Joseph Henry's House and Plan for the Princeton Campus

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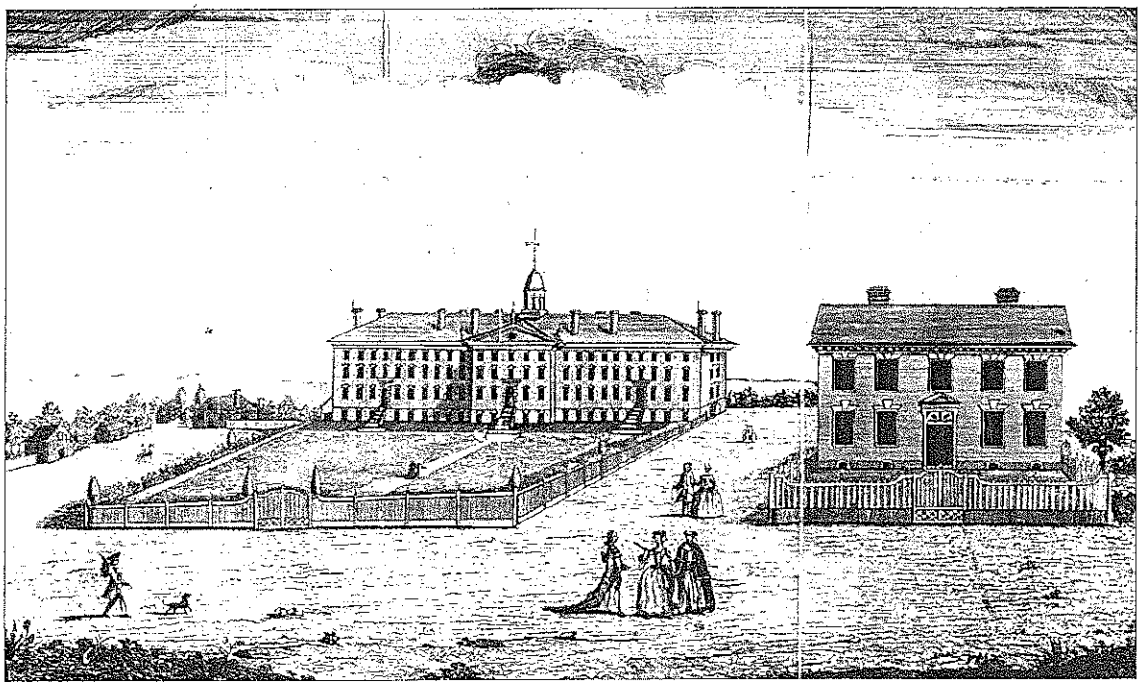
Abstract

Joseph Henry is often credited with the design of the Joseph Henry House, a registered National Historic Landmark on the Princeton University Campus. Joseph Henry was Professor of Natural Philosophy and Mathematics at Princeton College at the beginning of the 19th century. He also taught Architecture and Geology, and had worked earlier in the State of New York as a surveyor. In 1846, Prof. Henry moved to Washington, D.C. to assume leadership of the Smithsonian as its first Secretary. We set out to verify that Joseph Henry was responsible for the design of the House that bears his name, and found to our surprise that it is unlikely he designed it. Our conclusion is based on reviewing: financial documents and other College records; published and unpublished papers and letters of Joseph Henry; and, the diary of a College Building Committee member. We have established that Ezekial Howell, a local mason, was the principal builder of the house. We also determined that Charles Steadman, a local builder and carpenter, was responsible for certain drawings of the house. While it is possible that Steadman, as draftsman, was following Henry's specifications, we find that this is unlikely given that the 1838 house is so similar to others previously built by Steadman in the Princeton area. Prof. Henry did make his own drawing for a house and submitted it to the Building Committee, but his design is not like the design of the house that was built. That withstanding, Joseph Henry did select the location of the house as well as that of several other early buildings as part of his influential Campus Plan. A previously unknown freehand draft of the Campus Plan was discovered at the Smithsonian indicating the location of several unrealized buildings.

Introduction

BUILT IN 1838 and named a National Historic Landmark in 1965, the Joseph Henry House is one of the earlier structures at the College of New Jersey (known also as Princeton College, now Princeton University) [1–7]. The house has been relocated three times — perhaps a record — but its original location was close to the College's two original buildings, Nassau Hall and the President's House. Both of these structures still exist. Princeton College and its grounds are shown in the 1764 engraving by

Henry Dawkins in Figure 1 [8]. Today we would describe this engraving as showing the entire College campus at that time. 'Campus' is the Latin word for 'field,' and its first use to describe college grounds in the English language was in reference to the patch of land in front of Nassau Hall [9].



Credit: Princeton University Library

Figure 1. College of New Jersey: Nassau Hall and the President's House, 1764.

Joseph Henry proposed a plan for the development of Princeton College in 1836. The plan was formally accepted by action of the Board of Trustees [10]. Henry's plan included a new location for his home, as well as the placement of several proposed buildings. His plan called for a building arrangement that was symmetrical about Nassau Hall [11].

Joseph Henry was hired in 1832 by Princeton Vice President John Maclean, Jr. to teach Natural Philosophy and Mathematics. He also taught courses in Geology and Architecture. He served as a Princeton faculty member for fourteen years during a time when the entire faculty (including professors and tutors) numbered about fifteen [3]. In 1846, he moved from Princeton to Washington, D.C. to lead the Smithsonian Institution as its first Secretary.

The Joseph Henry House on campus is a brick dwelling in the Federal style with a Greek Revival portico. Henry and his family members were its first occupants when the construction was completed in mid-September 1838. It has been suggested by many sources that Prof. Henry

designed the house himself. A study of the house and documents relating to its origins reveals interesting facts, but no evidence that Joseph Henry actually designed it. Henry did present a drawing to the Trustees in January 1837 for a house [12, 13], but this drawing bears little resemblance to the house that was built [1, 14]. The brick house as built, however, is very similar to many wooden houses in the Princeton area constructed by carpenter and builder Charles Steadman [1], suggesting that perhaps Steadman may have been involved in the design.

Henry's Early Days in Princeton

Prof. Henry is best known for his many fundamental contributions in the then-new field of electromagnetism and especially for his discovery of self-inductance [15]. Electromagnetic induction, usually credited to Michael Faraday, is the creation of a voltage between the ends of a loop of wire when exposed to a changing magnetic field. The term of art for this phenomenon in the 19th century was magneto-electricity, that is, electricity from magnetism. Electromagnetic induction often involves two coils in proximity — one to produce a changing magnetic field and another to convert the changing magnetic field into a voltage. This property of electricity and magnetism is the basis of the electromagnetic transformer.

