

The Scientific Detective, Sherlock Holmes, Solves the Case of the *Sign of Four*

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It has long been my stated belief that Sherlock Holmes embodies, in both his methods of operation and his personality, the aspects most often associated with a dedicated and monomaniacal research scientist.¹ Perhaps no account of his activities best displays these traits than the narrative entitled *Sign of Four*, in which Dr. Watson clearly delineated these attributes. Throughout, I will refer to the most available collection of Sherlock Holmes adventures - the Doubleday Edition - as my reference source so that we can all be “on the same page.”²

I will attempt to show that Mr. Holmes personality, as depicted in the Watsonian account, is typical of a dedicated research scientist. My lack of training in the areas of psychiatry and psychology force me to limit such observations to a relatively superficial level. However, since Dr. Watson went to great lengths to explore this facet of Sherlock Holmes' persona, it would be very negligent of me to ignore them completely. This is especially true since his later writings have shown that Dr. Watson was quite interested in psychological manifestations including *idée fixe* and catalepsy.^{3,4} He even read Dr. Percy Trevelyan's limited distribution monograph on obscure nervous lesions. I will take this opportunity to reiterate my personal, though not scientifically-supported, beliefs regarding the personality of Mr. Sherlock Holmes. His vast mood swings and changes in energy levels are legendary. Sometimes he is up and sometimes he is down in the dumps. Sometimes he sits around playing his violin or having philosophical discussions with Dr. Watson, and demonstrates a hearty appetite for good food and entertainment. Alternatively, he sometimes is seen running hither and yon, night and day, without a word to Watson or a bite to eat. He requires a difficult problem to keep him from being bored. Several respected Holmesian scholars have concluded that these personality changes are the clinical manifestations of bipolar disorder, and that the actor who best exemplifies this condition in Sherlock Holmes is Jeremy Brett. Although I believe that Brett gives a very good picture of this condition in his interpretation of Sherlock Holmes, I tend to disagree that it is entirely accurate. Also, I believe that if Sherlock Holmes suffered a serious psychological disorder, Dr. Watson would have noticed it after there many years of intimate friendship, and discussed it candidly. After all, Watson tells us about many other private aspects of Sherlock Holmes bohemian habits, especially his abuse of cocaine in his early years. In my opinion, as one who has dealt very closely with scientific researchers over many years, Mr. Holmes extreme behavior mirrors in a somewhat exaggerated manner the personality characters that are encountered among that community. The need for mental stimulation, the absolute single mindedness to a scientific goal, the lack of interest in physical comfort during investigative activity may all be manifested, in one way or another, in the descriptions of such noted individuals as Albert Einstein, Louis Pasteur, Paul Ehrlich, and many others. Of course, scientists do not always display all of the outrageous attributes we have come to recognize in Sherlock Holmes. They usually seem to be fairly normal people. Some even dress well. But, I can guarantee you that they all possess some of these attributes in one way or another. I have

previously stated that my choice for demonstrating the Sherlockian persona is the often overlooked actor Ronald Howard. But, enough of this. Let's go on to a more tangible exploration of Sherlock Holmes actions as a research scientist who has turned his training and inclination toward the solution of crimes and other puzzles that are presented to him.

After 36 years of dealing with research scientists both as a graduate student and fellow researcher, I feel much better equipped to comment on Mr. Holmes scientific methods of problem solving, rather [sic] than his personality. During this essay, I will avoid the use of the term "Scientific Method" since that often implies carefully spelled-out rules of logic. Its implementation varies among different schools of philosophy, a field of which I have little understanding. The "methods of scientists," which evolved over several recent generations, have served the research community well in the search for scientific truth and the development of our modern technological culture.

Before attempting an evaluation of Sherlock Holmes problem-solving methodology, it would be useful to outline the methods that scientists use to answer the questions that are presented to them. Briefly, they may be summarized as follows:

(1) **Problem.** Clearly state the problem in its simplest form. Research requires the step by step solution of each problem on the path to an ultimate overall objective. For example, an overall scientific goal may be to find out how food is turned into energy. However, a research problem may require a group of scientists to work years on one step in the process, for example how sugar is absorbed into the blood stream or how sugar is split into glucose and fructose.

(2) **Data.** Gather all of the information that you can find on the subject. Use any method available to acquire the needed data. For example, glance at some else's lab photos (Watson and Crick), crawl in the mud looking for cigarette butts (Holmes) or human skeletons (several Leakeys). Scientists often talk to each other to gather information that will be helpful to them. Such activity has been expanded by the availability [sic] of the Internet.

(3) **Observation.** Be very diligent to observe everything no matter how unrelated it may appear at the time. Sherlock Holmes often makes use of the differences between seeing something and observing it. Many microbiologists had no doubt **seen** the effects of fungi on staphylococci in an agar culture. It was not until Alexander Fleming's **observations** that anyone realized that the fungus was possibly producing a substance - penicillin - that retarded the growth of the staphylococci.

