

TURNING THE HORIZON

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Thomas Jefferson's Survey of the University of Virginia - Pages 24 - 27

The Darden-Jefferson Sculpture

**Jefferson contemplating
implications of his survey of the
University of Virginia, July 18, 1817**



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Thomas Jefferson's Survey of the University of Virginia

On the morning of July 18, 1817, Thomas Jefferson, aged 74, rode his horse Bremo from Monticello to the site purchased for his planned national university. Accompanied by Edmund Bacon, his overseer, and James Dinsmore, a carpenter, he picked up locust shingles in Charlottesville to make stakes, and proceeded to the hill that would become The Lawn of the university. Jefferson set up his sophisticated theodolite that had been made by one of the most lauded instrument makers of the 18th century, and began his survey.

Thomas Jefferson played a critical role in the promotion of surveying as an indispensable tool in the development of the United States. This article summarizes his lifelong involvement with surveying, then focuses on his survey of the grounds of the future University of Virginia—the most consequential of the surveys he conducted personally. The article concludes with the story of the creation of a monumental sculpture commemorating this event, which was researched, designed and sculpted by the author and his two colleagues, and dedicated at the university on September 22 this year.

Jefferson specified that his tombstone should list his three greatest achievements: founding of the university, and authorship of the Declaration of Independence and of the Virginia Statute for Religious Freedom. His presidency did not make the cut.

Surveying Background

A polymath, Jefferson was fascinated by scientific instruments, acquiring a large collection over his lifetime. He was never a professional field surveyor, but made significant contributions to American surveying through appointments, directives and recommendations over the course of many decades. He received some instruction in surveying from his father, inherited his father's surveying equipment and maps when he was fourteen, and may have received a modicum more of surveying instruction while at the College of William and Mary.¹ The most important influence at college was his professor William Small, who invigorated his fascination with quantitative and scientific thinking.² Jefferson extensively measured, weighed and computed parameters for many of his endeavors, large and small, throughout his adult life.

He personally conducted field surveys of his own land, that of neighbors and nearby mountains. One such survey that has accompanying notes written by Jefferson in the first person, dates from October 15, 1793, and describes his reference point as lying midway between the front columns of Monticello.³

Contributions to American Surveying ⁴

Jefferson was a tireless promoter of institutions and policies that would strengthen the intellectual foundations of his young nation, believing that a population that possesses firm grounding in all the arts, ranging from science and technology to the humanities, is best equipped to live up to the ideals stated in the Declaration of Independence. Jefferson's active promotion of surveying as a tool of public policy had profound consequences for the speed and orderliness of the country's expansion, and for the recognition and development of the field. The following summary is by necessity cursory—it is but an outline of some of Jefferson's contributions.

In 1780 and '81 he recommended the method for extending the Mason-Dixon Line to and along the western meridian (as specified in William Penn's original grant) to the Ohio River. While minister to France in the 1780s he made a map of Virginia by synthesizing several sources, and calibrated it to a prime meridian centered on Philadelphia. For the Land Ordinance of 1785, he advocated a system of rectangular surveys to be conducted prior to any sales or settlements, to enhance the fairness of land acquisition.⁵ As Secretary of State he supervised surveys for the Residence Act of 1790 to locate the site for the nation's capital.

As President, he appointed Jared Mansfield Surveyor General of the Northwest Territory. "Mansfield was the only man, ... who had been appointed to an important public office solely on the ground of his scientific attainments," an action clearly reflecting Jefferson's understanding of and respect for science.⁶ He created the office of Surveyor General of the Mississippi Territory, appointing Isaac Briggs in 1803. (He also recommended Briggs as surveyor of the Erie Canal in 1816.)

In 1804 his interest in the establishment of an American prime meridian led to its demarcation with the "Jefferson Stone," located near the Washington monument. At Jefferson's behest Meriwether Lewis received survey training in Philadelphia for the Corps of Discovery expedition. Jefferson even specified specific surveying equipment for the Corps, (but it was too delicate to be taken along). In 1806 he proposed a Survey of the Coast, which was begun in 1816.⁷ During the period between 1788 and 1819, and possibly longer, he purchased and tested odometers as an aid to map making.

His public-surveying concepts saw their final policy realization in the state lines of Colorado (1876) and Wyoming (1890), using his recommended principle of aspect ratios of latitudes to longitudes.⁸ An unanticipated legacy is that the grid lines beginning in Ohio and laid out into the western U.S. are one of the man-made artifacts visible from Earth orbit.

Father of the University of Virginia

While Jefferson is known principally as the author of the Declaration of Independence, the period spanning his seventies constituted perhaps the most focused and consistently productive of his life. Virtually every aspect of the University of Virginia, including its secular mission, location, physical appearance, curriculum, and faculty was, for all practical purposes, Thomas Jefferson's concept. It was also his final contribution to the development of the United States.

