'The Extent of These Materials is Simply Enormous': The Creation and Publication of *The Medical & Surgical History of the War of the Rebellion* from 1862 to 1888

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ABSTRACT: As a major component of its creation in 1862, the Army Medical Museum (now the National Museum of Health and Medicine), was to produce *The Medical and Surgical History of the War of the Rebellion*. This project was planned to discuss every aspect of military medicine encountered during the American Civil War. This was not the first time that a medical history of a war had been written; the British had produced a book on their medical experiences in the Crimea, and a similar account by the French was in preparation when America's war began. However, the American Civil War was of a different order of magnitude and so was its *History*. Using records such as correspondence, reports, memorandum and drafts of the project, this paper discusses the writing and producing of the six volumes, as well as their reception. An encyclopedic medical treatise based on case histories, the History

is a systematic, statistical compilation of the types of injuries and diseases a military surgeon could expect to treat, along with discussions of and examples of treatments. It was not a textbook but rather a reference book, a compendium of experience. Army surgeons John H. Brinton, George Otis and J.J. Woodward directed the project and amassed thousands of specimens and accounts from surgeons and doctors, including Confederates, while records of the Pension Office were heavily utilized to follow up cases. Museum specimens were photographed, and engravings, lithographs and photomechanical prints were made to illustrate the text. The giant undertaking was a triumph of medical research which eventually took twenty-three years and more than 6,000 pages to complete and weighed fifty-six pounds. When finished in 1888, both editions of the six volumes apparently had cost well over $100,000 to produce.
KEYWORDS: Civil War, surgery, George Otis, J.J. Woodward, Army Medical Museum, military medicine, pathology, US Army.

A product of the nineteenth century's philosophy of natural history, the *Medical and Surgical History of the War of the Rebellion* is an encyclopedic medical treatise based on case histories resulting in a systematic, statistical compilation of the types of injuries and diseases a military surgeon or doctor could expect to treat, along with discussions and examples of treatments. It was not a textbook, but rather a reference book, a compendium of experience. A triumph of medical research, this giant undertaking finally weighed fifty-six pounds and took twenty-three years and over 6,000 pages to complete. By the time it was done, both editions of the six volumes - three each of Surgical and Medical concerns - apparently cost well over $100,000.[1] The illustration plates for the second editions of the second and third Medical volumes alone cost $29,510. Since the *History* itself was a distillation of millions of pages

1. Woodward to Assistant Surgeon General Charles Crane, 29 July 1875, OHA 28: Curatorial Records: Woodward Letterbooks, 1864-1883, Otis Historical Archives, National Museum of Health and Medicine, Armed Forces Institute of Pathology, Washington DC. Hereafter cited as OHA 28 and all OHA citations are from the Archives of

of medical information, this article reviews its creation and a few points of interest, rather than the contents of each volume.

Only a few weeks after taking over the U.S. Army Medical Department in May of 1862 as a reformist political appointee, Surgeon General William Hammond established the Army Medical Museum, the first federal medical research facility. Hammond, although serving in the Army in the West, had joined the Philadelphia Biological Society while on sick leave. His experiences there seem to have influenced his conception of the Museum and a medical history of the war.[2] Government-funded medical research, which is now seen as a commonplace role, began with Hammond's creation of the Museum. The records collected by the Museum during the war, and indeed the entire idea of the Museum, were to produce the *Medical and Surgical History of the War of the Rebellion.*[3] This was not the first time that a medical history of a war had been written; the British had produced a book on their medical experiences in the Crimea, and a similar account by the French was in preparation when America's war began[4]. However, the American Civil War was of a different order of magnitude and so was its *History*. The six-volume set attempted to discuss every aspect of military medicine encountered during the Civil War. The massive Northern bureaucracy and organization was replicated on a smaller scale in the Surgeon General's Office. Hammond, brought in to replace the superannuated Surgeon General Clement Finley and to shake up the hidebound Department,[5] created his own, far larger, bureaucracy with its own

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the Museum.

2. Bonnie Ellen Bluestein. "The Philadelphia Biological Society, 1857-61: A Failed Experiment?" *Journal of the History of Medicine and Allied Sciences* April 1980, pp. 188-202. More information on Hammond can be found in Evelyn S. Drayton, "William Alexander Hammond 1828-1900: Founder of the Army Medical Museum," Military Surgeon, *109*, 4, October 1951, pp. 559-565 and Bonnie Ellen Bluestein, *Preserve your Love for Science: Life of William A. Hammond, American Neurologist* (Cambridge University Press, 2002).

3. Hereafter referred to in the text as the *History*. Cited in notes as *MSHWR*, Medical or Surgical volume number.

4. United States Army Surgeon General's Office. *Circular No. 6: Reports on the Extent and Nature of the Materials available for the preparation of a Medical and Surgical History of the Rebellion* (Philadelphia: Lippincott, 1865), p. 2.