(4) **Knowledge.** Read and master all of the available literature on the subject to see what data has previously been reported. Pay more attention to the data than to the conclusions of the person reporting the information.

(5) **Deduction.** Sift through all of the data, current and reported, and attempt to formulate a tentative hypothesis and working model that reasonably fits all of the available information.

Much has been made of Sherlock Holmes' use of the term deductive logic. Working scientists don't worry about the use of such terms. They use deductive and inductive reasoning as the need arises. They are analytical and synthetic, whatever works at the time. As we will see, so does Sherlock Holmes. Albert Einstein's theory of relativity is probably the best known working model that is still under experimental validation. Mr. Holmes' researches are generally less encompassing but still illustrative of the method of research scientists.

(6) **Experimental Proof.** List further needed information, observations, and experiments that may refute or support your hypotheses. Carry out these necessary observations and experiments and see how the results fit, or require a reformulation of the hypothesis.

(7) **Publish.** With all data in hand, report your observations, results, hypotheses, and conclusions in an appropriate format for others to read, challenge, and confirm. Also, of course, if you do not publish enough papers, you won't get that professorship or promotion.

Now, let us see how these steps apply to the Sherlockian discourse under consideration: *The Sign of Four*. What could be more instructive than the initial chapter titles themselves? I'm certain that their choice was not arbitrary. [sic] Let us list them: *Chapter 1 THE SCIENCE OF DEDUCTION*; *Chapter 2 THE STATEMENT OF THE CASE*; and *Chapter 3 IN QUEST OF A SOLUTION*. Is there any doubt that Dr. Watson was presenting this as a scientific exposition?

Now let's look at the first chapter as we begin to analyzie [sic] Sherlock Holmes' methods of problem solution, and how they relate to the method used by research scientists. Sherlock Holmes is quoted as stating, on the second page of this adventure, in reference to Dr. Watson's prior report of his activities regarding *Study in Scarlet*: "Detection is, or ought to be, an exact science and should be treated in the same cold and unemotional manner." Here we have the underlying premise. Detection is a science. It should be treated as a science, without emotion interfering with reason and logic. As Sherlock Holmes later stated: "The only point in the case (*Study in Scarlet*) which deserved mention was the curious analytical reasoning from effects to causes, by which I succeeded in unraveling it."

On the next page, when referring to the French detective François le Villard, Mr. Holmes says: "He possesses two out of the three qualities necessary for the ideal detective. He has the power of observation and that of deduction. He is only wanting in knowledge, and that may occur in time. He is now translating my small works into French." This is a reiteration of items (3), (5), (4), (7) in that order: **observation, deduction, knowledge, and publication**. The latter is supported again by Mr. Holmes' reference to "several monographs ... on technical subjects." Following that statement is a listing of several other monographs published by Sherlock Holmes on "tracing of footsteps," and "influence of trade upon the form of the hand." These are examples of the data gathering and publishing that research scientists do, not necessarily in pursuit of a specific problem, but to accumulate and disseminate information that will facilitate problem-solving in the future. New methods of chemical and biochemical analysis are clear examples, such as Sherlock Holmes' novel method to detect human blood revealed in the earlier account *Study in*

Scarlet. What follows, in the text, are two startling accounts of Holmes' observational and deductive skills. One is the simpler deduction that Watson was at the Wigmore Street Post Office that morning. This is followed by the sad account of Watson's older brother that is based on Sherlock Holmes' magnificent analysis [sic] of the clues embodied in Dr. Watson's [sic] old watch. At the conclusion of this examination, Sherlock Holmes states another premise of scientific logic: "No, no: I never guess. It is a shocking habit - destructive to the logical faculty." This is a rule often followed by scientists that has always driven lawyers and politicians crazy. Scientists usually refuse to guess. If they give an opinion based on available evidence, they always couch it in language such as "it is likely" or "it is possible," with the addition of "but, on the other hand ...". Members of the Press and the legal profession are always looking for "one handed scientists" to avoid such difficulties. It is also a characteristic of Sherlock Holmes that he rarely reveals a hypothesis until the final curtain. Although this appears to be a means of providing a surprise ending to the adventures, it has scientific precedence.

