The Chemical Adventures of Sherlock Holmes:  
Mrs. Hudson’s Golden Brooch  

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The Story

A professional man places particular value on a sound sleep in the very early hours of a Saturday morning, as he replenishes those hours spent in previous days of furious activity. This was certainly my predisposition when I awoke on a recent Saturday and found our landlady, Mrs. Hudson, moving aside objects on my dresser and actually rummaging through one of my open drawers.

“Mrs. Hudson, what are you doing?”

The landlady stood to attention at my sudden inquiry, then collapsed with her response. “Oh, Dr. Watson, I beg your pardon. I am so sorry to interrupt your sleep, but I am in crisis.”

“How can your crisis possibly involve my personal belongings?”

The woman blushed. “Of course, you are right, it is foolish of me. But I am so desperate, I am no longer thinking properly. I am at my wits’ end to find a lost article, and I—” She stuttered, with embarrassment, and then began to weep.

Suddenly aware of my immodest bed clothes, I quickly went for my robe and slippers. “See here now, Mrs. Hudson, might I be of some help?”

“I wish only that you could, sir, but you would have no possible knowledge of the object I am missing. It is a precious piece of jewelry that I never wear, but keep always in hiding.” The poor woman said, “It is a family heirloom left to me by my late husband and—” Once again, her sobs overcame her.

It was the first time I had ever heard her speak of a Mr. Hudson, and I chided myself for never having thought of the woman as a widow. It was only years later, in fact, that I finally learned that our landlady of 221B Baker Street was the widow of Lawrence Baines Hudson, a well-regarded barrister on the Queen’s Bench. After his untimely demise, his wife discovered that his savings were meager and that her most valuable asset was the residence itself. Lacking her own source of income, Mrs. Hudson chose to take on tenants for revenue. Holmes and I, the chemists, had visited Mrs. Hudson’s residence many times in the 18th century. She was a French woman of some noble descent, and it even fancies the royal seal. Why, my husband so guarded the medal that he would not allow those other than me to even handle it, for fear of damaging it. I have taken great pains these many years to protect the gift from loss or theft, but I gravely fear I have failed to honour Lawrence’s trust. He left me careful instructions that I should never to part with it, but now the medallion is gone.”

By the time Sherlock Holmes, the great detective, emerged from his bedroom, bleary eyed from a late evening of deliberation, Mrs. Hudson and I had completed an exhaustive search of the house, during which she took me to her hiding place for the medallion. It was a small, ornate jewelry box on her dresser. The missing object had been kept in the box beneath a collection of tenderly bound letters from her late husband.

“Were they written during our courtship,” offered the grieving widow.

Pressed flowers were placed delicately on the letters. Above the jewelry box, a framed image of Jesus Christ hung from the wall. The entire area around the dresser, including the foot rug before it, was immaculately kept. When Holmes was shown the scene, he frowned.

“Mrs. Hudson, I must ask, do you call this a hiding place? I
should conclude quite the opposite, as it cries out to be the site of some sacred shrine."

"Please, Holmes, can you not see that the poor woman is already suffering enough without you placing her stewardship in question?"

Holmes was unaffected by my criticism. "Not to worry, Mrs. Hudson, we shall have your heirloom back to you by day's end."

"Holmes, how can you possibly make such a bold promise?"

"Watson, the medallion was clearly stolen, not lost. Mrs. Hudson is the only person capable of losing it, and she has already established that the item never left this box on her watch. Thus, theft it must be, and whereas the pool of suspects is larger under this scenario, it is by no means limitless. Tell me, Mrs. Hudson, when is the last time you remember seeing your brooch?"

"Only two days ago, Mr. Holmes. I always make it my business to polish it once a week."

"Ha! A list of our visitors during that time should include the culprit. I believe that my brother Mycroft, who was here only yesterday, can reasonably be excluded, unless we wish to send Scotland Yard down to capture him at the Diogenes Club. That would leave Lady Monroe, who consulted with us regarding the case of the purloined Vermeer painting."

"Holmes, certainly not her," I remonstrated, in the interest of probity.

"No, of course not," retorted Holmes, with some irritation. "She is, after all, a lady and a patron of the arts," he added, in a regal tongue I could best interpret as being sarcastically embellished.

"Mr. Holmes," our landlady offered, "the chimney sweep was here only two days ago."

