely glitter. His face was bent downward, his shoulders bowed, his lips compressed, and the veins stood out like a whipcord in



*Figure 5.3 Holmes and his lens*

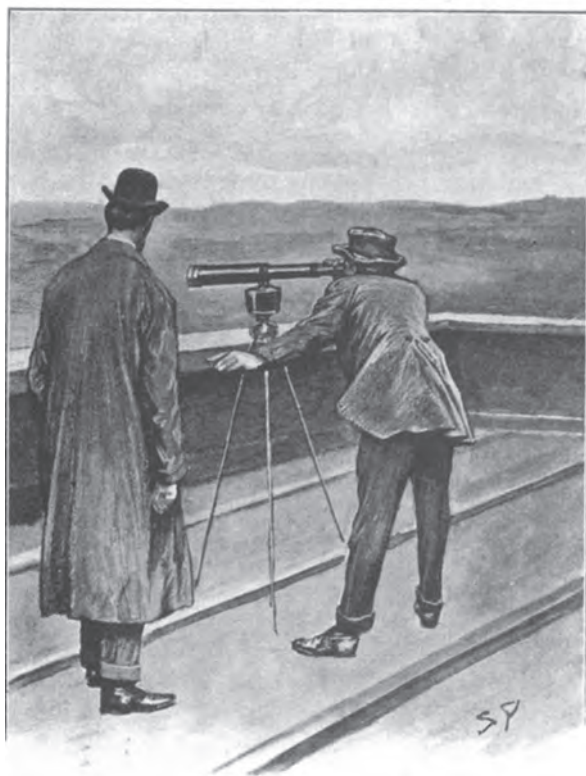


Figure 5.4 Telescope

his long sinewy neck. His nostrils seemed to dilate with a purely animal lust for the chase.”

In *BOSC* Holmes uses his lens to examine the ground around Boscombe Pool. This examination leads to the solution of the mystery. In *REDH* he uses his lens to examine the cracks between the stones in the floor through which the bank robbers are about to dig their way into the vault. Somehow this enables him to predict that it will be another hour before they climb up to their capture.

We’ve already seen how Sherlock was able to make accurate deductions about Dr. Mortimer in *HOUN* and Henry Baker in *The Blue Carbuncle* (*BLUE*). In those cases he used his magnifying lens on Mortimer’s walking stick and Baker’s hat.

In *NORW*, Holmes examines the vital thumb mark clue with his lens. In *The Beryl Coronet* (*BERY*) it is footprints on the window sill that he magnifies for examination. This allows him to trace movements of suspects and show that Arthur Holder did not steal the priceless coronet. The lens

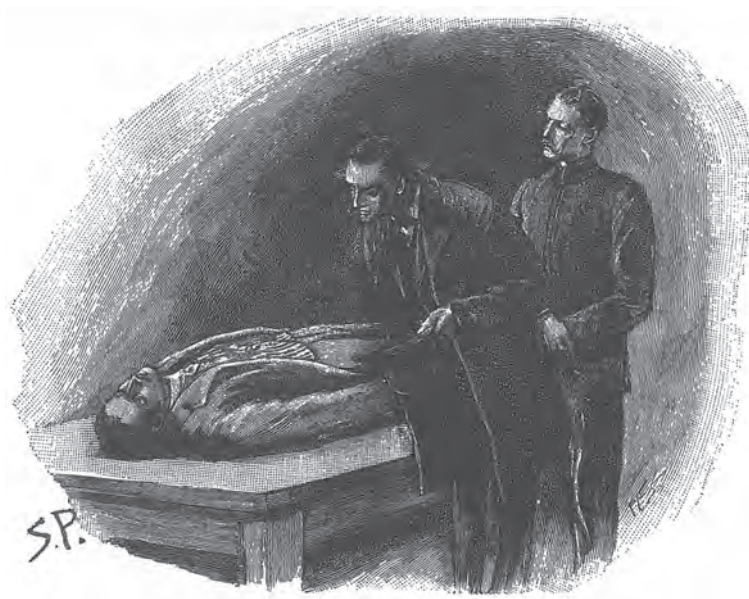


Figure 5.5 *Black powder*

is again used to examine the footprint of a shoe on a window sill in *The Valley of Fear* (VALL). In *The Golden Pince-Nez* (GOLD) Holmes looks through his lens at a telltale fresh scratch mark on the lock of Professor Coram's bureau. It's an important clue. The lens is used in several other cases as well, though without large impact on the case. He examines a bush in *The Bruce-Partington Plans* (BRUC), the crucial gash in the stone of *Thor Bridge*, a blood mark on a notebook in *Black Peter* (BLAC), and the lamp in *The Devil's Foot* (DEVI).

It is notable that Holmes continued to use his magnifying lens throughout the Canon. After a flurry of use early, in six of the first thirteen stories, he uses it nine more times in the last forty tales. These nine times are spread evenly through the stories. He may have drifted away from chemistry, biology, and math, but he stuck with his lens. It is generally true that his most effective uses were in the early stories. However, he did well with the lens in story number fifty-seven, *The Lion's Mane* (LION). By this time Holmes has left London and is living in a villa on the south coast "commanding a great view of the Channel." Unsurprisingly he gets involved in local events. For example, just before the local science teacher, Fitzroy

McPherson, dies he utters the words, “the lion’s mane.” Holmes is confused by these words as well as the strange marks on the body.

Holmes uses his lens to examine McPherson’s body. He then reminds us, for LION is one of the two cases narrated by Holmes instead of Watson, “that I hold a vast store of out-of-the-way knowledge.” He finally remembers a book that describes wounds such as McPherson’s and attributes them to *cyanea capillata*, a type of jellyfish also called the Lion’s Mane. Inspector Bardle of the Sussex Constabulary, anxious to make an arrest for murder, asks for Holmes’s help. Thanks to the lens and his vast store of knowledge, Holmes is able to show that no murder has been committed.

