

UNIVERSITY OF PENNSYLVANIA, LEA INSTITUTE OF HYGIENE  
(University of Pennsylvania, Smith Hall)  
225 South 34th Street  
Philadelphia  
Philadelphia County  
Pennsylvania

HABS No. PA-6175

HABS  
PA  
SI-PHILA,  
566F-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN BUILDINGS SURVEY  
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200 Chestnut Street  
Philadelphia, P.A. 19106

HISTORIC AMERICAN BUILDINGS SURVEY  
UNIVERSITY OF PENNSYLVANIA, LEA INSTITUTE OF HYGIENE  
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Location: 225 South 34th Street, Philadelphia, Philadelphia County, PA  
USGS Philadelphia Quad, UTM Coordinates: 18-483400-4422160

Date of Construction: 1891-2, alterations 1899

Present Owner: The University of Pennsylvania, 3451 Walnut Street, Philadelphia 19104

Present Use: Vacant

Significance: The Lea Institute of Hygiene, commonly called Smith Hall, is an early research institute on the University of Pennsylvania campus. The building was the design of mid-Victorian architects Collins and Autenrieth in consultation with its first director, John Shaw Billings (1839 - 1913). Billings was an early advocate of hygienic design; the Lea Institute of Hygiene marked the continuation of ideas represented by the design for the Johns Hopkins Hospital a generation earlier. Later alterations for new functions have changed the original balanced design but the original fabric is generally intact. Its last use was as a fine arts studio, and academic classrooms. The building forms a part of the University of Pennsylvania Historic District and stands across the street from the National Landmark Furness Building.

Project Information: Documentation was undertaken in 1992 and 1993 as research for a Section 106 report in accordance with a grant to the University for laboratory construction under the Department of Defense Appropriations Act for Fiscal Year 1991 (Public Law 101-511). Photographs were taken in March 1995. Additional documentation was undertaken in 1995 in compliance with a Memorandum of Agreement among the Advisory Council on Historic Preservation, the Pennsylvania Historical and Museum Commission and the United States Air Force as a mitigative measure prior to demolition of the above site.

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Part I. Historical Background:

A. Physical History:

1. Date of erection: The Lea Institute of Hygiene was built as the result of a gift from publisher Henry Charles Lea, a University of Pennsylvania trustee and benefactor.<sup>1</sup> Before the 1880s, courses in hygiene were not taught at American universities. But with the discoveries in Europe of Robert Koch and Louis Pasteur about the causal relationship between bacteria and infection, and the growing public awareness of public health, hygiene became a popular field of study. The University of Pennsylvania first offered a course in the field early in the 1880s.<sup>2</sup> In February of 1889, Lea offered to erect a laboratory of Hygiene at an "... expense of \$25,000.00 provided an equal sum was raised for its endowment."<sup>3</sup>

Within two months, the University of Pennsylvania had acquired from the City of Philadelphia the property between Locust, 34th, 33rd and Marston Streets for the construction of the new Institute. The block had been a part of the Blockley Almshouse property and was made available to various charitable organizations. The first of these organizations to build was the Foulke and Long Institute, a post-Civil War orphanage and school. In the summer of 1889, Lea altered his proposal slightly, proposing that all University medical students be required to take courses in hygiene while the core of the program was to center around original research in the laboratory. In November of 1889, he further modified his proposal, offering to double his gift to \$50,000.00 if \$250,000.00 were raised for endowment, and if John Shaw Billings, M.D. could be lured from his Washington, D.C. post to take the position as director.

Construction was initiated in the winter of 1890-1 and was completed in February of 1892. The south wing was demolished and replaced over the winter of 1899. With the removal of the hygiene and bacteriology programs, the building was adapted to the teaching of basic science in the 1930s; an internal stair was added in an addition on the south end in the 1970s.

2. Architect and consultant: The architect of the Lea Institute of Hygiene was Edward Collins (1821-1902) of the firm of Collins and Autenrieth (active second half of the nineteenth century). Collins, despite his seemingly English name was raised and educated in Germany where he studied architecture at Karlsruhe. With the diaspora

induced by the rumblings of Prussian statehood, Collins removed to Philadelphia where he worked for John McArthur before forming his own practice with another German, Charles Autenrieth (1828-1906). During the 1860s and 70s, working primarily in the eclectic fusion of classical and medieval design generally called the *rund-bogen stil*, Collins and Autenrieth designed a wide array of public, institutional, and commercial buildings, primarily for German clients. Their second-place design for the Centennial Exhibition main building marked a high point for their career, after which the planarity of their designs and its roots in classicism placed them at odds with more successful architects such as Frank Furness, George Hewitt, the Wilson Brothers and the others who dominated Philadelphia architecture until the turn of the century. According to their biographer, Jane Schweizer, by the 1890s when they received the Lea Institute commission, they were nearing the ends of their careers and were no longer at the fore of design currents of Philadelphia.<sup>4</sup>

Collins and Autenrieth had been the architects of the Lea family holdings for a generation. At this time, most of their work came from their association with Lea who provided them with a steady stream of commissions for warehouse modifications, small factories and stores, many of which came as the result of Lea's loans to businessmen. The University of Pennsylvania archives provide a clear record of the progress of the commission. Communication directed to Edward Collins makes it clear that he was the principal-in-charge of the project. Preliminary sketches were made in the summer of 1890, but the Minutes of the University Trustees meeting for 4 November 1890 reported that Institute director, John Shaw Billings, M.D., had some proposed modifications which he intended to refine after a visit to Europe to study laboratories there. These were communicated to the University in February of 1891, after the December 1890 signing of the contract.<sup>5</sup>

Though not an architect, John Shaw Billings, M.D. served an important role as consultant to the project. While construction got underway, Billings continued in his government post in Washington, D.C. but the building certainly reflected some of his insights.<sup>6</sup> In an 1890 memo, Billings wrote that he preferred an L- or T-shaped building disposed in narrow volumes with two stories and a basement because of greater ease of adequate ventilation. At the Johns Hopkins Hospital, he helped devise assisted methods of passive ventilation.<sup>7</sup> These and other issues related to the building were discussed in a "Memorandum on Building for a Hygiene Institute or Laboratory" (University of Pennsylvania Archives, 1890).

4. Builders, contractors and suppliers: The contractor for the Lea Institute was Thomas Doane, (listed as Thomas H. Doan in the 1880 Gopsill's Philadelphia City Directory). In the previous generation, other Doans had been carpenters and builders, presumably providing the link to this work. The Doan office was not one of the principal contracting firms of the city, and is otherwise unknown. The firm was no longer in existence by the early twentieth century.

5. Original plans and construction: No original plans survive in any of the local architectural archives, city offices or similar agencies. However, original plans were published in the "Opening Exercises of the Institute of Hygiene, February 22, 1892" in the University of Pennsylvania Archives.

6. Alterations and additions: In 1899, the original small classroom wing was demolished and replaced with a larger multi-story hall that returned to the tradition of the demonstration classroom. The addition continued the palette of materials of the original building but rejected the classical proportions and balance of the original composition. Its architect, Henry L. Duhring, rejected most of the decisions of the original design, using cast iron columns to carry a broad, open space and abandoned other elements, notably the ventilating louvers under the windows and the chimney-like ventilators as well. In 1969, Smith Hall was modified on the first floor and basement to house the labs and offices that were displaced by the demolition of the Harrison Chemistry Lab.<sup>8</sup> In the 1970s, the south end of the building was modified by the addition of a stair and room. Constructed of hard red brick with cast stone trim, it recalls the original color scheme. Exterior steel fire escapes, added in the early twentieth century, were constructed on the rear of the building.

Since 1974, Smith Hall has housed a variety of University of Pennsylvania departments and programs, including Fine Arts studios and the Program in the History and Sociology of Science. Those uses resulted in a continuous cycle of changes, as lab furniture was replaced by artists' easels, and the original mechanical system was modified toward contemporary standards. The louvers under the windows were filled in, the attic level doors into the ducts were closed off and mechanical forced air systems were substituted.

