



Jeremy Brett, as Holmes, in the Granada TV series, re-enacts the events at Thor Bridge

The Curious Incident Of the Gun

by Gary Nolan

Introduction

In the Sherlock Holmes story 'Silver Blaze' Holmes draws attention to the curious incident of the dog in the night. When Colonel Ross, the horse's owner, states that "the dog did nothing in the night", Holmes answers "That was the curious incident".

In the story 'The Problem of Thor Bridge', there is a similarly curious incident. It can be proven that the revolver would have struck the ground

and most probably been dragged along with an attendant clattering noise before being flung over the parapet of the bridge. It is the omission of these facts which I believe has a significant bearing on the case.

This article analyses the effect of mechanical forces and gravity on the revolver and rock used during the re-enactment of the 'suicide'. However, to understand why the revolver would have hit the ground before disappearing into the lake we need to review some history of the theory of falling objects and gravitation.

The Science Of Falling Objects

Aristotle (384–322 BC) was a Greek philosopher and polymath during the Classical period in Ancient Greece.¹ Aristotle proposed that the speed at which two identically shaped objects sink or fall is directly proportional to their weights and inversely proportional to the density of the medium through which they move. The density of the medium through which objects fall does affect their speed and the Aristotelian view is intuitive, even if it is not accurate.

The Aristotelian theory of motion came under criticism and modification during the Middle Ages. Modifications began with John Philoponus in the 6th century AD, who partly accepted Aristotle's theory that "continuation of motion depends on continued action of a force" but modified it to include his idea that a hurled body also acquires an inclination (or "motive power") for movement away from whatever caused it to move, an inclination that secures its continued motion.

The Persian physicist, Ibn al-Haytham (965-1039) discussed the theory of attraction between bodies. It seems that he was aware of the magnitude of acceleration due to gravity, and he discovered that the heavenly bodies "were accountable to the laws of physics". After the work of many pioneers such as al-Biruni, Copernicus, Tycho Brahe, Galileo, Descartes and Newton (who formulated the three laws of motion), it became generally accepted that Aristotelian physics was neither correct nor viable. However, the reign of Aristotelian physics, the earliest known speculative theory of physics, lasted almost two millennia.²

Galileo di Vincenzo Bonaiuti de' Galilei (1564–1642 AD), commonly referred to as Galileo, was an astronomer, physicist and engineer. In Europe, Aristotle's theory was first convincingly discredited by

¹ Wikipedia: *Aristotle* <https://en.wikipedia.org/wiki/Aristotle>

² Wikipedia *Aristotelian Physics* https://en.wikipedia.org/wiki/Aristotelian_physics

Galileo's studies. According to legend, Galileo dropped balls of various densities from the Tower of Pisa and found that lighter and heavier ones fell at almost the same speed. His experiments took place using balls rolling down inclined planes, a form of falling sufficiently slow to be measured without advanced instruments.

According to Wikipedia, Galileo also advanced a theoretical argument to support his conclusion. He asked if two bodies of different weights and different rates of fall are tied by a string, does the combined system fall faster because it is now more massive, or does the lighter body in its slower fall hold back the heavier body? The only convincing answer is neither: all the systems fall at the same rate.

Galileo's experiment was famously repeated on the surface of the moon by astronaut David Scott of Apollo 15 when a feather and a hammer were dropped at the same time. In the absence of an atmosphere, the two objects fell at the same rate.³

Plot Summary

'The Problem of Thor Bridge' is set in 1903 when Neil Gibson, the Gold King and former US senator from "some Western state", approaches Holmes to investigate the murder of his wife Maria to clear his children's governess, Grace Dunbar, of the crime. Maria Gibson was found lying in a pool of blood on Thor Bridge with a bullet through the head and a note from the governess in her hand agreeing to a meeting at that location. A recently discharged revolver with one shot fired is found in Miss Dunbar's wardrobe.

According to Watson, Holmes' account of the situation was that Maria Gibson committed suicide, rather than being murdered. Mrs Gibson, outraged and jealous of Miss Dunbar's relationship with her husband, resolved to end her own life and frame her rival for the crime. After arranging a meeting with Miss Dunbar, requesting her to leave her response in a note, Mrs Gibson tied a rock on a piece of string to the end of a revolver and shot herself, the rock pulling the revolver over the side of the bridge; the revolver found in Miss Dunbar's wardrobe was the other pistol of the pair, which had been fired off in the woods earlier, and a chip in the bridge was caused by the pistol hitting the stonework soon after it was pulled out of the dead woman's hand by the rock.

