
Who was Horatio Saltonstall Greenough?

Part 1

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1. His Major Step Forward

Horatio Saltonstall Greenough (1845-1916), HSG, is probably best known for his invention of the Greenough stereomicroscope. With the introduction of the Greenough-style stereomicroscope, stereomicroscopy took a major step forward.

The majority of Greenough stereomicroscopes use dual Porro prisms (named after their inventor Ignazio Porro), originally designed by Zeiss. The internally reflective prisms are used to provide erect images to the eyepieces from light paths which pass through two adjacent and separate objectives.

In the HSG design two microscopes are set side-by-side and their axes include an angle appropriate to allow for stereo viewing. The rotatable supports of the prisms allows the user to set the eyepiece distance appropriate for their personal intraocular distance. Greenough microscopes are designed for relatively low magnifications and long working distances. That is, they provide excellent conditions for dissecting and manipulating small specimen.

The Greenough stereomicroscope has been implemented by a variety of companies. It is perhaps the most popular design of stereomicroscopes in use today, or so it appears to the authors. The following photographs, shown in Figures 1 through Figure 8, show how Greenough's work has spread throughout the world. Included are some examples of Greenough stereomicroscopes from Germany, the US, England, and Austria. This is just "the tip of the iceberg" as there are, and were, many other Greenough stereomicroscopes produced.

The older models clearly show both inclined objectives, the characteristic of Greenough design. Each push against a stereo objective in older Greenough stereomicroscopes might affect their sensitive stereoscopic adjustment. This, fortunately, is not true today. To avoid this, later objective pairs are housed under a cover.

In the beginning of stereomicroscopy, the vertical view of a specimen, e.g., one in liquid, was obtained using vertical binocular tubes, but this method of observation could produce neck strain. Today all stereomicroscopes offer inclined binocular tubes making the process of viewing much easier on the user.

The implementation of varying magnifications was introduced gradually, in a step-by-step process over time.

At first quick and dirty methods were used by replacing the eyepieces and then assisting resolution and image brightness by providing interchangeable objective pairs. Later two to four objective pairs were arranged on a turret or slider for faster changing, but the use of these bulky objective pairs made the view of, and access to, a specimen more difficult.

The D 2x-4x-8x switchable objective pairs was a unique solution on the Zeiss DRC which was inspired by the magnification changer of competing CMO stereomicroscope design.

The third and last step seems to have been the insertion of two zoom optics between objective pairs and eyepieces. This allowed both optics to work in parallel and they gave the convenience of fast and step less magnification.

Additionally an optional front lens could be placed between specimen and objective pair to shift the zooming range up or down.



Figure 1. Beck Greenough Stereomicroscope, London, England.



Figure 2. Zeiss Double Tube XA with Interchangeable Objective Pairs, 1923, Jena, Germany.



Figure 3. Hertel and Reuss Greenough Stereomicroscope with Interchangeable Objective Pair, ca. 1927, Kassel, Germany.



Figure 4. Bausch and Lomb Greenough Stereomicroscope, ca. 1929, Rochester, USA.



Figure 5. Zeiss Double Tube XV with Quadruple Objective Turret, 1926, Jena, Germany.



Figure 6. Jug Handle Reichert Greenough Stereomicroscope with Triple Objective Drum, ca. 1955, Wien, Austria.



Figure 7. Zeiss Stemi DRC Greenough-style Body with Photo Port and Equipped with Changer D 2x-4x-8x, the 1.6x Objective Pair, and Transmitted-light Bright and Dark Field Illuminator, on an LO Stand, 1978. Zeiss Stemi DRC Light Paths with Permission of, Carl Zeiss Microscopy, LLC.



Figure 8. Today's Zeiss Stemi 508 doc Apochromatic Greenough Stereomicroscope with 8:1 Zoom, Equipped with AxioCam ERc5s Digital Camera, on K LAB Stand with Integrated LED Illumination. Courtesy of ZEISS Microscopy.

Today's primary competitor to the Greenough stereomicroscope is the CMO (**C**ommon **M**ain **O**bjective) stereomicroscope design, wherein both parallel optical channels are behind a single common main objective, on the left and the right of the objective's center. The quality demands for this type of objective are significant, and therefore this design is often found in expensive and multifunctional models.

