

# Astronomical Observatories in New England

By MARIAN CARD DONNELLY

THE history of astronomical observatories in New England begins two hundred years later than the history of astronomical studies. Such studies were early included in the curriculum of Harvard College, but it was not until 1836 that a permanent institutional observatory was built in New England, or anywhere else in the United States. Before that time certain temporary shelters were provided for telescopes used in determining latitude and longitude for surveying, or for special astronomical events, such as the transit of Venus across the sun on June 3, 1769.<sup>1</sup> None of these measures were permanent, nor was the observatory built at Chapel Hill, North Carolina, in 1831, which had fallen into disrepair by 1835 and was destroyed by fire in 1838.<sup>2</sup> The "Observatory" in Portland, Maine, built in 1807, appears to have been used to watch shipping rather than for astronomical research.<sup>3</sup>

To single out New England observatories built before World War I is an arbitrary choice of study, since they are not, as a group, marked by any regional characteristics. On the other hand, the period of time in which they appeared was that in which visual telescopes were fully developed for modern intensive research, and the buildings constructed in New England to house them reflect, over the years, the changing requirements of these instruments. A thorough description of each building cannot be attempted here, but some of the principal features will be

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reported to show how the builders met the needs of the astronomers.

The earliest permanent observatory building in the United States seems to be the one built by Professor Albert Hopkins at Williams College, Williamstown, Massachusetts, in 1836-1838.<sup>4</sup> (Figure 1.) Since Galileo demonstrated in 1609 that the recently invented telescope could be used for astronomical observations, the buildings designed to shelter them were directly influenced by the problems of mounting and using these and other astronomical instruments. By the time Hopkins Observatory was founded, some of the principal difficulties in telescope making had been solved, making it possible for educational and government institutions to extend research considerably beyond what could be attempted in the seventeenth and eighteenth centuries.<sup>5</sup>

The telescope chosen by Professor Hopkins was a Herschelien reflector of 10-foot focal length. The observatory is built of local stone, is 48 feet long, and is divided into a central portion and two wings. A cylindrical dome 13 feet in diameter is set on a drum over the central portion. This size allows space for free use of the 10-foot telescope with little waste space. A transit instrument was mounted in the west wing. Both wings have vertical openings in the north and south walls and roof shutters for transit instruments or meridian circles.

The general plan of Hopkins Observatory, with the dome in the center and flanking wings, was already established in Europe. Jacques-Dominique Cassini had recommended it, somewhat modified, as an ideal plan,<sup>6</sup> and the same prin-

ciple was used at the Cambridge University Observatory in England, 1821-1824.<sup>7</sup> Professor Hopkins, who had visited England, may have been influenced by the latter building in his adaptation of a similar plan and use of Doric motifs (here Roman rather than Greek). Both observatories have porticoes of Doric columns, spaced regularly at Cambridge and with a wide central opening at Williams-town. The interruption of the balustrades by the slits in the wings of both observatories indicates how astronomical requirements may conflict with decorative styles chosen for observatories.

After visiting Hopkins Observatory on November 14, 1865, Emerson commented: "Of all tools, an observatory is the most sublime. . . . What is so good in a college as an observatory? The sublime attaches to the door and to the first stair you ascend;—that this is the road to the stars. Every fixture and instrument in the building, every nail and pin, has a direct reference to the Milky Way, the fixed stars, and the nebulae, and we leave Massachusetts and the Americas and history outside at the door, when we come in."<sup>8</sup> Another building, the Field Memorial Observatory, was built in 1882 for meridian observations, but it received only limited use and was demolished in 1927.<sup>9</sup>

Almost immediately after the building of Hopkins Observatory came that of the first observatory at Wesleyan University, Middletown, Connecticut, 1838-1839.<sup>10</sup> This was a wooden building, octagonal, nine feet in diameter. The telescope for which it was built was a refractor on 6-inch aperture and 7-foot focal length. It was replaced by a larger telescope in 1868, for which a tower was built on the Boarding Hall,<sup>11</sup> and the first observatory became a henhouse.<sup>12</sup>

In 1843 land was purchased for the first permanent observatory at Harvard College.<sup>13</sup> Proposals for an observatory had started in 1805, and the matter was again raised in 1815, when William Cranch Bond, later to become the director of the Observatory, visited Greenwich Observatory and others in England to study their construction and equipment. The Harvard Observatory was at last officially established in 1839 and Dana House fitted up with instruments.<sup>14</sup> This building, which was also the residence of the Bond family, was soon superseded by the present observatory on Summer House Hill.