## B. Historical context:

1. Background: As with any artifact of modern scientific development, the question of

architectural significance of the Lea Institute of Hygiene is gauged by originality, intention, effectiveness of solution, and its dissemination to other buildings of its type. At the end of the nineteenth century, originality in laboratory building design is particularly difficult to assess because of the progressively more rapid rate of change. An additional field of inquiry is the history of the evolution of scientific procedure. In the case of the Lea Institute of Hygiene, significance also includes the importance of the founder and donor, the publisher Henry Charles Lea; the first director, well-known doctor, medical bibliographer, and popularizer of hygienic design John Shaw Billings (1839-1913), and the architects, Collins and Autenrieth. Finally, the lab should be evaluated in the light of the work accomplished there.<sup>9</sup>

Three areas of investigation seem to be most relevant: first, the development of the laboratory and other buildings of the modern university that facilitated new types of teaching and the pursuit of new knowledge about the workings of the physical world; second, the architectural origins, evolution and expression of the lab as a new building type; and third, the dissemination of the specific forms and its influence on later design.

b. Early laboratories: A survey of the index of the *American Architect and Building News* in the 1880s indicates that the purpose-built laboratory became relatively common in that decade.<sup>10</sup> Most of these labs were relatively modest buildings, similar in size to Smith Hall that were aesthetically related to other classroom buildings, differing principally in extent of architectural provisions for ventilation and fenestration.

In the Philadelphia vicinity, and at the University of Pennsylvania in particular, the evolution toward experimental and laboratory practice in teaching began as early as 1850 in rooms adapted for the chemistry program in the University buildings on Ninth Street. Similar though more elaborate laboratory lecture halls were constructed in College Hall and Logan Hall. The first purpose-built structures that initiated the transformation of medical education were the Hare Medical Laboratory on the University of Pennsylvania campus, designed in 1877 by Thomas W. Richards. Other nearby, surviving labs that antedate Smith Hall include the Chandler Chemistry Lab at Lehigh University of 1883-4 by Addison Hutton. These new buildings supplanted such classroom--demonstration buildings as Logan Hall, and their importance was recognized by their contemporaries. In the case of the Hare Lab, engineer and University of Pennsylvania Trustee Fairman Rogers, wrote to fellow trustee John Welsh that

it was intended to serve the new teaching methods of medicine, making laboratory training and practice, part of the curriculum.

As the new Medical instruction introduces more chemistry and laboratory practice, it is absolutely necessary to have more laboratory accommodation.... We have decided, therefore, to erect a building 150 by 40, on the ground to the south of the medical Building .... The lower story will be for the Dental Clinic... The second and third stories will be for the medical laboratories... The fourth story which is in the roof will be occupied by the Physiological (sic) and Histological rooms...

The new building will be of green stone, like the rest, finished with brick on the inside.... (Fairman Rogers to John Welsh, 9 April 1878)<sup>11</sup>

Because of the experience of its architect, Thomas Richards, as a designer of hospitals during and immediately after the Civil War, the skyline of the Hare Lab bristled with ventilating flues and stacks denoting the ventilation and fume hoods of the modern lab. These were less thoroughly resolved but similar to, the work of Billings at Johns Hopkins Hospital of the same decade in Baltimore. Interiors were finished with impervious brick and tile to permit cleaning. Otherwise the building was similar to the rest of the University of Pennsylvania campus, with Gothic detail overlaid on a symmetrical volume which was constructed of conventional masonry with wood joists. Its descendants are the University of Pennsylvania's large teaching labs designed by Cope and Stewardson at the turn of the century for engineering, zoology, and medicine. Thus the true teaching lab preceded the Lea Institute on the University of Pennsylvania campus by more than a decade.<sup>12</sup>

Five years after the construction of the Hare Laboratory, Addison Hutton's Chandler Lab at Lehigh University began the transformation of the lab toward the scale and character of modern design. Though its exterior is of load-bearing masonry, its interior is spanned by massive steel columns and girders that allow flexibility of interior space while permitting the loads of modern industry. Chandler's facade, accented by ventilating flues and stacks, celebrates the new purpose and stands as the ancestor of such modern expressions of the lab as Louis Kahn's Richards Medical Research lab on the University of Pennsylvania campus. The Chandler lab at Lehigh was awarded a gold medal for excellence

at the 1889 Paris Exhibition.<sup>13</sup> Buildings of this larger scale and character became the norm for American colleges in the late nineteenth century.

2. Later laboratories: A second type of laboratory appeared on university campuses in the 1880s. Instead of a purely teaching lab, the new building was focussed on research, or what the writers of the period called "the creation of new knowledge." This was very nearly the exact phrase that was used in the program of the Biology Department of 1882, and later, in the charter of the Wistar Institute of Anatomy and Biology which was founded on the University of Pennsylvania campus simultaneously with the Lea Institute of Hygiene.<sup>14</sup> At the University of Pennsylvania under Provost William Pepper, M.D., a generation of research labs was constructed beginning in the mid-1880s. Biology, mechanical engineering, hygiene, anatomy, and other disciplines received small, independent buildings encircling the hospital to the north and west. Because of the impact of German methods and training in the 1880s, these buildings became widespread at American college and institutional campuses by the 1890s.

Of these programs at the University, it appears that chemistry and biology were the leaders in the shift toward the German system of graduate education and directed experimental method. When Horace Jayne, M.D. returned from training and research into the nature of modern laboratories in Great Britain and the continent in 1882, he undertook the development of a program in biology. Though allied with the medical school whose pupils it was intended to prepare, the biology department's independence was maintained so that its diverse and interdisciplinary faculty could pursue their own research.<sup>15</sup> With independent graduate researchers, and a faculty devoted to research, biology led the wave of change that transformed the University of Pennsylvania's scientific departments. Thus, the Hygiene Program was part of a movement already initiated in other University departments.

### 3. John Shaw Billings and the Lea Institute of Hygiene:

a. The hygienic environment and innovation: The Lea Institute was built as a part of a generation of specialized research buildings. Surprisingly, despite the involvement of John Shaw Billings in the design of the Hygiene Laboratory, the resulting building was technically no more

advanced than other buildings of its generation on the University of Pennsylvania campus, a point which must have also been apparent to its builders. Ventilation, the basis of the hygienic environment, was ensured by fenestration and by internal vent shafts. Each room had at least two windows, and the stair and toilets were placed at the intersection of the two wings to insure maximum air movement. In addition to the plan-related ventilation, a troublesomely time-consuming manual ventilation system was devised. It consisted of small, operable louvers below each window that permitted air flow into the building even when the windows were closed. Air moved across radiators in front of windows and then was exhausted through internal brick flues. These were given a positive draft by openings at the attic level which admitted hot attic air. Though Dr. Billings praised his new building in the dedicatory address of 1892, his remarks were back-handed compliments, pointedly comparing its plainness, as "a workshop of the future" to the cathedral-like richness of Frank Furness's library across 34th Street.<sup>16</sup> Billings stated:

As regards the exterior of the building, opinions will of course differ. I will only say that it has been planned from within, outward which is why it looks like a laboratory and not a castle or a cathedral. Skylines and projections or recesses to obtain shadows have not received much consideration; space, light and adaptation to the work to be done have been the points insisted on.<sup>17</sup>

Despite Billings' efforts to put a brave face on the resulting building, it is noteworthy that most of Collins and Autenrieth's works of the period used the same forms and primitive construction techniques. In fact, the Lea Institute building does not seem to have been particularly innovative in any area. Thanks to the work of the Wilson Brothers, Philadelphia was on the cutting edge of modern steel frame construction, but the construction of the Lea Institute could have been managed by a pre-Civil War house carpenter. The method of construction would impose limits on the future adaptability of the structure.

Nor does the Lea Institute seem to have been particularly innovative in the areas of Billings' expertise in hygienic design. The ventilation system

was based on the work that Billings had undertaken at the Johns Hopkins Hospital almost a generation before, but did not make the shift from augmented convection to modern mechanical systems that were already being used in contemporary industrial architecture. Systems to move air through public spaces had evolved from the middle of the nineteenth century, beginning in such buildings as the Elmira Female College, in Elmira, New York in the 1850s, while the bristling skylines of the University of Pennsylvania's College Hall and Logan Hall show the effects of hygienic design of the 1870s. Though Dr. Billings had augmented passive air movement with steam coils at Johns Hopkins Hospital, and used steam or, in the summer, the super-heated air of the attic to foster a draft in the Lea Institute, these systems were by then widespread.<sup>18</sup> In other instances, simpler solutions were more effective. For example, Furness merely drilled large holes in the window sash and provided a brass cover to provide fresh air when windows were closed. The decision to ignore the ventilation system of the original design when the south wing was replaced in 1899 is perhaps conclusive. No later classroom or medical buildings on the University of Pennsylvania campus followed the system of the Lea Institute.