Contrast this with the Greenough stereomicroscope which provides high optical quality at a reasonable price due to its imaging along both optical axes. This relatively low cost and high optical quality provides the Greenough stereomicroscope a prominent place in today's stereomicroscope market.

For comparison, Figure 9 shows a Leitz Greenough stereomicroscope side-by-side with a Zeiss CMO stereomicroscope.



Figure 9. Leitz Greenough Side-by-Side with Zeiss Opton CMO Stereomicroscope, 1949, Inclusive 6x-10x-16x-25x-40x Magnification Changer like Zeiss Jena Citoplast, 1946.

The Greenough stereomicroscope was invented by American HSG. Relatively little information has been published about HSG's life. Although, and this is an aside, Mr. Greenough was the son of, the same named, Horatio Greenough, one of the first American sculptors to gain international recognition, and for whom much information is available.

Fortunately, the correspondence of HSG to the Zeiss Company is available in the Carl Zeiss archive and this, thankfully, gives us exact dates and details of the evolution of the Greenough stereomicroscope.

On July 4th, 1892, the first letter was written by HSG to Ernst Abbe (1840-1905), of the Carl Zeiss Company, but it is unfortunately missing. HSG and Prof. Abbe met in the university city of Jena, Germany in 1893 late autumn. This meeting resulted in the development of the first prototype Greenough stereomicroscope which arrived in Paris on March 31st, 1894, as acknowledged by HSG via post card on next day.

At the time Zeiss was probably Europe's leading microscope maker, and the timing of the meeting was fortuitous. Ernst Abbe was the world's leading expert on microscope optics. He had become Zeiss' partner about a decade earlier in 1875.

Prof. Abbe became the head the Zeiss Company in 1891. He and his personal assistant, Dr. Siegfried Czapski (1861-1907), had the technical abilities to understand and improve HSG's concept. They were also in a position to insure the Greenough microscope's development.

Although HSG's concept for a stereomicroscope was presented to Prof. Abbe and Dr. Czapski in 1892, it took some engineering modifications before Zeiss produced the first commercial Greenough stereomicroscope in 1897 and then offered it for sale in its 1898 microscope catalog for the first time [Zeiss, 1898].

This was referenced to, in the Catalog, as the Greenough double microscope of Zeiss design. The Zeiss Company has continued the Greenough design for 120 years. Some Zeiss catalogs for its Stemi (**S**tereom**ic**roscope) series use the tag line, "Conceived by Greenough, Realized by Zeiss".