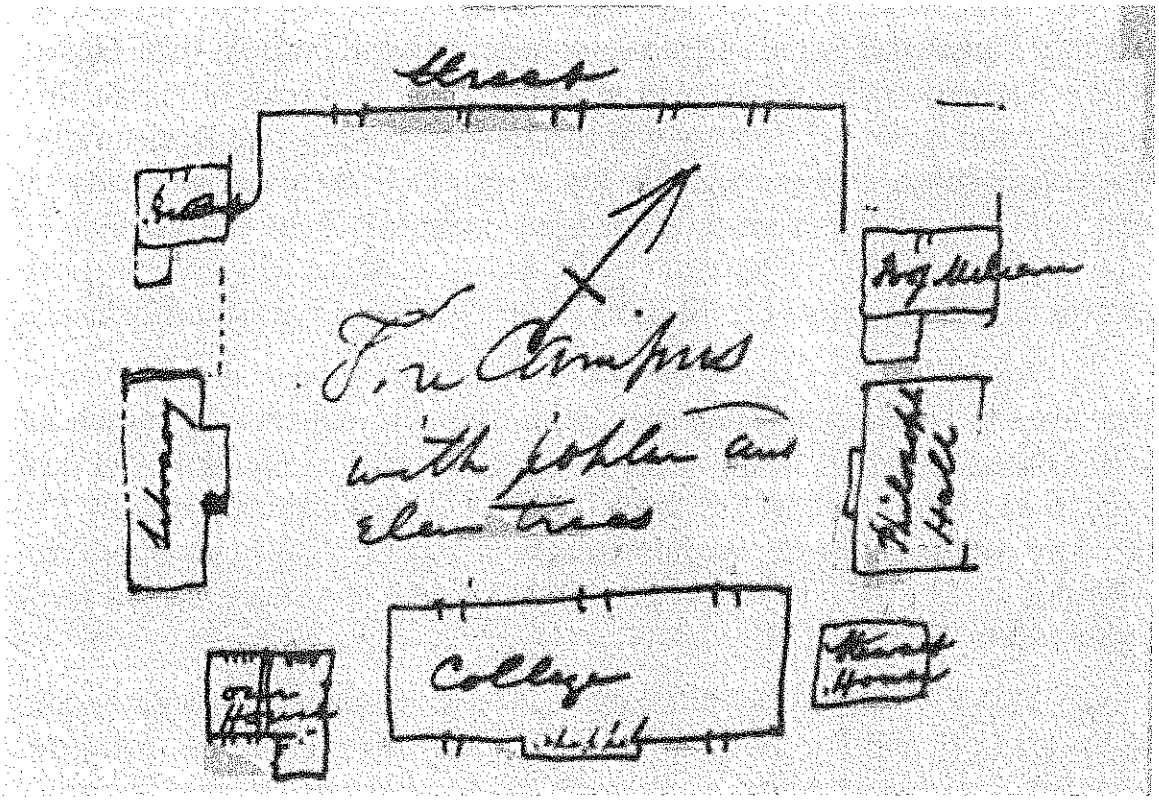
Joseph Henry discovered that a voltage is produced in the same coil used to produce the magnetic field. This phenomenon is known as self-inductance and it is the basis of an effect commonly observed and known as 'back voltage' or 'back EMF' (electromotive force). In the standard system of units used internationally (Le Système International d'Unités, or SI), the unit of electrical inductance is the henry, named after Joseph Henry himself [16].

Henry is also known for constructing the strongest electromagnets of his era [17], and for discovering how to apply electromagnetism for the transmission of information and power. He demonstrated a sounding-type telegraph before Samuel Morse [18], and he constructed the first practical electromagnetic engine, which was a precursor to the modern electric motor and the modern electromagnetic relay [19].

Henry moved to Princeton in 1832 from the Albany Academy where he taught Mathematics and Natural Philosophy for eight years [20]. Upon arriving in Princeton, Joseph Henry was provided the use of a house that stood immediately to the west of Nassau Hall. At that time, there were three professors' houses: one occupied by professor of Chemistry and College Vice President John Maclean Jr.; another by professor of

Mathematics Albert Dod; and the third by Prof. Henry and his family. Henry's assigned home had been used previously by Prof. Henry Vethake, the faculty member whom he was replacing [6, 7].

Figure 2 is a map drawn by Prof. Henry for his brother, James Henry, in an 1833 letter [21]. Henry's house, labeled "our house" in Figure 2, can also be seen in Figure 3, a circa 1825 drawing of the front campus by an unknown artist [22]. In Figure 3, Henry's original house is located immediately to the right of Nassau Hall and it faces the street (Nassau Street). Figure 4 shows a cropped image of this house that exhibits five bays in a Federal style. The house to the left of Nassau Hall in Figure 3 (labeled "Steward House" in Figure 2) is visually similar to Henry's house.



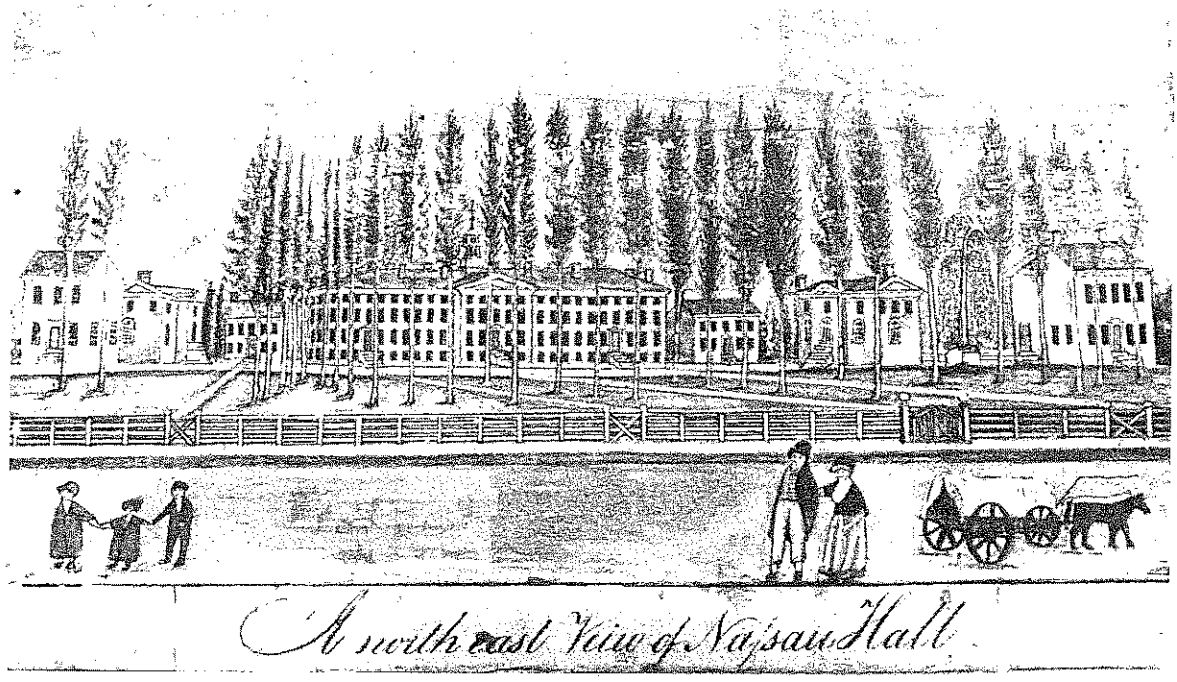
Credit: Smithsonian Institution Archives

Figure 2. Henry's map of the "Front Campus with Poplar and Elm Trees," 1833.