Another feature of the design that received comment in the dedication address was the intention that the building itself would serve as an educational apparatus for the students within. The pipes for the heating system and water and sewage were to be painted different colors so that they could be identified. And, in the first floor chemistry lab, radiators of four different designs were installed so that students could study their relative effectiveness. Again, however, this was not a new approach. In 1888, the premier engineers of their age, the Wilson Brothers, designed the University of Pennsylvania's new mechanical laboratory and generating plant across 34th Street where Irvine Auditorium now stands. Its program, emblematic of a more trusting and responsible age, called for its use as a lab by the Mechanical Engineering Students.<sup>19</sup> The nearby new building of the Drexel Institute by the same architects offered the same advantage because its electrical plant could be "... used as a means of instructing the students in applied electricity."<sup>20</sup>

3. Design: Architecturally, the Lea Institute building was conservative. The

architects did not produce a new design particularly related to the laboratory function; instead they used motifs which they had been using in most of their work in the decade, including for example, a small office building on the 1200 block of Market Street and a refacing of a building on the 700 block of Sansom Street, both for Lea. The Justi false tooth factory at 32nd and Spring Garden streets, shares the same details from basement to belt courses, to pilastered subdivisions and shallow pediment accents.<sup>21</sup> Contrary to Billings' statement, there is in fact much conventional architectural character and detail on the building, from its balanced and nearly symmetrical composition with advancing side wings framing a recessed center, and its applied pilasters framing wings and horizontal beltcourses, to its shallow pediments in the gables, that look less like a lab than an Italianate Victorian city house. And, its plan, with center hall and large front rooms and a rear service ell, and its masonry and wood framed construction are more in keeping with domestic rather than laboratory architecture.

In addition to the dedicatory address, where decorum and homage to the donor could be expected to focus his comments on the positive, Billings had numerous other opportunities to comment on the Lea Institute; instead he chose to ignore it. For example, at the end of the construction of the Lea Institute, Billings and his colleague Seneca Egbert organized a conference on hygienic design, the results of which were published as *Hospitals, Dispensaries and Nursing* (Baltimore: Johns Hopkins Press, 1894). Though the publication discussed the new laundry at the University of Pennsylvania Hospital, no mention was made of the Lea Institute. For that matter, after the dedication, Billings never saw fit to discuss the building in print. Indeed, from the time of its construction in 1891-2 into the 1990s, there have been few published accounts of the building save for a sentence on the existence, though not the merits, of the building in Paul Clark's *Pioneer Microbiologists of America*.<sup>22</sup>

By contrast, Billings found other laboratories on the University of Pennsylvania campus worthy of his praise. Three years after his address for the Lea Institute, as one of his last acts at the University of Pennsylvania, Billings was asked to give the dedication address for the Pepper Laboratory of Clinical Research. It was a situation that paralleled the dedicatory address for the Lea Institute, but where Billings had given faint and often oblique praise for Collins and Autenrieth's work, he was effusive in his praise of the Cope and Stewardson

design. After commenting favorably on the logic of the plan, the liberal fenestration, and the massive ventilating flues, Billings closed by stating unequivocally:

Great credit is due to the architects, Messrs's Cope and Stewardson for the manner in which they have solved this problem.<sup>23</sup>

With Billings' later writings as evidence, it would seem that the hyperbole of the dedicatory address was soon tempered by his own knowledge of contemporary achievements in laboratory design. In that context as well as architectural design, the Lea Institute was conservative. Technologically, it was not much advanced over Thomas Richards' Hare Laboratory of fourteen years earlier, but unlike the Hare Laboratory and Hutton's Chandler Lab, which revelled in their laboratory flues and shafts and made them central features of the facade, Collins and Autenrieth chose to subordinate those features, pushing them back toward the ridge of the roof. Unlike Furness's Library which caught the feeling of the new industrial age, Collins and Autenrieth suppressed the features that would have denoted the modern spirit.

4. Effects on later laboratory design: The evidence on the relative importance of the Lea Institute in the history of its own field, and in the development of laboratory research at the University of Pennsylvania is clear. Under Provost William Pepper, and based on the success of the Hare Laboratory, the University of Pennsylvania made a remarkable turn away from the old system of lectures and recitation in clinical amphitheaters toward laboratory-based research building. Biology (1884), Mechanical Engineering (1888) Hygiene (1892), Anatomy (The Wistar Institute, 1892) and the Pepper Clinical Research Lab (1894) offered the opportunity for students and faculty to engage in research and laboratory experiment. As noted above and discussed in Thorpe, *Benjamin Franklin and the University of Pennsylvania*, the new experimental method began with the Biology Department in 1884, which like the Hygiene Institute was architecturally conservative. The evolution toward the modern research lab on the University of Pennsylvania campus began, ironically, at the Wistar Institute which was founded on the study of comparative anatomy, a method that has not proven fruitful, though Magnetic Resonance Imaging and other non-surgical methods may yet make comparative anatomy an effective teaching and diagnostic method. However the Hewitt Brothers' building design, which

incorporated modern steel framing and fire-proof construction, has proven adaptable and is still in use as a lab.<sup>24</sup> This change could happen because the spatial usage could be reversed; the large specimen hall could be transformed into flexible, vibration-free, modern lab while the smaller, specialized rooms reserved for the laboratory function could be turned into administrative offices.

It is also important to note that the change in method initiated in 1878 at the Hare Laboratory, and refined in the generation of research laboratories, was applied to the entire University of Pennsylvania by the end of the 1880s. The same values of the Pepper administration supported the construction of the new library which was intended to provide students with an opportunity to "learn the methods of original investigation and research."<sup>25</sup> The presence of the Henry Charles Lea Reading Room on the east side of the library, facing the Lea Institute confirms Lea's estimation of this new approach to university education. Thus, the Lea Institute was part of a general movement in the University and survives with other buildings on this and other campuses that are a part of this broad story.

On the more specialized subject of the role of the Lea Institute of Hygiene in its field, there is also evidence. Though Billings claimed for it the role as the first institute of hygiene and bacteriology in the nation, he must have known that he was incorrect. New York City already contained two such buildings, the Carnegie Laboratory of Pathology, erected in 1884-5 for William Welch's work at Bellevue Hospital, which still stands at 336 E. 26th Street, and the far more elaborate and successful Hoagland Hygiene Laboratory at the Long Island College Hospital in Brooklyn, erected from the plans of John Mumford in 1887-8 which was recently destroyed by fire.<sup>26</sup> The Lea Institute was neither the first, nor is it the only building of its generation to survive. And recent histories of the field pay little attention to the Institute or the building.<sup>27</sup>

5. Conclusion: The physical aspects of the building of the Lea Institute, notably its style, as well as the underlying structural and ventilating systems, were at best conservative while its applied use in the teaching of scientific inquiry and method was apparently conventional for the period. Neither was it the first of its type either in the nation or even on the campus, nor was it the last of its group of buildings on the campus. As a monument to Billings it seems of modest significance against his larger accomplishments. Though the importance of

Billings to his various fields is obvious, the University of Pennsylvania interlude was a minor interlude in his distinguished career. He was one of the principal figures of his field and but his career at the University of Pennsylvania was regarded by his chief biographer, Fielding Garrison, as a disappointment in large measure because of its brevity, but also because of the "embarrassing" way in which Billings abandoned his responsibilities for the opportunities presented by New York. His resignation was a blow because many gifts had been received based on his involvement.<sup>28</sup> Certainly, Billings is better celebrated at those locations that were central to his career, notably the U.S. Surgeon General's Office in Washington, D.C.; the Johns Hopkins Hospital in Baltimore; and the New York Public Library. Though there was much promise in the Institute and the work which Billings initiated, there was less fruit.

Why the Institute bore so little fruit says much about the goals and talents of its founders who were active in the urban reform movement, and presumably established the Institute to embarrass the municipal government. For that reason, the city established its own competing laboratory, diminishing the Lea Institute's role.<sup>29</sup> At the same time, Billings's interests lay, not so much in bacteriology, but in hygiene. His contract with the University of Pennsylvania required that a bacteriologist be hired to do the lab work for him. With the germ theory vindicated in experiment and practice, hygiene faded in importance, reducing the number of students in Billings's classes. By comparison with the Hoagland Lab at Long Island College Hospital which was headed by bacteriologist George Sternberg, whose work on yellow fever was turned over to Dr. Walter Reed for completion, the Lea Institute was less successful.