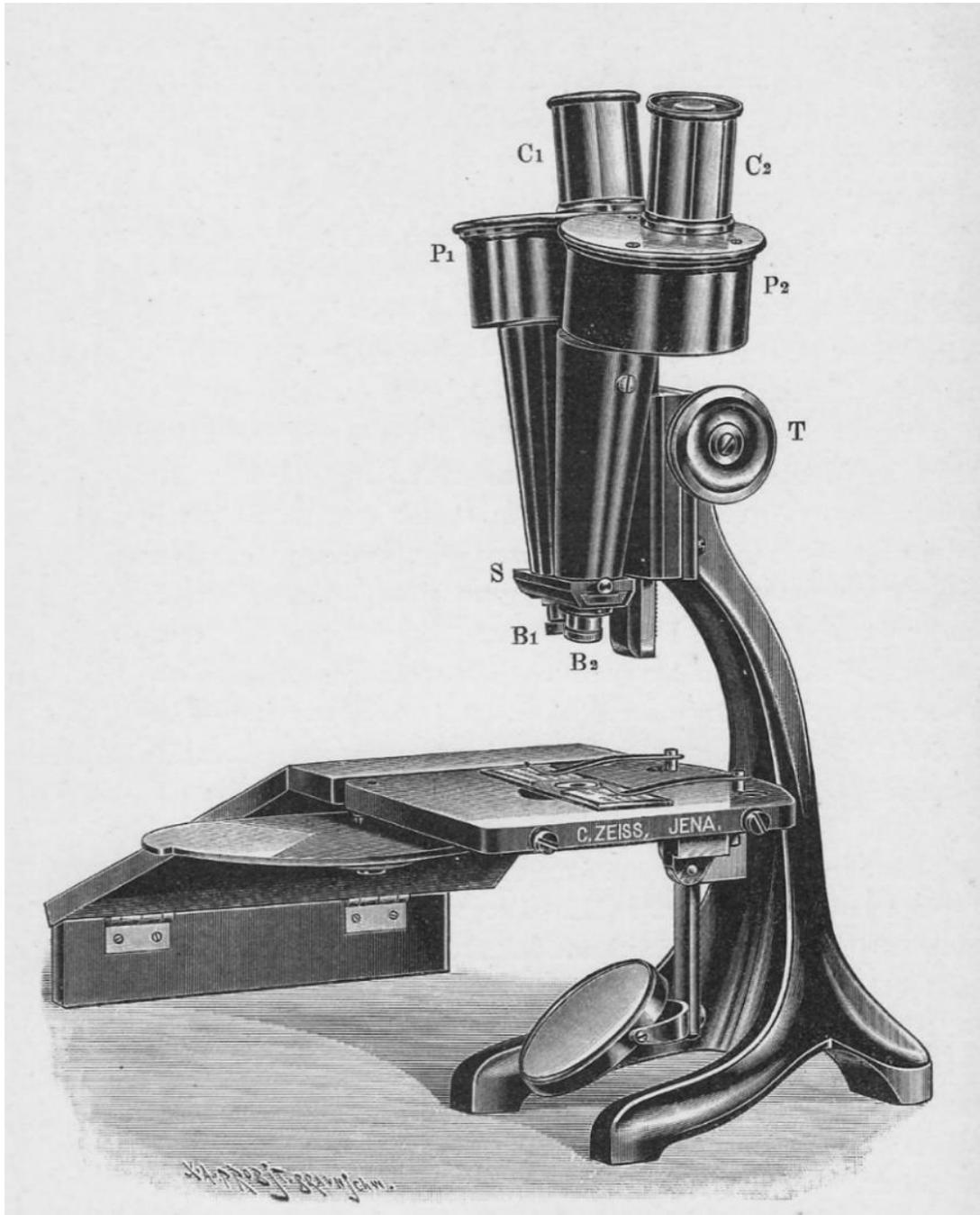


Figure 10. First Modern Stereomicroscope by Zeiss – Greenough Design, from 1898 Carl Zeiss Jena Microscope Catalog [Zeiss, 1898].

The health of the mother was thought to be weak, and that combined with several prior miscarriages suggested the spa-sanatorium to the minds of the Greenough's.



Fig. 12. Graefenberg in Silesia (Graefenberg in Schlesien) [Meyer, 1860].

The **Henry** and **Saltonstall** Christian names, were given to HSG because of his Uncles *Henry* (1807–1883, architect and importer) and Richard *Saltonstall* Greenough (1819–1904, sculptor) [Greenough, 1969].

Professor Nathalia Wright (1913-2004) tells us something on HSG's childhood in her biography of the sculptor [Wright, 1963]. The authors' remarks are shown in italic:

(Page 238) From Vienna Louisa wrote ... (in summer 1846), My boy flourishes, & repays me for all the slopping, sousing, & drenching I have undergone. He coos, laughs, & crows to any extent & of course I look upon him as a perfect wonder.

(Page 247) Little Henry Greenough made his presence felt increasingly in both families (i.e., those of Horatio and Henry)... He reminded her (Frances Boott G. (1837-1883), spouse of Uncle Henry) of the children of a royal family...

A year later she recalled, Horatio, who has never noticed any babies, used to speak of him as a perfect wonder of health & strength ! which to us was quite (Page 248) amusing, he did not walk till he was 19 months old ! So much for not being a father till one is 40 years old & only having experience in marble infants.

The disturbing fact was that the infant was sickly throughout his early years.

(Page 255) During the first of these years Greenough was often concerned about the well-being of his family. In the spring after they returned from Grafenberg an epidemic broke out in Florence, which he first called spotted fever, but later thought was cholera.

Louisa fell ill, and for a while he despaired for her life. Evidently little Henry was also ill, and Horatio had fever late in April... By the fall little Henry had gained weight, and in December he at last walked. Yet his father continued to be apprehensive. "Poor Horatio!" Frances wrote ... early in 1848, I really pity him, his little boy cannot have a common cold or a heaviness of the eye lids, without alarming him and making him wretched. He says he was very happy till he was 40 yrs old! but that since the birth of the baby, he has been on a bed of thorns! Partly in consequence of such attention the child was "wilful and noisy," she thought."