Two other optical devices get a mention in the Holmes stories. A telescope is used in HOUN. Mr. Frankland uses it to keep tabs on all that happens on the moor. When he has Watson look through his telescope, he too sees suspicious activity. Watson immediately goes out on the moor to investigate. He is shocked to find that the mysterious person living out there is none other than Sherlock Holmes. Holmes and Watson had been working separately on the Baskerville case, but from now until the close they will work together. That is the only role that a telescope plays in the



*Figure 5.6 Smell of powder*

Canon. There is not even an entry under “telescope” in the Holmesian encyclopedias (Tracy 1977, Bunson 1994, Park 1994). We’ve seen in chapter four that Holmes uses a microscope in SHOS. Though his work with it was successful in SHOS, the case was one we never hear about. It provides evidence in a case he is working on simultaneously with the events surrounding Shoscombe Prince. Watson tells us little else about Holmes and the microscope. Since SHOS is the very last story published, we can take Holmes’s use of the microscope as evidence that he was evolving as a forensic detective. Though he never gave up the magnifying glass, he was looking to the future in beginning to use the microscope as well.

## OTHER PHYSICS

There are a few other aspects of Holmes’s work that fall under the mantle of physics. One is his knowledge and use of gunshot residues, still important in today’s courtrooms. Holmes’s first significant use of gunshot residues takes place in *The Reigate Squires* (REIG). William Kirwan, the coachman for the Cunninghams, is found dead. The Cunninghams, both father and son, claim to have seen the murderer. Young Alec Cunningham reports that Kirwan and his assailant were locked in a struggle when the fatal shot was fired. The murderer then fled following the shot. Upon examining the body Holmes instantly concludes that Alec Cunningham is lying. The basis for this conclusion is that there is no powder mark on the dead man. As Holmes explains his reasoning at the end of the case, he remarks that the lack of powder blackening had convinced him that the shot had been fired from a distance of more than four yards. Coupling this evidence with his brilliant deductions based on the handwritten note (see section 3.4), Holmes is able to make his case against the actual murderers, the Cunninghams.

In *The Dancing Men* (DANC) we get a somewhat different usage of powder following a gunshot. In this story it appears that Elsie Cubitt shot and killed her husband, Hilton. She then failed in her attempt to kill herself. Holmes immediately rejects this official version. He had been contacted by Hilton Cubitt about messages being left at his house in the strange form of dancing men figures. Holmes has already cracked the code (see section 3.4) and knows there is another person involved in the case. Two servants, Saunders the housemaid and Mrs. King the cook, find the Cubitts, one dead and the other nearly so. They report that they could immediately smell powder upon hearing gunshots and exiting their upstairs rooms and before coming down to the study where the crime was committed. Holmes deduces that both the window and the door to the study had been open. Here he is applying knowledge of Graham’s Law of Diffusion to the movement of the vapor through the house.

Thomas Graham, a Scotsman, formulated two laws that describe how fast gases move. His Law of Effusion can calculate how rapidly a gas will escape through a pinhole into a vacuum. Graham's Law of Diffusion deals with the speed with which two gases mix. That is the situation in DANC. Diffusion is more complicated than effusion, and thereby more approximate. The powder vapor in DANC must move through the air and arrive in the upstairs hall almost immediately. Holmes knows that won't happen unless there is the assistance of a breeze. This is a common sense type conclusion but Inspector Martin is a bit slow to grasp it.

"You remember, Inspector Martin, when the servants said that on leaving their room they were at once conscious of the smell of powder, I remarked that the point was an extremely important one?"

"Yes sir, but I confess I did not quite follow you."

Holmes goes on to describe the murder scene. A third person was outside the window. He and Hilton Cubitt fired almost simultaneously, giving rise to the very loud noise which woke the staff upstairs. Cubitt was killed by Abe Slaney, but his bullet missed Slaney. Holmes looks for and finds evidence of a third bullet on the window sill. Elsie Cubitt, distraught over her husband's death, then shot herself in the head.

In BRUC Watson tells Holmes,

"A masterpiece. You have never risen to a greater height."

What has impressed Watson is mainly physics, again mixed in with common sense. BRUC is one of the cases involving Mycroft Holmes. The plans to a new submarine have gone missing. Worse than that, Arthur Cadogan West is dead. His body is found next to the London Underground train tracks near the Aldgate station. BRUC was published in December 1908. Another dead body was also found at the Aldgate station in "The Mysterious Death on the Underground Railway" (Ackroyd 2011, 168), also published in 1908. This novel was perhaps one of Doyle's sources.

In BRUC, no ticket for the train is found on the dead body. Only Holmes considers that important. He says to Inspector Lestrade,

"Why had he no ticket?"

Lestrade's idea is that the murderer removed the dead man's train ticket before he tossed the body out of the train. Holmes's insight about the lack of a train ticket helps him deduce that Cadogan West was never in the



train, but on top of it. He was killed in a flat that was on the edge of the tracks in one of the few areas where the Underground emerges, near the Gloucester Road Station. The murderer merely tossed the body onto the top of the train as it paused nearby. The murderer may even have thought of this strategy after hearing guards along the Underground. They used to call out (Ackroyd 2011, 140)

“It is forbidden to ride on the roof.”

The body remained there, following the principles of friction, inertia, and momentum.<sup>4</sup> Friction had to be overcome before it could move. This occurred near Aldgate because of two factors: “Points, and a curve,” says Holmes.