In Chapter 2, we initiate the specific scientific examination that begins this adventure, the problem presented by Ms. Mary Morstan. Note how calmly and precisely Sherlock Holmes questioned Ms. Morstan. Although Watson let his emotions and infatuation creep into his narrative, Sherlock Holmes coldly stuck to the investigation at hand. Would other scientists note Ms. Morstan's attractiveness? Probably. I would. But, once started, they would still be able to concentrate on business, unlike Watson who was never able to separate facts from the person stating them. During a particularly trying time for Ms. Morstan [sic], as she began to sob, Sherlock Holmes coldly asked: "The date?" This was followed by a series of additional queries, asked without regard to her emotional state. He was cold and calculating when it suited his purposes. His need to obtain information predominated. Throughout the interview, Sherlock Holmes very carefully sought all of the facts from Ms. Morstan and carefully examined the physical evidence available - the handwriting on the envelope, the letters, and the box that held the pearls. Dr. Watson chastised Sherlock Holmes by calling him a "automaton - a calculating machine." Holmes replied: "It is of first importance not to allow your judgement [sic] to be biased by personal qualities. A client is to me a mere unit, a factor in a problem." Contrast this with members of the Press or legal profession who first ask about the mental state and credibility of the witness, and seem to regard a search for motivation to dominate. As the chapter closes, Sherlock Holmes has already started to feel the wisps of a tentative hypothesis, but he will not reveal it until he has the opportunity to go out and seek additional information.

At the beginning of Chapter 3, we begin *IN QUEST OF A SOLUTION*. Sherlock Holmes has returned from gathering more data from the back files of the *Times*. He has started to reach an inference concerning the confluence of events: "Look at it this way, then. Captain Morstan disappears. The only person in London whom he could have visited is Major Sholto. Major Sholto denies having heard that he was in London. Four years later Sholto dies. Within a week of his death, Captain Morstan's daughter receives a valuable present, which is repeated from year to year and now cumulates in a letter which describes her as a wronged woman. What wrong can it refer to except this deprivation of her father? And why should the presents begin immediately after Sholto's death unless it is that Sholto's heir knows something of the mystery and desires to

make compensation? Have you any alternative theory which will meet the facts?" Later, Sherlock Holmes admits: "There are difficulties, there are certain difficulties ... but our expedition of to-night will solve them all." So we have Sherlock Holmes taking all of the available information, that derived from his interview with Ms. Morstan coupled with that obtained from his later readings. He deduced from them a tentative hypothesis that fits the available facts, with the acknowledgment that further exploration will be required to complete the picture.

Thus begins the mysterious and exciting series of events that produce additional data and a further set of problems for Mr. Sherlock Holmes to unravel. In Chapter 4, we at least have a verbal confirmation, from Thaddeus Sholto, of Mr. Holmes hypothesis that Major Sholto had been involved in the mysterious disappearance of Captain Morstan, and events related to the death of the former led to the annual shipment of pearls to Ms. Morstan. Apparently Thaddeus Sholto's brother also had some degree of analytical ability, enabling him to deduce the location of the missing treasure by determining the inside and outside measurements of the rooms of his father's house. But that skill only led to his death, as we see in Chapter 5, and the disappearance again of the of the jewels after only a brief time in the hands of Major Sholto's sons.

Occasionally during a scientific investigation, new findings reveal a major new research initiative that needs to be followed up. Generally, the primary researchers will gather additional information to confirm the validity of their new discovery. Satisfied with this, they then assign available staff to provide temporary help to carry on the additional assignments, while awaiting the approval of a new research grant to support required supplementary staff and equipment. At a major university laboratory, this phase is easily handled by giving more work to the available personnel at the school - graduate students, postdocs, teaching assistants, junior faculty, etc. Since Sherlock Holmes did not have such a built-in supply of indentured labor, he had to make do with the staff currently available to him. He commissioned Dr. Watson to obtain a scent detector otherwise known as Toby the dog. Then, he later assigned his available junior associates, the street urchins known as the "Baker Street Irregulars" to assist him further. How this came about is discussed below.

Discovered in Chapter 5 is the dead Bartholomew Sholto. His face bore the obvious signs of alkaloid poisoning and the delivery instrument, a thorn, was found "stuck in the skin just above the ear." Near the body was a primitive stone axe and at the foot of the steps was a coil of rope. Fortuitously, in the corner was a carboy from which was leaking of a dark colored liquid with a pungent odor. A note bearing the words "The sign of the four" completed the mysterious scene. Already, Sherlock Holmes sharp mind was beginning to formulate a hypothesis.