(Page 257) The next month they all had influenza, and little Henry was so ill that Louisa took him to Leghorn, presumably to benefit from the sea air. They stayed until the middle of February 1849. By this time Frances regarded the "Florentine scion" as unworthy his name. He was "the most disagreeable child I have ever seen," ... and I fear will prove a source of trouble to his parents (*citations end*).

In 1851 October HSG came to US by the America liner together with his parents and his younger sisters Mary Louise (1847-1854) and Charlotte (1850-1919) [Archives, 1960]. Only one year was granted him with the complete family in Boston and Newport, Massachusetts, due to the unexpected death of his father.

In the summer before Horatio wrote in a letter [Wright, 1972], "I write with a noisy boy at my elbow and beg you to excuse my incoherence." Professor Nathalia Wright states the contrasting ideal view of the Unitarian father [Wright, 1963]:

His creed had been prepared, he said, for his young son, who had asked him what God was. "Three things, my child," he replied, have I seen in man worthy of thy love and thought. Three proofs do I find in man that he was made only lower than the angels—Beauty—Action—Character.

By beauty I mean the promise of function.
By action I mean the presence of function.
By character I mean the record of function.

The glory of beauty is the faith of future action.
The honor of action is the hope of future character.
The divinity of character is the charity that giveth itself to God,
in sacrificing self to humanity.

These three do I find, and the greatest of these is charity. Go thou, my child, into the thoroughfare, test these my words, and if they be clever statements of a lie, say to them, retro Satana! But if they be feeble lines of truth, come to me once more, and we will pull these threads and seek to know where their other end fastened (*citations end*).

The period of contact for both was too short, and too early for HSG in learning from the genius. Mother Louisa changed HSG's Christian name from Henry to Horatio after his father's death. In spite of HSG's various efforts he often falls short of the expectations caused by his name. HSG seemed to be in his famous father's shadow for his whole life.

In the 1855 census [Census, 1855/1] the half-orphan is called Horatio and lives in a house on Quincy Street at the corner of Cambridge Street (after 1872 that same house was numbered 42 Quincy) in Cambridge, Mass., and HSG was living with his Mother Louisa I. Gore and his Sister Charlotte in Ward 1-12. Sister Mary Louise had deceased the year before.

The house at 42 Quincy is the earliest known house designed by Henry Greenough. It was built in Italianate in style in 1845. That house was destroyed by fire and demolished in 1968. The four children of Uncle Henry (Ward 1-10) were playmates of HSG, we the authors are supposing this was owing to their proximity: Florence (1852-1940), Henry Jr. (1848-1880), Frances (Fanny) Boott (1843-1939) and Francis Boott (1837-1904).

3. His Youth and the Intellectuals of New England

Quincy Street adjoined the Campus of Harvard University and so there is no wonder that many Harvard professors lived there. In the house at 30 Quincy Benjamin Peirce (1809-1880) was a neighbor [Census, 1855/2]. This well-known professor of mathematics and astronomy at Harvard since 1842 had published a number of mathematical textbooks.

He could be a teacher or, perhaps, a paternal friend who filled HSG with enthusiasm about mathematics and influenced HSG by his idea of “mathematics as study of God’s work by God’s creatures”. On May 21st, 1878 HSG wrote him about a geometrical topic [Houghton, 1878]:

“My dear Mr. Pierce,

I venture with great diffidence to send you the following – I am so very unfamiliar with symbolic reasoning that I strongly suspect I am wrong – it is however an idea I have had for a long time and something I read in the “Nation” the other day makes me think I may possibly be right, if not, sometime when I see you will you kindly point out my error + excuse my having troubled you -: If a space of N dimensions ... (*long discussion of geometrical topic follows*) ... Hoping I have not bored you too much + that you will excuse me if I have made very much of an ass of myself I remain

yours very truly
H. S. Greenough”

From 1854 Swiss born Louis Agassiz (1807-1873) - professor of zoology and geology at Harvard - lived in a house on the corner of Quincy and Broadway (later 36 Quincy) which was designed gratis by Uncle Henry in accord with Agassiz’ desires. Uncle Henry was a personal friend of Agassiz [Agassiz, 1885]), and in 1859 both presented the building plan [Chronicle, 1859] for the new Museum of Comparative Zoology today named Louis Agassiz Museum of Comparative Zoology in Cambridge. Unfortunately, in his later life, Louis Agassiz expressed his racist views, but in his earlier life he had a significant influence on HSG’s interest in living things. This is in comparison to Pierce’s mathematical influence on the boy.