"Ah, yes," said I, expressing my first signs of hope, "and he would have been left to work unsupervised, thus providing opportunity to perform the deed. Now we must establish motive.""Quite so, my good fellow, and well done, Mrs. Hudson. We should find this chimney boy for questioning at his earliest opportunity to perform the deed. Now we must establish motive."

"Yes, Mr. Holmes, remarkable indeed. One might even say most certainly never—"

Holmes interrupted. "Yes, sir, quite right. I did not believe so myself. I do apologize for the inconvenience. Please accept this gratuity for your trouble." Holmes handed the man a silver brooch and began to escort him to the door.

"Holmes," I asked, incredulously, "this is the end of your interrogation? Just one question for the man?"

Before Holmes could respond, the Baker Street Irregulars emerged with Mrs. Hudson, triumphant and beaming. "Mr. 'Olmes, we 'ave it! We 'ave it!" Mrs. Hudson embraced the found treasure against her heart, as if it were a talisman. Tears of joy streamed down her face. A great sigh of relief could be seen, as well, on the face of the chimney sweep, who, thanking Holmes, took his leave most precipitously.

"Well done, boys," said Holmes. "And it took you only a single afternoon. That is most impressive indeed. Pray tell me in which establishment did you manage to recover the item?"

"In none of 'em, sir," said the oldest boy, who went by the name of Sharky. "That's the magic of it, Mr. 'Olmes. Young Will found it in a gutter just outside your residence. Bright as the sun, it was." The young lad Will, who could not have been more than ten years old, smiled sheepishly but said nothing.

"How remarkable," I exclaimed. "And what an excellent stroke of luck that it was not first found by someone else passing by, or we might have never seen it again."

"Yes, Watson, remarkable indeed. One might even say most unlikely. Tell me, boy, how came you upon this treasure?"

The boy only shrugged his shoulders. Sharky spoke in his stead, "It was a miracle, Mr. 'Olmes, a God-given miracle. We 'ad been to every last shop in the area and 'ad found absolutely no sign of it. Even the usual sources, if you know my meaning, sir, was dried up. Just then, we was about to knock on your door to deliver you the bad news, when Will stumbled into the gutter. 'e is an awkward one, you see, 'avin' a bad leg from a sickness when 'e was but a wee lad. When 'e rose from the gutter, the medal was shinin' in his 'and. And again the boy Will shrugged with modesty.

Holmes clapped his hands. "A tale well told, if I do say so. And so Mrs. Hudson is reunited with her good husband's gift. "Good day to you, sir," said the sweep, meekly. "Am I to understand, sir, that you have a problem with your chimney, sir?"

Holmes said nothing at first. Instead, he merely stared into the man's dirty face with a piercing and most intimidating expression. The sweep attempted a timid smile, exposing a number of lost teeth and certain signs of gum disease. He coughed again.

Holmes finally spoke, with a sudden alacrity. "Kind sir, you were in this very home but two days ago, is this not correct?"

The little man replied, with awkward formality, "Yes, sir, I most certainly was, governor. Was my work not satisfactory to your liking, good gentleman? I would be most pleased to provide any additional service you may require to complete our contract, sir."

Holmes wasted no time. "Sir, did a golden medallion perchance find itself in your possession when you last left this residence?"

The sweep's sooty jaw dropped, and his eyes went wide with astonishment and terror. "Why, no, sir," he stammered, phlegmatically. "Please, sir, I beg you to believe me that I would most certainly never—"

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Holmes clapped his hands. "A tale well told, if I do say so. And so Mrs. Hudson is reunited with her good husband's gift.
All that remains is to confirm the authenticity of the item. Mrs. Hudson, if you would be so kind as to part with the medallion for a few minutes?"

"Holmes, is this necessary?" I inquired, perplexed. "The woman clearly recognizes the object as belonging to her."

"Not to worry, Watson, this is merely a formality."

