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Nantucket’s Compass Stones
Unlocking mysteries of the Meridian Stones

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The pair of marble obelisks located in downtown Nantucket and known as “Meridian Stones” is probably the most enigmatic historical monument on Nantucket. The inscriptions engraved on them state: “Northern (Southern) Extremity of the Town’s Meridian Line” (Figure 1). The year of their creation, 1840, is indicated on the Northern stone. There is little doubt that the person who erected them was William Mitchell (1791-1868), the most prominent astronomer and surveyor on Nantucket at that time and the father of the first American woman astronomer, Maria Mitchell (1818-1889).

But why did he erect them?

In 2002, we started an investigation aimed at answering this question. This article is the final report on our study. Some preliminary results were presented at two meetings of the American Astronomical Society (Amory et al. 2002; Boyce and Davis 2003).

**Mitchell Meridian Stones: What For?**

Throughout time, the purpose of the Mitchell Meridian Stones has been cloaked in controversial legends. In particular, one could often hear from the guides of Nantucket tours or read in local publications that the stones aided William Mitchell in rating chronometers for whaling ships, or that they had no practical use at all but simply served as a symbolic monument of astronomical and geographic works on the island.

Everything we know about the procedures for precise determination of time in the middle of the 19th century fails to support the speculation about the use of meridian stones for rating chronometers.

Among the town’s public documents of the epoch, we found two mentions of the Meridian Stones. The 18th article in the warrant for the 1840 Nantucket Town Meeting reads: “To see if the town will cause a meridian line to be established for public use and defined by suitable bounds.” (NTM 1840a). The report of the Town Meeting states that the Town voted “To take up and act on the 18th article of the warrant respecting the establishment of a Meridian Line. To refer the subject to the Selectmen and that they have the line as above established – provided it can be done at a cost not exceeding seventy five dollars.” (NTM 1840b). These documents show that the stones were conceived as a functional instrument – “for public use.” The thin vertical line on each stone suggests that the stones were used for some precise measurements.

Despite an intensive search, we have found no further specific mention of the Nantucket Meridian Stones in any...
other public or private documents until nearly 80 years later. An inquiry regarding the stones published in the local paper, the *Inquirer and Mirror*, was responded to on January 8, 1921 by a New York City resident, who identified him/herself as “J” and wrote that the stones “represent a true north and south line by which surveyors were to correct their compasses and show the variation of the compass each year.” This explanation seemed very plausible.

We soon realized that the Mitchell Meridian Stones may be a very early example of “Compass Stones” – a pair of meridian markers used to measure magnetic declination, the angle between the directions to the magnetic North and the true (Geographic) North. The corresponding corrections would then be introduced into surveyor’s compass readings.

**Re-measuring the Mitchell Meridian**

Before trying to place the Mitchell Meridian Stones into the context of the history of surveying, we decided to measure the current orientation of the line defined by the Stones. We did it by two different methods.

The first was the standard astronomical method based on observations of the North Star with a surveyor’s transit, an instrument similar to the ones which would have been available to William Mitchell. We used a K&E Paragon transit made in 1963. Two of the authors (PB and AD) observed Polaris with the transit on the night of June 11, 2003. Each observer made four separate measures of the North stone as seen from the south stone and a corresponding set of measures of Polaris. Each measure was the average of one direct measure and one with the telescope reversed. We found that the line defined by the two stones now deviates of 7.1’ +/- 0.8’ West of North from the true meridian line.

The second method, executed by one of the authors (LA), utilized a modern era land surveyor’s Total Station (Leica TC 1010), which possesses a 3’ standard deviation. Existing geodetic survey control in the immediate area was extended to the Meridian Stones baseline from which both monuments were located at the upper terminus of the vertical line imprinted on each stone. All distance measurements were
taken electronically by the Total Station and each angle was read in the direct and reverse format and then averaged. This procedure allowed us to determine the coordinates of each stone in NAD 27, Massachusetts Coordinate System (Island Zone), from which the true astronomic azimuth from the South to the North stone was calculated to be N 00 06' 25" W, with the probable error no greater than +/-10". The results of the two measurements agree within the margins of the probable errors.