HSG mentioned Agassiz in a 1893 letter from Concarneau, France: “With regard to soaring flight I do not think Professor Agassiz’ explanation is adequate” [Harvard 13/30]. This topic, and birds, will be focal points of zoological interest in HSG’s scientific life.

Professor Agassiz was one of the last great biologists who did not agree with Darwin’s Theory of Evolution. Agassiz’ “Contributions to the Natural History of the United States of America” were edited in 1857. Its list of subscribers contains HSG’s Mother, Mrs. Horatio G., and Aunt, Miss Louisa G., of Cambridge [Agassiz, 1857]. Up to time in 1858 that HSG lived in their home, he could read the Contributions. The genius and enthusiasm of Professor Agassiz would waken HSG’s interest in zoology and the Contributions served for his basic zoological education.

In 1858 HSG’s Mother Louisa was appointed the Vice-Regent for Massachusetts for the Mount Vernon Ladies’ Association and was active up to 1865 as a very successful fundraiser [Catalogue, 1953]. Her home was a center for the great intellectuals of New

England and so served as an ideal place to direct her Association appeals. The Mount Vernon Record of January 1, 1859 mentions that HSG and Charlotte donated one Dollar each in Cambridge [MVR, 1859]. Before July 1859 HSG lived in Milliken's Hotel in Boston [BD, 1859] – in the interim between his mother's departure for Europe and his upcoming stay in Deerfield?

4. His Education Abroad and at Cambridge

The US passport application of 1859 July 13th written in Deerfield, Franklin County [USPA, 1859] describes the 14 old Horatio S. Greenough as having a height of 5 feet, 2 inches (157.5 cm, the authors), forehead high+large, eyes blue, nose Grecian, mouth medium, chin medium, hair brown, complexion light, face oval. This is the only information found by the authors on his appearance as a youth.

The teacher Henry H. Barber (1835-1923) witnessed HSG's passport application. He was ten years older than HSG and already married. He would serve as a teacher for HSG and his cousin Henry Waldo Greenough (1846-1864 killed in Civil War), who lived in his father's farm house in Deerfield [Greenough, 1968].

On the same day this young teacher witnessed also the passport application of Rev. John Farwell Moors (1819-1895) from Deerfield, a Unitarian like HSG's father. His passport was sent to the same address in Boston as HSG's. From 1884 to 1904 the Unitarian theologian Barber was professor of philosophy and theology at Meadville Theological School [Schaff, 1951].

In the summer of 1859 Moors and his wife left on a sabbatical to Europe and Near East [Green, 2017] and so our speculation would have the 14 year old boy accompany them for schooling abroad (1859-66). Unfortunately, the record, if this is true, is missing because no lists of passengers leaving the US was ever made that we could find. The HSG obituary of the Boston Evening Transcript says he "was educated principally in France" [Transcript, 1916]. We know that Mother Louisa had departed for Europe the year before [Catalogue, 1953] - probably accompanied by Sister Charlotte - and could have selected the school for HSG. The 1865 Census finds neither HSG nor his mother or sister in Massachusetts.

In September 1866, the 21 year old HSG returned by RMS Cuba from Liverpool to Boston [USIPA] coming from Austria – after college graduation, he, probably, visited his mother and sister. A year later (1867 November) both ladies sailed from Europe to Boston by Java vessel [BPL, 1867].

HSG returned in time for courses beginning the first Monday of October at the recently established Boston Tech, renamed Massachusetts Institute of Technology after its

move to Cambridge. HSG was enrolled as a third-year student in 1866-67 or perhaps 1867-68 (as indicated by another source), in any case the time was short and he did not receive a degree from MIT.

The courses HSG likely attended were Civil Engineering and Chemistry oriented. These include topics such as calculus, astronomy and surveying for the first and industrial chemistry, mineralogy and geology for second [Murphy, 2016].