On September 29, 1835, the Board of Trustees decided to expand Henry's house [23]:

> "Resolved that an addition be made to the house of Professor Henry, by erecting a wing on the southwest end of the house, which shall contain four comfortable rooms of such materials, and

on such plan as the building committee may judge proper, and that the funds necessary for completing this addition be procured in the same manner, as prescribed in the second resolution [that is, to get a loan from a bank]."



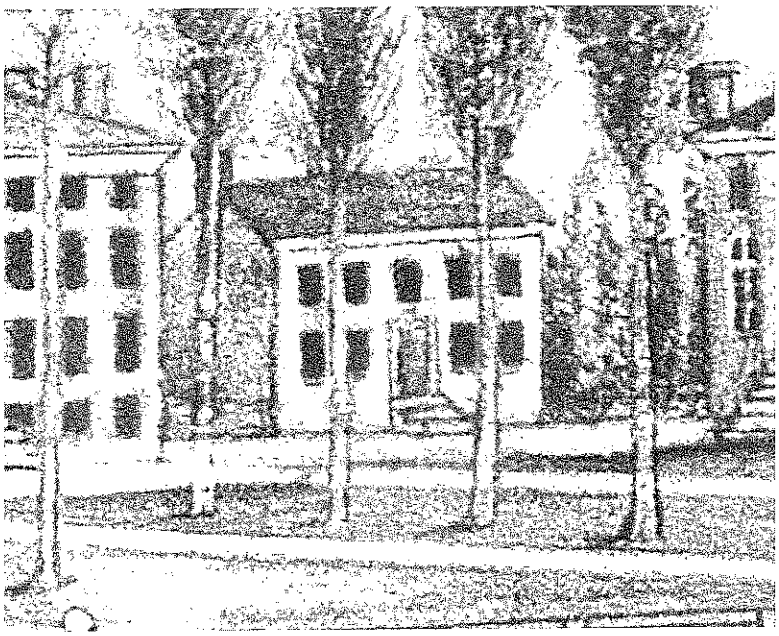
Credit: Princeton University Library

Figure 3. Drawing of "Princeton's Front Campus as seen from Street," circa 1825.

Henry's Campus Plan

Besides being the Professor of Natural Philosophy and Mathematics, Henry was also a member of the Whig Society. The Whig Society was one of two debating clubs at the College — the other being the Cliosophic Society. Both debating societies are still active at Princeton University today. In a circular printed in 1836 [11], an appeal for funds was made to build a new hall for the Whig Society. Henry drew a plan for the campus (Figure 5) which was included in this document. In a letter to Whig Society members, the following was written:

> "The erection of the new Halls is intimately connected with the improvement of the College grounds, as these edifices can be so placed in reference to the buildings now erected as to form with the latter a convenient and beautiful architectural arrangement. The plan of the disposition of the whole will readily be understood by a reference to the annexed Map."



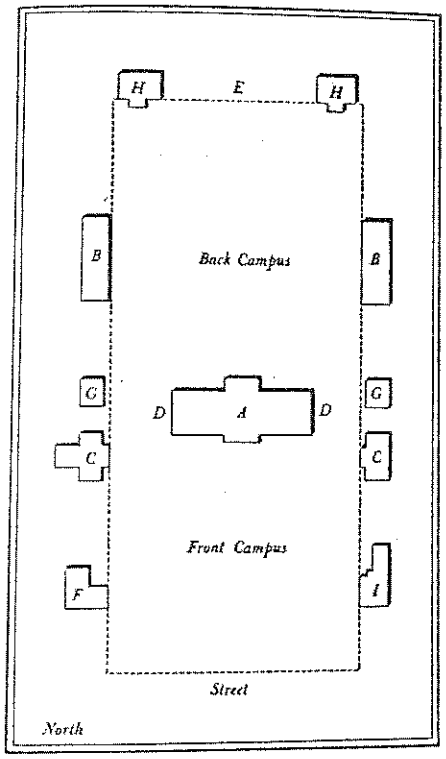
Credit: Princeton University Library

Figure 4. Cropped view of the 'professor's house' occupied by Joseph Henry until 1837.

At the time of this letter, buildings A (Nassau Hall), B-left, C-left, C-right, F, and I were already present. Building B-right (today known as West College) was under construction. Buildings G-left, G-right, H-left, and H-right did not yet exist. Two existing structures, D-left ("steward's house") and D-right ("our house"), were proposed for relocation to G-left and G-right. Prior to the construction of the Halls, the debating societies met in the C-right building (Library).

We discovered an earlier freehand draft of the printed Campus Plan in the Smithsonian Institution Archives along with other Joseph Henry documents [24]. This freehand version of the Figure 5 Campus Plan is shown in Figure 6. Henry wished to continue the strict symmetry of the campus by pairing new buildings on each side of Nassau Hall at a respectful distance. At the rear of the campus, Whig Hall is paired with Clio Hall. East-West symmetry was already present, but Henry added to the concept of a back campus delineated by the proposed Halls. Henry proposed also that his house be set in a North-South alignment with the front of the Library (today known as Stanhope Hall) and West College.

The Board of Trustees approved Henry's Campus Plan and then followed with a September 29, 1836 resolution to build a new stone house for his use [10]:



1836 Joseph Henry's Plan of the Campus, 1836, Princeton University Archives

A	Old Nassau
B.B.	New Colleges
C.C.	Library. Philosophical Hall
D.D.	Present sites of Professor's & Steward's Houses. These to be removed to G & G
E	Site reserved for Chapel
G.G.	Intended sites for Professor's & Steward's Houses
I	President's House
F	Vice President's House
H.H.	Sites of new Society Halls

Credit: Princeton University Library

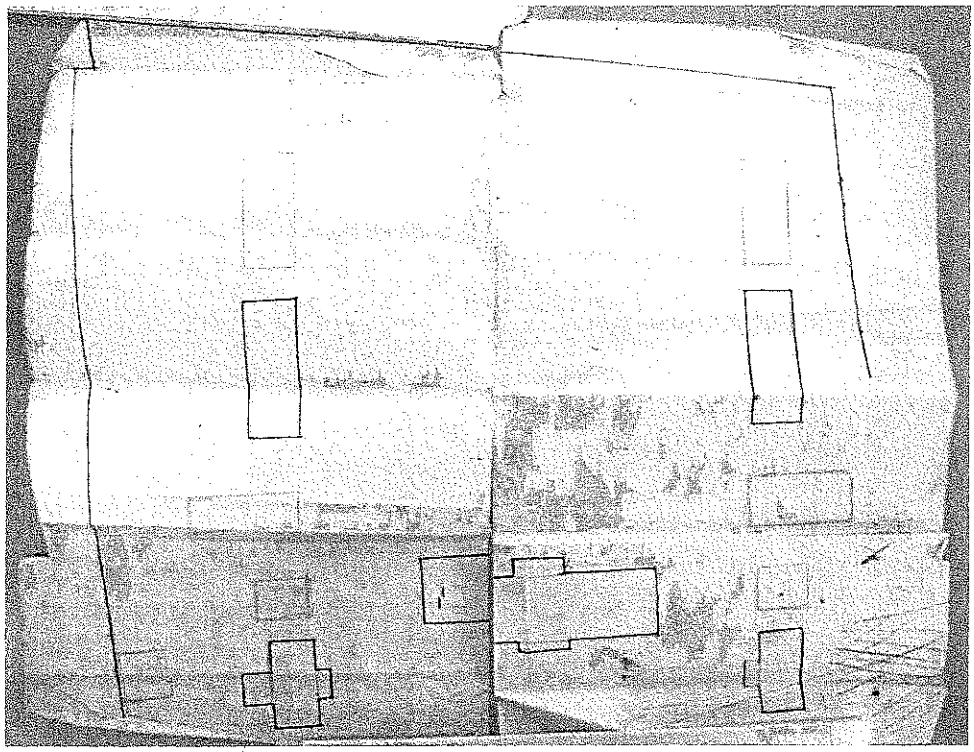
Figure 5. Henry's Campus Plan of 1836.