With the distance between the stones 289.19 feet (88.15 m), a 6.4' deviation corresponds to 16 cm linear displacement. This present misalignment of the stones, although small, is far larger than would be expected from a careful observer like William Mitchell. The techniques and instruments available to him should have produced an accuracy better than 1 minute of arc. We know that the south stone has been removed and replaced at least twice, for construction and paving projects. Quite likely, it was not replaced accurately in its original position, which may be the cause of the misalignment.

**Analogues to the Stones?**

So far, we have found only one close analogue of the Nantucket Mitchell Meridian Stones: the Meridian Stones in downtown Medina, Ohio (Figure 2). The local legend has it that these two stones were erected in 1832 by two men, Thomas Miller (probably, a local surveyor) and a visiting astronomer whose name “may have been Powell,” and that the alignment of the stones with the meridian was achieved by astronomical observations of Polaris “at midnight” (Kovach 1966). In response to our request, Ms. J.G. King, the former Curator of the Medina County Historical Society, undertook an intensive search, but she could not find any other document or reference related to the origin of the stones (King 2005, private communication).

Ignoring the obvious fantasy about observations “at midnight” (the time for observing Polaris in order to trace the meridian is not usually midnight), we do not have reasons to doubt the legend of the Medina Stones’ origin in general. The horizontal table on the top of the Southern stone (to place a compass?) and small dots on the tops of both stones undoubtedly indicate that the stones were functional. There is little doubt that the Medina Meridian Stones are another example of early attempts to create permanent local meridian lines for calibrating surveyors’ compasses.

**Ahead of the Times**

Time variations of magnetic declination have been known from the mid-17th century. Starting early in the 19th century, this issue was becoming more and more a point of concern for the U.S. state legislatures preoccupied with...
the precision of surveying and mapping. For example, the Massachusetts General Court passed a resolve on March 1, 1830 requiring each incorporated town to make “accurate Plans of their respective towns or districts, upon a scale of 100 rods to an inch…” and to include in the Plans “…the length and course by the magnetic needle (noting its variations from the true north) of the boundary lines of the town or district…” (A&R, 1830a).

It was, probably, in response to this resolve that the Nantucket surveyor William Coffin Jr. created in 1834 the first detailed map of the town of Nantucket. In 1838, William Mitchell, with the help of his daughter Maria, created the first accurate map of the whole island. The values of the magnetic declination indicated on both maps are plotted in Figure 3, together with some later data. The old and new data seem to be in good agreement.

A combination of an enthusiastic surveyor and a professional astronomer was needed to create a permanent meridian line in a small town as early as 1832 (Medina) or 1840 (Nantucket). In Medina, according to the legend, two men did the job – an astronomer and a surveyor. In Nantucket, both skills, and the enthusiasm to use them, were happily combined in one person – William Mitchell.

The Meridian Stones were erected by Mitchell in the period of time when intensive surveying of Nantucket and its environs began, and when Mitchell himself became a nationally known authority in astronomy and surveying. It was Mitchell’s letter to A.D. Bache, the new Superintendent of the U.S. Coast Survey, which initiated the Coast Survey study of Nantucket Shoals in 1846 (see pp. 11, 12 and 41 in http://www.lib.noaa.gov/edocs/BACHE2.htm#N_28_).

On the charts ##12, 13, 14 and P_1019 of the Coast Survey (http://historicals.ncd.noaa.gov/historicals/histmap.asp) one can read that “Astronomical observations [for those charts] were made by Mr. W. Mitchell in 1845 & ’49.” In
1845 William Mitchell was recommended for the prestigious position of Civilian Practical Astronomer at the newly created Naval Observatory. The recommendation was given by two leading astronomers and mathematicians of that time, William Bond and Benjamin Peirce of Harvard (Dick 2002).

The Nantucket Mitchell Meridian Stones and the Medina Meridian Stones are the only “compass stones” from the 1830-40 period in the U.S. history of surveying, of which we are aware. By creating permanent meridian lines – and increasing thereby the precision and reliability of compass-and-chain surveys in their towns in this early period – W. Mitchell and the two people in Medina, Ohio, preceded by several decades the mandatory installation of similar constructs elsewhere in the U.S.