Aldgate is a junction and the tracks curve. At a junction the train goes over “points,” making for a bumpy ride. The lessening of the friction that resulted coupled with the momentum in a straight line as the train also went round a curve got the body moving right over the side of the train to the ground. Had the train gone smoothly in a straight line, the body would have remained on the roof.<sup>5</sup>

The last application of physics that we shall discuss has been a source of controversy in the Sherlockian literature for years. In *The Priory School* (PRIO), Holmes claims to know the direction a bicycle was traveling by examining its wheel tracks in soft ground. When he remarks to Watson that the bike was heading away from the Priory School, Watson responds,

“Or towards it?”

Holmes answers,

“No, no, my dear Watson. The more deeply sunk impression is, of course, the hind wheel upon which the weight rests. You perceive several places where it has passed across and obliterated the more shallow mark of the front one.”

<sup>4</sup> A map of the 1908 London Underground suggests that Cadogan West’s body remained on the roof of the Underground train for approximately 12 stops.

<sup>5</sup> An extensive analysis of the Underground and its motions was the subject of early Holmesian research. See Crump, N. 1952[AQ: Please provide complete details of “Crump (1952); Drayson (1888); Pratte (1992) and Schweichert (1980)” in the reference list.], *Sherlock Holmes Journal*, Vol. 1(1), 16–23.

In this story Lord Saltire, ten year old son and heir of the Duke of Holderness, has been abducted from his school. Heidegger, who taught German at the Priory School, rode his bicycle desperately after Lord Saltire in an attempt to help him escape. James Wilder, secretary to the duke and his illegitimate son, arranged the abduction by Reuben Hayes. Wilder wished to become heir to the duke's fortune.

When Holmes comes upon a set of bicycle tracks made by Dunlop tires, he makes his claim about its direction. His claim was immediately challenged by readers who thought that obliteration of tracks could not enable direction to be determined. Holmesian scholars lined up on both sides of the debate (Baring-Gould 1967, Vol. 2, 617). Arthur Conan Doyle soon heard that the point was under dispute (Haining 1995, 161):

“I dare say I have had twenty letters upon the one point alone.”

He decided to use a bicycle and test the idea. He found he could not tell direction on flat ground; but he could on a hill. Actually, in the story, Doyle had already hit upon the solution to the direction question. At one point Holmes says to Watson,

“Do you observe that the rider is now undoubtedly forcing the pace?”

Holmes has observed that the tracks of both front and back wheels are equally deep.

“That can only mean that the rider is throwing his weight on to the handle-bar, as a man does when he is sprinting.”

This principle, accepted by both sides of the debate, provides the answer to the direction question. Watson describes the terrain as “rolling hills.” Doyle found that going uphill resulted in deeper tracks by both wheels than going downhill. So Holmes could tell the direction of travel, but not by obliteration of tracks.

There are two other notable features in PRIO. The first deals with the fact that Holmes can easily tell Heidegger's bike tracks from Wilder's. Heidegger's bicycle has Palmer tires and Wilder's has the Dunlop tires.

“I am familiar with forty-two different impressions left by tyres.”

Holmes's feat may have been less impressive than it seems. At the time it was common for bike tires to bear the company logo on the tread (Klinger 2005, vol. 2, 948). When Heidegger's Palmer tracks are encountered they lead to his dead body. Hayes has killed him with a blow to the head.

Holmes's claim about tire treads also brings to mind similar claims he made elsewhere. In IDEN Holmes asserts that James Windibank's typewriter had sixteen different characteristics that were unique. In REIG he says that there were twenty-three characteristics of the handwriting that would link the incriminating note to the Cunninghams. In HOUN Holmes remarks that there are seventy-five perfumes that a criminal expert should be able to distinguish. In BOSC he even claims to have authored a monograph on 140 varieties of tobacco (Smith 2011, 49). All this knowledge he gathered before we ever met him. This seems like it might be an interesting time in Holmes's life. But I suppose stories about a would-be detective educating himself might not be as entertaining as Doyle's sixty tales.

The other aspect of PRIO caused Holmes to say,

"The case deserves to be a classic."

How did Reuben Hayes get out on the moor, abduct Lord Saltire, kill Heidegger, and leave no tracks? The only tracks other than those of Heidegger's and Wilder's bicycle tires are from cows. Meditating on this over lunch Holmes says to Watson,

"Well, now, Watson, how many cows did you see on the moor?"

"I don't remember seeing any."

Watson too now wonders about the cow tracks. He asks,

"And what is your conclusion?"

"Only that it is a remarkable cow which walks, canters, and gallops."

Holmes has recalled the pattern of the hoof marks and correctly deduced that the tracks were those of a horse. Hayes put shoes on the horse which looked like cow tracks. He was attempting to avoid blame by concealing that he'd been on the moor. He wasn't expecting Sherlock Holmes as the investigator.

When Watson assesses Holmes's abilities in STUD, and also when he recollects his ratings in FIVE, he says nothing about physics. Given what physics we have in the stories, this is understandable. Holmes's physics is

mainly common sense reasoning that many could do without knowing the physical principle being applied. That he does it better and quicker than the official police force shows again that he is well grounded in science.

## Section 5.4

Other Sciences

*How's the glass? Twenty-nine, I see.*

Sherlock Holmes, "The Boscombe Valley Mystery"

### ASTRONOMY

We get our initial glance of Sherlock Holmes as astronomer in the very first story, *STUD*. It is in *STUD* that Watson makes his famous assessment of Holmes. Part of it reads

Knowledge of Astronomy—Nil

Holmes appears to be unaware of how the solar system works. And when Watson describes it to him, Holmes vows to forget it because it won't help him solve crimes. In the early stories we're dealing with the super practical Holmes. He is only interested in things that have direct application to his work. Who cares about the solar system?