> "Resolved, that this Board adopt the plan, submitted by Professor Henry for the location of buildings on the College ground …
>
> Resolved, that a house for Professor Henry be forthwith erected, that it be of stone, on the site shown by the plan of the grounds adopted by the board; and that a sum not exceeding four thousand dollars (with materials now in the house occupied by Professor Henry) be appropriated for that object.
>
> Resolved, that Dr Carnahan, Mr Cooley and Mr Green be a committee to carry the immediate proceeding resolution into effect."

The use of stone made sense given that the two closest buildings to the proposed house were Nassau Hall and the Library, and both of these buildings were constructed with stone from the local quarry.

Dr. James Carnahan, identified in the above resolution, was President of the College. Rev. Eli Field Cooley of Trenton (Princeton Class of 1806) and Mr. James Sprout Green of Princeton (lawyer and son of Carnahan's predecessor, Dr. Ashbel Green) were Trustees of the

College [3]. Pres. Carnahan served as the chairman of the Building Committee; we know this by comparing entries in the Treasurer's general accounts for September 1838 and in the "Statement of Moneys Paid for Professor's House" in the Treasurer's records of "Repairs for Joseph Henry House" [25]. This same group had worked previously as a Building Committee to oversee construction of several other structures on the College grounds including: the house that Prof. Dod occupied (built in 1827 and also known as a 'professor's house,' first occupied by Prof. Patton); East College (1832-33); and West College (1835-36) [26].

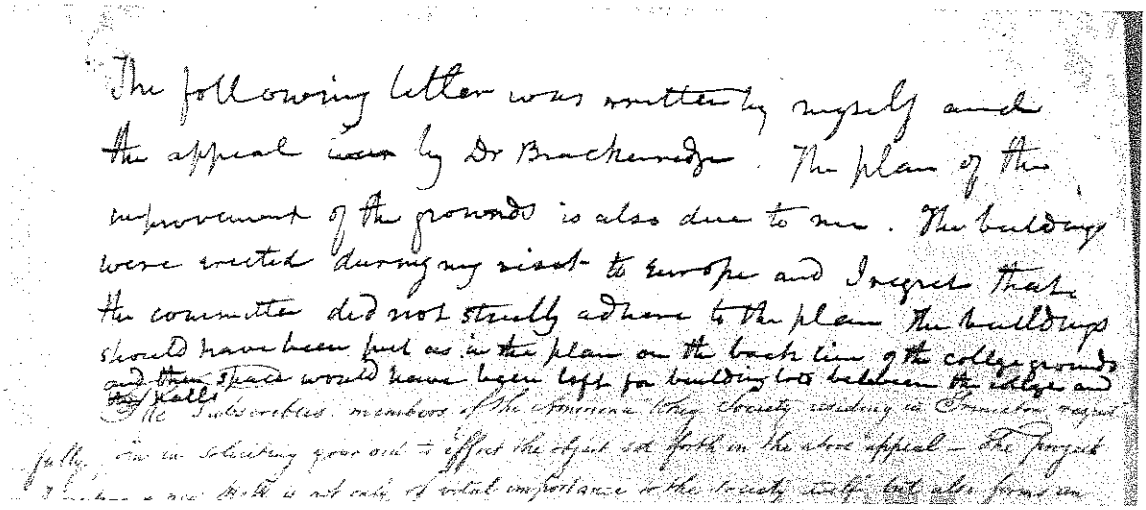


Credit: Smithsonian Institution Archives

Figure 6. Henry's freehand drawing of the plan for the College grounds.

The Whig Society was successful in raising the needed funds, and local builder Charles Steadman agreed to construct the new Whig Hall for $7000. Architect John Haviland of Philadelphia provided a Greek Revival design for the Whig structure. The cornerstone of Whig Hall was laid in the summer of 1837 and completed by the autumn of 1838 [26, 27]. Henry's Campus Plan was not followed precisely, as reflected in an annotation in his personal copy of the 1836 Whig circular [28]. The handwritten note in Figure 7 was added to the printed circular some time after Henry returned from an April-September 1837 trip to Europe. It reads:

"The following letter [the text in the lithographed circular] was written by myself and the appeal [written] by Dr Brackenridge. The plan of the improvement of the grounds is also due to me. The buildings were erected during my visit to Europe and I regret that the committee did not strictly adhere to the plan. The buildings should have been put as in the plan on the back line of the college grounds and then space would have been left for building lots between the colleges and the halls."



Credit: Smithsonian Institution Archives

Figure 7. Henry's hand-written note added to the 1836 Whig Circular.

The 'building lots' to which Henry referred are understood by looking at Figure 6, which shows lightly-drawn rectangles for two additional buildings between the Society Halls and the New Colleges. One can also see that Henry envisioned two other buildings, symmetrical about Nassau Hall, and between the proposed houses and the new Colleges. The circle that appears at the top of the drawing in Figure 6 is identified on the reverse side as "site reserved for chapel," as shown in Figure 5. The chapel was eventually located elsewhere, and that circled site became a privy.