Holmes asked Watson for his revolver to recreate the murder. Holmes obtained ten yards of twine from the police officer and marked out under the guidance of the policeman the exact spot where the body had been stretched.

He then hunted among the heather and the ferns until he found a considerable stone. This he secured to the other end of his line of string, and he hung it over the parapet of the bridge so that it swung clear above the water. He then stood on the fatal spot, some distance from the edge of the bridge, with revolver in his hand, the string being taut between the weapon and the heavy stone on the farther side...he raised the pistol to his head, and then let go his grip. In an instant it had been whisked away by the weight of the stone, had struck with a sharp crack against the parapet, and had vanished over the side into the water.

Holmes' reconstruction reproduced the damage to the balustrade of the bridge. He then asked the policeman to drag the lake for the revolvers of Watson and Gibson. Watson describes the gun as in an instant being whisked away and striking the parapet. It is indeed curious that in the re-enactment the gun is never reported by Watson to have hit the ground nor any consequent noise before it was dragged

³ Wikipedia *Galileo Galilei* https://en.wikipedia.org/wiki/Galileo_Galilei

over the parapet. Surely Watson would have heard the noise and would not have been happy that his revolver was being scratched or damaged while dragged across the bridge.

The Re-Enactment

The location of where the body was found was shown to Holmes and Watson by Sergeant Coventry, who had marked the position with a stone at the mouth of the bridge. Later during the examination of the scene Holmes sees the chip in the stone in the opposite parapet. Watson states “But it is at least fifteen feet from the body.” Holmes responds: “Yes, it is fifteen feet from the body. It may have nothing to do with the matter, but it is a point worth noting.”

Although Gibson had insisted the body not be moved, he was not the first on the scene and the body could have been moved. There are arguments against this however as there is no obvious reason for the body to have been moved before the police arrived (the body could have been moved to allow passage of a carriage, but none are mentioned in the story) and had the body been moved there would have been staining from the pool of blood where the body originally fell. Whether the body was moved is moot as the re-enactment commences from the location that Sergeant Coventry identified, which is confirmed by Watson’s statement “He then stood on the fatal spot, some distance from the edge of the bridge”

There is speculation the revolver was a Webley Mark III Pocket Revolver in the .380 calibre which can weigh over 2 lbs, as it fits the time frame of this story.⁴ A heavy stone is problematic as it must be heavy enough to fulfil its purpose but light enough that it can be moved and held in position. A reasonable weight would be around twenty pounds which gives a weight ratio of ten to one.

Holmes’ height is described by Watson in *A Study in Scarlet* as “rather over six feet.” For the parapet we can assume a height of three feet. Therefore, we can assume the initial conditions are fifteen feet distance between the revolver and the parapet; a revolver release height of six feet; a parapet height of three feet and a weight ratio of ten to one.

Determining the Trajectory Of the Pistol

A simplified analysis based on classical mechanics can be made using an Atwood machine with an inclined plane, which is essentially two weights (M and m) suspended over a pulley, with the lighter weight m being drawn up an inclined plane by the heavier weight M . The acceleration of the system is given by $a=g \times ((M-m \times \sin \theta) / (M+m))$ where M is the mass of the rock, m the mass of the revolver, g is acceleration due to gravity and θ is the angle of the string to the horizontal.

To calculate the horizontal acceleration of the gun, we assume the string is nearly horizontal in which case $\sin \theta$ will be close to zero. Also, M is much greater than m and so the horizontal acceleration can be approximated by $a=g \times M / (M+m)$. The acceleration of the revolver downward is $a=g$, where g represents acceleration due to gravity.

The horizontal acceleration will always be less than the vertical acceleration as the ratio $M / (M+m)$ is always less than one. This is because, while gravity is acting on the rock, the inertial mass of the system includes that of the revolver. A ten to one weight ratio means the horizontal acceleration is about 9% less than the vertical acceleration of the revolver. This means that after release, the revolver’s horizontal distance (towards the parapet) cannot exceed the vertical (downward) distance travelled. Thus, if the revolver falls six feet down, it ought to move no more than six feet sideways. The revolver

⁴ Berg, Stanton O. ‘The Firearms–Safeties of Sherlockian Victorian London Part 1’. *AFTE Journal*, Vol.30, No. 2 (Spring 1998), pp.283-290.

would therefore strike the road more than nine feet from the parapet and be dragged along (probably clattering due to its irregular shape) until it is lifted over.