The position of the central telescope pier for the new building was marked August 12, 1843, and ground broken the next day.<sup>15</sup> A year later some of the instruments were put in place, although the great 15-inch refractor was not mounted until June, 1847.<sup>16</sup> This telescope was at that time equaled in aperture only by that of the Imperial Observatory at Pulkowa, Russia. The building to house it and auxiliary instruments was evidently erected "according to the plan and specifications drawn by Isaiah Rogers," the prominent Boston architect.<sup>17</sup> The then Astronomer Royal, Sir George Biddell Airy, had advised the Harvard group in 1839: "I may remark, that the Cambridge Observatory was built in a plan architecturally symmetrical, which arrangement I should deprecate in any new Observatory, on account of the difficulties which it presents to all future alterations."<sup>18</sup> In spite of this counsel, the plan chosen was similar to that of Hopkins Observatory, on a more extensive scale.

In the central portion a granite pier was begun 26 feet below the ground level and continued on 40 feet high, taper-

ing from 22 feet in diameter at the base to 10 feet at the top. A granite capstone was placed on top, then the mounting for the telescope itself. The cross section of the central part of the building is characteristic of observatories of that time. (Figure 2.) The piers for the major instruments rose through two or three stories of the surrounding building and were constructed to be independent of the

On either side of the central tower connecting portions, housing meridian circles and other instruments, lead to the east and west blocks of the building. The west wing was occupied by a smaller telescope, library and computing rooms, while the east formed a residence. The building is oriented toward the compass points for the benefit of certain instruments. It is 170 feet long, built of brick,

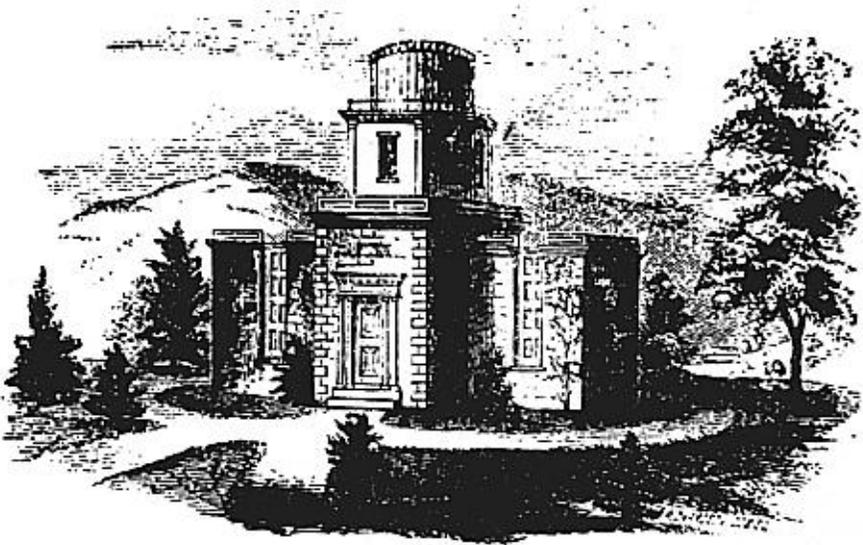


FIG. 1. HOPKINS OBSERVATORY, WILLIAMS COLLEGE

From *Harper's New Monthly Magazine* (1856).

floors around them. Both height and isolation were measures taken to protect telescopes from vibrations which would prevent accurate readings. The wooden dome over the Harvard Observatory is 30 feet in diameter on the inside and is turned by eight iron balls running on a circular track. "Although this dome is estimated to weigh about fourteen tons, yet it can be turned through a whole revolution by a single individual without any very great exertion, in thirty-five seconds."<sup>19</sup>

again with modified Grecian detail. Ten acres of land were purchased for the grounds, and of them Bond wrote in 1849: "The trees and shrubbery appear to thrive, and promise, ere long, to enhance the beauty of the place and the comfort of the occupants, besides affording an excellent screen from dust, so annoying to the observer, and injurious to his instruments."<sup>20</sup>

The first observatory at Amherst College followed soon after, having been started in 1847 and finally dedicated June

28, 1848.<sup>21</sup> In this case the observatory had an octagonal tower, 17 feet in diameter and 50 feet high, for the telescope, and a room on the east side for a transit instrument.<sup>22</sup> The building was planned to house the zoological "Cabinet" as well, under the direction of Charles B. Adams, adjunct professor of astronomy and curator of the Cabinet. The telescope was a  $7\frac{1}{4}$ -inch refractor with a focal length of  $8\frac{1}{2}$  feet. The Cabinet was built beside the octagonal tower and the transit room on another side, no formal plan or symmetry being attempted. Heavy brackets on the cornices lent a slight touch of the picturesque, particularly on the tower. The building was abandoned for astronomical purposes at the completion of the new observatory in 1903.