The later history of the building reflected the continuing evolution of the program. By the late 1920s, the hygiene program had been absorbed back into the medical school from whence it had come in the 1880s.<sup>30</sup> With its reabsorption into the Medical School, the building was turned over to the neighboring chemistry program which used it as the "General Laboratory Building." It kept that name until 1969 when it was renovated to house the labs and offices displaced by the demolition of the Harrison Building for the 1973 Chemistry Building. Then, it was renamed by the University Trustees as "The Edgar Fahs Smith Chemistry Laboratory" to honor Edgar Smith, Professor of Chemistry and Provost of the University of Pennsylvania (1911-1920).<sup>31</sup> Six years later, after the completion of 1973 Chemistry, and the conversion of the

building to art studios and other uses, its laboratory name was adapted to Edgar Fahs Smith Hall.<sup>32</sup>

3. Original owner and subsequent users: The building was erected for the Lea Institute of Hygiene which was a part of the University of Pennsylvania. When it was given to the University, the student body was little more than a thousand with the bulk of its students taking courses in medicine and law. The Institute was merged into the medical school by the 1920s. At that time the building was adapted to serve as an annex for the adjacent chemistry program; undergraduate chemistry classes were taught there. Long after it became a part of the chemistry program, the building was renamed in honor of Edgar Fahs Smith, a chemist who had become the University of Pennsylvania Provost on the retirement of Charles C. Harrison. The construction of the 1973 Chemistry Building made Smith Hall surplus for chemistry.

#### 4. Important Persons Associated with the Building:

a. Henry Charles Lea: The donor of the Institute was Henry Charles Lea (1825 - 1909), publisher, historian, and urban reformer. Though principally employed as a publisher in the firm of Carey and Lea, Lea's interests spanned the chemical sciences, ancient and modern languages, and church and legal history. He is now remembered for his four volume *The History of the Inquisition of Spain* (1906-7). The social pressures of the Civil War led to Lea's efforts in behalf of urban reform which would be a subject of continuous interest to him over the next generation. After first involving himself with political reform, Lea shifted to the physical problems of the city, leading efforts to upgrade the city sanitation and water supply which in turn led to his support of the Institute of Hygiene.<sup>33</sup>

b. John Shaw Billings: The medical and research direction of the Institute was shaped by its consultant and later the first director of the Lea Institute, John Shaw Billings (1839-1913). He was one of the ablest men of a remarkable age. After serving as a military surgeon in the Civil War, he had organized the Surgeon General's library and published the *Index Catalog of the Library of the Surgeon-General's Office* (16 vols. 1880 - 1894).<sup>34</sup> Simultaneously, he had served as the advisor for the hygienic design of the Johns Hopkins Hospital in the mid 1870s. It was this building that gave Billings an international reputation in the application of hygiene to architecture and made him the target of Lea's interest. He accepted Lea's offer in 1890, agreeing to take charge when the

building was completed. After his brief stay as director of the Institute of Hygiene, Billings became the director of the New York Public Library.

c. Other Faculty: Billings' first selection to work with him at the Institute was Dr. Alexander Abbott who was appointed as First Assistant in 1891. Abbott took over the direction of the Institute in 1895 when Billings precipitously resigned after less than one full-time year, to head the New York Public Library system.<sup>35</sup> In later years, the initial idea of hygiene as a separate discipline was supplanted by the incorporation of its discoveries into such diverse fields as architecture, public health, and medicine. Under Dr. Abbott's direction, the program headed toward bacteriology. By 1912, most of the faculty were trained in that discipline.

As with most departments at a major university, the hygiene lab produced work of merit. Alexander Abbott was instrumental in testing the water supply of the Schuylkill River for typhoid bacteria leading to the filtration plants; Abbott's colleague and successor, David Bergey published *Principles of Hygiene* and *A Manual of Determinative Bacteriology* (1923), both of which were solid scholarly works, but by all accounts not defining events in their fields.<sup>36</sup>

## Part II. Architectural Information

### A. General Statement:

1. Architectural Character: Like most of the other buildings of the second generation of building on the University of Pennsylvania's campus, Smith Hall is of red brick, contrasting with the green serpentine stone of the first generation. Smith Hall is the most self-effacing of all the buildings along 34th Street and within the Central Science Precinct. Ivy covered, and low, screened by trees along its side and rear, and anti-monumental in its massing, it contrasts with both the vibrant originality of the Furness Building and Irvine Auditorium across 34th Street and the stolid, academic character of the Towne Building and Hayden Hall to its rear. Reflecting the mid-century German training of its designers, the building's balanced main facade, shallow pedimented end gables and pedimented doorway recalls the classicism of the Pre-Civil War years, while its subtle polychromy of sandstone base and lintels, brick walls and terra cotta bands is of the post-Civil War period. Interior finishes are simple, reflecting post-Civil War ideas about hygienic surfaces. The building was given an elaborate, largely passive

ventilation system that was augmented by steam pipes and super heated attic air that drew fresh air from small exterior vents, located under windows, to interior flues and out central ventilating shafts.

Smith Hall's original, nearly symmetrical composition was altered almost immediately by the addition of a wing on the south end.

2. Condition of fabric: Smith Hall is in generally fair condition. It has undergone the usual modifications and alterations of a peripheral building in an evolving campus district. The result has been a general decline in building condition with a steady erosion of historic spaces and fabric. Spaces have been modified in length, the original ventilating system has been closed off; original tin ceilings have been covered by modern dropped ceilings. Despite these alterations, the building itself has a considerable degree of integrity, though, lacking its lab equipment and other features, its ability to convey its original purpose is limited.

#### B. Description of Exterior:

1. Dimensions: The original facade was 91'9" feet on the west front with a north wing of 113'9" feet. Wings are roughly 35 feet in width, providing for modest rooms on either side of a center-loaded corridor. With the 1899 wing, the building is now nearly 100' on the west front.

2. Construction: Walls are of load bearing masonry. Foundations are of rubble stone with quarry-faced, random ashlar blocks of brownstone facing the basement. Upper walls are of red brick laid in common bond, interrupted with bands of terra cotta and pressed brick and terra cotta. Brownstone lintels span openings on the upper levels.

3. Structural system: The structural system is conventional, consisting of masonry load-bearing perimeter and interior corridor walls to support short spans of wood joists carrying floors and frame partitions. This construction limited the sizes of rooms as well as later uses of space

4. West facade: The main facade facing 34th Street, rises on a base of rusticated ashlar blocks of brownstone laid with a slight batter. This base is capped by two courses of smooth dressed stone which forms the transition to the hard pressed Philadelphia red brick of the upper walls. Above the fifth course of brick is a molded terra cotta belt

course on which rests the window sills; this terra cotta band is interrupted by small pairs of openings directly beneath each window. These openings are part of the ventilation system, permitting fresh air to be drawn into the building when the windows were closed. Projecting brownstone lug sills and flush brownstone lintels accent the large windows. These are subdivided by 4-over-4 sash. The same scheme, diminished a bit in accordance with classical proportions, reappeared on the second story. Two story high brick pilasters capped with terra cotta capitals frame the projecting pavilions which give three dimensionality to the main front. Galvanized metal cornices cap the facade and serve as the base for the shallow pediments of the gable ends and the center of the long north facade. The roof was of standing-seam galvanized tin. It is interrupted along the ridge by a central ventilating belvedere that provided a continual air flow up the stairwell, as well as by chimney-like brick ventilating flues along the ridge of the roof.

a. Entrance Portico: The Institute of Hygiene received one important architectural accent which corroborates the design character of the building, a centered brownstone, entrance fronticepiece, which is Victorian in its color, but classical in inspiration. Its carefully proportioned pilasters were a recollection from the architects training two generations earlier. These forms had been adapted into the American vernacular in the 1860s in commercial architecture such as Stephen Button's Cape May hotels from the 1860s, and were continued to be used on most of Collins and Autenrieth's commissions in the 1880s.<sup>37</sup>

5. North facade: The north facade is also public in intention, and therefore has a higher architectural character than the rear facades. Its west half is organized along the lines of a classical facade with two story pilasters supporting a shallow galvanized metal cornice and shallow pediment masking the cross gable. The rear portion of the facade functions rather like the service el of a Victorian house and is correspondingly less architecturally developed. An angled window that breaks through the cornice at the east end denoted the blue-print exposing room. The slope of the ground makes the east end taller than the west end.