Jefferson wrote about inadequacies in American higher education and advocated corrective innovations as early as the 1760s, when Virginia's colonial governor asked him for expansion plans for the College of William and Mary. As Virginia governor in 1779, concerned about quality of education, he attempted to reduce the influence of clergy at the College.

Jefferson's desire to create a major university was stated as early as January, 1800, in a letter to the renowned English scientist Joseph Priestly.⁹ His multi-stage plan was initiated at least as early as 1814 when he became director of the on-paper-only Albemarle Academy. That year he sketched his concept for what he termed an "academical village," integrating the design of many buildings, as opposed to the concentration of all functions in a single structure. In 1816 the Virginia Assembly transformed the academy into Central College—still existing only on paper, but by name emphasizing its importance.¹⁰ He presented his 1814 drawings to the Board of Visitors (trustees) in May 1817, and gained their approval. The remaining nine years of his life were devoted to the establishment of his university.¹¹

Theodolite

Jefferson owned more than one theodolite in his lifetime, but we know that the one used for his university survey is the one currently on view at Monticello.

According to Bedini, Jefferson purchased this theodolite from its maker, Jesse Ramsden in London on March 16, 1786, when he was visiting London while minister to France. (On the same day he purchased a telescope, hygrometer, microscope, thermometer, globe, protractor, dividers, and a draw-pen.)¹² Monticello's researchers believe this theodolite was not included that day—that he had purchased it from Reverend Andrews of Williamsburg eight years earlier.¹³ Ramsden was an Englishman who gained international recognition as an inventor and maker of precision measuring instruments and optics, including theodolites. His most famous theodolite, used in the Principal Triangulation of Great Britain of 1790-1853, was 3 feet in diameter and could divide angles to 1 arc second. The invention for which he is most recognized by surveyors is his "dividing engine," which could mark angle-calibrations far more accurately than could earlier techniques. He was elected to the Royal Society in 1786 and

awarded the Copley Medal in 1795 for his achievements.¹⁴ Jefferson always tried to acquire the best.

Jefferson's Ramsden theodolite was a sophisticated instrument for its date of construction and remained relatively so for many decades. It has a large compass, two telescopes for sighting reference points, calibration for altitude and around the slanted edge of the compass body (to 3 minutes of arc) for azimuth. Four adjustment-screw knobs are placed vertically to level the instrument relative to spirit levels.

Survey of the University: July 18, 1817

Jefferson's notes from the day of the survey record that he planted his theodolite in a position convenient for taking multiple readings (see his survey notes, Figure 1).¹⁵ He would not have to move it during the surveying session. Modern surveyors, if using the Ramsden instrument, would move it so as to be able to keep the seven points on each side of the field in a straight line, and then measure distances directly. But, a) Jefferson's love of computation may have led him to locate all of the points from a single position, for the sheer fun of the challenge; and b) his instrument enabled that approach because it could measure the southward drop in elevation of the hill and his azimuth measurements simultaneously. Trig computations would have been assisted by published tables. Edmund Bacon and James Dinsmore performed as rod men and point markers. Jefferson had a relatively soft voice, so communication with his assistants may have been through hand signals.

The first measurement could have provided a known distance for a reference-base line. Jefferson may have used a Gunter's chain with 100 links, equivalent to 66 feet in length, since he recommended Gunter's chains as a standard for American surveying while serving on the Public Land Act Committee from 1783 to 1785. A mile equals 80 chains, and 10 square chains equals one acre. But many Gunter's chains were 33 feet long—more convenient in hilly country—and the surviving one at Monticello is 33 feet.

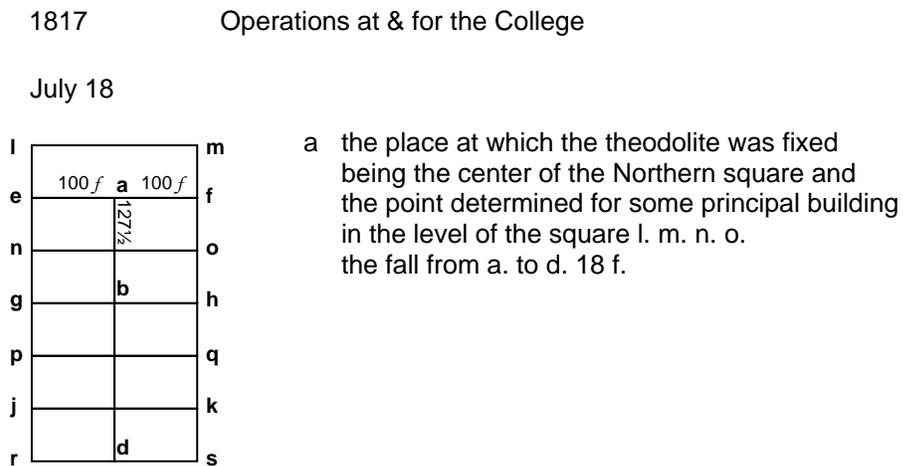
There are no stadia hairs in the theodolite's telescopes today, and it seems likely that they had not yet been invented by the time it was made in the late 18th century.¹⁶ Consequently Jefferson and his crew could not have used stadia rods. Instead, Bacon and Dinsmore simply did their best to keep the rod vertical, possibly with the aid of a plumb bob. The entire survey would have required at least several hours.¹⁷