Joseph Henry's Design for the Professor's House

With the Board of Trustees granting permission for the construction of a new professor's house, Henry submitted a design to the Building Committee [12]. Though Henry was not a practicing architect, he understood architectural principles and even lectured on architecture to Princeton students [29]. Figure 8 shows his sketch for the house, dated

January 1837 (Henry's annotation on the reverse side of the sketch addressed to Pres. James Carnahan was: "Plan of a house submitted to the building committee of college. This was the plan submitted by myself"). On April 11 of the same year, the Board of Trustees directed the Building Committee to proceed with construction of the house [13]. (Trustee meetings were held in April and September, and Princeton's commencement for this period was held in September.) The following is excerpted from the April 1837 Trustees minutes:

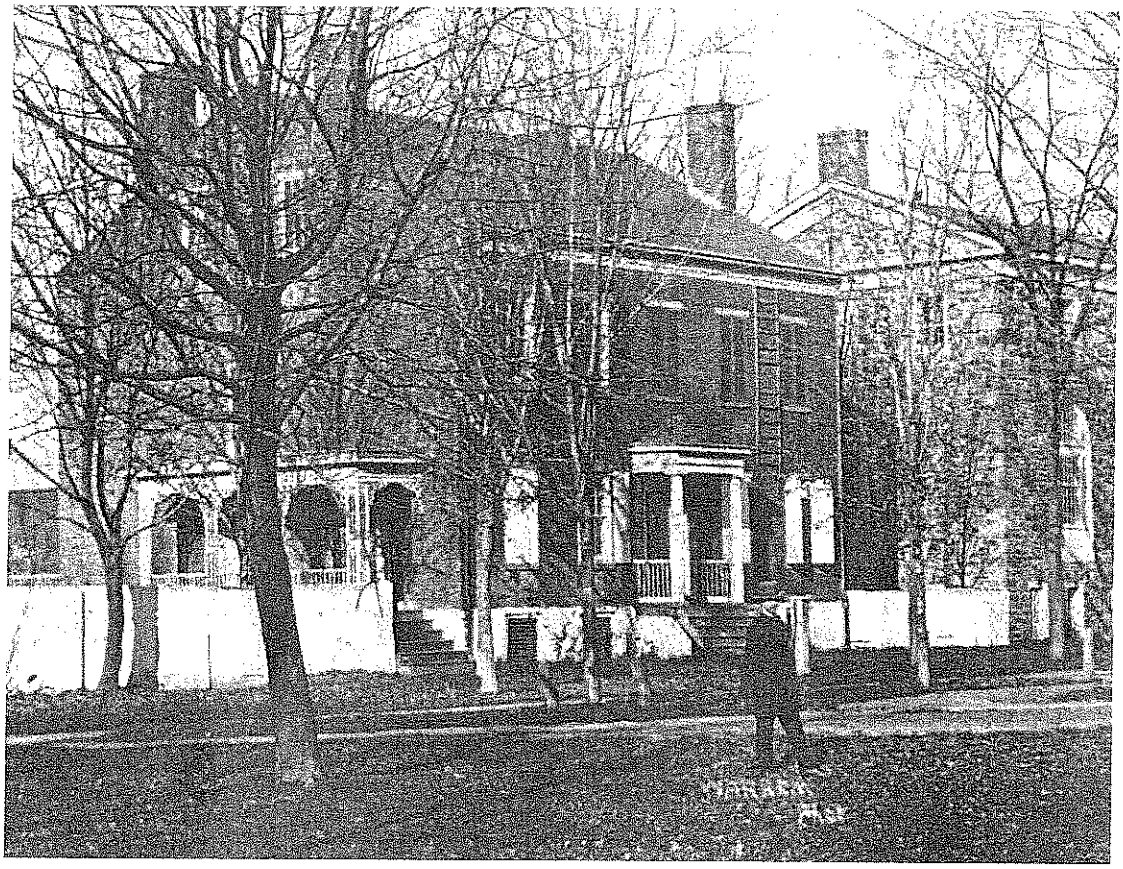
> "The subject of Professor Henry's house was taken up; and it was on motion. Resolved, that the building committee proceed as soon as they shall think it expedient, to erect a dwelling house, agreeably to the plan submitted to said Committee, by Professor Henry."

Credit: Smithsonian Institution Archives

Figure 8. Henry's proposed design of a Professor's House, submitted to the Building Committee, January 1837.

Henry's January 1837 design looks nothing like the structure that was built. The house that was constructed in 1838 is shown in Figure 9, the earliest known photograph of the Joseph Henry House. Today, the brick is painted light yellow. The stone structure to the right of the house is the Library (now known as Stanhope Hall). Both the Library and its

twin, Philosophical Hall, were designed by Benjamin Latrobe, the designer of the U.S. Capitol.



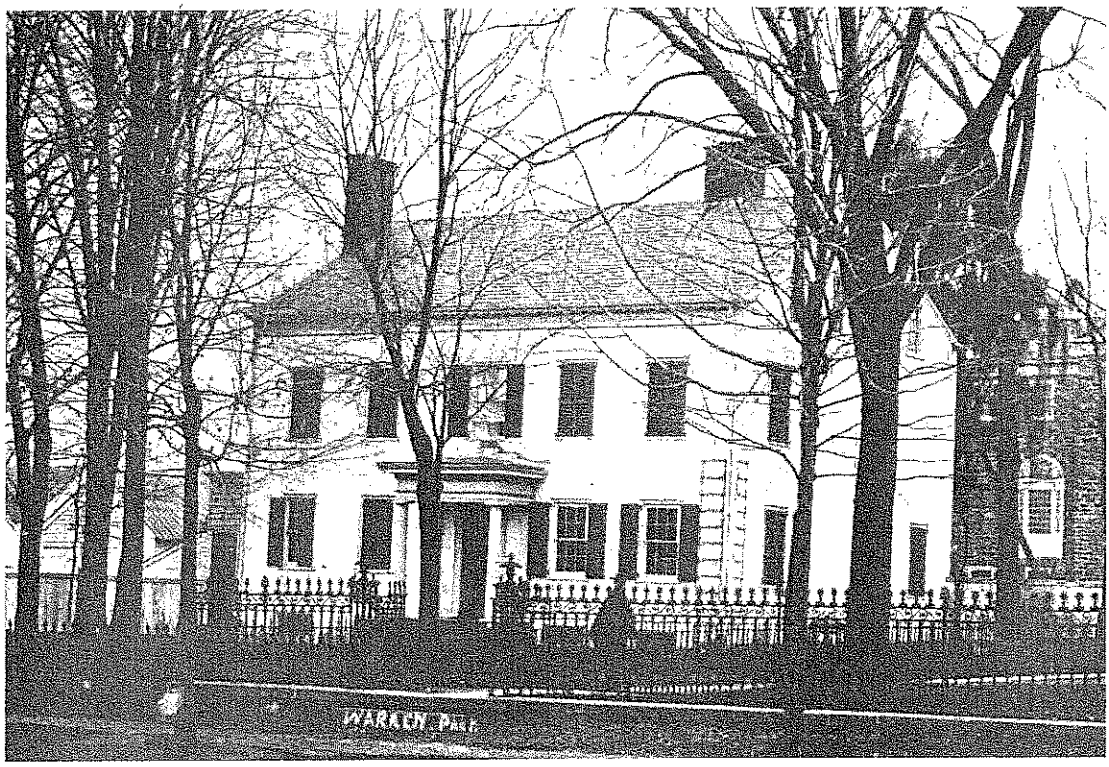
Credit: Smithsonian Institution Archives. Image #2012-2992.

Figure 9. The Professor's House that was built, in earliest known photograph, 1863.