The last of the New England observatories founded before the Civil War was Shattuck Observatory of Dartmouth College, 1854.<sup>23</sup> Here the plan is a Latin cross, with a rotunda on the west, observers' rooms on the north and south, and a transit room on the east. (Figure 3.) The dome, 18 feet in diameter on the inside, sheltered a 6-inch telescope with  $8\frac{1}{2}$ -foot focal length, dimensions similar to those at Amherst. This dome was moved to the Mid-Fairfield County Youth Museum at Westport, Connecticut, in the spring of 1959, and has been replaced by a modern structure.

The facilities of one private astronomer, while not forming an institutional observatory such as the ones under discussion here, should be noted. Maria Mitchell, later to become the first director of the observatory at Vassar College, worked with instruments on the roof of a bank and in her back yard at Nantucket, Massachusetts, achieving international recognition, particularly for her work on comets. During a trip to Europe in 1857

she remarked: "All the observatories of Europe seem to have been built as temples to Urania, and not as working-chambers of science."<sup>24</sup> Her telescope was later preserved in a small observatory built by the Nantucket Maria Mitchell Association in 1908.

No institutional observatories were built in New England from Shattuck Observatory in 1854 to the John Payson Williston Observatory at Mount Holyoke College, South Hadley, Massachusetts, in 1881.<sup>25</sup> By that time the Civil War years were past and more important, the application of photography and spectroscopy to telescopic studies, together with further perfections in optical glass, were stimulating a marked expansion in astronomical studies all over the world. From 1850 to World War II more than twice as many observatories were built as had been during the preceding seventy-year period. Most of these were newly founded, while some already-existing institutions expanded old buildings or built new and larger ones to replace them. Both developments took place in New England.

At Mount Holyoke a 6-inch telescope had been obtained by the college in 1853 and placed in a little tower 12 feet high. The growth of surrounding trees soon made the telescope useless. The present building is unusual in its wooden construction: "The chief part of the expense was for the instruments, as a massive structure was considered undesirable."<sup>26</sup> An 18-foot dome rests on a low tower at one corner of the building. "The dome is very light, and rotates so easily that any young lady can manage it without difficulty."<sup>27</sup> Like many others of educational institutions, Williston Observatory was planned primarily for instruction, with less emphasis on research.

In contrast to some it is an informal building, with porch, clapboards and shingles. Scientific necessity was turned to architectural advantage in the transit slits of the wings, which are carried above the roof into gambreled dormers, providing the required openings and adding interest to the roof line.

An important development in observatory planning in the late nineteenth century may be seen at the Yale University Observatory, New Haven, Connecticut. A telescope had been acquired in 1830 and a tower built for it on one of the college buildings, but there was no permanent observatory until 1881-1882.<sup>28</sup> The Sheffield Scientific School built towers on Sheffield Hall in 1866 for a telescope and meridian circle.<sup>29</sup> The observatory of 1882 consists of a main building for offices, computing rooms, etc., and a west wing for machine shop and heliometer dome. (The principal telescope is not in New Haven but at the station in Johannesburg, South Africa.)

In the plan adopted here, the various instruments are housed separately, individual buildings having been provided for the polar telescope, small telescope, catalogue camera and zenith camera. This separation helps to protect the instruments from vibrations and also aids in keeping constant temperature between the interiors and the outdoors. Sudden changes in temperature can fog lenses and cause slight deviations in the alignment of metal parts. If instrument chambers are set apart from workrooms which need heat in winter, an even heat in the former is more easily maintained.

The Smith College Observatory, Northampton, Massachusetts, was built in 1886 for an 11-inch telescope, housed in one of the earliest steel domes.<sup>30</sup> The

observatory is a one-story stone building, with wings extending from either side of the dome chamber, which is buttressed between the windows. Instead of building a larger observatory, the department of astronomy has, in recent years, made some use of the nearby Amherst observatory.