It seems reasonable to assume that Jefferson would have taken his recently approved 1814 drawings (layout of the grounds on one side, architectural elevation of Pavilion VII on the other) to place his survey into perspective relative to the site.

Survey Results and Consequences: The Rotunda

The schematic in Figure 1 is the author’s simplified version of the rough sketch done by Jefferson the same day he completed the survey, depicting the “squares” he “laid off.”¹⁸ The text to the right of the sketch is an excerpt from his handwritten notes.

Figure 1. Jefferson’s Survey Notes



In addition, Jefferson’s notes specified his assumptions about compass declination, and that locust stakes were driven at all points except *d*, which was marked with a pile of stones.

The survey revealed that the field, which was aligned with the spine of a long hill that sloped gently to the south, was too narrow to accommodate his 1814 plans, so he had to reconsider. Sixteen days after the survey he wrote Benjamin Henry Latrobe, the architect with whom he worked on the original university buildings, that the “law of the ground” made the “principal building” (Figure 1) at the north end of the grounds necessary.¹⁹ It is possible that the idea for the building occurred to Jefferson during the survey, later that day or the next day—in response to the need to rework his plans.

At least one source suggests he had received the idea for “some principal building” from Latrobe.²⁰ Certainly, the concept for a major building at the center of the north end of the grounds occurred to, or was confirmed in Jefferson’s mind, at a date in close proximity to the survey of July 18.

Another consequence of the survey is that Jefferson decided to adapt to the southward slope of the hill by creating three terraces.

In a letter written to John Hartwell Cocke on July 19 Jefferson wrote "our squares are laid off, the brick yard begun, and the levelling will be begun in the course of the week."²¹

Central College received its charter as the University of Virginia in January 1819. The "principal building" mentioned in his survey notes quickly evolved into the famous Rotunda, which is considered one of the most significant architectural designs in America. Among other honors, it was designated one of eighteen architectural treasures in the United States by the UNESCO World Heritage Convention of 2001.

The Darden-Jefferson Sculpture: Jefferson Surveying the University

In 2005 alumni of the Darden Graduate School of Business at the University of Virginia sponsored a nationwide competition for a sculpture commemorating Thomas Jefferson's founding of the university, to stand at the north end of Darden's main courtyard. The author and his two colleagues won with their proposal to depict Jefferson, not only accurately, but in the act of creation. Rather than posing as if for a portrait, the Jefferson in our composition is dynamic, evocative of his character, and relates directly to his extraordinary efforts in his last years as he physically carried out his plans. Our 9-foot bronze sculpture captures Jefferson on the morning of July 18, 1817, having just completed his survey. He is standing on a sculpted grass field, wearing his riding clothes and holding his two-sided 1814 drawing. His Ramsden theodolite stands to his left, above the saddlebags used to carry the marking stakes.

We researched Jefferson's founding of the university, and uncovered as many details about his theodolite, personal appearance, clothing, and accoutrements as we could during a full-time three-month effort, consulting many published sources and Jefferson experts. The research was expanded after we won the sculpture commission.

This issue's cover shows a view of the full sculpture. Jefferson is depicted contemplating the implications of the survey results as they relate to his 1814 drawing. He may be thinking that the idea for a grand building at the north end of the grounds should, in fact, be implemented. Or he may be struck for the first time with the concept for the principal building that became the famous Rotunda—thanks to his survey that made him rethink his plans.

Figure 2. The Darden-Jefferson Sculpture, Jefferson's Right Side



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Figure 2 is a close-up of Jefferson's right side, showing the right pocket of his vest. The fan-like item in the pocket is his ivory-slat note pad, on which he wrote field notes in grease pencil, to be transcribed after returning to his "cabinet" (office). The other item in his pocket is his sunglasses, which he called his "goggles." His left pocket, behind the drawing in the photo, holds his watch and

architect's rule. His seal stamp is tied to a ribbon looped through the top ring of his watch.