It is interesting that Henry's new house is similar in style to the Vice President's House (building F in Figure 5 from 1836, and the leftmost building of Figure 3 from 1825) [30]. The early-on Vice President's House was constructed in 1799 in a classic Federal style, modified in 1832-34 (3 bays increased to 5, and a Greek Revival portico added), and later demolished in 1873 [1]. A photograph of Vice President Maclean's house in 1870 is shown in Figure 10. This is how Prof. Maclean's house appeared in the first few years after Henry joined the faculty.

Prof. Dod's house was to the east of East College and it, too, was in a Federal style with a Greek Revival portico. Figure 11 shows this house in a lithograph on the left [31] and in a photograph on the right [32]. Two houses are shown in the lithograph; the house on the left is Henry's

House, which was relocated in 1870 to make way for Reunion Hall, and the house to its right is that of Prof. Dod who occupied it in Henry's time. Prof. Dod's house was removed in 1881 to make way for Marquand Chapel.

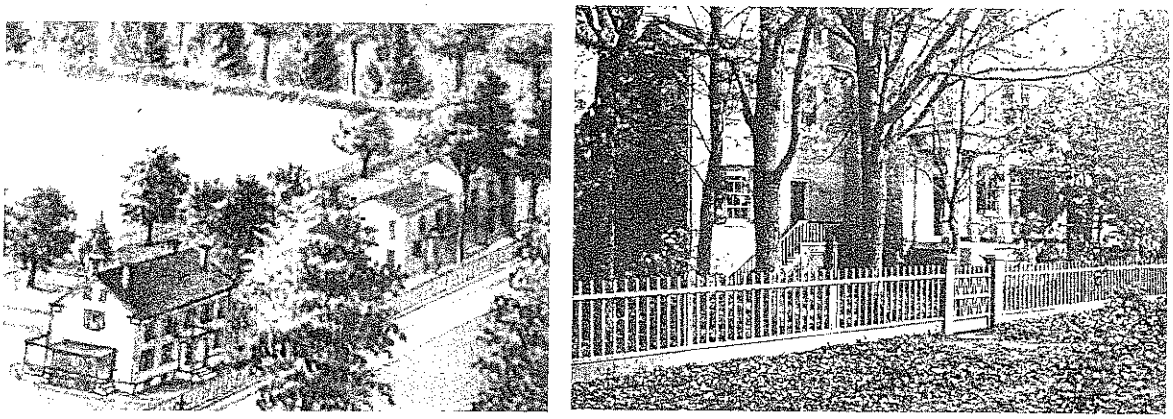


Credit: Princeton University Library

Figure 10. The Vice President's House, constructed in 1799 (portico and addition constructed 1832), and demolished in 1873.

Knowing that Henry's proposed house design is so different from the structure that was built brings into question the phrase "agreeably to the plan submitted" in the April 1837 Trustee's resolution [13]. Did "plan" refer to Henry's house design or his site plan? The similarity in style of Henry's house to the existing nearby Vice President's house also suggests that perhaps the Building Committee made the decision to have the new professor's house look like the other professor's houses on the campus. We know that this Building Committee was in the habit of making design decisions with regard to structures they oversaw, including Prof. Patton's house which was built in 1827 by carpenter Charles Steadman. From many bills in the College Treasurer's files, we know also that this Building Committee supervised the construction of East College in 1832-33 and repairs to the President's House in 1836 [33]. These two structures

drew heavily upon the skilled labor of mason Ezekial Howell and his employees.



Credits, lithograph & photograph: Princeton University Library

Figure 11. Prof. Dod's House shown in lithograph and photograph, circa 1875.

Construction of the Henry House

Although the Trustees' September 1837 minutes note that construction of the professor's house was to commence "without any delay," construction did not begin until early 1838. We know from a letter sent to Joseph Henry that his old house was dismantled in November 1837 [34]. We know also that Henry and his family occupied a rented house at the nearby Princeton Theological Seminary, fully covered by the College [35]. The Trustee's minutes from September 26, 1837 state:

> "Resolved, that a sum not exceeding three hundred dollars, be appropriated for the rent of a house for Professor Henry, for the present year."

We know also from the Building Committee's minutes that there was difficulty in securing funding. College finances were not the best and, at this time, it was common for individual Trustees to loan money to the struggling College. A member of the Trustees expressed the desire to get started quickly and he offered to loan funds to begin construction. That Trustee was not named in these documents but, in the April 1838 records of the Treasurer, there is a credit to Trustee Robert Lenox for $1500 in support of Prof. Henry's house. Lenox was chairman of the Finance Committee and recommended that Henry's original house be expanded in 1835. In the April 1838 Trustee minutes, the Building Committee announced its decision to substitute "brick for stone" [36]. No explanation

was found for this switch. Financial records concerning construction of the house show that Daniel Dougherty dug the cellar. He was paid $35.00 for this on April 12, 1838, so presumably his work was completed by that date [25]. Dougherty was a regular contractor to the College whenever digging was needed.

We know also from the personal diary of Rev. Cooley, who served as the agent overseeing most expenses related to the House, that Ezekial Howell began work on the house on or about April 8, 1838 [37]. Howell received substantial payments at regular intervals over the next several months. It is very clear from the Treasurer's records of bills and payments [38] and also from Cooley's diary entries that Ezekial Howell was the principal builder of the Henry House.

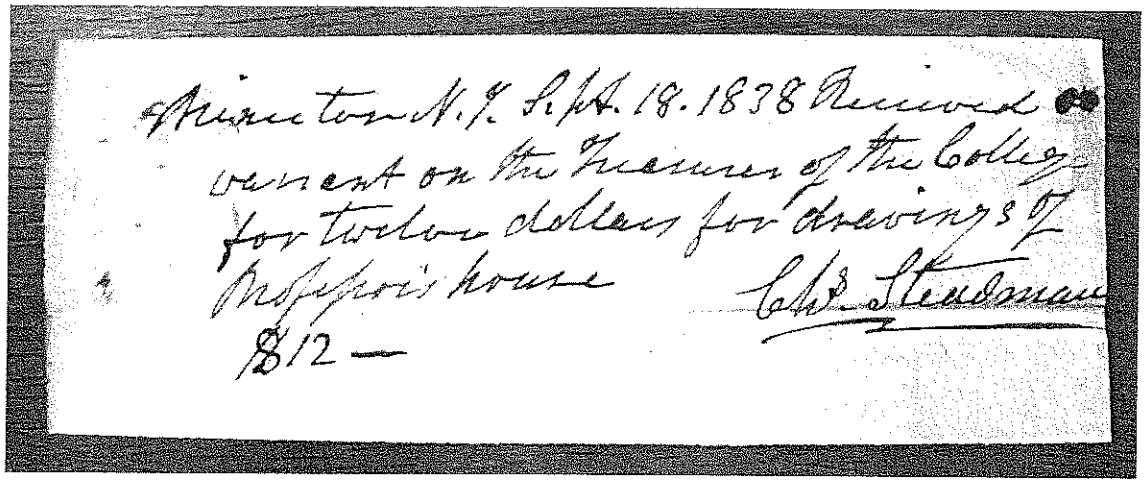
We know that Henry's house was completed by mid-September 1838. Joseph Henry himself told his brother James in a letter he finished on September 13, 1838 [39]:

> "We are just about to move and hope to get into the new house in the course of the present week ... We commenced to move to day and expect to get through by tomorrow night."