Ladd Observatory of Brown University, Providence, Rhode Island, was built in 1891 as a single structure on a plan similar to that of Shattuck Observatory.<sup>31</sup> A two-story octagonal tower of brick and stone on the west contains the telescope pier and is surmounted by a 19-foot dome. A two-story rectangular building is attached to the east side of the octagon for offices, laboratory and library. Transit instruments are mounted in a wooden extension on the east. In commenting upon the site the *Providence Journal* said: "It is very high ground, the highest point but one in the city, and the roominess of the lot, in that remote section of the city, gives the Observatory an excellent outlook and quiet surroundings. Prof. Upton, the astronomer at Brown, says that the astronomical idea is not necessarily to get as near the sky as possible, but to obtain an outlook and a quiet place. This is one of the reasons why the Observatory is not a lofty building."<sup>32</sup> A few words of regional pride were spoken by Professor E. C. Pickering of the Harvard Observatory at the dedication exercises on October 21, 1891: "There is no place, he says, where there is such a general recognition of this work as in New England. The future of astronomy is going to depend on America. He [Professor Pickering] hoped a great deal would be done through Ladd Observatory."<sup>33</sup>

Classical principles were used again at

Whitin Observatory, built in 1900 for Wellesley College, Wellesley, Massachusetts.<sup>34</sup> The architects, Angell and Swift of Providence, chose white Georgia marble and included pilasters and acroteria in their final decorative designs. The plan is like that of Hopkins Observatory, i.e., a central dome flanked by east and west wings. Whitin Observatory does not, however, have the telescope in as relatively a lofty position as Hopkins Observatory. Instead the dome chamber is

than 100 feet. This makes the plan of the observatory, whether by accident or by design, resemble that of Yerkes Observatory at Williams Bay, Wisconsin, built in 1897, with its great dome on the west and the rest of the building extending toward the east.<sup>36</sup>

Finally, with the Van Vleck Observatory at Wesleyan University, dedicated June 16, 1916, the history of observatories planned in New England before the two World Wars is brought to a

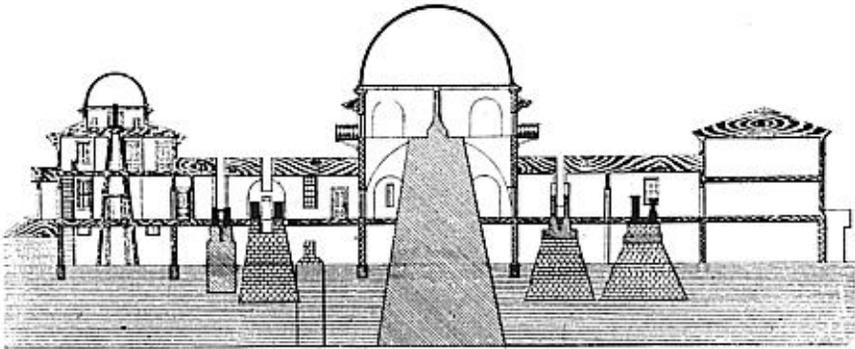


FIG. 2. SECTION, HARVARD COLLEGE OBSERVATORY  
From *Annals of the Observatory of Harvard College* (1876).

only one story high, making a lower, more horizontal mass. A wing for an additional telescope and other equipment was added in 1906.

Preliminary plans for the second observatory at Amherst College were drawn by York and Sawyer of New York in 1899, then further plans drawn by McKim, Mead and White in 1902.<sup>35</sup> As originally intended, the building was to have been 150 feet long, with three domes, the largest in the center. As constructed, the dome for the 18-inch telescope is on the west, while offices, laboratories, etc., extend in a long wing on the east, with an over-all length of less

close.<sup>37</sup> This building, the second complete observatory at Middletown, is constructed of Portland brownstone quarried nearby, and consists of three main parts: the 35-foot dome on the east, linked by a vestibule to a second, rectangular portion running north-south for offices, and finally the transit room on the west. No particular decorative style was adopted for the building, and the following remarks were included by the director, Frederick Slocum, in his address at the dedication: "The building has been likened to a fort, and the dome to a beehive, and even to a sore thumb. The most encouraging comment on the exterior ap-