However, by the time of the forty-second story, *BRUC*, Holmes is well up on the solar system. He is shocked to receive a telegram from brother Mycroft announcing his imminent arrival at Baker Street. Sherlock, no longer ignorant of the solar system, states that for the famously lazy Mycroft to leave the comfort of the Diogenes Club to come to the Baker Street lodgings is as likely as a planet leaving its orbit. But we had known that Holmes had gotten up to speed in astronomy long before this.

Our first hint that Holmes was getting familiar with astronomical subjects comes in *The Musgrave Ritual* (*MUSG*), the twentieth story. He figures out the correct position of the sun for his calculation of where the shadow of the oak tree will fall (see section 5.1). He also notes that Brunton's intelligence is "quite first-rate." Therefore Holmes feels that he will not need to take into account "the personal equation<sup>6</sup> as the astronomers have dubbed it." He is saying that Brunton will not have made any errors. The point here is that Holmes is now referring to astronomers, indicating that he has been doing some reading in that field.

We next hear Holmes mention astronomy in the twenty-fourth story, *The Greek Interpreter* (*GREE*). Watson and Holmes have a discussion on the

<sup>6</sup> the variation or error in observation or judgment caused by individual characteristics.

“obliquity of the ecliptic.” The earth’s orbital plane around the sun is called the ecliptic plane. If the earth were not tilted, but had its axis of rotation perfectly upright, the obliquity of the ecliptic would be zero (Ridpath 2006, 132). But earth currently has an axial tilt of about 23.5° away from vertical. It is this tilt of the axis about which we daily rotate which gives the earth its seasons. The value of the tilt varies over the years between a minimum near 22.5° and a maximum near 24.5°. It is this variation in the earth’s tilt, called the obliquity of the ecliptic, that Holmes and Watson discuss in GREE. Perhaps now Holmes is showing some real expertise in astronomy. We know that when they first met in STUD Watson knew more astronomy than Holmes. Perhaps then it was he who led the astronomical conversation in GREE. We’re not told. Holmes at the least knew enough now that he could participate in such a conversation.

It is obvious that Arthur Conan Doyle was an extremely well-read individual. Even so it is surprising that a physician/author would insert a comment in his writings about “the change in the obliquity of the ecliptic.” Was Doyle reading accounts of current astronomical research? It turns out that he had a personal friend in the astronomical community. Alfred Drayson lived near Doyle in Southsea near Portsmouth in the 1880’s. Drayson was actually a patient of Doyle the physician (Schaefer 1993). Drayson and Doyle vacationed together. Who is this close friend to whom Doyle would dedicate a book?

Alfred Drayson made a career in the military, graduating in 1846 from the Royal Military Academy in Woolwich. After military service in India, South Africa, and North America (Stashower 1999, 95), Drayson returned to Woolwich to be instructor of astronomy at his alma mater. He also did some part-time work at the observatory at Greenwich. In 1868 he was elected to the Royal Astronomical Society. Doyle was so impressed by Drayson that he considered him a genius (Booth 1997, 122) and compared him favorably to Copernicus (Stashower 1999, 95). In March of 1890 Doyle published a collection of ten short stories under the title *The Captain of the Polestar*. He dedicated the book to Drayson (Booth 1997, 134):

“To my friend Major-General A. W. Drayson as a slight token of my admiration of his great and as yet unrecognized services to astronomy.”

Drayson did publish the results of his astronomy researches. But some of his work did not stand the test of time. An 1875 paper of particular interest to Sherlock Holmes readers was entitled *Variation on the Obliquity of the Ecliptic*. (Schaefer 1993, 176). It proposes a theory that proved to be wrong. He also gave a lecture in 1884 to the Portsmouth Literary and Scientific

Society on “The Earth and its Movement.” In the lecture he described the obliquity of the ecliptic (Booth 1997, 98). Doyle was a member of the society and very likely went to hear his friend speak. Drayson’s 1888 book, *Thirty Thousand Years of the Earth’s Past History*, discusses variations in the obliquity of the ecliptic. It is nearly certain that Doyle got the idea to use the obliquity of the ecliptic from his friend Alfred Drayson. So in GREE he has Holmes and Watson discuss the topic. In Section 5.1 we saw that the level of conversation between the roommates was on a high mathematical level. Again this is true as they talk about astronomy.

The other major astronomical topic in the Canon involves that other astronomer, Professor Moriarty. We’re told in *The Final Problem* (FINA) that his “*Treatise on the Binomial Theorem*” had secured a chair in mathematics for Moriarty. But his most impressive work was astronomical. His “*The Dynamics of an Asteroid*” was a “book which ascends to such rarefied heights of pure mathematics” that few could even read it. So the professor had gravitated to astronomy once he became a faculty member. Even after moving on to become London’s crime lord, Moriarty retained interest and expertise in astronomy. When Inspector MacDonald goes to Moriarty’s study to question him, the professor can’t resist explaining eclipses to the inspector. He even gives a demonstration of how eclipses occur. He concludes by lending MacDonald a book on the topic (VALL).

But Moriarty’s major effort in astronomy dealt with asteroids or “minor planets.” Since the 1700’s astronomers have had an equation for computing the distances of the planets from the sun. It is called the Titius-Bode law:

$$D \text{ (in A.U.)} = 0.4 + (0.3 \times N)$$

Where  $N = 0, 1, 2, 4, 8, \text{etc}$  (doubling)

D is in astronomical units  
(the distance of the earth from the sun is defined as 1 astronomical unit)

This equation gives good estimates to the actual distances, as shown below (Kowal 1996, 2).