There were also several mid-September bills for leveling the ground, erecting fences, and the like — expenses which are typically expected at the end of a home building project. Some of these final bills and a few earlier ones involved Steadman whose personal expertise was carpentry. During the time that the Henry House was being constructed by Howell, Steadman was building Whig Hall on the back campus, only a few hundred feet away. A cumulative statement listing the money paid for the Henry House shows that the last payment prior to the Trustees meeting was entered on September 27, 1838 when construction was mostly finished. At that point, the total expenditures for the house tallied $5754.79, or roughly 50% over the original $4000.00 budgeted.

At the following Trustees meeting in April 1839, for reconciliation of the Treasurer's records, there is yet another bill for "contingent expenses associated with the professor's house" which amounted to $328.85. These additional expenses, which were not included in the September 1838 reconciliation, included bills from Steadman for labor costs in constructing a wooden stable associated with the house and a warrant (payment) dated September 18, 1838 for "drawings of the professor's house" (Figure 12). Judging from many other bills and warrants associated with Charles Steadman for many other Princeton

College projects, he would submit his bills at the end of a construction project and then receive payment. Sometimes his bills were not submitted for many months after a project was finished. For example, Steadman was regularly hired to construct the College commencement stage in September, and his bills for such work would not be submitted or paid until the following March or April. Steadman's September 18, 1838 warrant shows that he was responsible for the drawings of Henry's house, but perhaps not its design.



Credit: Princeton University Library

Figure 12. Charles Steadman's bill for "drawings of Professor's house."

The Case for Steadman as Designer

From bills and the Treasurer's record of general accounts [38], we know the following about the Henry House:

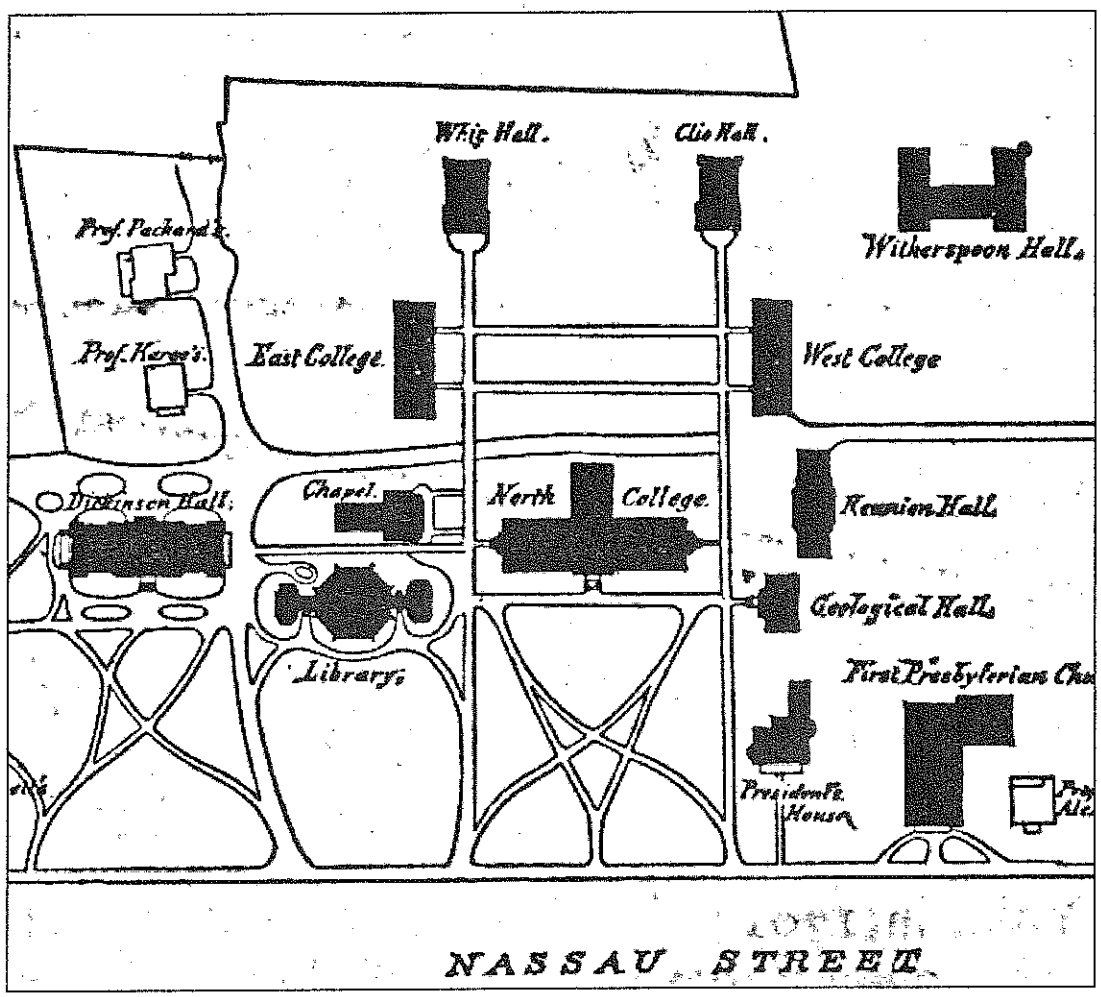
- Daniel Dougherty was the digger,
- Ezekial Howell was the primary builder,
- Charles Steadman was the draftsman, and
- Rev. Eli Cooley was the financial agent.

Today, we would describe Rev. Cooley as the general contractor. As noted above, we know also that this same Building Committee supervised the construction of East College six years earlier, and the design for East College reputedly came from the Committee.

With regard to the house that Prof. Dod occupied, we know that Charles Steadman was its builder and was also responsible for its design. That house, constructed in 1827, was located east of East College. The related 'article of agreement' with Steadman compares that house to

another one he previously designed and built for a Princeton resident (Mrs. Field). In a map of the College campus that appeared in *Scribner's Monthly* [40], March 1876, the house Steadman built in 1827 is labeled as "Prof. Packard's" (Figure 13).

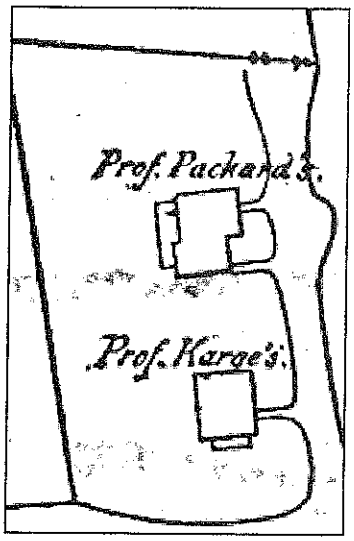
The house labeled "Prof. Karge's" in Figure 13 is the relocated Henry house which, as noted earlier, was moved in 1870 to make room for Reunion Hall. There is an interesting crossed-out entry in the 'rough minutes of the Trustees' that never made it into the final minutes of the Trustees that "the house for Professor Henry be similar in size and accommodation to that of Prof. Dod." Given that Prof. Dod's house was designed by Steadman, it would make sense that Steadman would be asked to design Henry's house. Unfortunately, no similar 'article of agreement' has been found for Henry's house, which would likely clarify the matter.