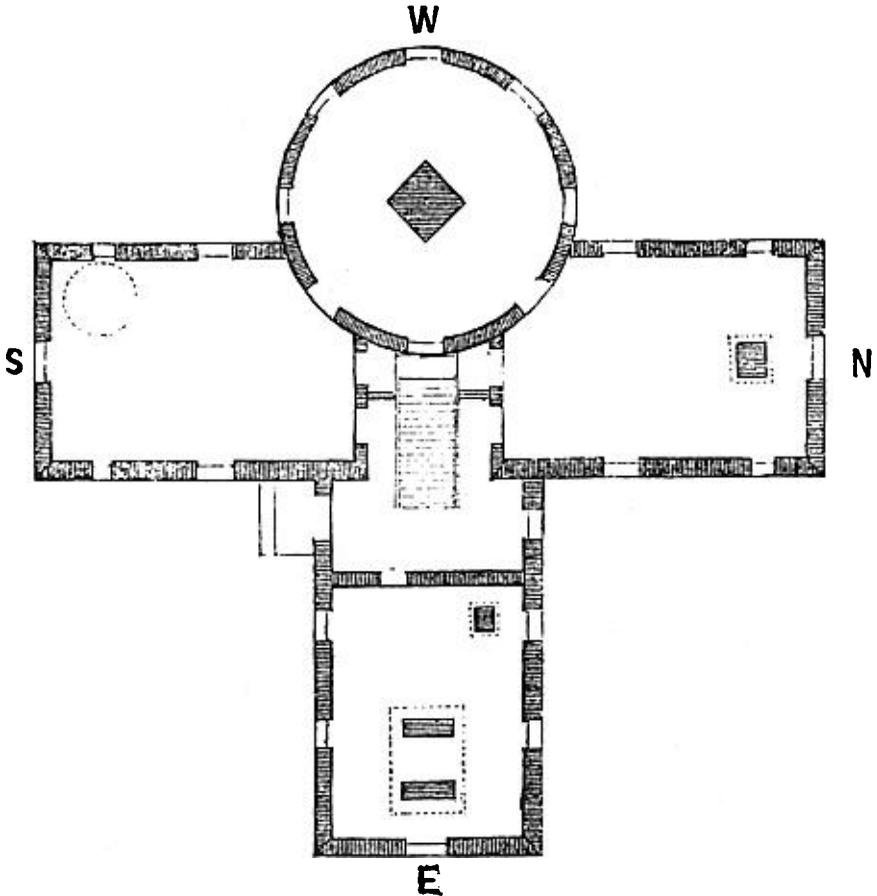


FIG. 3. PLAN OF SHATTUCK OBSERVATORY, DARTMOUTH COLLEGE

From *Harper's New Monthly Magazine* (1856).

pearance of the structure is one by a member of the Wesleyan Faculty, which I take the liberty of quoting.

'Little bits of plaster,  
Little blocks of stone,  
Make a handsome building,  
When the ivy's grown.'

Probably this is too harsh a judgment for Van Vleck Observatory, and many another. The presence of domes will set an

observatory apart from more blocklike buildings near it, and the consequent irregular shape may lend itself particularly well to varying appearances with changing light and shadow.

The twelve New England observatories under discussion here, built during the course of eighty years, constitute about one-fourth of the total number of American observatories for that period. In architectural style a taste for the Clas-

sical predominated throughout, with occasional variations, as at Mount Holyoke.

Of perhaps greater interest in showing the relation between science and architecture are the changes in the buildings brought about by the development of telescopes and other instruments. As at Hopkins Observatory, the early nineteenth-century practice was to place the telescope high on the building. When larger lenses and mirrors were available, massive piers, such as that of the Harvard Observatory, were necessary to insure stable mounting. Later measures adopted were the substitution of iron columns for masonry piers,

the placement of the telescope closer to the ground (Wellesley), and the separation of the dome chamber and other instrument chambers from each other (New Haven and Middletown). An absolute chronological development did not, of course, take place. The New England observatories do demonstrate, however, that during the nineteenth century the over-all concept of an astronomical observatory changed from a compact mass crowned by a dome to a building or even set of buildings with greater differentiation of parts according to their functions.

## NOTES

<sup>1</sup> Willis I. Milham, "Early American Observatories," *Popular Astronomy*, XLV (1937), 523-527.

<sup>2</sup> Kemp P. Battle, *History of the University of North Carolina* (Raleigh, N. C., 1907), pp. 334-336.

<sup>3</sup> Edward H. Elwell, *Portland and Vicinity* (Portland, 1876), p. 53.