Planet	N	Calc. D	Measured
Mercury	0	0.4	0.39
Venus	1	0.7	0.72
Earth	2	1.0	1.00
Mars	4	1.6	1.52
GAP	8	2.8	2.77 (Ceres)
Jupiter	16	5.2	5.20
Saturn	32	10.0	9.54

A notable feature of these calculations is the gap between Mars and Jupiter. The existence of this gap caused astronomers to search for a missing planet. What was found instead was the first asteroid. It was in Sicily in 1801 that Giuseppe Piazzi discovered Ceres at 2.77 A. U. He gave it a name to honor the patron goddess of Sicily (Kowal 1996, 1). Note how close its distance from the sun matches the 2.80 value in the list above. The discovery of Ceres was soon followed by that of Pallas, in 1802. This second asteroid was named in honor of Pallas Athena, the Greek goddess of wisdom. Eventually hundreds of asteroids would be found in the “asteroid belt” between Mars and Jupiter<sup>7</sup>.

These discoveries caused great excitement in the scientific world. Soon there were theories explaining why asteroids were found instead of another planet. Chemists took note of these astronomical advances by naming the next two chemical elements to be discovered after these two asteroids. Cerium and palladium were found in 1803. By the time of Doyle and Holmes excitement about asteroids would have died down since hundreds were then known. But then in 1898 the first “near-earth” asteroid, Eros, was discovered. Never does an astronomical thing or event play a significant role in one of Holmes’s cases. The most interesting thing about the astronomy in the tales is how it got there. Conan Doyle’s familiarity with Alfred Drayson’s work on the obliquity of the ecliptic, and the continuing interest in asteroids brought about the astronomical references in the Canon. Doyle was able to emphasize the scientific literacy of Holmes and Watson by making them knowledgeable about the current state of astronomy.

## GEOLOGY

Watson’s original assessment of Holmes the geologist, given in *STUD*, is “practical, but limited.” When he tried to recall the geology rating in *The Five Orange Pips* (*FIVE*), he misremembers just as he did with chemistry. Instead of practical Watson now says profound. Was Holmes knowledge of geology practical or profound? There’s no good way to know since, unlike chemistry, very little geology is in the sixty stories. In both *STUD* and *FIVE*, Watson’s analysis focuses on Holmes’s ability to identify soils and connect them with areas of London, and maybe beyond. This is hardly profound geology.

There are several instances where Holmes does make use of this skill. In *STUD* Watson reports

<sup>7</sup> Ceres is no longer considered an asteroid. In 2006, when Pluto was downgraded from planet to dwarf planet, Ceres was upgraded from asteroid to dwarf planet. There are currently officially five dwarf planets.

“After walks has shown me splashes upon his trousers, and told me by their colour and consistence in what part of London he had received them.”

In *SIGN* Holmes applies this knowledge to reddish soil on Watson’s shoe. He is able to state that Watson has been to the Wigmore Street Post Office. Holmes knows the pavement has been removed exposing the reddish soil, and that it is hard to avoid when entering the post office. In *FIVE* Holmes makes a similar deduction about a client. He deduces that John Openshaw has come up to London from the southwest.

“You have come up from the south-west, I see.”

“Yes, from Horsham.”

“That clay and chalk mixture which I see upon your toe caps is quite distinctive.”

These three examples of Holmes’s deductions about soils and locality are entertaining. But they neither further the story much, nor are significant geology. And in fact Holmes’s deduction about Openshaw and Horsham has been disputed (Klinger 2005, 137).

One instance of soil providing a clue that helps identify a culprit occurs in *The Three Students* (3STU). There an examination for a lucrative scholarship is scheduled. But the day before the test Hilton Soames, a tutor and lecturer at the college, discovers that one of the candidates has snuck into his chambers and read the exam. No footprints and no fingerprints are found at the scene. Holmes turns to the two pieces of black clay that were found in Soames’s room. He notes that the clay has traces of sawdust on it. He is already suspicious of Gilchrist. Only he is tall enough to have seen in the tutor’s window to observe the examination papers upon the desk. Gilchrist competes in the long jump and is the only athlete among the three students. Holmes is up at six the next morning to visit the athletic grounds where he finds sawdust covered black clay in the long jump pit.

Another instance of the use of soil in a case happens in *The Devil’s Foot* (DEVI). As usual, only Holmes notices the soil on the window sill at Mortimer Tregennis’s house.

“The gravel upon the window-sill was, of course, the starting-point of my research.”

When he discovers that gravel is found only near Dr. Leon Sterndale’s cottage, Holmes has his man. Confronted with this and other evidence, Sterndale confesses to the murder. But here again we have a case where



Holmes considers that Sterndale had good reason to avenge the death of his beloved Brenda Tregennis by her brother Mortimer. He tells Sterndale, lion-hunter and African explorer, that he is free to return to Africa to continue his work.

There is one other topic that falls into the area of geology. In *The Engineer's Thumb* (ENGR) Fuller's Earth plays a role in the plot. It is a clay that had industrial uses in Holmes's time. It continues to have applications today. Since the 1960's the major use of Fuller's Earth has been to absorb oil and grease and as cat litter (Hosterman and Patterson 1992, 3). Fuller's Earth takes its name from its former principal use, which was cleaning or "fulling" wool (Hosterman and Patterson 1992, 2). Thus, in Victorian London it was mainly used as an agent to remove oils from wool. The principal oil in sheep's wool was lanolin. Fullers Earth removed it. This cleansing process enabled the wool, to be made into a cloth that was valued.