For example, it was only in 1870 that the Massachusetts General Court passed a resolve that stated (A&R 1871a): “It shall be a duty of the county commissioners… to erect on land situated in the county… a true meridian line or lines, to be perpetuated by substantial stone posts or pillars.” Section 2 of this resolve
elaborated on the manner the pillars should be constructed (A&R 1871b): “Each post shall be of granite or other equally durable stone, shall be at least eight feet in length, eighteen inches square at the base, and one foot square at the top; three posts of this description shall be erected in an exact line north and south, and distant from each other not less than two hundred feet… The top of each post shall be tapered to a square or circle of eight inches diameter, on which shall be placed a brass or copper cap of circular form on which shall be plainly engraved a cross indicating the four cardinal points…”

Led by this document, we found in Barnstable, Massachusetts, on the street with the evocative name “Meridian Way,” two stones that looked almost exactly as directed by the document (Figure 4). According to the Barnstable County Registry of Deeds, the stones were installed in April 1871, less than a year after the General Court’s 1870 resolution (R. Stuart, private communication).

Recently, one of us (LA), along with Jeffrey L. Blackwell, PLS, recovered the remnants of three “Meridian Stones of Nantucket County,” whose location had been lost for decades. These monuments were installed sometime after the 1870
General Court resolution, off Lovers Lane, approximately in the middle of the island. In 1887, the United States Coast and Geodetic Survey (USC&GS), during triangulation incident to the resurveys on Nantucket, established geodetic control on the existing South Meridian Stone. In a subsequent survey in 1908 by the USC&GS, a considerable error was found in the positions of the North and Middle stones, and they were moved into the true meridian. Currently, only the middle stone remains intact, minus the brass cap. Both the southern and northern stones have been destroyed with only the base stone sections remaining to signify their existence (Figure 5).

Unlike the Mitchell Meridian Stones and the Medina Meridian Stones, erected by enthusiasts in the 1830-40s, the 1871 Barnstable Meridian Stones and the post-1870 Meridian Stones of Nantucket County were installed, several decades later, in accordance with the mandates issued by the state legislature to the county commissioners.

**Concluding Remarks**

Meridian markers are reminders of an important period in the history of Western civilization, during which people were learning how to precisely measure the local territory and, eventually, the whole planet. There are inevitable natural processes that displace or destroy such monuments (Figure 6). Furthermore, the dramatic story of the Federal meridian markers in Washington, D.C. (The Jefferson Stone, by Silvio Bedini, 1999), or of the Northern and Southern post-1870 Meridian Stones of Nantucket County, demonstrate how easily such historical monuments can be forgotten, neglected or discarded by people unaware of their historical value. These monuments merit permanent identification and preservation.

Dr. Vladimir Strelnitski is Director of Astronomy and Dr. P. Boyce and R. diCurcio are Research Associates at the Maria Mitchell Association (MMA), Nantucket, MA. L.C. Asadoorian is a professional surveyor at Blackwell & Associates, Inc., in Nantucket, MA. L. Amory was a history major at Vassar College in Poughkeepsie, NY, and A. Davis was a physics major at SUNY at Plattsburgh, NY, while working on this project as MMA summer interns.

**Acknowledgments**

We thank Silvio Bedini for discussions on historical meridian markers; J. Finger for valuable biographical data on Mitchell family; G. Clayton for indicating the website mentioning the Medina Meridian Stones; J.G. King for an extensive search of additional information on the Medina stones; R. Stuart for providing copies of documents about the Barnstable Meridian Stones; Nan Strelnitski for valuable corrections in the draft. This project was supported by the Nantucket Maria Mitchell Association, Vassar College and the NSF/REU grant AST-0097694.

**Editor’s Note:** References may be accessed in the pdf version of this article on our website at www.theamericansurveyor.com.

Speaking of compass stones, Maryland surveyors have been working for several years on a pair of stones at the old courthouse in Frederick. Find out more at www.theamericansurveyor.com/docs/The_Maryland_Surveyor-July_1999_Compass_Stones_Part1.pdf and www.theamericansurveyor.com/docs/The_Maryland_Surveyor-December_2003_Compass_Stones_Part2.pdf

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A&R 1830b, *ibid*. 1830, p. 278.


(NTM 1840a). Minutes of Nantucket Town Meetings, 1840, p. 176.

(NTM 1840b). Minutes of Nantucket Town Meetings, 1840, p. 189.