Science and the Public

Semester 2, 2025-2026

Short Essay & Object Description

The Harrison No. 1 Marine Chronometer

A Mechanism as will Afford a Nice or True Mensuration of Time [1]

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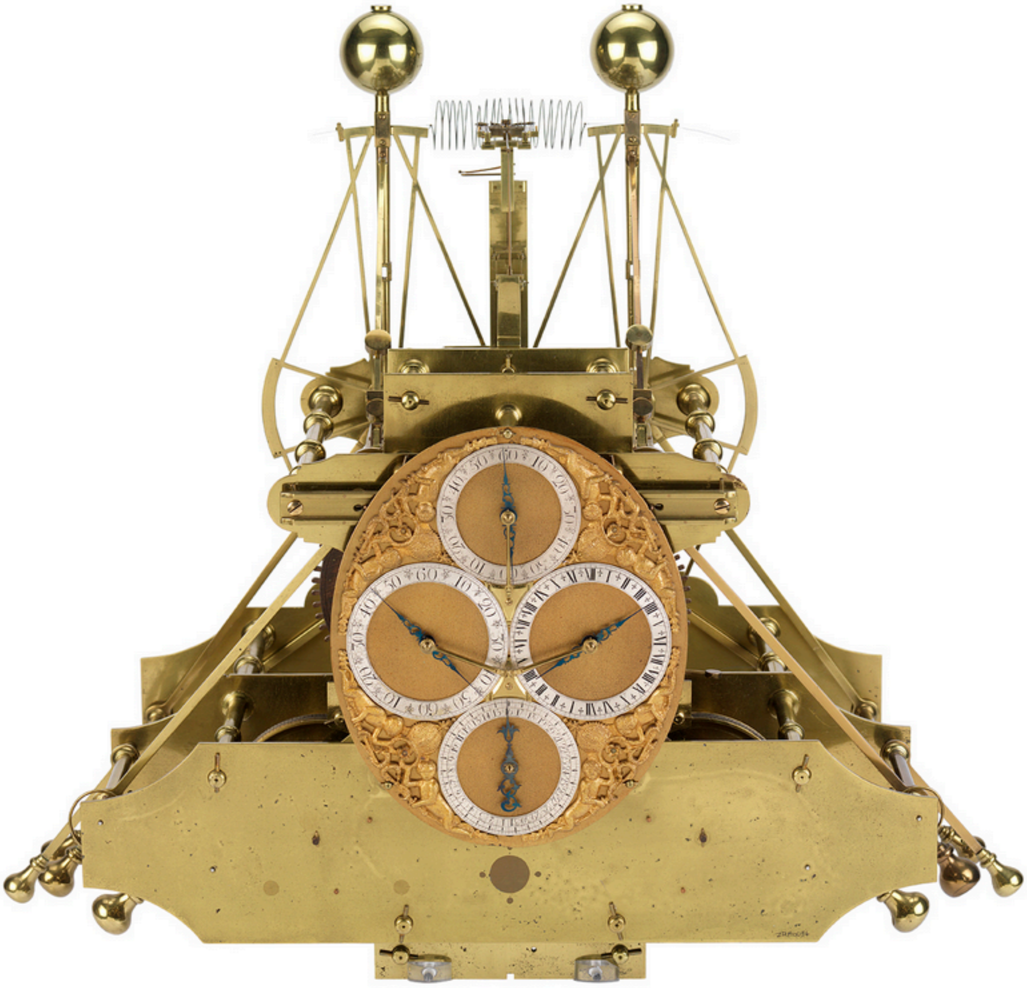
Exhibition

“Science, Seafaring, and the Public”

Room 9

“The Time-Trapper: Trusty Tool or Treacherous Trinket?”



Picture taken from the online catalogue of the National Maritime Museum [2].

John Harrison’s No. 1 marine chronometer (1735) emerged from a long-standing search for a reliable method to determine longitude at sea, a problem that captured both scientific and public attention. Established by the Longitude Act 1714, the Board of Longitude favoured astronomical solutions and viewed Harrison’s clock with suspicion, doubting its reliability and the credibility of its maker. Nevertheless, practical navigators increasingly embraced timekeepers due to their ease of use and falling cost. No. 1 thus reveals how scientific knowledge depends not only on invention, but also on the adoption by wider communities.