5. For more information, see Mary C. Gillett, *The Army Medical Department 1818-1865* (Washington, DC: United States Army Center of Military History, 1987).

policies, forms and regulations. Reports were revised time and again to ensure the clear flow of knowledge back to Washington. The History could only be done by a large, and soon to be permanent, bureaucracy.

The project was assigned by Surgeon General William Hammond to Museum curators John Hill Brinton and Dr. Joseph Janvier Woodward. Brinton had the responsibility to compile the Surgical (i.e. injuries) section and Woodward the Medical (i.e. diseases) section. When Brinton left the Museum, George Otis took over the Surgical section. Both Otis and Woodward had been recommended for their assignments by Assistant Surgeon General Charles Crane.[6] Surgeon General Joseph K. Barnes, who succeeded Hammond, and Crane's support for the project never flagged as the years went by. Accounts were solicited from surgeons and doctors, including Confederates, and the records of the Pension Office were heavily utilized to follow up cases. Museum specimens were photographed; engravings, lithographs and photomechanical prints were made to illustrate the text. Books, photographs, specimens, equipment - all were purchased although not at the rate the authors would have preferred.

Brinton was well-suited to the task of creating both the Museum and the *History.* Born and raised in Philadelphia, he was thirty years old when assigned to create the Museum. He had received his medical degree from Jefferson Medical College in 1852 and a master's degree from the University of Pennsylvania a year later. After a year of study in Paris and Vienna, the centers of medical education at that time, he returned to practice in Philadelphia. He taught surgery at Jefferson Medical College until the outbreak of the war. Enlisting as a volunteer surgeon, Brinton served in the West with Grant and Sheridan before transferring to Washington to work on the Museum.[7]

Brinton's colleague, J.J. Woodward, had been assigned to the Surgeon General's Office on 19

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6. John C. Hemmeter, “Joseph Janvier Woodward, Brevet Lieutenant Colonel, U.S. Army, Pioneer in Photomicography, Pathologic Histology and Medical Historian of the Civil War,” *Military Surgeon,* 1923, *52*, 635-647, p. 647.

7. John S. Haller, Jr., “Preface” in John Hill Brinton, *Personal Memoirs of John H. Brinton, Civil War Surgeon,*

May 1862.[8] Woodward was also from Philadelphia, where he was born on 30 October 1833. He received his medical degree from the University of Pennsylvania in 1853 and, like Brinton, a master's degree afterwards. He began practicing medicine in Philadelphia and, until the outbreak of the war, conducted research and published several papers on cancer.

Other people besides Brinton and Woodward helped establish the Museum. Frederick Schafhirt, a German-trained anatomist, was hired in 1862 to prepare bones for the collection. He had worked for Joseph Leidy at the University of Pennsylvania and "was adept in preparing and mounting specimens for a museum."[9] At various times, Schafhirt's two sons, Adolph and Ernst, assisted him.[10] He remained with the Museum until his death in 1880. Daniel S. Lamb, who was with the Museum for sixty-five years, joined the staff as a hospital steward on 3 November 1865. Lamb, a native of Philadelphia, was born in 1843 and enlisted in the Army at age eighteen and spent the war serving in military hospitals. After joining the Museum, he earned his medical degree from Georgetown University. Lamb became the staff pathologist and essentially ran the Museum from 1883 until the entry of America into World War I in 1917.

Along with Brinton, both Otis and Woodward brought an immense learning to the project, surveying all that was known on a subject before drawing any conclusions. Woodward wrote, "In view of the many errors of fact scattered through the text-books, some of which have been repeated for ages by authors copying from each other, I early resolved that, so far as possible, I would cite no authority not before me when I wrote; and that, for the convenience of subsequent students, I would in every case give

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1861-1865, (Carbondale: Southern Illinois University Press, 1996), pp. xv-xxiv.

8. Daniel S. Lamb, *A History of the United States Army Medical Museum 1862 to 1917 Compiled from the Official Records*, unpublished manuscript, Otis Historical Archives, National Museum of Health and Medicine, p. 2.

9. John Hill Brinton. *Personal Memoirs of John H. Brinton, Civil War Surgeon, 1861-1865*, (Carbondale: Southern Illinois University Press, 1996), p. 182.