Later a friendship developed between HSG and Professor Frédéric Wallerant (1858-1936), a French geologist and crystallographer.

HSG was listed as a “Special Student” living in Cambridge, where he could select elective courses e.g., mechanical drawing, geometry, free-hand drawing, elementary mechanics, experimental physics, chemistry, English language and literature or modern languages consisting in reading French and German literature [MIT, 1867].

5. His Interim Period as Bank Clerk

According to 1870 census, HSG lists no occupation and lives with the Morse couple, his cousin and physician Dr. Francis Boott G., and two other gentlemen and a domestic servant at the house at 17 Charles Street, Boston [Census, 1870/1]. His Mother Louisa runs a female household in her house at 42 Quincy Street, Cambridge, Mass. This household included HSG’s Sister Charlotte, his Aunt Miss Louisa and three domestic servants [Census, 1870/2].

The 1870-1872 Tax Books identify HSG as Real Estate Broker (or more modestly Real Estate Salesman) with the National City Bank in room 4 at 61 State Street - without any of his own personal estate or real estate and a \$2 minimum tax [BTR, 98].

This skilled real estate trade required pre-license courses (from 40 hours up to 120 hours) and a state exam. His Uncle Henry could had induced him to undertake such an occupation, as he managed the estate of his deceased Father David (1774-1836), a builder and real estate developer in downtown Boston [Greenough, 2007].

A life-long friendship [Harvard 13/30] connected HSG and the younger Abbott Lawrence Lowell (1856-1943), who later (1909-1933) became President of the Harvard University.

The first time both young men probably met was in Boston’s State Street. HSG was employed at 61 State, as noted above, and the Lawrence’s father, Augustus Lowell (1830-1900), owned a merchant office across the street in 60 State [BD, 1870]. His son studied at the Noble and Greenough School and probably spent his free time in and near his father’s office. That is, near HSG work location.

In 1872 HSG came to 70 State Street and the office of Page, Richardson, & Co., Bankers who were advertising bills of exchange in London, Paris, and the principal continental cities and travelers' credits for Europe and the East [BD, 1872].

On July 3rd, 1873 HSG was appointed as Assistant Currency Redemption Clerk with the US Independent Treasury in Boston and earned \$1,000 compensation per year – a fifth what his office head made [USTR, 1874]. HSG worked at least two years as clerk.

The 1877 Boston Directory correlates HSG's activities with the U.S. Sub-treasury and locates him with Dr. Francis in the house at 17 Charles Street continually [BD, 1877]. Two further cousins had lived there temporarily also, Edgar C. Curtis (1846-1886, architect) and Horatio G. Curtis (1844-1922, merchant) who will be mentioned in HSG's obituary printed in the Boston Evening Transcript [Transcript, 1916].

6. HSG's Way to Scientist

In 1877, on December 11th, HSG was baptized by the Roman Catholic Archdiocese of Boston [NEHGS, 1877]. His sponsor was the strong religious zealot and physician, Dr. Thomas Dwight Jr. (1843-1911). Dr. Dwight Jr. was a member of the American Society of Naturalists among other memberships.

In 1890 HSG tried to contact him and wrote to A. Lawrence Lowell, "I request that you will show this present communication to Dr. Thomas Dwight Parkman Professor of Anatomy at Harvard University" [Harvard 13/30]. Dwight had this position of Anatomy Professor from 1883. He was born in Boston, attended school in Paris and studied medicine in Boston and Europe. In 1870-1876, he lived and could practice medicine in the house at 9 Charles, Boston [BD, 1870-76].

Nearby in 17 Charles, HSG lived (1869-1877) and would meet his neighbor and or, perhaps, became his patient. In these years this excellent teacher was also an instructor at Harvard in comparative anatomy (1872), in histology (1874), and also in embryology [Warren, 1911]. HSG dealt in all these fields in his later zoological period! It seems further that HSG tried to follow Dwight's former way of life for the second half of his life.

In May 19th, 1878 HSG got the Mauritius confirmation name [NEHGS, 1878]. The 1878 Valuation Book states HSG as an auditor without any valuation and he moved to the house at 9 Brimmer Street [BTR, 38]. At 33 HSG turns his back on his father's Unitarian creed of Catholic baptism and confirmation and also finishes his commercial career.