Unfortunately, it is not so simple. The above is an approximation which may not be true where the horizontal distance is no longer significantly greater than the vertical distance. The force associated with the rock is not always horizontal or nearly so and thus exerts a vertical component, acting down so as to increase acceleration of the revolver during the first three feet of descent and retarding the acceleration during the remaining three feet. Intuitively this probably won't have a significant effect but we need to rule it out. To test this, I constructed a scale version (weight ratio of 1:10) on a tabletop using fishing line and mechanical nuts and confirmed this effect is insignificant. The test confirmed the revolver would have fallen close to ten feet from the parapet.

A more rigorous mathematical description is that the rock and revolver system comprise a 'swinging Atwood's machine'.⁵ Although the mathematics is complex, an internet-based simulation at analyticphysics.com indicates good agreement with this approximation when based on the initial conditions.⁶ Another simulation can be found on YouTube with trajectories for a range of mass ratios of the unswinging mass (the rock) to the swinging mass (the revolver) and again this confirms good agreement with the approximation.⁷

We can be confident the revolver struck the ground. We can surmise the revolver was dragged for at least some of the way but we cannot be certain.

An Alternative Theory

Why did Watson omit the sound of the revolver as it struck and likely dragged across the bridge? It was because the re-enactment never happened and the only plausible explanation is that it was murder, not suicide. Watson and Holmes have clearly invented a cover story for what really happened.

In inventing the cover story that the revolver was whisked away and struck the parapet, Watson (or Holmes) may have recalled the actual case published in an English translation in 1906 by an Austrian criminal jurist Hans Gross (1847–1925), in a compendium of criminal cases.⁸ In the compendium Gross writes of a case described in 1893 in which a grain merchant shot himself on a bridge with a revolver tied to a stone with a rope. As in Thor Bridge, after he fired the pistol, it was dragged over the parapet of the bridge into a deep stream by the weight of the stone.

There are other difficulties with the story by Watson. Mrs Gibson's body lay at the mouth of the bridge, presumably where the rise above the mere was at its lowest so that there would have been insufficient fall for the rock. Readily finding a heavy rock for which string could be securely attached could have also been problematic. And Neil Gibson would have been more familiar with the pistols than either Maria or Grace.

So, if it was murder, who are the suspects? We can readily eliminate both Marlow Bates and Mr Ferguson as there is no motive and no reason for Holmes to cover up their crime. There are only two persons

⁵ Wikipedia *Swinging Atwood's Machine* https://en.wikipedia.org/wiki/Swinging_Atwood%27s_machine

⁶ Analyticphysics.com: *An Interactive Swinging Atwood Machine* <https://analyticphysics.com/General%20Physics/An%20Interactive%20Swinging%20Atwood%20Machine.htm>

⁷ *Swinging Atwood's Machine Trajectories*: <https://www.youtube.com/watch?v=p-PyVs0FVVA>

⁸ Klinger, Leslie S. *The New Annotated Sherlock Holmes* Vol.2. Norton, 2005 and Damiani, Ernesto 'Disguising a Suicide as a Homicide Sir Arthur Conan Doyle, Hans Gross, and "The Problem of Thor Bridge"' in *The American Journal of Forensic Medicine and Pathology*, 37(2):79, June 2016. Lippincott Williams & Wilkins.

who could reasonably be seen to benefit from the murder: Grace Dunbar or Neil Gibson. Grace is unlikely to be the murderer (but could be an accessory to murder) because she would not have planted the pistol in her wardrobe. She later tells Holmes that the note allegedly written by Maria was left for her on a table whereas she could have claimed Maria gave it to her personally. Neil Gibson, on the other hand, is described by Marlow Bates as a hard man who was brutal to Maria and made her life a misery. This isn't evidence of guilt, but it clearly puts Gibson in the frame.

Neil Gibson either by intent or conveniently by accident killed Maria. Holmes and Watson conspired to cover up the details and present the cover story. It may have been for political reasons as Neil Gibson was previously a US Senator, or that Maria Gibson was the daughter of a Brazilian government official, but we don't really know. Or it could be for future purposes as they would be in Holmes' debt.