Credit: Princeton University Library

Figure 13. Prof. Packard's house built by Steadman in 1827; Prof. Karge's house is the Henry House, relocated in 1870 (1876 engraving).

[Figure 13 enlargement]



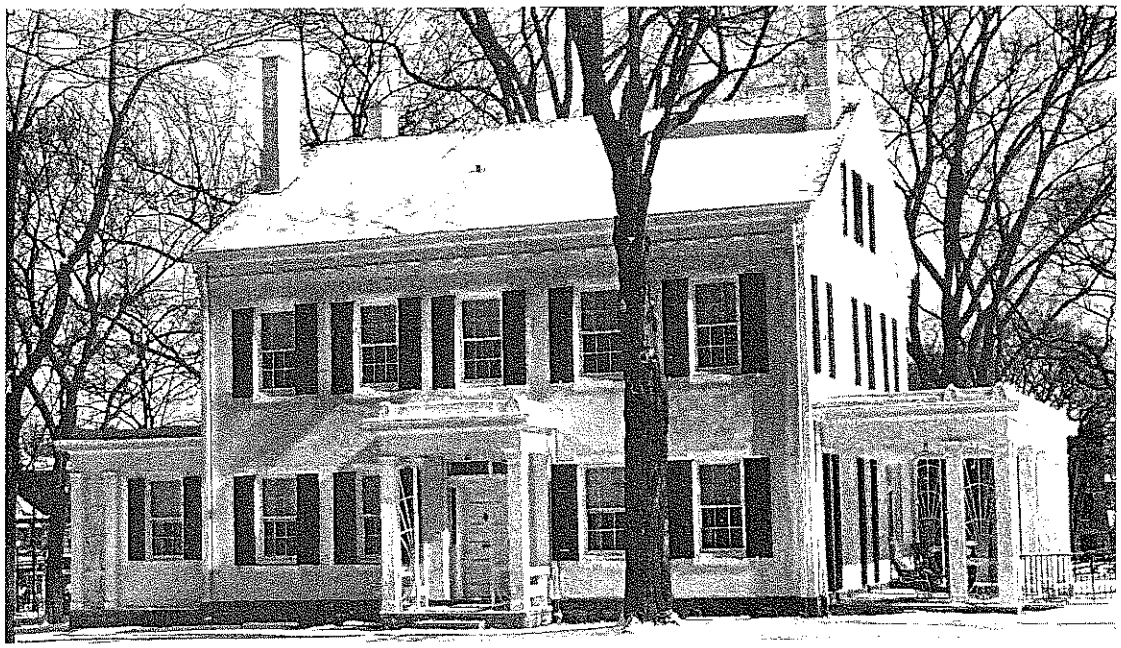
The best case for Steadman as designer, though, is circumstantial — that is, the Joseph Henry House looks very much like other known Steadman houses in the local area, including ones that did not involve the Building Committee. Constance Greiff, in her book, *Princeton Architecture*, also notes the similarity in style of the Henry House to those constructed by Steadman [1]. Figure 14, for example, shows a wooden 5-bay Steadman house (built for Steadman's two daughters) that was next door to the house of Building Committee member James S. Green. This house is especially close in appearance to the Henry House. Green, himself, lived in a 3-bay house that Steadman also built.

Credit: Michael G. Littman

Figure 14. Steadman-built House at 40-42 Mercer Street; Building Committee member James S. Green lived next door.

Figure 15 shows a recent photograph of the Joseph Henry House at its present location. The similarity of this image to the one in Figure 14 is

striking, particularly given that the left and right porches were added later. We think that if Henry played any role in the design of the house that now bears his name, it was to instruct Steadman to make the house look like others Steadman had been building in the area.



Credit: Princeton University Library

Figure 15. The Joseph Henry House at its current location; the left and right porches were added later.

Henry's Houses and Electromagnetism

Prof. Joseph Henry's residences entered into his experiments on electromagnetism. The house he occupied from 1832 until 1837 was used in 1836 for a demonstration of a critical improvement in telegraphy. Henry described his telegraph experiments in a letter to Prof. Dod in 1876 [41]:

> "I think that the first actual line of telegraph using the Earth as a conductor was made in the beginning of 1836. A wire was extended across the front campus of the college grounds from the upper story of the library building to the philosophical hall on the opposite side, the ends terminating in two wells. Through this wire, signals were sent, from time to time, from my house to my laboratory. The electro-magnetic telegraph was first invented by me, in Albany, in 1830. Prof. Morse, according to his statements, conceived of the idea of an electro-magnetic telegraph in his voyage across the ocean in 1832, but did not until several years

> afterward — 1837 — attempt to carry his ideas into practice; and when he did so, he found himself so little acquainted with the subject of electricity that he could not make his simple machine operate through the distance of a few yards. In this dilemma he called in the aid of Dr. Leonard D. Gale, who was well acquainted with what I had done in Albany and Princeton, having visited me in the latter place."

Henry's new house of 1838 was similarly used in his experiments. At the new Henry House, Henry detected lightning flashes some 8 miles distant by magnetizing steel needles inserted into a spiral of what was, in essence, a receiving antenna. In the same letter to Dod, Henry recalled:

> "The next series of experiments ... was on the induction from thunder clouds. For this purpose the tin covering of the house in which I resided was used as an inductive plate. A wire was soldered to the edge of the roof near the gutter, was passed into my study and out again through holes in the window-sash, and terminated in connection with a plate of metal in a deep well immediately in front of the house. By breaking the continuity of that part of the wire which was in the study, and introducing into the opening a magnetizing spiral, needles placed in this could be magnetized by a flash of lightning so distant that the thunder could scarcely be heard. The electrical disturbance produced in this case was also found to be of an oscillatory character, a discharge first passing through the wire from the roof to the well, then another in the opposite direction, and so on until equilibrium was restored."

It is noteworthy that Henry's detection of radio frequency induction, above, occurred more than 40 years before the well-known transmission and detection of radio waves of Heinrich Hertz.

Conclusion

Based on the above discussion, a few points can now be made assuredly. First, Joseph Henry was responsible for the influential Princeton Campus Plan that placed several buildings along a long rectangle centered on Nassau Hall, including his own home. Henry's plan allowed for an unobstructed view of Whig and Clio Halls as seen from Nassau Street. The fact that the central Princeton campus is not cluttered with buildings is rightly credited to Joseph Henry. Second, Charles Steadman drafted the plans for Henry's house, and had earlier designed and built another professor's house in a similar style. Given that the

Joseph Henry House so closely resembles other houses that Steadman built in Princeton — including some constructed before Henry arrived in Princeton — suggests strongly that Steadman was involved in its design; however, this is not conclusive proof. Lastly, the Henry House is remarkable because of its distinguished occupant and connection to the early history of electromagnetism, but not necessarily because of its design or designer.

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