In Chapter 6, Sherlock Holmes quickly completes his investigation to gather all of the evidence before the official police disrupt the crime scene. Marks on the floor of the chamber revealed to Mr. Holmes that one of the villains was a club footed man who came in through the window, climbing up the side of the house with the assistance of the rope. Tiny footprints on the floor in the secret chamber above showed the identity of his ally as a small man who came in through a trap door in the roof. Sherlock Holmes explained all of these theories to Dr. Watson,

following which a minute investigation of the area provided a break that would enable them to expand their investigations further. The small-footed man had stepped into the pool of creosote that had seeped from the leaking container. Before leaving the field to Inspector Altheny [sic], Sherlock Holmes reveals the prime suspect [sic] in the murder, Jonathon Small, and describes his appearance to the Inspector. How did Sherlock Holmes know who the stump-footed man was? He called upon his observational skills to achieve a description of the home jewel thief and then tied it together with his vast knowledge of members of the criminal class. Thus, Sherlock Holmes brought to bear items (2), (3), and (4), from my list of methods used by scientists to solve their research problems: **Data, Observation, Knowledge, and Deduction.**

In Chapter 7, Sherlock Holmes and his medical companion use the molecular detecting skills of their new instrument, the dog Toby, to track the creosote-scented foot of Jonathon Small's ally to, as revealed in Chapter 8, Moredcai Smith's boat launch at the edge of the river. It is in Chapter 7 that Sherlock Holmes explains the elucidation of his hypothesis that Jonathon Small was the criminal that they seek, and explained his theory regarding the sequence of events leading up to their adventure that night. All of the evidence was revealed during the interviews with Mary Morstan and Thaddeus Sholto, but only the reasoning skill of Sherlock Holmes could tie all of the loose ends together into a working hypothesis. This is discussed at length on pages 119-121. This passage is well worth rereading since it demonstrates the reasoning skills that Sherlock Holmes applied to resolve all of the many clues that were clear to both him and opaque to Dr. Watson. It would not be appropriate to reiterate the long conversation between Dr. Watson and Mr. Holmes, in which the latter narrates his hypothesis and explains the many steps used in its derivation. The data appear to support Mr. Holmes thesis that Jonathon Small made a deal with Captain Morstan and Major Sholto to find the treasure, using a map drawn and signed by Small. Sholto probably double-crossed them and took the treasure to England where he feared a wooden-legged man. The arrival of this man and the shock of seeing him led to the death of Major Sholto. After Small found out that Sholto's older son Bartholomew had finally deduced the location of the treasure, he went after it. His small companion climbed to the roof, went into the chamber below, and dropped down a rope to allow Small to climb up. The companion killed Sholto's son, and they then both fled with the treasure to the river's edge where the hunt continues.

In Chapter 8, Sherlock Holmes determines, by skillful questioning, that the villainous pair chartered the steam launch *Aurora* of Morecai [sic] Smith to make their escape. He mobilized [sic] his available resources - his Baker Street Irregulars - to locate the missing boat. While awaiting word of the boat's appearance in their Baker Street quarters, Sherlock Holmes reveals to Watson his hypothesis regarding the Andaman Island origin of the small-footed, club wielding, poison dart shooting companion of Jonathon Small. Sherlock Holmes deduces that the ethnicity of the murderer using the **data** derived from his **observation** at the crime scene, the stated location of the convict prison where Jonathon Small was incarcerated [sic] under the control of Captain Morstan and Major Sholto, and the **knowledge** that he gained by reading about the tiny primitives in his gazatteer.

There is no further movement until Chapter 10 when Sherlock Holmes reveals to Dr. Watson and Inspector Jones that he has deduced the location of the missing steam launch. Since the Baker Street Irregulars have not located it, Sherlock Holmes figured that it had been hidden away in a repair yard. Dressed as an old seaman, he went from yard to yard until he found where the boat had been installed by a wooden-legged man for spurious repairs. Learning that the launch was to leave at 8:00 PM, Sherlock Holmes and his companions lay in wait for the boat to come out. This was followed by an exciting chase scene that, although full of adventure, revealed nothing about Sherlock Holmes prowess as a scientific detective. As a result of this chase, the Andaman Islander is killed and Small captured. Incidentally, as we see in Chapter 11, the treasure had been ditched in the river by Small. Emboldened by her sudden change in fortune, Dr. Watson was now able to court Mary Morstan.

Finally, the denouement [sic] comes in Chapter 12, in which the captured Jonathon Small narrates the true story of getting the treasure and the succeeding events. It is very remarkable how very near the truth Sherlock Holmes was able to come by his deductions. This is a tribute to his skills in the application of the methods applied by research scientists.

¹ For a previous, more general discussion, please see my article “Staying Focused” which appeared in *Communication* (a publication of the Pleasant Places of Florida), No. 173 New Series, Volume 1, Issue 5, pages 3-4.

² *The Complete Sherlock Holmes* by Arthur Conan Doyle, with a preface by Christopher Morley, Doubleday and Company, Garden City, New York, single volume, 1122 pages.

³ The Adventure of the Six Napoleons [sic] in *The Complete Sherlock Holmes* by Arthur Conan Doyle, with a preface by Christopher Morley, Doubleday and Company, Garden City, New York, single volume, pages 582-595.

⁴ The Resident Patient in *The Complete Sherlock Holmes* by Arthur Conan Doyle, with a preface by Christopher Morley, Doubleday and Company, Garden City, New York, single volume, pages 422-434.