In ENGR a counterfeiting gang has set up shop in the village of Eyford. They are using a powerful press in their coining operation. When it begins to malfunction they induce the engineer, Victor Hatherly, to come one evening to repair it. Their cover story is that they own land which has deposits of Fuller's Earth. They need secrecy so that they can purchase adjacent land after they convince investors that their operation will be a success. So they blindfold Victor Hatherly and take him on what he estimates is a twelve mile carriage ride to the house where the press is located. Hatherly fixes a leaky cylinder, but then makes the mistake of saying he knows the press is not being used to compress Fuller's Earth. One of the crooks, Col. Lysander Stark, locks Hatherly in the room with the press and turns it on. Hatherly escapes but not before his thumb is cut off by the machine. He is brought for treatment to Dr. Watson who notifies Holmes. Holmes makes a brilliant deduction about the location of the house by asking Hatherly about the condition of the horse when it arrived to take him there. Holmes is the only one to realize that a fresh horse had not come twelve miles to fetch the engineer. The twelve mile ride was merely six miles away from the station, and then six miles back. The counterfeiter's house was right near the Eyford train station. But they escape before Holmes arrives in Eyford, never to be apprehended.

## METEROLOGY

We'll close the book with a discussion of the most surprising scientific topic of all. In BOSCO, Holmes has been summoned by Inspector Lestrade to help with a murder case in the west of England. As they ride the train westward, Holmes relates what he knows of the case to Watson. He also remarks that the train is traveling "fifty miles an hour." In SILV Holmes

calculates a train speed of 53.5 miles per hour. There he tells us that “the calculation is a simple one,” and explains how he did it (see section 5.1). The remark about train speed in BOSC has attracted little interest, perhaps because it appears to be more of an estimate.

When they arrive at Herefordshire, Inspector Lestrade has a carriage ready to take Holmes to the crime scene. Surprisingly Holmes declines the offer. Usually he wants to examine the scene before others alter it. Recall how he complained in *STUD* about the “herd of buffaloes” that obliterated much of the footprint evidence. Also since this murder was committed out of doors, it would seem even more urgent to go to the scene at once. If it was to start raining, for example, the crime scene data may have become compromised. But Holmes is confident that no rain is on the way, and thus there is no need for haste to go to Boscombe Pool. How does he know that it will not rain? Holmes checks the barometer, i.e. the “glass.” The age-old principle that rain accompanies low pressure is, presumably, his guide.

Mercury barometers made their appearance in the mid-1600’s. But since October 2009 the sale of new ones has been banned in the UK. The elemental liquid mercury which fills the inverted tube in such barometers is now considered too toxic. Old mercury barometers can be restored and individuals can construct their own. Needless to say, barometers were very much more common in 1890’s England than they are now (Rothman 1990, 137).

“A barometer was usual in the hall of every middle-class English home.”

Barometers may have been viewed as attractive accouterments in homes. Watson considers the barometer in the hall at Mrs. Cecil Forrester’s house to be an indication of a “tranquil English home.” He is glad that Mary Morstan, his future wife, is lodging there during the events surrounding the Agra treasure in *SIGN*. As Klinger reports (Klinger, L. S., 2006, 284), “Mercury wheel, stick, and marine barometers, beautiful glass-and-wood objects used to predict the weather and now prized as antiques, were often found in Victorian homes.” This familiarity suggests that in England then just about everyone could tell a low barometric pressure from a high one. Was Sherlock Holmes an exception?

In a mercury barometer the pressure exerted by the Earth’s atmosphere is sufficient to hold up a column of mercury that is 29.92 inches high. That is a normal value at sea-level. At higher elevations the barometric reading will be lower than that average. It will also vary a little locally as pressure fronts come and go. When Holmes sees that the value is twenty-nine inches he is assured that bad weather is not coming. Later he says,

“The glass still keeps very high. It is of importance that it should not rain before we are able to go over the ground.”

Incredibly he retires for the night without ever seeing the ground around the murder site. Twenty-nine inches is a very, very low value. It is a strong indicator of stormy weather. But Holmes’s luck holds because next day “the morning broke bright and cloudless.” As we’ve seen (see section 3.3) Holmes solves this mystery using the still intact, undisturbed footprints.

Who should we blame for the bad science here? Was Sherlock Holmes ignorant when it came to meteorology? Was Arthur Conan Doyle? Shall we accept that ingenious explanation offered by Schweichert (1980, 244) that the barometric pressure was so low that Holmes’s (and everyone else’s) perceptions were altered leading to the misstatement? Sherlockians have a tendency never to blame Holmes. They might very well attribute the remark to an error by Watson as he wrote up the case for publication. As with all Holmesian issues, you are free to form your own opinion.

## Conclusion

“When you have eliminated the impossible, whatever remains,  
however improbable, must be the truth”

Sherlock Holmes, *The Sign of the Four*

Sherlock Holmes and Professor Moriarty plunged over the Reichenbach Falls in *The Final Problem* (FINA), the twenty-sixth story. What we read about the post-Reichenbach Holmes is that he had “never been the same man afterwards” (Stashower 1999, 443). Actually the very first story written after Holmes and Moriarty fell over the Reichenbach Falls was HOUN. It is the most famous Holmes tale and it is always rated as the very best story too. The next three stories, *The Empty House* (EMPT), NORW, and DANC all get rated fairly well. So Doyle gets to the halfway point quite strongly (DANC is story #30). But soon the quality drops off. The fifty-six Holmes short stories have been rated several times (Bigelow 1993, 130-138). It is revealing to compare the first thirty stories with the last thirty. Here are the results from the 1959 ratings done by readers of *The Baker Street Journal*.