The woman only reluctantly acceded to Holmes' peculiar request. The first thing he did with the medallion was to bite on it. "Very hard indeed," he said. "It is no wonder that your husband never sold the piece to a jeweler or collector." Mrs. Hudson smiled proudly, with some relief that this may have concluded the sleuth's forensic investigation. But her hopes were dashed when the detective commenced to place the item on a balance, after which he dropped it into a graduated cylinder carefully measured to contain fifty milliliters of water. As the Irregulars and Mrs. Hudson looked on with curiosity and concern, Holmes furiously recorded the following in his laboratory notebook:

| Mass: 112.6 g |
| Original volume of water: 50.0 mL |
| Final volume of water: 62.8 mL |
| Water displaced: 12.8 mL |

Finally, Holmes removed a strangely labeled bottle from his cabinet of chemicals. *Aqua Fortis* was the moniker on the darkened glass container, which I remembered as being the classical name for concentrated nitric acid. He poured some of the corrosive liquid into a beaker and brought it to an open window. He dropped the medallion into the yellow liquid and stood back to observe. Immediately the medallion began to release a monstrous red gas, and the liquid turned a striking shade of green. Mrs. Hudson screamed and reached for the beaker, but Holmes gently restrained her. As she looked on with horror, Holmes promptly poured copious amounts of fresh water into the beaker, turning the green liquid to an aqua blue and causing the gaseous reaction to cease. With tongs, he quickly removed the medallion from the beaker and rinsed it in more fresh water. The metal still shined, but no longer was it golden. Instead, the royal seal of France had turned a rather familiar shade of metallic red. The onlookers in the shabby gallery were audibly impressed, but Mrs. Hudson decidedly was not.

"Oh, what have you done, Mr. Holmes?" she cried, in agony. "My precious golden brooch is lost again!" In this respect, the woman was certainly correct, for the majestic golden colour had disappeared and the clasp, which had made it a brooch from her husband, still lay in the beaker, severed from its body. She raised the transformed medallion to her heart once again and collapsed to her knees in tears.

"Not to worry, good woman," said Holmes, unaffected. "We shall, in but a moment, return your treasure to its golden splendor. First, however, it is time to get to the truth of this matter."
The Solution

Without hesitation, Holmes turned his gaze on the Baker Street Irregulars. "Watson, I should inform you that we have not exhausted our list of possible suspects. While you and Mrs. Hudson were both out yesterday, I had these boys over to discuss some surveillance concerning an unrelated case."

"The Vermeer case!" I cried, suddenly, slapping my forehead. "Could it be that the lady of the 'ouse. I thought that you 'ad many such wonderful things, being a lady and all. I didn't know."

"But, Holmes, what then is the medallion made of? And how could you have possibly restored it to its previous state?"

"I assure you, Watson, that I possess no philosopher stone. The medallion is composed mostly of copper, which has a density of 8.9 grams per milliliter. The metal had been plated with an alloyed mixture of zinc and copper, and with great skill, I should add. Why, in fact, it is absolutely fascinating to consider that perhaps this bit of sorcery was performed by the great Antoine Lavoisier himself, the father of modern chemistry, who was subsequently beheaded after the fall of the Bastille. This alloy of zinc and copper, which I produced by melting the two metals..."
together, is called brass, a splendid mixture that presents itself to the eye as being the colour of gold.” Finally, the boys raised their eyes in recognition. “True gold, however, being a noble metal, will not react with corrosive acids, not even concentrated nitric acid. Yet, copper and zinc both will. When placed in the aqua fortis, these metals will oxidize to produce a toxic red–brown gas, mostly consisting of nitrogen dioxide (17). Hence, I did this experiment at an open window for the purpose of ventilation, and I was obliged to keep Mrs. Hudson from trying to retrieve her treasure.” Holmes then paused, with satisfaction, to light his pipe. “I was able quite easily to restore the golden luster of brass through a rather complicated bit of chemistry. I first plated the exposed copper surface with powdered zinc, employing the aid of caustic lye, or sodium hydroxide. This would have made the medallion to appear silver. Lastly, I carefully heated the object on my burner, allowing the zinc surface to melt into the copper body, thus producing the gold-coloured alloy you see now. Is it not exquisite? Please feel free to review my notes for further detail.”

Mr. Holmes,” Mrs. Hudson said, with unusual affection toward her tenant, “you have given back my precious gift. The good woman kissed him on the cheek, which caused the detective to recoil slightly.

Having just witnessed the sleuth’s exposure of her medal as a base fraud, Mrs. Hudson’s unmitigated joy seemed ill-warranted. Nevertheless, I said, “Well, this is a happy ending to a dreadful affair. I say, we should be done with these sorry urchins for good. Shall I summon Inspector Lestrade?”

The Baker Street Irregulars, cowering and frightened, began making their way toward the door of our sitting room. “Not so fast!” shouted Holmes, thunderously first at me and then the boys. The urchins stopped in their tracks. “Watson, we may still have use of them in the future, and I believe that they may have barely enough wisdom among the lot to have learned a valuable lesson on this day.