Watson had forgotten his Galileo that all bodies fall at the same speed and mistakenly assumed that the heavy rock would accelerate the revolver sideways faster than it could fall. If only Watson had either not given us the distance between the parapet and the body or had reported the revolver had struck the ground in the re-enactment, our suspicion would not have been raised.

This story is especially bewildering because it features domestic violence on an ugly and extreme scale. It is difficult to imagine Holmes being willing to overlook the violence Gibson inflicted on Maria. According to Jeremy Strahan, Holmes

*demonstrates a willingness to uphold Victorian-era values on love, marriage, and masculinity, and...the detective will, on multiple occasions, defy the law for their sake by refusing to punish a female criminal in recognition of some failure in English society.*⁹

Holmes demonstrates this willingness in many stories, for example in 'The Adventure of the Abbey Grange' when Holmes helps Lady Brackenstall and Captain Jack Crocker hide the real story of murder from the police; and in 'A Case of Identity' Holmes threatens to whip Hosmer Angel with a hunting crop.

There must have been a very important reason for Holmes to let Neil Gibson escape the gallows but unfortunately, we will never know. There is a clue in the opening paragraphs of the story when Watson mentions there are many cases that hardly bear narrating, some of which were either complete failures with no final explanation being forthcoming or others which may affect Holmes' reputation. Perhaps this is Watson's way of informing us that the real story of Maria and Neil Gibson will never be told.

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Below Decks with Bilge Rat: On Smelling a Rat

by Allan Mitchell

In this occasional series, the Hotspur's Bilge Rat (a.k.a. Passenger Allan Mitchell) takes an off-beat view of matters Sherlockian.

It has long been the bent of the *Hotspur's* premier rodent to find, if not flaws in the logic of the words and works of the great ACD (as related by his literary alter-ego Dr John Watson), then interesting intermittent inconsistencies in those passages embedded in the Canon which can only be satisfactorily explained away by resorting to levels of sneaking suspicion sufficient to have the suspicion sneaker labelled as being 'as cunning as a rat'.

Now, it would be a nose of some proficiency which could sniff out suggestively suspicious sections of licentious literary logic against the background of a ship's bilge filled with, apart from bilge water, the variously describable and indescribable flotsam and jetsam which has ended up floating in, sinking into or stagnating at the bottom of that bacteria-ridden, stomach-retching, nostril-jolting soup which defines and enriches the homes of bilge rats of the world, but this maritime whisker twitcher thinks that he's up to the challenge. After all, by way of qualifications, he does possess the face-frontal, nostril-brushing, soup-straining whiskers required and does have the reputation of having had, at times, stuck his bristle-underlined proboscis where it just didn't belong.

Bilge Rat's CV having been produced, it is now necessary to brush the nostrils clear to permit the olfactory apparatus full access to the subject of Mrs Watson. The good lady is someone who came on the scene as Miss Mary Morstan in *The Sign of the Four* and, despite John Watson's feeble attempts to place the blame on the party of the first part, proceeded to have him amorously smitten, so much so that he had to remind his readers, at every conceivable opportunity, that he was a rough-tough, no-nonsense, always-prepared, rumble-tumble-never-fumble, 'I've been to Afghanistan and got shot' military man, though, from time to time, he did forget just where that Jezail bullet actually penetrated despite being a trained and experienced surgeon presumably very conversant with the human body's spatial arrangements and the locations of its various major components and appendages.

Watson's infatuation with the pearl-bearing, treasure-presumptive and male-influence-and-protection-deprived Miss Morstan came on suddenly when she took his breath away and he ended up with a level of composure commensurate with, and expected from, a recently stunned mullet. That he fancied the young lady was no secret after he had fumbled his way to a bumbling introduction and began fawning about her like a big galoot, but when, in lieu of an ungainly round-the-ankles crash tackle, Mary grabbed his sleeve to prevent his departure from their first meeting, that was it - the doctor was done for.

No longer his own man, Watson proceeded to strut about and use medically-enhanced technical terms when something like "He's dead!" would have sufficed, but the lady was, despite Watson's initial half-hearted but favourable description, one of the dainty and frivolous fairer sex and would obviously be susceptible to the awe-filled authoritative atmosphere surrounding such a marvel of medical and