Figure 3 is a photo of the sculpture's bronze theodolite, which, like the rest of the sculpture, is scaled to nearly 1 ½ times actual size. While there are some uncertainties about its exact configuration as of 1817, we have followed Monticello's current interpretation.

Figure 3. Jefferson's Ramsden Theodolite

The theodolite in the sculpture is based both on direct inspection of the actual instrument at Monticello, and many measurements and photographs taken for this purpose by Monticello staff. Consequently, the instrument and its tapered tripod legs are as accurate as we could make them without subjecting the original instrument to unnecessary handling.

The two telescopes are set at different angles to indicate recent completion of the survey. The tripod legs are spread at equal angles, which would have facilitated centering of the instrument.



Two details on the theodolite will be seen by few viewers. The compass needle is pointing in the estimated correct direction, as if the sculpture were standing on

the spot where Jefferson conducted his survey, adjusted with an estimate for magnetic declination as of 1817. Two script inscriptions on the upward facing surface of the compass include identification of Jesse Ramsden of London and a label for angular calibration.

Creation of the sculpture, including: ongoing research, composition, sculpting of several maquettes in clay, enlargement, resculpting at full size, multiple molds, adjustments for new historical data, modeling the theodolite, lathing the tripod legs, and months of foundry work, spanned nearly three years. The Darden Class of 1974 sponsored the project, and the approximately sixty people we worked with at various stages of the project all deserve credit. Special thanks to Lisa Jacobs, Executive Director of the Museum of Surveying and Jack Owens, Editor of this journal, for their patient suggestions regarding surveying for this article.

Conclusion

Our hope is that the Darden-Jefferson will stand for centuries as an inspiration to young people, and not so young people, as the definitive older Jefferson: energetic, thoughtful, rational, ignoring conventional expectations of advanced age, realizing through his own hard work a significant, productive, forward-looking dream.

Thomas Jefferson's many accomplishments had a profound influence on the development of the United States. His Declaration of Independence became the permanent expression of democratic aspirations of all Americans. His fascination with science and technology, and his devotion to improvement of serious education, supported his unending drive to make the United States a leading modern nation as rapidly as possible. His role for nearly fifty years as champion of objective measurement through surveying, (reinforced by his political power and moral authority), substantially accelerated the country's orderly development. His field survey of the University of Virginia now serves as a manifest tribute to Thomas Jefferson's foundational contributions to our country, and as a reminder of the foresight, energy and actions required of individuals to continue his work.

Author: Rob Firmin, Ph.D., is one of three principals in the former sculpture team of Daub Firmin Hendrickson Sculpture Group, LLC. along with Eugene Daub and Jonah Hendrickson. The group is now Daub & Firmin Studios, LLC., located in Kensington and San Pedro, California. Its work can be seen at www.dfsculpturestudios.com. In addition to sculpting, Rob conducts the historical research that supports design of the studio's monuments.

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Notes

¹ Bedini (1990) p. 27 [The most thorough single source on Jefferson's quantitative and scientific interests, as well as an excellent general biography.]

² Linklater (2003) pp. 54, 55

³ Wheeler, Derek, Monticello archaeologist: Personal communication. The notes are from the N-196 series for surveys conducted between September 1793 and August, 1795. The map drawn based on these surveys is N-521-9, at the Massachusetts Historical Society.

⁴ Bedini (1990) [Referenced in addition to other cited sources in this section.] For surveying, see pp. 15, 21, 60, 84, 449

⁵ White (1983) p. 11

⁶ Dudley (1998) p. 235; quoting the *Personal Memories* of Mansfield's son Edward, p. 3.

⁷ Bedini (1999) entire work

⁸ White (1983), p. 172

⁹ Koch & Peden (1944), pp. 552, 553 for a transcription of the letter

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- ¹⁰ Wills (2002), pp. 25, 48-53
- ¹¹ Grizzard (1996), p. 2
- ¹² Bedini (1990), p. 151
- ¹³ Taylor, Carrie E., Collections Manager, Monticello: Personal communication
- ¹⁴ *Encyclopædia Britannica On-line* "Ramsden, Jesse" <http://www.britannica.com/eb/article-9062618>; "Jesse Ramsden" *Wikipedia, The Free Encyclopedia*; "Principal Triangulation of Great Britain" *Wikipedia, The Free Encyclopedia*
- ¹⁵ Owens, Jack, Editor, *Turning the Horizon* Surveyors Historical Society: Personal communication
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- ¹⁷ Jacobs, Lisa D., Executive Director, Museum of Surveying: Personal communication
- ¹⁸ Wilson *et al* (2005), pp. 14, 16, 30, 31
- ¹⁹ Grizzard (1996), p. 14; and note 48
- ²⁰ Lasala (1992), p. 17
- ²¹ Grizzard (1996), p. 17