Short Essay

The Harrison No. 1 chronometer was built by the English carpenter and clockmaker John Harrison between 1730 and 1735. The idea of determining longitude at sea using a sea-ready clock had been suggested two hundred years earlier by the Dutch scientist Gemma Frisius [3]. The intervening years had seen little progress. Isaac Newton remarked in 1714 that "by reason of the motion of the Ship, the Variation of Heat and Cold, Wet and Dry, and the Difference of Gravity in different Latitudes, such a watch hath not yet been made" [4].

The rudimentary state of navigation made seafaring a risky business; the diarist Samuel Pepys wrote in 1683 that "it is by God's Almighty Providence [...] that there are not a great many more misfortunes and ill chances in navigation than there are" [4, p. 16]. The difficulty of the problem, and the revolutionary implications of its solution, meant that "finding the longitude" occupied a place in the public imagination comparable to that of curing cancer today. In Jonathan Swift's *Gulliver's Travels*, the titular character dreams of the "discovery of longitude, the perpetual motion, the universal medicine, and many other great inventions" [5].

In May 1714, Parliament received a petition from "Captains of Her Majesty's Ships, Merchants of London, and Commanders of Merchant-Men", who demanded government action on longitude [4, p. 50]. Parliament responded in June with the Longitude Act 1714 [6], which promised a prize of £20,000[1] for a reliable way of determining longitude at sea to within "one Half of a Degree of a great Circle"[2]. The Board of Longitude, composed of leading scientific authorities including Newton, was established to oversee the competition.

The Board was soon flooded with pamphlets proposing solutions ranging from the innovative (a vacuum-sealed pendulum), to the bizarre (the yelps of wounded dogs) [4]. Pamphlet authors would ridicule their competitors with colourful ad-hominems: "if [Mr Whiston] has any such Thing as Brains, they are really crackt" [4, p. 56]. This illustrates the vibrant and often contentious print culture that emerged in England after the lapse of the Licensing Act in 1695, a development discussed by Adrian Johns [8]. The nutty ideas and petty jabs tarnished the public image of the searcher for longitude: In *A Rake's Progress*, William Hogarth portrays a "longitude lunatic" scribbling a solution on the walls of Bedlam Asylum [9].

In 1735, John Harrison brought his clock down to London for the Board's consideration, providing a case study in science's tendency to "define itself with regard to its 'others'", as Bernadette Bensaude-Vincent has put it [10]. It so happened that Harrison produced his timekeeper during the period when astronomers were making major strides in putting the clock of heaven to nautical use with the so-called 'lunar method' [4, p. 89]. Astronomical approaches to the longitude problem were preferred by the Board *a priori*: Newton argued that "when the Longitude at sea is once lost, it cannot be found again by any watch" [4, p. 60]. Aware of the Board's biases, Harrison tactfully included a discussion of his own 'improvements' to the lunar method in his description of his timekeeper, thereby signalling his scientific respectability [1].

In 1736, the No. 1 was sent on a round-trip test voyage to Lisbon on the H.M.S. *Orford*. It performed remarkably well, gaining the praise of Master Roger Wills [4, p. 81]. The Act required solutions to be tested on a voyage to "any Port in the West Indies," but Harrison first requested support to develop an improved timekeeper. The Board agreed to fund his efforts, and between 1741 and 1759 he presented three successive timekeepers for testing. Each underwent extensive trials. The No. 4 was

[1] about £3m today [7].
[2] about 56km at the equator.

found to determine the longitude to within a sixth of a degree - three times more accurate than required by the Act - on voyages to Jamaica and Barbados [4, p. 128]. Despite these successes, the Board never awarded Harrison the full prize. Dava Sobel has blamed the Board's astronomical biases for this outcome, though conceding that Harrison's own perfectionism and humility did not help his case [4].