10. Henry, Robert S. *The Armed Forces Institute of Pathology: Its First Century 1862-1962*, Washington: Office of the Surgeon General, 1964, p. 22.

not only the name of the author but the edition and page to which each citation referred."[11]

Otis and Woodward traced diseases through history. Woodward asked Otis, "Will you do me the very great favor to request one of the distinguished French Physicians with whom you have the honor to correspond, to obtain for me at the Bibliotheque Nationale of Paris a textual copy of that part of the Greek Manuscript of Ætius which corresponds with the heading and first sentence of ... the Latin translation of J. Cornarius, Basel Ed. of 1532..." Woodward wished to ensure the two translations he had were both from the original Greek document on diarrhea.[12] The books collected to fulfill this need to review directly all known information on a subject formed the foundation, under John Shaw Billings's direction, of the National Library of Medicine.

On 9 June 1862, the *History* was publicly announced to the Medical Department. Hammond's *Circular No. 5* assigned the writing of the *History* to Woodward and Brinton and requested many types of information from medical officers. To promote compliance, the announcement promised to put the contributor's name in print for the ages.

Charged with writing the *History*, while also creating the Medical Museum, both Woodward and Brinton had their own ideas on how to proceed. They both began collecting specimens from surgeons in the field.[13] Woodward began looking at statistics, publishing *Circular No. 15: Sickness and Mortality of the Army during the first year of the War*, an eight-page survey, on 8 September 1863. Brinton soon published his statistical survey, *Circular No. 9: Consolidated Statement of Gunshot Wounds* and then proceeded to ignore the cold, dry numbers and solicited descriptive battlefield reports.

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11. *MSHWR*, Medical II, p. iv.
12. Woodward to Otis, 27 December 1875, OHA 28.
13. See John Hill Brinton and William Moss, *Catalogue of the Army Medical Museum*, (Washington: Government Printing Office, 1863) for information on the earliest collections of the Museum. This was soon superseded by a larger three-volume set: Alfred A. Woodhull, *Catalogue of the Surgical Section of the United States Army Medical Museum* (Washington: Government Printing Office, 1866); J.J. Woodward, *Catalogue of the Medical Section of the United States Army Medical Museum* (Washington: Government Printing Office, 1867); Edward Curtis, *Catalogue of the Microscopical Section of the United States Army Medical Museum* (Washington: Government Printing Office, 1867).

Brinton envisioned the surgical history as a chronological one, following the war, battle by battle. In the first Surgical volume, Otis described Brinton's plan:

> In the preparation of the surgical portion of the *Medical and Surgical History of the War of the Rebellion*, it was at first proposed to treat the surgery in connection with the military operations in the several battles and campaigns. ... After giving a general account of a campaign, enumerating the troops engaged, the mode of transporting the injured, and the available hospital accommodations, the wounds and operations of each engagement were discussed, the reports of medical directors, and all other reliable sources of information being brought into requisition. Among these were observations personally made in the base and field hospitals of the armies of the Potomac and of the West, after the great battles, where much valuable surgical material was collected, including admirable illustrations of the graver injuries, pathological specimens, and a series of excellent surgical drawings.[14]

In keeping with his plan to track surgery in the war through each battle, Brinton needed maps of the battlefields. "A great desideratum is a map of the locality with the position of the hospital correctly laid down. This I could have engraved and inserted in the Book," he wrote to Surgeon John Craven who had reported on skirmishes on Morris Island, South Carolina.[15] In later years, Brinton felt that he did not get enough credit for his initial work on the surgical portion. In his autobiography, he wrote:

> By the way, I may add that this map [of Antietam] and nearly all the other field hospital maps, etc., of great battles in that book, except the extreme southern campaigns, were prepared under my direction when stationed in the Surgeon-General's office in Washington. The were

14. *MSHWR*, Surgical I, p. xiii.

> modified and reduced by an artist named [Pohlers], from the topographical maps, and the position of the hospitals I usually had located by any medical inspectors or other medical officers, who might know the ground well. My name does not appear in any of this work, but it was designed by me, and much of it executed under my direct superintendence. Some was done by my successor after my departure from Washington.[16]

The maps were published, along with the field reports solicited by Brinton, in the appendix of the first Medical volume. They were credited to Woodward and Otis; Brinton's name was not mentioned although Otis credited him in the opening paragraph of the first Surgical volume.

Brinton encountered difficulties in gathering information to research bullet wounds. He found reports coming into the Museum listed gunshot wounds without accompanying information such as part of the body wounded or results of surgery. Another problem was patients being counted as new cases each time they were transferred from hospital to hospital.[17] Brinton was forced to state, "The inadequacy of the entries in the ...monthly report of sick and wounded was early acknowledged, and it was officially declared that previous to September, 1862, 'the surgical statistics of the war were absolutely worthless,' and that 'the only information procurable is such as can be derived from the examination of a mass of reports, all of which present merely certain figures under the vague and unsatisfactory heading, *Vulnus sclopeticum* [gunshot wound].'"[18] New forms, reports and registers were designed in late 1863 by a special board of medical officers. A small register was given to officers to use in the field. Two larger ones, one for information on the sick and wounded and one for surgical operations, were used in hospitals with new quarterly report forms. The new information, as well as specimens, arrived in the Museum to be