The 1878 Boston Directory shows "Greenough Horatio S. / Greenough H.S. Mrs." under the same address [BD, 1878]. Although, in contradiction to the aforementioned Mrs. H.S., all other sources, we the authors could find, say that HSG was never married

[Transcript, 1916] and a marriage certificate could not be found by us. The Boston Directory does not mention a spouse separately. So we suppose that his mother Mrs. Horatio Greenough lived in the same house temporarily and the S. letter was typed wrongly in the Directory editions of 1878 to 1883. There is verified only one HSG residence in Boston after 1878.

Did HSG have a four year study journey? The 1883 Boston Directory [BD, 1883] locates HSG and Mrs. H. S. boards at 11 Beacon Street. Sister Charlotte declared herself as an artist and lived temporarily at the same address, even though she continued using the same address as her French teacher.

The impressionistic landscape painter Achille Oudinot (1820-1891) lived in Boston between 1876 and 1886. Sister Charlotte probably went with him back to France.

HSG wrote to A. Lawrence Lowell in a letter dated Nov. 21st, 1906 [Harvard 13/30]: "We both took part in the founding of the M. P. Club". It is known that in 1883 the astronomer Percival Lowell (1855-1916, brother of A. Lawrence) helped to form the Mathematical and Physical Club [Wiki, LP], a group of Boston-area scientists around the Harvard mathematician and astronomer Benjamin Peirce.

94. IV. 11

21 Ave Beaujon
 Paris April 11th 1894
 Professor Dr. Able
 Dear Sir

Will you
 undertake ^{Undertaking} Will you
 oblige me by the following
 experiment. - Take Two
 Photographs of the Moon in
 opposite phases of Libration
 and mount each Photo-
 graph so as to maintain
 the Invariance of the Solid

Angle Ω subtended by the
 Moon when seen with the
 naked eye; bearing in
 mind that $\nabla\Omega$ has
 shape as well as magnitude
 whereas ^{In} $\nabla_P\omega$, i.e. plane angle
 shape and size are merged.
 The photographs thus
 examined will show the
 moon as a Round Ball.

yours very faithfully
 Horatio Mauritius Saltmattall Greenway
 P.S: ρ is the Vector to an
 equipotential Strain Surface

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Figure 13. HSG's letter of 1894 April 11th and his signature including his Mauritius confirmation name [BACZ 1578].

In 1884 September aged 27, H. S. Greenough merchant born in Austria returned from London with 11 baggage pieces [BPL, 1884]. Did HSG transfer residual sculptures of his father from Europe to US? We the authors do not know if he declared a merchant due to his extensive baggage, although there are indications.

In February 1895 HSG gave as a gift to The Public Library of the City of Boston, the busts of Christ and Lucifer [Wadlin, 1911]. On January 26th 1898 HSG donated the Lafayette marble bust (probably created 1831-1833) to the State House of Boston where it was displayed in the Senate Room [Forbes, 1925].

HSG's first scientific paper was published in *The American Naturalist* in June 1886, in the *Journal of the American Society of Naturalists*. It is titled "Observations on Young Humming-Birds". His observing conditions are given, "DURING the month of June last, I heard through friends of the nest of a humming-bird (*Trochilus colubris*) at Cotuit, on Cape Cod, where I was then staying, and having long wished for such an opportunity, I immediately decided to do what I could towards observing the growth of the young. Unfortunately the position of the nest made this rather difficult, for it was on a small dead branch of a yellow pine tree, some distance from the trunk' and twelve to fourteen feet from the ground, or thereabout ... By means of a long step-ladder, improvised for the occasion by tying together two ordinary ladders, I was enabled to view the young within a few inches ... I was unable to secure any photographs, though a friend kindly tried to take some for me, our ladder proving too short to admit of getting the camera into position for focusing; but the rough drawing made on the spot with aid of an opera-glass may give a better idea of the feeding position assumed by mother bird than my description has done." [Naturalist, 1886].

So we learn that HSG visited Cotuit, owing to his zoological interest, in the summer of 1885. In the following years his permanent residence was in Paris, France where he resided until his death in 1916. He completed his histological education, investigated marine organisms on the Atlantic coast, and improved some optical apparatus (the Greenough stereomicroscope being his most pervasive improvement).

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We would like to thank Dr. M. B. for his intensive literature researches.

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