<sup>4</sup> Willis I. Milham, *The History of Astronomy in Williams College and the Founding of Hopkins Observatory* (Williamstown, 1937), p. 25.

<sup>5</sup> For brief accounts of the history of telescope making, see A. Frederick Collins, *The Greatest Eye in the World* (New York, 1942), or G. Edward Pendray, *Men, Mirrors, and Stars* (New York, 1935).

<sup>6</sup> Jacques Dominique Cassini, *Mémoires pour servir à l'histoire des sciences et à celle de l'observatoire royal de Paris . . .* (Paris, 1810), pp. 79-85, Plates V and VI.

<sup>7</sup> F. M. J. Stratton, "The History of the Cambridge Observatories," *Annals of the Solar Physics Observatory, Cambridge*, I (1949), Plate I.

<sup>8</sup> Ralph Waldo Emerson, *Journals of Ralph Waldo Emerson*, ed. Edward Waldo Emerson and Waldo Emerson Forbes (Boston and New York, 1914), X, 118.

<sup>9</sup> Milham, *The History of Astronomy*, pp. 22-25.

<sup>10</sup> F. Slocum, C. L. Stearns, and B. W. Sit-

terly, "Stellar Parallaxes," *Publications of the Van Vleck Observatory* (1938), I, xi.

<sup>11</sup> *Ibid.*, Figure 1.

<sup>12</sup> Carl F. Price, *Wesleyan's First Century* (Middletown, Conn., 1932), p. 40.

<sup>13</sup> William Cranch Bond, "History and Description of the Astronomical Observatory of Harvard College," *Annals of the Observatory of Harvard College*, I (1856), xvi.

<sup>14</sup> Josiah Quincy, *The History of Harvard University* (Boston, 1860), II, 392.

<sup>15</sup> Bond, *op. cit.*, p. xvi.

<sup>16</sup> *Ibid.*, p. xviii.

<sup>17</sup> See Harvard College Records, VIII, 230.

<sup>18</sup> Bond, *op. cit.*, p. civ.

<sup>19</sup> Elias Loomis, "Astronomical Observatories in the United States," *Harper's New Monthly Magazine*, XIII (1856), 39.

<sup>20</sup> Bond, *op. cit.*, p. cxxxvii.

<sup>21</sup> David Todd, "Early History of Astronomy at Amherst College," *Popular Astronomy*, XI (1903), 323.

<sup>22</sup> Loomis, *op. cit.*, p. 44.

<sup>23</sup> Frederick Chase, ed. John K. Lord, *A History of Dartmouth College and the Town of Hanover, New Hampshire* (Cambridge, Mass., 1891), II, 288.

<sup>24</sup> Maria Mitchell, *Life, Letters and Journals*, comp. Phebe Mitchell Kendall (Boston, 1896), p. 140.

<sup>25</sup> Sarah D. (Locke) Stow, *History of Mount Holyoke Seminary, South Hadley, Mass., during its First Half Century, 1837-1887* (South Hadley, 1887), p. 259.

<sup>26</sup> *Ibid.*, p. 260.

<sup>27</sup> C. A. Young in "Reports of Astronomical Observatories," *Annual Report of the Board of Regents of the Smithsonian Institution* (1880), p. 663.

<sup>28</sup> Collins, *op. cit.*, pp. 141-149.

<sup>29</sup> J. E. Nourse, "Observatories in the United States," *Harper's New Monthly Magazine*, XLIX (1874), 530-531.

<sup>30</sup> L. Clark Seelye, *The Early History of Smith College, 1871-1910* (Boston and New York, 1923), p. 66.

<sup>31</sup> Winslow Upton, "The Ladd Observatory," *Sidereal Messenger*, X (1891), 502-505.

<sup>32</sup> *Providence Journal*, October 22, 1891, p. 3.

<sup>33</sup> *Ibid.*

<sup>34</sup> S. F. Whiting, "The Whiting Observatory of Wellesley College," *Popular Astronomy*, VIII (1900), 482-484.

<sup>35</sup> *Popular Astronomy*, XI (1903), 325.

<sup>36</sup> George E. Hale, "The Yerkes Observatory of the University of Chicago," *Astrophysical Journal*, V (1897), 254-267, Plate IX.

<sup>37</sup> Slocum, *op. cit.*, p. 3.

<sup>38</sup> *Ibid.*, p. 4.