15. Brinton to Craven, 22 August 1863, OHA 15: Curatorial Records: Letterbooks of the Curators, 1863-1910.
16. Brinton, *Personal Memoirs*, p. 206.
17. Ibid, pp. 249-50.
18. Brinton, *Consolidated Statements of Gunshot Wounds*, quoted in *MSHWR*, Surgical I, p. xxv.

processed by doctors and clerks for use in the *History*.[19] Woodward, like Brinton, had problems gathering information. Soon after he was placed in charge of the Division of Medical Records, Woodward realized that the then-current forms with spaces for 143 diseases worked fine during peace but were inadequate in war.

Circular 6

When Otis succeeded Brinton as curator of the Medical Museum, he also became responsible for the Surgical section of the *History*. Before the close of the war, Otis realized that Brinton's plan to write a surgical history of each battle would not work due to the sheer amount of information being received. "During that year [1864] there were no less than two thousand skirmishes, actions, or battles, and to have given a correct analysis of the casualties from the returns from the field and base hospitals would have been impossible."[20] Instead, Otis decided to arrange the Surgical volumes by type of wound and region of the body. The battlefield reports that Brinton had already collected would be an appendix to the first Medical book. He promoted his new plan in the Museum's first major post-war publication, *Circular No. 6: Reports on the Extent and Nature of the Materials available for the preparation of a Medical and Surgical History of the Rebellion.*[21]

Otis and Woodward published *Circular No. 6*, heavily illustrated with woodcuts and lithographs, on 1 November 1865. The *Circular* became the blueprint for the *History*. In keeping with the planned format of the *History*, Otis wrote the Surgical report while Woodward produced the Medical one. The book, which it certainly is at 166 pages, purports to be a report to Surgeon General Barnes from Otis, "in response to your inquiries relative to the nature, extent, and value of the surgical data that have accumulated in the department of your office under my charge."[22] Barnes knew very well what Otis and Woodward were doing, especially in light of the considerable financial costs of the project. *Circular 6*

19. *Circular 6*, p. 3-6.
20. *MSHWR*, Surgical I, p. xiii.
21. Hereafter cited in text and notes as *Circular 6*.

was even published by the noted medical printer J.B. Lippincott of Philadelphia. The first edition of 5,000 copies cost well over $6,000. When Lippincott raised the issue of selling copies of the book, Otis replied, "I am directed by the Surgeon General to acknowledge your communication of the 22nd inst. and to instruct you to refer all applicants for copies of Circular No. 6, S.G.O. 1865, to this office. The Surgeon General does not entertain favorably the proposition to supply demands from booksellers, but decides that all issues must be made gratuitously from this office."[23] *Circular 6* was aimed at the medical officers of the Army, to whom it was distributed freely, to encourage their continued enthusiasm for, and participation in, the projected *History*. Otis wrote to a prospective contributor, "In reply to your communication I would state that Circular No. 6, S.G.O. 1865, is distributed to all medical officers who rendered faithful service during the late war and who have notified this office of their P.O. addresses... It is proposed to distribute future publications relative to the medical and surgical history of the war to those medical men who have contributed or who shall contribute to the material from which such publications may be compiled."[24] Much of the expense of such free publications was made possible by the transfer to the Museum of slush funds from the closing hospitals.[25]

Both Woodward and Otis wrote extensive introductions on their materials and methods before presenting specific examples of information available for the *History*. Otis began his report by discussing the types and quality of the data available to him:

> The materials in the office relating to the surgery of the late war consist of the reports of the medical officers engaged in it, and of illustrations of these reports in the shape of pathological specimens, drawings and models. The documentary data are of three kinds; first, the numerical returns, in which the number alone of the different forms of wounds, accidents, injuries, and

22. *Circular 6*, p.1.
23. Otis to Lippincott & Co, 24 February 1866, OHA 15.
24. Otis to Roberts, 11 May 1866, OHA 15.