Rankings of the Sherlock Holmes Short Stories

<i>Ten Best</i>		<i>Ten Worst</i>	
<i>Name</i>	<i>Story #</i>	<i>Name</i>	<i>Story #</i>
SPEC	10	MAZA	49
REDH	4	VEIL	59
BLUE	9	YELL	17
SILV	15	BLAN	56
SCAN	3	3GAB	55
MUSG	20	CREE	51
BRUC	42	RETI	58
SIXN	35	LION	57
DANC	30	SUSS	52
EMPT	28	MISS	38



Figure C1 Holmes and Moriarty at the Reichenbach Falls

Eight of the ten stories on the “best” list are from the first half of the Canon. Only two later stories make that list. The “worst” list is just the reverse. Nine of the ten stories are from the second half; eight of the tales on the “worst” list are from the last twelve stories that Doyle wrote, between 1921 and 1927. Even Doyle himself agreed with this. In 1927 he listed his twelve favorite short stories, and later added his next seven. Doyle’s list has fifteen early stories and four late ones.

#### Arthur Conan Doyle’s Favorite Holmes Short Stories

SPEC (#10), REDH (4), DANC (30), FINA (26), SCAN (3), EMPT (28), FIVE (7), SECO (40), DEVI (43), PRIO (32), MUSG (20), REIG (21), SILV (15), BRUC (42), CROO (22), TWIS (8), GREE (24), RESI (23), NAVA (25)

When the four long stories are included, not much changes. Generally HOUN displaces *The Speckled Band* (SPEC) as number one. But the later stories still fare poorly. One of the second-half tales that always rates high is *The Bruce Partington Plans* (BRUC). This may be a “Mycroft Effect.” An appearance by the ever-popular lazy brother gives BRUC added appeal. This story, as shown in section 5.3, shows Holmes relying a good deal on his knowledge of science as he applies the physics of momentum and friction to help solve a murder.

In section 4-6 we mentioned Arthur Conan Doyle’s shift to Spiritualism. More than one literary critic has been gratified to note that Doyle kept Spiritualism and the occult out of his Sherlock Holmes work. But Doyle was now less a physician and man of science; and so was Holmes. Doyle spent more and more of his time and energy in the Spiritualist cause. So we find that in the latter half of the Holmes oeuvre Doyle began to leave science out. In chapter four we pointed out how Holmes drifted away from Chemistry. There is little mention of it in the second half of the Canon. Tracy (1977, 70) lists seven stories (COPP, DANC, IDEN, NAVA, RESI, SIGN, and STUD) in which Holmes does chemical experiments. Every single one of these tales is from the first half of the Canon. In chapter five we saw a similar thing with regards to Biology and Mathematics. With regard to Physics we found that Holmes continued to use the lens throughout his career, but most effectively early on. Of the references to Astronomy, Geology, and Meteorology, fully 80 percent occur in the first half of the Canon. Holmes’s use of scientific methods to solve his cases, discussed in chapter three, also declines in the later stories, though not as dramatically. About 60 percent of the use of forensic science is in the first half of the Holmes saga. The diminished presence of science in the late stories is obvious.

It is surely no coincidence that those very stories which are short on science are generally viewed as inferior. Even Arthur Conan Doyle himself was well aware of this. He would often draw a laugh from banquet audiences by telling a story which made the very point (Higham 1976, 216): A Cornish fisherman was the worst critic I ever had. He told me,

“Well sir, Sherlock Holmes may not have killed himself falling over that cliff. But he did injure himself something terrible. He’s never been the same since!”<sup>1</sup>

<sup>1</sup> The exact wording varies, depending on the source. See Lellenberg, et al, 2007, p. 517.

There seems to be a cause and effect relationship between the use of science and the quality of the stories. When Holmes was being portrayed as a detective actively using science in his work and in his life, the stories were full of appeal to readers. The science lends a robustness and occasional complexity to the stories which contributes to their authenticity and provokes thought in the reader. In fact it was Doyle's idea from the start that a consulting detective who divined solutions in the absence of science and the scientific method would stretch even the simplest credulity. However, one who applied these things actively before us would challenge our own faculties and impress us with a resourcefulness that, though occasionally improbable, is never impossible.

Having identified science as a large factor in the success of the Sherlock Holmes stories, we turn to Isaac Asimov for one final thought. Earlier in this book we attempted to refute Asimov's criticisms of Holmes the chemist. But another of Asimov's articles on Holmes (Asimov 1987, 204) got it just right. In this age of Terminators and special effects, we revere Sherlock Holmes because he is "someone who *thinks* rather than bashes."





## Appendix

### Doyle Scams

Holmes makes a remark about amber in *The Yellow Face* (YELL). But the wording in the American text differs from that in the English version. The English text reads,

“I wonder how many real amber mouthpieces there are in London? Some people think that a fly in it is a sign. Why, it is quite a branch of trade, the putting of sham flies into sham amber.”

In American texts the last sentence about sham amber is omitted. The result is an incomplete thought which leaves the reader wondering what it is a sign of. The idea is that amber is a fossilized tree resin which can contain things, including flies, that were trapped in the substance even millions of years ago (Klinger 2005, Vol. 1, 451). The natural history museum of Great Britain has over 2500 specimens of insects trapped in amber (Kaye 1995, 299). Apparently there were unscrupulous people in Doyle’s time who would prepare fake amber and put something the resin to resemble a fly. This was done in an attempt to persuade the unwary that they were buying something ancient.<sup>1</sup> When chemists found a way to make synthetic resins in the 1940’s, there was a surge in amber forgeries (Hoffmann 1997).

Doyle shows here an awareness of scientific fakery which has led some to consider him as a perpetrator of other scientific frauds. The most sensational of these charges is that Sir Arthur Conan Doyle was the originator of the most famous fraud in the history of science, the Piltdown Man. This charge was made in the science news journal “Science 83” (Winslow and Meyer 1983). The charge was repeated and expanded in 1996 (Anderson 1996). Sherlockian scholars have reacted with outrage that the gentlemanly Arthur Conan Doyle should be labeled a fraud (Elliott and Pilot 1996).