6. Rear facades: Facades that face the interior court framed by the wings of the building follow the general lines of the main facade but with some simplification befitting their less important position. Pilasters, terra cotta and decorative brick bands are generally suppressed while the ashlar facing of the basement, the brick walls and the galvanized metal cornice continue.

7. Roofs: Roofs enclose shallow gables carried on wood trusses with the minimum slope; the trusses are sheathed in pine planking and are covered with what appears to be galvanized, standing seam metal. That material has been coated with a reflective paint in recent years.

a. Cornice: The facade is capped by a galvanized metal cornice that extends completely around the building. It is made up of multiple pieces, soldered together and carried on outriggers with some ability to ventilate through the cornice.

b. Chimneys, Ventilators and Belvedere: Along the ridge line of the roofs, set back from the edge of the facade to reduce their architectural effect are short but massive brick flues that vented air from the interior spaces. At the intersection of the wings, and marking the position of the stair well on the interior, is a simple rectangular belvedere with bracketed cornice. It recalls nothing so much as conventional Victorian domestic architecture.

#### C. Description of Interior:

1. Floor plan: The exterior massing describes the interior circulation. A central entrance vestibule opens through two pairs of double, paneled doors into a cross corridor which gave access to the public lecture hall and museum on the south and the private laboratory, classroom, and research wing on the north. This more private zone was closed off by double doors. At the intersection of the central and north wing, beyond the double doors is a stair with turned balusters which provides access to the basement and the second floor.

a. basement: The basement is served by a double loaded corridor that provides access to small rooms along the perimeter of the building. These have been modified in detail and purpose with no historic functions surviving.

b. First floor: The vestibule opens into an L shaped hall that serves the front block of rooms. It is interrupted by a pair of doors for privacy, that provides access to the main stair at the intersection of the rear wing. Beyond the stair, a double loaded corridor serves the small offices and laboratories of the rear corridor.

c. The second floor follows the pattern of the first with a central corridor across the 34th Street wing. There, the director's office was placed directly above the entrance, with his private laboratory adjacent to it. Teaching labs with multiple tables were placed at the north-west corners of the first and second floor, providing light and ventilation on two sides.

d. Attic: The attic is served by a secondary stair in the second floor corridor. Wood planks cover the joists to provide access to the attic vents in the interior flues.

2. Stairways: A domestically scaled wood stair serves the building. Located at the intersection of the two wings and lighted by an immense window, it is given architectural interest by a *neo-Grec* grooved newel, and by a shallow curve in the railing at the well to the basement.

3. Floors: Floors are of yellow pine in the original wing. Most areas have been covered with carpet or vinyl tile.

4. Walls and ceiling finishes: Interior finishes were intended to be sanitary and washable with most rooms finished in plaster over lath or brick, varnished wood floors and pressed tin ceilings. Public spaces were given tongue and groove wainscot following the method of College Hall of the 1870s. Finishes are generally plain, befitting the purpose of the building. Floors were of yellow pine, most of which have since been covered with linoleum. Ceilings were uniformly sheathed in pressed tin in a variety of patterns depending on the size of the room. The field of the ceiling areas is subdivided into square panels which are surrounded by pressed borders in egg and dart and rock-faced patterns. This material was chosen because it was impermeable, protecting occupants of rooms above and below from dust and contagion that might be spread by air movement.

5. Openings:

a. Windows: Windows are oversized double-hung sash which are typically divided into 4 lights by intersecting muntins. One decorative window with small bordering lights in the Queen Anne style embellishes the stair landing. Otherwise, windows are utilitarian.

b. Doors: Paneled wood doors with grooved millwork frames were typical.

Most were replaced with flush doors in the 1969 rehabilitation. Modern metal fire doors have replaced the original wood doors that closed off corridors.

6. Decorative features and trim: Whether because of its budget or the intention that it have the appearance of a laboratory, the building is largely devoid of ornament on the interior. A pressed tin ornamental border with federal-revival ovals enlivens the soffit in the stair. There appears to have been a skylight above the stair in the ceiling of the second floor. It has been covered over in the attic.

7. Mechanical equipment: The building was heated by cast iron radiators served by the central University of Pennsylvania steam plant across 34th Street. Radiators under most windows warmed fresh air which was drawn from the exterior through louvers under the windows. The air-flow was controlled by operable panels behind each radiator. Unlike most domestic buildings of the period which concealed most of the mechanical workings, the architects chose to expose much of the pipes, ducts, and flues which were painted in different colors so that students could visually understand the mechanical and heating systems. A further refinement that survives in the first floor room originally devoted to chemistry was the placement of four different styles of radiators along the north wall to permit students to study the effectiveness of various configurations.

Apart from the plumbing, heating and other systems, the principal feature was the ventilating system. This depended on massive brick interior flues that rise along the corridor partitions, which exhausted air provided from either open windows, or in the event of inclement weather, from small through-the-wall chases that could be closed by interior wood shutters. The system proved troublesomely time-consuming, and represented the old technology of gravity systems rather than the coming mechanically assisted systems of the turn of the century.

8. Alterations to the Interior: Because of changes in use, most of the rooms of the building have been modified in length and configuration. Many ceilings been lowered and the ventilating and air movement systems have been closed off or otherwise modified. These changes occurred in 1969 as a part of the alterations to the "General Laboratory Building" to accommodate faculty during the demolition of the Harrison Laboratory.<sup>38</sup> All of the original lab equipment has long since been removed and the original ventilating system has been modified for the air conditioning system.

D. Site:

1. General setting and orientation: Smith Hall stands midway on 34th Street between Walnut and Spruce Streets where Locust Street would continue were it not interrupted by the University of Pennsylvania campus. It is directly across 34th Street from the Furness Building, a National Historic Landmark, and is in line with two small brick buildings, now called the Morgan and Music Buildings, which were erected for the Foulke and Long Institute from designs by Cope and Stewardson. It is adjacent to the 1973 Chemistry Building which replaced an earlier chemistry building by Cope and Stewardson. Set back slightly from the street, with a small yard planted with trees, Smith Hall frames Smith Walk to its north and is part of the 34th Street streetscape.

Smith Hall is part of the University of Pennsylvania National Register Historic District, whose significance is based on history of the institution and persons associated with it as well as the generally high caliber of its architecture.

2. Relationship to campus design: The University of Pennsylvania campus began as a Victorian Gothic campus built of green serpentine stone; by the 1880s Frank Furness had taken over as campus architect and turned the architecture toward the red brick and red stone and terra cotta trim that would characterize the buildings of the provostship of William Pepper. These buildings generally line 34th Street, and extend east along Smith Walk to 33rd Street. On the east side of the street are Smith Hall, (the present name of the Lea Institute of Hygiene) and the Morgan Building and the Music Building (the buildings of the former Foulke and Long Institute). The last are the youthful works of Cope and Stewardson who would become the campus architects of the Harrison provostship, designing the academic Gothic with light stone trim such as the Towne Building and Bennett Hall that typified the 1895 - 1925 campus. Since 1950, most of the University of Pennsylvania's buildings have reflected the directions of modern architecture. Examples in the immediate vicinity include the brutalist modern Meyerson Hall, the present home of the fine arts program, and 1973 Chemistry which stands to the south of Smith Hall on 34th Street.

These buildings break into three distinct groups: the sculptural, monumental and visually arresting Furness Building and the Irvine Auditorium, and the equally large, historically detailed, but more simply massed Towne Building and Hayden Hall; the small, relatively complicated Smith Hall, and the Morgan Building and the Music Building set back on small lawns; and the large, blocky twentieth century buildings,

including 1973 Chemistry and Meyerson Hall. These modern buildings, like the Towne Building, and Bennett Hall, delineate streets and walkways. By design, each plays different architectural roles in shaping this portion of the campus, reflecting their place in the University chronological development and their purpose. The landmarks that dominate 34th Street, the library and the auditorium were intended as major public facilities. However, unlike the Irvine Auditorium, the library of 1888 turns its back on 34th Street and faces onto the center of the main campus, which was the entire University of Pennsylvania when it was built. The auditorium of 1926 faces the corner of 34th and Spruce streets denoting the University of Pennsylvania's expansion in the 20th century. Similarly, Hayden Hall and the Towne Building face each other and frame Smith Walk, announcing the enlarged scope of the campus. Smith Hall and the Morgan Building and the Music Building face 34th Street, and are inflected toward the main campus, across the street while turning their flanks toward each other -- because there was no street between them.