> surgical diseases is given; secondly, what might be called the nominal returns, in which are furnished the name and military description of each patient, and the particulars of the case, with more or less of detail; and thirdly, the miscellaneous reports... In the third class are included the reports of medical directors of armies in regard to the operations of the Medical Department, and the succor given to the wounded; reports and dissertations on new methods and modes of treatment, and modifications of surgical apparatus and appliances; pathological researches on morbid processes pertaining to surgery, as hospital gangrene, osteomyelitis, pyaemia, and the like; plans for ambulance organization, and the transportation of the wounded by land and water.[26]

"The extent of these materials is simply enormous," Otis continued. By comparison with the British and French experience in the Crimea, where the combined armies had suffered 653 gunshot fractures of the femur, over 5,000 such cases were reported to Otis. Otis recognized and explained the value of this material, saying:

> It may be emphatically said that they throw much light on some of the great moot points in surgery; that they comprise on some subjects, as, for example, on the question of the propriety of excising the head of the femur for injury, fuller data than are now extant in the entire range of surgical literature; and that it may be hoped, without temerity, that they include the elements for the solution of many grave surgical problems.[27]

Otis laid out *Circular 6* the way he anticipated organizing the *History*. He covered wounds of the body, starting with the head and working down. He then examined surgical treatments such as excision and

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25. Lamb, *History*, p. 37.
26. *Circular 6*, p. 1-2.
27. Ibid., p. 3.

amputation. A brief overview of the medical department staff was followed by a review of the medical resources, including transportation, available to the surgeons. Otis optimistically ended his report,

> In conclusion, it has been estimated that it will be possible, by judicious condensation, to include in one large quarto volume the statistics of the graver injuries, as fractures of the extremities and wounds implicating the joints or great cavities, and of the major surgical operations they have involved, the individual cases, their progress and results, being concisely recorded; while a second quarto volume could comprise numerical tables of the less serious injuries, an historical summary, and a discussion of the lessons derived from the statistical records of the war.[28]

In fact, none of these estimates were accurate, and Otis's plan for the Surgical history was much altered when it began appearing. An additional 600-page volume proved necessary to cover the topic adequately.

Woodward's report to Barnes followed much the same pattern as Otis's. He listed the available material that he would be using:

> The matter collected is partly statistical, partly pathological. The first category embraces the medical statistics of the several armies and general hospitals. The second consists of a number of memoirs and reports by medical officers on the causes, symptoms and treatment of the more important camp diseases, of numerous histories of cases and autopsies, of the fine series of medical and microscopical specimens in the Army Medical Museum, and of the results of the pathological studies conducted under my direction of the basis of these collections. In addition, there are a large number of descriptions and plans of general hospitals, of reports on hospital organization, and some other miscellaneous matters.[29]

28. Ibid., p. 88.

Woodward's statistical work led him to conclude that fewer troops died from disease in the Union Army than during any previous war, but that the mortality rate for soldiers due to disease was more than five times higher than expected for a similar group of men during peacetime. The rate of deaths due to disease was also far higher than that from injuries. Facts like these enabled Woodward to state unequivocally the value of the *History*:

> Such a publication, therefore, becomes one of the most important duties of the Medical Department of the army; a duty the evasion or neglect of which would be a grave crime against the army of the United States, and against every American citizen who, in future wars, volunteers in the defence (sic) of his country."[30]

Woodward's primary interest for his first volume lay in statistics. He defended his data against criticism of two types. Diagnostic errors would be eliminated by combining similar diseases that might have been confused by doctors. Diseases of the eye would all be put together under "ophthalmia" to highlight the most important fact -- disease of the eye occurred at a certain rate in the Army. Errors of negligence were a bit more difficult for Woodward to address. Woodward answered these critics, saying the reports during the war to the Surgeon General "contain internal evidence of the care with which they were prepared, and, it is believed, will compare favorably with any other set of statistical papers in existence."[31] It was true that some reports were never made, were lost or were badly done, but in light of the sheer mass of information, in Woodward's view, they became statistically insignificant.

Woodward, like Otis, organized the *Circular* as he would the *History*. He discussed the mortality

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29. Ibid., p. 89.
30. Ibid, p. 90.
31. Ibid, p. 92.

rate of the Army and statistically examined the disease rate. He previewed the Medical and Microscopical sections, the two Museum sections under his care, relating details of individual cases. A full color lithograph by F. Moras after artwork by Hermann Faber was included; plates by this team would be published in the third Medical volume twenty-three years later. Woodward closed with a discussion of the design of hospitals during the war. He included lithographs that were later not reproduced in the *History* such as a "Birds Eye View of Lincoln General Hospital."

Woodward's projections for his volumes were more accurate than Otis's:

> In conclusion, I may express the opinion that, with the utmost brevity and care, it may be hoped to digest the material above sketched, not including surgical cases, into three quarto volumes... The prominent subjects in these volumes would be the medical statistics of the several armies, with the principal facts in their medical histories; the medical statistics of the several general hospitals, with descriptions of their construction and administration, illustrated by a sufficient number of ground plans and perspective views to give a just idea of them; and lastly, an account of the causes, history, symptoms, pathology, and treatment of the principal diseases of the troops, based upon statistical facts, contributed papers, histories of cases and autopsies, and observations made in the medical and microscopical sections of the Museum. ... Of the subjects thus indicated, about one-half of the statistical matter is compiled, and most of the material required for the remaining portion of the work is collected, and can be prepared for the press with reasonable rapidity.[32]

Woodward correctly estimated that three volumes would be necessary while Otis only planned for two of the final three; neither, however, would live long enough to see the work completed.