<sup>1</sup> Such trickery comes to mind when paleogeneticists fail in attempts to extract DNA from fossilized insects preserved in amber. See *The New Yorker*, August 15 & 22, 2011, p. 67.

In December 1912 Charles Dawson and Arthur Woodward announced the discovery of important fossils near the village of Piltdown in southern England. Piltdown Man seemed a perfect intermediate form in that it had a cranium that was human-like; and a jaw that was ape-like. It should be noted that the articular condyle, the hinge of the jaw, was missing. Conspiracy theorists noted the similarity between Doyle's name and this piece of bone, which is distinctively different in ape and human. In 1915 a second individual was found about 2 miles away in the Piltdown II site. At this point Piltdown Man had taken its place in the evolutionary chain leading to homo sapiens.

However, as additional fossils were discovered around the world, they were consistent with one another and different from the Piltdown bones. All "intermediate forms," except Piltdown, had a jaw that was human-like and a cranium that was ape-like. Piltdown Man had just the reverse. Not until 1949 was the telltale fluorine content of the Piltdown bones measured. Soon nitrogen analyses also demonstrated problems for the Piltdown fossils. The pigment known as van Dyke brown had been used. Now it was noticed that the teeth had been ground down to give the desired appearance. Striations were observed.

Piltdown Man had been a hoax. The jaw was that of a juvenile female orangutan, about 500 or 600 years old from the East Indies. Other animal bones were from the eastern Mediterranean area. The skull fragments were human. The teeth had been artificially filed. The articular condyle had been deliberately removed.

The premise of the *Science* 83 article (Winslow and Meyer 1983) was that Doyle had planted the bones in order to deliberately fool the scientific community. His purpose was to demonstrate that one fraud did not disprove all of science. Neither, then, should one fraudulent "medium" disprove all of spiritualism. The authors pointed out that Doyle had visited all of the areas from which the bones were assembled; Doyle lived within walking distance of the Piltdown site; he was even photographed there. He had the chemical knowledge to do the fake staining of the bones. To the conspiracy theorists he seemed like a perfect candidate. Much of the latter part of his life Doyle spent promoting Spiritualism. He spent a great deal of money and gave hours to the cause. He believed his wife Jean was a medium. He worked diligently to persuade the magician Harry Houdini that Spiritualism was real. If he could convince Houdini, then much of the world might also accept his claims. Richard Milner has been described as the "principal proponent of the Doyle theory" ([www.tiac/net/~cri\\_a/piltdown/piltdown.html](http://www.tiac/net/~cri_a/piltdown/piltdown.html)). He claims that the reason Doyle didn't admit the hoax was that World War I was approaching and he wished to be an advi-

sor to the English government. Sir Arthur didn't think a scientific hoaxer would be welcome in that role (Kalesh and Sloman 2006, 391).

I presented a poster paper<sup>2</sup> at the national meeting of the American Association for the Advancement of Science in San Francisco in January 1989. The poster mounted next to mine had the title "Doyle Scams." Being an admirer of Doyle, I was quite interested in the evidence for the three scams discussed by the author, Charles L. Scamahorn of Berkeley, CA. His main evidence that Doyle was the Piltdown Man hoaxer was the above mentioned similarity of his name to the missing articular condyle. Add to this the photo of Doyle at Piltdown, and what more does a conspiracy lover need?

But there was more. Scamahorn also claimed that Doyle planted the Kensington Runestone—between the towns of Holmes and Kensington in Minnesota. The evidence this time is that Doyle visited the area in 1894, four years before the stone was discovered. Making some fancy rearrangements of letters on the stone, Scamahorn claims that Doyle again had inserted clues on his stone and clearly was spoofing the scientific community. Why? He was just a fraud. How Doyle transported the 202 pound "stone" is not explained. How he managed to entwine it in the roots of a poplar tree is not explained. The Kensington Runestone is generally viewed as a fraud, having been denounced by several academic figures. Runic experts cite the style and type of the runes. Believers display it in the Runestone Museum in Alexandria, MN. They claim it demonstrates that Vikings made it to Minnesota in 1362.

Finally, Scamahorn claims that Doyle also planted the Drake Plate near San Francisco when he was there in 1923. The "proof" is just as in the Kensington case. Doyle visited the area in 1923. In addition, fanciful rearrangements of letters on the plate appear to Scamahorn to represent Conan Doyle's name. He is convinced that Doyle planted it and left clues that others have missed. In 1628 Francis Fletcher, chaplain aboard Drake's ship the *Golden Hind*, wrote that Drake had placed a brass plate in the San Francisco Bay area in 1579. In 1936 such a plate was found. But its metallic composition was modern, 35.0 percent Zn and 64.6 percent Cu (Lambert 1997, 194). The method of fabrication showed that it had been "rolled," also a modern process not available in Drake's time (Kaye 1995, 309). Someone planted the Drake Plate. Scamahorn is convinced that it was Doyle.

<sup>2</sup> My paper was entitled The Calomel Rebellion. It had nothing to do with Sherlock Holmes or Arthur Conan Doyle.

Despite his difficulty in getting his ideas accepted, Charles Scamahorn continues to push his theories about Doyle. See the blog site probaway.wordpress.com where in March 2009 he described the three scams. Then in December 2009 and January 2010 he presented his “proof” that Arthur Conan Doyle was the world famous killer known as Jack the Ripper—enough said!<sup>3</sup>

<sup>3</sup> I still possess an autographed copy of the paper, inscribed to me as the first to see the “Doyle Scams.”

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