3. Outbuilding: A second, smaller building stands in the rear courtyard framed by the rear ell. It was intended to house small animals for research. Though utilitarian in purpose, it was constructed of the same hard pressed Philadelphia brick with a molded brick course below the window sills. Doors in the gable ends and groups of three small windows on each side light the interior. A gable roof, set off by a pressed metal cornice with a high ventilator, caps the roof.

### Part III. Sources of Information:

#### A. Original Architectural Drawings:

No original architectural drawings of Smith Hall have been discovered. However, the 1892 dedication booklet contains plans (see appendix) of the building as it was constructed. University of Pennsylvania Facilities Development offices contain contemporary sketch plans of the building as it presently exists. In 1991, Marianna M. Thomas Associates undertook measured drawings of the building as a record of the building in the event of demolition. Originals are on file with the Philadelphia Historical Commission.

#### B. Early Views:

An early exterior of Smith Hall was taken from the north-west prior to the construction of the new (1899) wing. This shows the nearly symmetrical original facade. The next earliest view is after the construction of the 1899 wing and shows the building essentially as it remains to the present. Other photographs of the campus in the University of Pennsylvania Archives show fragments of the building from different positions in photographs of other structures. There are few historic interiors in University of Pennsylvania collections including a view of the upper floor of the new 1899 classroom laboratory in the *Alumni Register* (Feb. 1900) p. 7. The *ASM Journal* 58: 6 (June 1992) published a 1930s view of the interior of a lab c. 1930.

#### C. Interviews:

Several historians have been interviewed on the project including Dr. Robert Breugmann whose dissertation on early mechanical systems made him an important resource. It was his conclusion that this was not innovative in the 1890s, and that Billings' important work in the field of hygiene had occurred in the 1870s with the Johns Hopkins Hospital design. Dr. Tom Peters of the Lehigh University Building and Technology Institute noted other more advanced designs of the time. Dr. Randy Swanson, has completed a dissertation on lab buildings. His degree is from the architecture program at the University of Pennsylvania, giving him familiarity with Smith Hall.

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#### Part IV. Project History:

In 1973, the Smith Hall site was designated as the site for future expansion of the chemistry program. Planning studies undertaken in 1988 for the University of Pennsylvania recommended the site for laboratory construction because of its central location within the science precinct. In 1991, the University was awarded

a grant under Department of Defense Appropriations Act for Fiscal Year 1991 (Public Law 101-511) to support the construction of the Institute for Advanced Science and Technology. Phase I, consisting of a wet laboratory building, is proposed to be erected on the site of Smith Hall.

Prepared by: George E. Thomas, Ph.D., historian 15 May 1993, revised February 1995

Notes:

1. Lea's contributions to his native city can be understood in E. Sculley Bradley, *Henry Charles Lea: a Biography* (Philadelphia: University of Pennsylvania Press, 1931).
2. A brief history of the program can be found in David Cooper III and Marshall Ledger *Innovation and Tradition at the University of Pennsylvania School of Medicine*, (Philadelphia: University of Pennsylvania Press, 1990), pp. 123-127.
3. The evolution of the institute can be followed in the University of Pennsylvania Minutes of the Board of Trustees, which are indexed in the University Archives. cf. vol A-12, p. 441 (5 February 1889); A-12 p. 468 (7 May 1889); A-12 p. 501 (5 November 1889); A-12 p. 556 (4 November 1890).
4. See Jane K. Schweizer, "Collins & Autenrieth, Architects in Victorian Philadelphia" (Master's Thesis, University of Delaware, 1981). She discusses the building within the rubric of Lea-related commissions, and makes no special claims for it (p. 79). In addition, Collins and Autenrieth have been discussed in Sandra Tatman and Roger Moss, *Biographical Dictionary of Philadelphia Architects*, (Boston: G.K. Hall, 1985), pp. 156-9, and by MJL [Michael J. Lewis], in James O'Gorman, Jeffrey A. Cohen, George E. Thomas and G. Holmes Perkins, *Drawing Toward Building, Philadelphia Architectural Graphics 1733-1986* (Philadelphia: University of Pennsylvania Press, 1986), p. 105, neither of which mentions Smith Hall or the Lea Institute.
5. The Doane contract, dated December 1890, is filed in the University of Pennsylvania Archives under Hygiene in the General Files; the work was to be accomplished by 1 January 1892 for a cost not to exceed \$11,394.60.
6. See John S. Billings, "Memorandum on Building for a Hygienic Institute or Laboratory," (General Files, Hygiene, University of Pennsylvania Archives, 1890).

7. For a brief discussion of the Johns Hopkins Hospital design see John Thompson, *Hospitals: a Social and Architectural History* (New Haven: Yale University Press, 1975), p. 180-193.
8. Alterations to Smith are noted in "The Chairman's Report," *The Penn Chemist*, 2 (July 1969), p. 1. It reported remodelling of the first floor and basement of the General Laboratory Building, to accommodate faculty during the demolition of Harrison.
9. The history of the laboratory as building type is only now being written. Studies are being undertaken by Randy Swanson a graduate student in the University's History and sociology of Science program, presently at UNC Charlotte. His view today is that Smith is unremarkable and that it took most of the wrong directions that were possible when it was built. These included its inflexible plan and simple materials as well as its primitive ventilation system. Of greater interest, however, is the plan of its labs which reflects the old craft apprentice tradition rather than the new mass education system of the modern world. A direct quote, "In terms of the evolution of the lab building in America, the Hygiene Institute played no significant role and did not respond to modern directions." His dissertation discusses plan of labs - by orientation of tables to windows as the key indicator of the orientation toward the future or the past. In addition, others consulted included Dr. Tom Peters of the Building and Architectural Technology Institute at Lehigh University as well as Robert Breugmann, Ph.D. whose doctoral dissertation began the study of heating and mechanical systems in nineteenth century architecture.
10. A brief survey of the illustrated projects in the *AABN* turned up five or six designs, most of which were related to contemporary academic design.
11. See Edward Lowber Stokes, ed., *Letters of John Welsh*, (Philadelphia, 1937), pp. 72-73.
12. George W. Comer commented on the revolutionary impact of the Hare Laboratory on medical teaching; op cit., p. 130-1.
13. A recent visit to the Lehigh campus showed that the Chandler lab was still standing as the Fine Arts building. Its importance was pointed out by Dr. Tom Peters who reported on its award at the Paris Exhibition.
14. See "The Wistar Institute of Anatomy and Biology, Organization and Deed of Trust," (Philadelphia, 1895), p. 27 which stated "...the object of the laboratories and workrooms ... shall be for the improvement and research of post-graduate or advanced students or searchers after new and original knowledge."

15. The biology program is discussed in Francis Thorpe, *Benjamin Franklin and the University of Pennsylvania* (Washington: Government Printing Office, 1893), pp. 327 - 42.
16. John Shaw Billings, "Opening Exercises of the Institute of Hygiene," 22 February 1892. University of Pennsylvania Archives, General Files, Hygiene.
17. *ibid.* p.27.
18. Ventilation and its relationship to health had been studied though not completely understood for almost a century. See John Aiken, *Observations sur les Hôpitaux relative à leur construction aux vice de l'air d'Hôpitaux* (London: Chez Briand, 1788), Luther Bell, *Practical Methods of Ventilating Buildings being an address before the Massachusetts Medical Society, 1848* (Boston: Dammell and Moore, 1848); John Shaw Billings, *Ventilation and Heating* (New York: The Engineering Record, 1889). By the 1880s, Billings' original work at Johns Hopkins had been supplanted by mechanically assisted systems leading in the new direction toward modern mechanical systems.
19. That use of the campus mechanical plant was described in Thorpe, *Benjamin Franklin and the University of Pennsylvania*, p. 303.
20. See for example, the *Drexel Institute of Art, Science, and Industry, Dedication Ceremonies, December 17, 1891* (Philadelphia: Drexel Institute, 1893), p. 38. The importance of the building and the intentions and capacities of its architects are discussed in George E. Thomas, *An Architectural History of the Main Building, 1891 - 1991*, (Philadelphia: Drexel University 1991).
21. A list of the architects' work arranged by client is available at the offices of the Clio Group, Inc. It shows a dozen or more commissions by the Lea family; Schweizer indicates that other projects for other clients were often funded by the Lea family who presumably required that their architects be given preference.
22. Paul F. Clark, *Pioneer Microbiologists of America* (Madison: University of Wisconsin Press, 1961) p. 196. "In 1892 the University of Pennsylvania Laboratory of Hygiene opened the doors of its grand new building with John Shaw Billings, who had been so vital in planning the Johns Hopkins Hospital and in the organization of the Library of the Surgeon General as director, and Alexander C. Abbott, a protege of Welch, as his first assistant.
23. John Shaw Billings, "Address" *Proceedings at the Opening of the William Pepper Laboratory of Clinical Medicine, December 4 1895* (Philadelphia, 1895).