32. Ibid., p. 166.

Circular 6 proved to be extremely popular; on 9 February 1866, four months after it was printed, Otis requested a bid from Lippincott for a second edition of 2,500 copies. No substantial changes were to be made. "With the exception of the correction of typographical errors, the second edition must be in every respect uniform with the first," were his instructions.[33] Otis negotiated with Lippincott over the price of the second edition; he was willing to pay $1.28 per copy for a total cost of $3200, not $3475 as Lippincott had requested.[34] *Circular 6* was the last volume that Lippincott, who had printed forms and books for the Museum through the war, would handle; in the future, Museum publications were usually done by the Government Printing Office.

Technical production

Brinton's major artist was Edward Stauch, "who had enlisted, tempted by the bounty [money paid to volunteers], or to avoid the draft, and had immediately been detailed on this special duty as water colorist at the Surgeon-General's Office."[35] Brinton thought highly of Stauch's work, if not of Stauch personally:

> E. Stauch was a German water-colorist. His work was very fine, and his coloring exquisite. He came to me in the early part of 1863, or the end of 1862. He accompanied me in several visits to the army in the field, and frequently visited the hospitals with me, especially to make pictures and sketches of the hospital gangrene cases, occurring in our troops sent north and exchanged from the Southern prisons. ... He was a most excellent artist, and when in a good humor, or well satisfied, could, and would, work well, and with tolerable rapidity. Like so many artists, however, he was capricious and irritable, and when these fits were on him, he could not be depended on. When I took him with me to the army, I always took great care of his bed and food,

33. Otis to Lippincott, 9 February 1866, OHA 15.
34. Otis to Lippincott, 15 February 1866, OHA 15.
35. Brinton, *Personal Memoirs*, p. 231.

> far more than I did of my own. I worked with him thus. I first selected the patients to be pictured on the field or in the hospital. Then the point of injury, say the wounds of entrance, were carefully painted by Stauch in oil. Next a pencil outline sketch was taken of the general locality. This work he did with great rapidity, and then when he reached Washington again, the beautiful pictures you will see in the *Surgical History* were elaborated.[36]

Unfortunately, Stauch did not survive the war. He died on a trip home to Philadelphia after successfully sketching wounds at the siege of Petersburg, Virginia. Brinton, who had gone to Philadelphia to find Stauch, thought his illness "probably of some nervous type, the result of exposure or of mental disturbance."[37] Stauch's death left a hole in the Museum's ability to produce medical illustrations, a hole both Brinton and Otis deplored. Otis, crediting Stauch's work years after his death, wrote, "The gifted artist, Mr. STAUCH, whose services Surgeon Brinton had fortunately secured, after preparing many water-color drawings of recent injuries, at the field hospitals, died from pernicious fever contracted before Petersburg, without completing the exquisite studies of embolism, cranial abscess, false aneurism, osteomyelitis, and gangrene, which he had drawn from dissections made at the Museum."[38]

Hermann Faber was the Museum's other main artist. Faber, a trained artist who emigrated to America from Germany, has been described with his sons as "the founders of medical illustration as a profession in this country." He did many illustrations for the Museum, mostly for Woodward's *Medical History*. After the war, he moved to Philadelphia and continued his career as a medical illustrator along with two of his sons.[39]

Otis seems to have assigned more value to the position of 'photographic artist' than Brinton did. Most of the Army Medical Museum's early photographic work was done by Philadelphian William Bell

36. Ibid., p. 285-6.
37. Ibid, p. 287-8.
38. *MSHWR*, Surgical I, p. xxviii.

in the Museum's studios. Bell joined the Museum staff, reenlisting in the Army as a hospital steward, on 22 February 1865.[40] A professional photographer in civilian life, Bell replaced Wills as the main photographer in the Museum while Wills stayed as his assistant.[41] Bell might have been recommended to Otis by Constant Guillion, the president of the Philadelphia Photographic Society.[42] Otis had written to Guillion, requesting advice on the purchase of camera equipment as Otis felt much of the equipment he purchased was defective.[43] Otis undoubtedly needed Bell; two weeks earlier, Otis had had to turn to L. W. Walker, the Treasury Department photographer, to test a camera that he had ordered for $182.00.[44] Bell had served in the Mexican War with the 6th Louisiana Regiment, U.S. Volunteers. After the war, he moved to Philadelphia and worked as a daguerreotypist. In 1862, he again enlisted in the Army, this time in the 1st Pennsylvania Volunteers, fighting at Antietam and Gettysburg.