Suddenly there arose a cacophony of contumacious statements. “Oh, yes, sir. Mr. ‘Olmes, a valuable lesson indeed, sir. Thou shalt not steal, sir. It’ll never ‘appen again, sir. We ‘ave learned a truly wonderful lesson on this day, sir.”

Holmes drew deeply from his pipe. “Well done, lads. Yet still there is a penance to be served for these infractions.” The Irregulars looked at each other with trepidation. Young Will only stared at Holmes’ belt, apparently too well familiar with this particular instrument of justice.

Said Holmes, in his declaration of sentence, “I know of a chimney sweep in need of some unpaid assistance. In the morn-

ing, I shall arrange for you to make his acquaintance.” Then, with a wave of his long hand, the boys scampered away downstairs like so many rats. The next we heard of them was a moment later, their shrill and scolding voices resounding in the street below. Holmes turned to Mrs. Hudson, who was serenely caressing her treasured medallion, once a brooch. “I am indeed sorry, my dear lady, to inform you that your heirloom is not quite as valuable as your late husband believed. Yet, as I know how undying your love was for your husband, I can infer with confidence his commensurate love for you from the very nature of this object you hold so dear. In this respect, financial value of any kind for such a treasure pales. The medallion, Mrs. Hudson, remains a most precious commodity, and I am pleased beyond measure to see it back in your possession.”

Mrs. Hudson, exhausted from her turmoil of the day but nonetheless rejoicing, replied, “Mr. Holmes, I thank you, most sincerely. But my hiding place is lost now, and this brooch lacks its clasp. Where do you suggest I place it for safe keeping, sir?”

Holmes smiled slyly and pulled from his pocket a delicate chain of some metal resembling gold. “This morning,” he said, “I found myself passing by a modest jewelry shop on King’s Road and found a piece that might serve a useful purpose.” Placing the medallion in its well-fitted new home, Holmes delicately placed around Mrs. Hudson’s throat her new necklace. “For safe holding, madam, I must advise that you should keep this treasure before your heart, where your husband would have wanted it.”

Mrs. Hudson seemed at a loss for words. “Why, Mr. Holmes, this is most unlike you.”

“Not to worry,” muttered Holmes, “I often find myself unlike me.”

The enthralled landlady managed to float from the sitting room in quiet exultation.

Later in the evening, I tried to occupy myself with a brandy and the day’s newspapers, which my morning’s house search had precluded me. Meanwhile, Holmes was busily engaged with any number of cases, not the least of which must have been Lady Monroe’s missing Vermeer. After waiting for him to take some break from his silent deliberations, I finally relented to ask, “Holmes, this case today still confuses me. Given the gravity of the theft, why did we not turn that boy over to Scotland Yard?”

“Mrs. Hudson may have been only one victim among many. My God, now that I think on it, perhaps that bunch may have in-
Unfortunately for young Will, the failed recovery effort was completed too quickly for him to find a way to separate himself from the item in a believable fashion. Left without options, he simply played on his malady to fall in the gutter before our door, desperately producing the contraband from his pocket. Case closed.

I nodded in acceptance. “But what of all that chemistry you performed on the medallion? I dare say you all but proved that Mrs. Hudson’s prized medallion is nothing more than a cheap fake.”

“I did no such thing,” Holmes riposted, pausing to ruminate over the blue smoke of his clay pipe. “My exhaustive research into the case work of the French detective Lecq informs me that the intricate royal seal is exceedingly difficult to forge,” he said, raising a stack of aged papers in the air to emphasize his point. “And yet, the casting on our specimen was exquisitely provided him the cast.” Musing further, the sleuth added, “It may be the case that France’s last monarch was sending a subtle metallurgical message across the channel, warning against pyrrhic victories.”

“Holmes, how marvelous. Do you really believe it?”

Holmes raised his eyebrows playfully, then frowned. “No. Our landlady’s husband surely knew more of the truth in the matter than he shared with his wife, for why else would he have so strongly objected to its examination by experts? We may never know the source of the medallion or the full measure of the symbolism intended by it. But to the good Mrs. Hudson, such science and politics and history matter little. Her golden medallion is returned to her, exactly as she remembered it. She is restored to keep her beloved husband’s trust.”

Literature Cited