24. It is currently fashionable to denigrate the effectiveness of Wistar because its original great hall spaces were devoted to housing the collection for the study of comparative anatomy. However, according to its charter in the University of Pennsylvania Archives, its purpose was the same as the Lea Institute -- "the creation of new knowledge." However, the Wistar Institute building has proven more flexible and continues to be used for its original purpose.

25. William Pepper *Provost's Report* (University of Pennsylvania, 1887) p. 5.

26. See Simon and James Thomas Flexner, *William Welch and the Heroic Age of American Medicine* (New York: Viking, 1941), pp. 116; Arnold Eggerth, *The History of the Hoagland Lab* (Brooklyn: Privately Published, 1960); Joseph H. Raymond, *History of the Long Island College Hospital and its Graduates Together with the Hoagland Lab and Polhemus Memorial Clinic* (Brooklyn: Alumni Association, 1899). Other labs at Johns Hopkins and the University of Michigan are also a part of this development.

27. Paul Clark, op cit. reports on several of the early faculty, p. 197-8; Robert Kohler ignores the program and the building in *From Medical Chemistry to Biochemistry: The Making of a Biomedical Discipline* (Cambridge: Cambridge University Press, 1982).

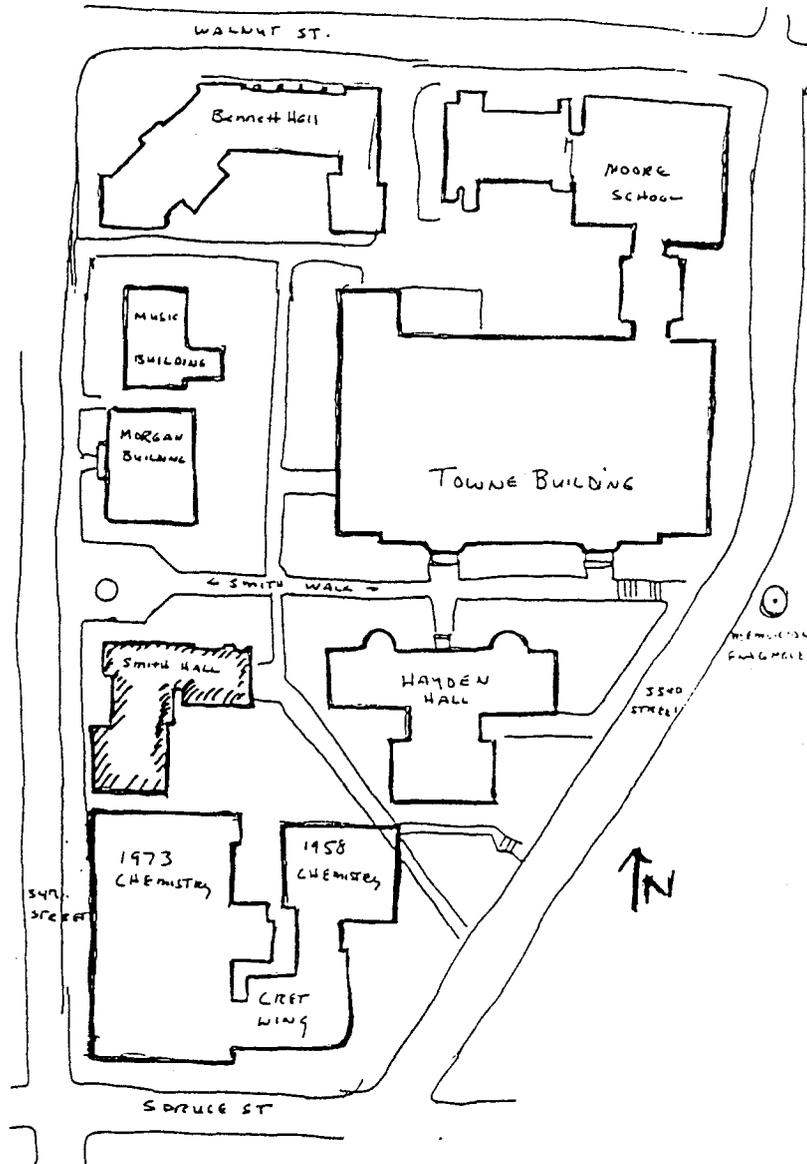
28. Garrison, p. 281.

29. The reform movement was caught up in the failure of the Whig political party which Lea and others favored, over the Democrats who were still reviled in Philadelphia for their role in ending Philadelphia's control of the National Bank, and who after the Civil War were often seen as southern sympathizers, and the Republican party which ran the city machine. See George E. Thomas, "The Red City: The Patronage of Reform," in *Frank Furness: The Complete Works*, New York, Princeton Architectural Press, 1991, pp. 65 ff. The lack of effectiveness of the Lea Institute is described in Michael McCarthy, *Typhoid and the Politics of Public Health in 19th Century Philadelphia*, Philadelphia: American Philosophical Society, 1987. See especially p. 28

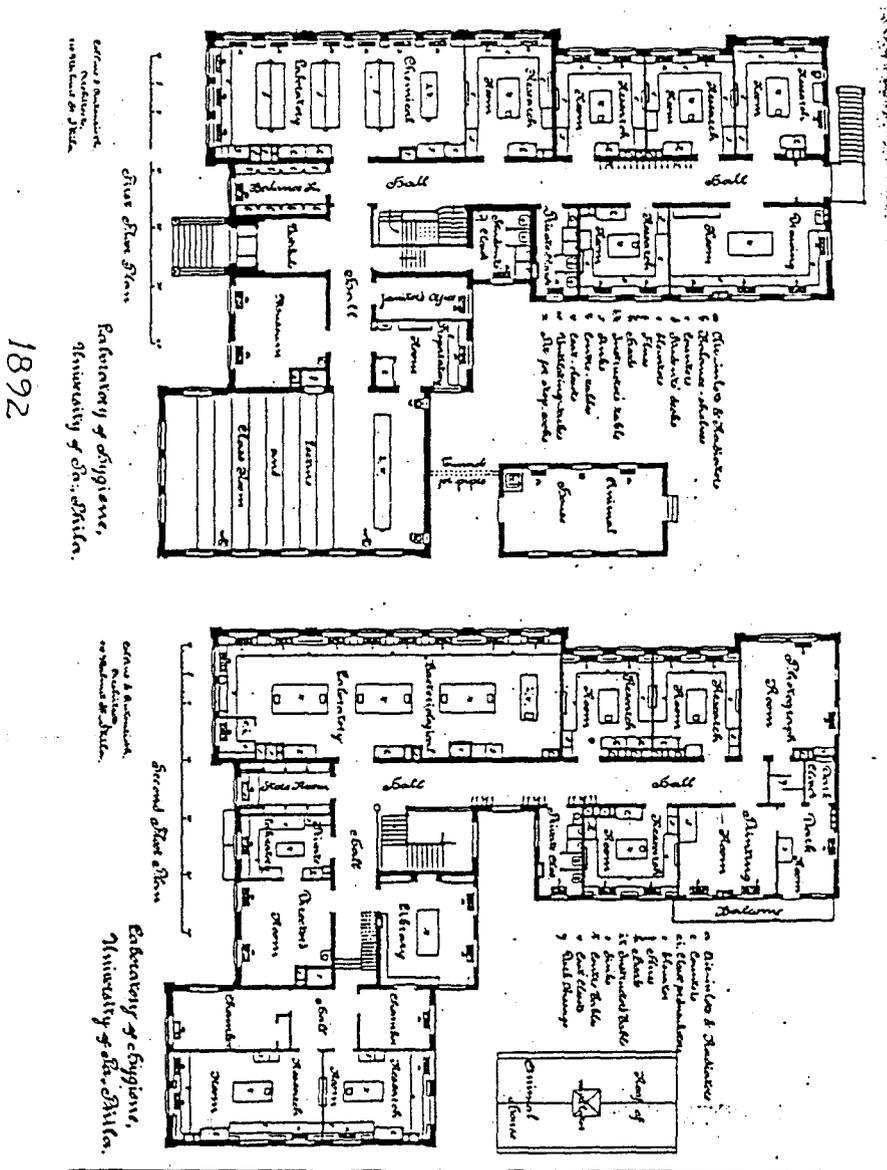
30. The later history of the Hygiene program can be found in the Trustees' Minutes and the University of Pennsylvania Medical School Announcements which were published annually. See especially 1912, 1926, 1930. See also George Washington Comer, *Two Centuries of Medicine: A History of the School of Medicine of the University of Pennsylvania* (Philadelphia: University of Pennsylvania Press, 1965), p. 183-4.