After its Lisbon voyage, No. 1 was taken on loan by clockmaker George Graham and displayed in his London shop, where timekeeping enthusiasts admired its intricate movements. On his visit from Paris in 1738, French clockmaker Pierre Le Roy described it as "a most ingenious contrivance". Perhaps its opacity heightened its intrigue; its workings remained a mystery even to the astronomical elite. But science, as Robert K. Merton has pointed out, is "public, not private knowledge" [11]. Thus, in 1761, the Board declared that No. 1 had "become the property of the public" and required Harrison to disassemble and explain - under oath - the workings of each part. The Board then forcibly took it from Harrison and stored it at the Royal Observatory in Greenwich, where it was subjected to further tests. Neglected, it ceased ticking in 1767 [4, p. 136].

Despite Harrison's difficulties with the Board, practical navigators increasingly favored simple timekeepers over the unwieldy lunar method. After John Harrison's death in 1776, other instrument makers, such as John Arnold and Thomas Earnshaw, refined his designs and reduced their cost [4, p. 159]. By the early nineteenth century marine chronometers had become standard equipment on long voyages, supporting global navigation and the expanding maritime networks of the British Empire [4, p. 164].

In 1920, the retired Lieutenant-Commander Rupert T. Gould rediscovered Harrison's timekeepers, noting their pitiful state: "No. 1, in particular, looked as though it had gone down with the *Royal George* and had been on the bottom ever since". His restoration work lasted until 1933, a moment that Gould poetically describes in his diary: "I finished this, with a gale lashing the rain on to the windows of my garret, about 4 p.m. on February 1st, 1933—and five minutes later No. 1 had begun to go again for the first time since June 17th, 1767: an interval of 165 years" [4].

After its restoration, No. 1 was transferred to the National Maritime Museum in Greenwich, where it remains on display and is kept in working order through daily winding [2]. Its exhibition reflects the transformation of a once-contested mechanical device into a canonical artifact of scientific history and represents science's dependence on vernacular ingenuity as much as elite scholarship.

Bibliography

[1] J. Harrison, *A Description Concerning Such Mechanism as Will Afford a Nice, or True Mensuration of Time; Together with Some Account of the Attempts for the Discovery of the Longitude by the Moon: As Also an Account of the Discovery of the Scale of Musick*. London: London, 1775.

[2] Royal Museums Greenwich, "H1 | Catalogue page of the Royal Museum of Greenwich." [Online]. Available: https://www.rmg.co.uk/collections/objects/rmgc-object-79139

[3] A. Pogo, "Gemma Frisius, His Method of Determining Differences of Longitude by Transporting Timepieces (1530), and His Treatise on Triangulation (1533)," *Isis*, vol. 22, no. 2, pp. 181–198, 1935, doi: 10.1086/346920.

[4] D. Sobel, *Longitude: The True Story of a Lone Genius Who Solved the Greatest Scientific Problem of His Time*, 10th Anniversary Ed. New York: Harper Perennial, 2005.

[5] J. Swift, *Gulliver's Travels*, First Edition. London: Benjamin Motte, 1726.

[6] *12 Anne, Stat. 2, c. 15: An Act for Providing a Publick Reward for such Person or Persons as shall Discover the Longitude at Sea.* Acts of Parliament Great Britain, 1714. [Online]. Available: https://archive.org/details/1714-longitude-act-1755-a-collection-of-all-such-statutes-and-pa

[7] Bank of England, "Inflation calculator." Accessed: Mar. 17, 2026. [Online]. Available: https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator

[8] A. Johns, "Print and Public Science," *The Cambridge History of Science, Volume 4: Eighteenth-Century Science*. Cambridge University Press, Cambridge, pp. 536–560, 2003. doi: 10.1017/CHOL9780521572439.024.

[9] W. Hogarth, "A Rake's Progress, Plate 8: In the Madhouse." [Online]. Available: https://en.wikipedia.org/wiki/A_Rake%27s_Progress#/media/File:William_Hogarth_-_A_Rake's_Progress_-_Plate_8_-_In_The_Madhouse.jpg

[10] B. Bensaude-Vincent, "A Historical Perspective on Science and Its 'Others': Science and Rival Forms of Knowledge," *Isis*, vol. 100, no. 2, June 2009, doi: https://doi.org/10.1086/599547.

[11] R. K. Merton, *Science, Technology and Society in Seventeenth-Century England*. London: George Allen & Unwin, 1938.