31. 14 November 1969, Minutes of the Board of Trustees of the University of Pennsylvania, vol. A-33, p. 34.
32. The name was amended without trustee action, but by agreement between the president, the provost, and facilities director John Hetherston, 8 August 1975.
33. Joseph Jackson, *Encyclopedia of Philadelphia*, vol. 3, (Harrisburg: National Historical Association, 1932) 826 - 7.
34. Billings's biography was written by his disciple, Fielding Garrison, *John Shaw Billings: A Memoir*, (New York: G.S. Putnam and Sons, 1915). The Penn experience is treated in pages 276-83 and was characterized as a "disappointment." See also WFW [William F. Willcox] "John Shaw Billings," *Dictionary of American Biography* 2 (New York: Charles Scribner's Sons, 1929), pp. 266-269.
35. The duration of Billing's stay can be calculated by various methods. He was engaged in the fall of 1889 and severed his connections with Penn in 1895. However, most of his time until the 1892 opening of the Institute was spent in Washington, D.C. His biographer, Fielding Garrison, states that he was in residence for eight months, "John Shaw Billings," *National Academy of Science, Biographical volumes* vol. 8. pp. 396-7.
36. See Paul F. Clark, *Pioneer Microbiologists of America* (Madison: University of Wisconsin Press, 1961), pp. 196-198.
37. For Button's work see George E. Thomas and Carl E. Doebley, *Cape May: Queen of the Seaside Resorts*, (Philadelphia: Art Alliance Press, 1976); Collins and Autenrieth's works using the same motifs include the Justi Dental Factory at 32nd and Spring Garden streets, and the Lea office building on the 1200 block of Market Street, both in Philadelphia.
38. "The Chairman's Report," *The Penn Chemist*, 2 (July 1969), p. 1.

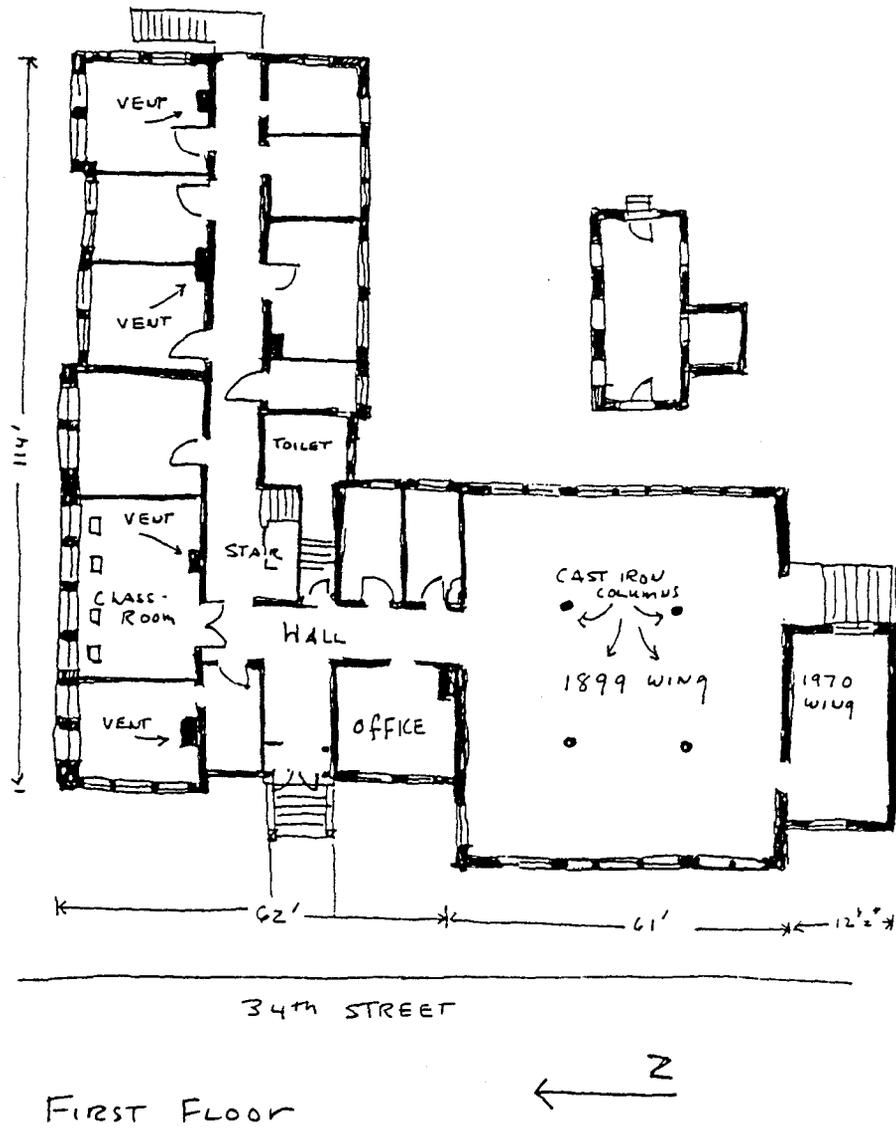
Site Plan

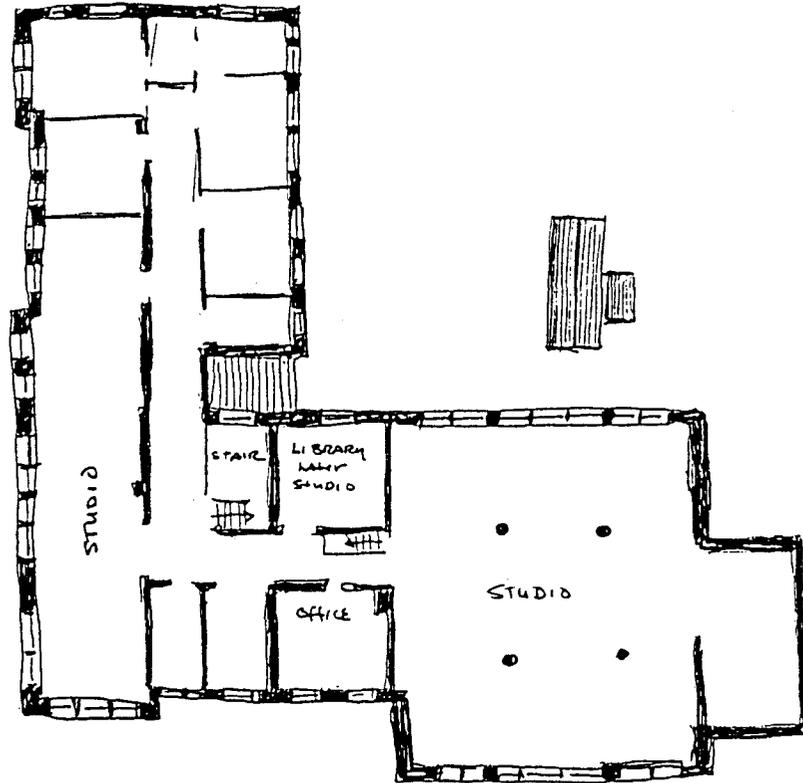


Original plans, "Opening Exercises of the Institute of Hygiene, February 22, 1892"



1892





← 133' →  
SECOND FLOOR