In addition to photographing specimens and wounded veterans who visited the Museum, Bell did other photographic work, little of which has been credited to him. Bell, and later Ward, took dozens of portraits of notable Washington personalities and visitors. Bell photographed General Seth Williams at the Medical Museum. Otis recalled, "The picture was taken at the Army Medical Museum, and a few prints were prepared, after which the negative was sent to Brady, from whom a number of General Williams' friends have procured copies of the photograph. The negative is still in the keeping of Mr. M.P. Brady, (Brady & Co) 352 Penna Avenue, Washington, D.C."[45] The negative, taken with a carte de visite camera, actually had four images of Williams on the plate. Broken in half, one section remains in the Medical Museum while the other is in the National Archives credited to Brady.

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39. “Ars Medica,” *Medical Affairs University of Pennsylvania*, October 1968, pp 2-10.
40. Although Brinton says in his autobiography, "In the latter part of the summer [or 1864], a photographic bureau was added to the Museum, and I had to see to engaging the proper artists and outfit. I succeeded after much trouble in procuring an excellent artist, named Bell..." Brinton, *Personal Memoirs*, p. 284.
41. Lamb, *History*, pp. 33, 35.
42. Unfortunately letters arriving in the Museum have been missing since at least 1917. Lamb labored under the same difficulty in producing his *History*. Lamb, *History*, p. 144.
43. Otis to Guillion, 13 December 1864, OHA 15.
44. Otis to Holmes, Booth and Haydens, 9 February 1865, OHA 15.
45. Otis to George E. Hastings, 15 June 1866, OHA 15.

When his second term of enlistment lapsed on February 22, 1868, Bell returned to Philadelphia and opened the Bell & Silver photographic studio. He continued working for the Museum, writing to Otis on 28 May 1868, soon after leaving the Museum, "I express today to the Army Medical Museum, Negatives and Prints of 'Durkins' Case... the Quality of the Negatives and Prints will I feel assured equal any done while under your Orders in Washington."[46] In an undated letter to Otis, Bell said, "While there [at the Philadelphia Pennsylvania Hospital] endeavored to see if there was anything that would be of value to the Museum but saw nothing..."[47] Bell continued working for the Army and went with Lieutenant Wheeler's expedition to the West in 1872. He returned to Philadelphia in 1875 and was the photographer for the Pennsylvania Railroad until once again joining an official expedition, this one to Patagonia in 1882 to photograph "The Transit of Venus" across the face of the sun. Bell did early work in designing a dry plate negative, making photography far easier, safer and cheaper. He died in Philadelphia in January, 1910.[48]

Engravings were made from small-format photographs, roughly carte de visite size, taken of museum specimens to illustrate the *History*, the *Catalogue* and other publications of the Museum. This was by far the most common way the Museum published its photographs. When *Circular 6* was published soon after the war, the Museum had two staff engravers, probably hospital stewards and the specimens in the Museum were already being photographed for the engravers.[49]

The Museum could not achieve the technique of printing a photograph on wood for its early publications such as *Circular 6*. In June, 1866, Otis wrote to William Washburne of Lippincott & Co. requesting advice on photoengraving:

46. The picture was published as Surgical Photograph #194. Otis's text for the photograph claims that Durkins visited the Museum to have his picture taken. This seems unlikely in light of the ornate mirror and rug in the picture.
47. Bell to Otis, OHA 26: Curatorial Records: Special Correspondence, 1862-1887, Box 2 - Photography.
48. OHA 111: Bell Collection, 1865-1910, Folder 5 Obituaries.
49. *Circular 6*, p. 7.

> Can you do me the favor to enquire of the wood engravers in Philadelphia what process they find most available for securing photographic impressions on wood blocks. I have tried a great variety of plans, using black coatings and making ambrotypes on the block, and white coatings on which, after silvering, the object is printed from a negative in the usual way. But all my results are unsatisfactory to the engravers, and practically I am compelled to continue to use photographic prints on albumen paper, which are subsequently traced and transferred by draughtsmen on the wood blocks. I know that Sears and others in New York have a simple method of photographing directly on the wood; but I cannot find out from any one here, nor from any of the books on photography what the method is. If you could get the merest hint from the engravers, we could follow up the clue and perfect the process. I don't expect to get better pictures by photographing on wood directly; but the profession will perhaps be better satisfied of the exact fidelity of the illustrations, if this plan is adopted.[50]

Even in 1874, few photographs were printed directly on wood in the Museum; most were still being drawn by the draughtsman for the engraver. In April 1874, only five photographs were made on wood by Ward, while forty-one drawings and fifty engravings were done.[51]

Nichols's and Wells's work was still considered technically excellent. Otis had tried contracting some of the work to Lippincott and Co., but:

> The critics here do not esteem the work equal to that done by our own engravers. It is fine and delicate, but does not represent the texture of the unbroken and fractured or necrosed surfaces of bone as accurately as is done by the engraver (sic) who work steadily on this particular branch. Such at least is the verdict of the artists and officers here, who are perhaps not impartial judges. I

50. Otis to Washburn, 19 June 1866, OHA 15.

think in future I shall have the mechanical drawing done in Phila[delphia], and the pathological illustrations illustrated here.[52]

After Wells completed the image's transfer and Nichols finished his engraving, the wood block was sent to Philadelphia or New York to be electrotyped. The wood block engraving was pressed in wax and then copper or nickel was electrolyzed to cover the wax and produce the electrotype printing plate. The electrotype block, which could be set in with the type for the book to be printed, was easier and cheaper to use than lithographs or photomechanical prints, which had to be individually printed and then bound into the typeset pages.

Lithography was the Museum's initial choice for reproducing artwork and photographs in publications. Many lithographers were used by the Museum. John Cassin of Bowen & Co. in Philadelphia did two-color chromolithographs for *Circular 6* at a rate of no more than $150 per 1000 prints.[53] Thomas Sinclair of Philadelphia did the lithographs for the circular. Sinclair & Son and Julius Bien of New York city did most of the chromolithograph plates for the Surgical volumes.[54] Otis was an exacting taskmaster, frequently requiring modifications in the chromolithographs. He wished them to be exact in a medical sense with correct coloration of tissue and injuries, but he had aesthetic requirements as well. A lithographer was told, "I find the flesh tints too highly colored, the face especially too florid. The man had been confined to a hospital for more than a year and was probably pale and less fleshy than would be inferred from your representation of his remaining leg. The gray of the cap and jacket has too much blue in it. You must give the regular pepper and salt dirty Confederate gray. In the stump you should follow the drawing sent you quite closely. Do not omit the eight dots which represent the scars of the punctures

51. Parker to Otis, 30 April 1874, OHA 15.
52. Otis to Washburn, 23 May 1866, OHA 15.
53. Otis to Cassin, 3 November 1866, OHA 15.
54. Otis to Sinclair, 26 January 1876, OHA 15.

through which the stitches passed."[55]

Otis was willing to countenance extensive modifications of the original work to get a good print. F. Moras of Philadelphia, who did most of Woodward's chromolithographs in the *History*, was asked to do a print for Otis's *Circular 7* and later reprinting in the *History*:

> By this mail I send you a photograph and colored sketch of a patient exhibiting the results of a successful amputation at the hip-joint. I wish to have a chromolithograph prepared of this case to illustrate a circular about to be issued by this office...
>
> The photograph is poor, being enlarged from a carte de visite, and the colored sketch is execrable both in drawing and color. But they were the best pictures I could get of the case.
>
> If possible, I wish to engage you to have a presentable drawing made from the photograph and water-color picture.
>
> What I chiefly wish to illustrate is the appearance of the cicatrix and stump. The painter has rendered the appearance of the healed wound tolerably well, though his tints are bricky. He has dislocated the right ankle and knee by turning the foot out too far, and has immensely exaggerated the size of the face. Please to have an outline prepared for me of such a sketch as you would be pleased to have published over your name. Put some accessory such as your taste suggests in place of the unsightly table, and modify the dreadful formal floor. Leave out the gilt watch chain and substitute something for the particolored neck-tie. The vest must be of army blue. The background seems to me well enough. I like the arrangement of the shirt in the

55. Otis to Rosenthal, 11 April 1867, OHA 15.

aquarelle better than in the photograph, though in the former it is brought down rather too low on the stump. With the aid of the photograph I have confidence that your artist can give a correct anatomical drawing, and I trust that he will also produce a pleasing chromo-lithograph...[56]

For the second edition of the first Surgical volume and the second and third Surgical volumes, Otis had most of the chromolithographs done by Thomas Sinclair. Bien, described by Otis in 1867 as "the best lithographer we employ," could not meet Sinclair's prices.[57] Bien and Sinclair were the only lithographers Otis used after the first edition of the first Surgical volume. He wrote to the Surgeon General that "I can learn of no other lithographers willing and competent to undertake the work."[58] Sinclair and Son were paid $1,080 for 10,200 copies of a chromolithograph for the second Surgical books.[59] Woodward had his chromolithographs done by F. Moras. The colors were supervised on contract by Hermann Faber, who had done the original artwork a decade earlier while at the Museum.[60]

For the second book in both the Medical and Surgical series, Otis and Woodward began using woodburytype photomechanical prints in place of black and white lithographs. The woodburytype looks extraordinarily like a photograph, tipped-in on the page. Walter B. Woodbury patented the process in 1864. A positive gelatin relief was printed from a collodion negative and hardened by exposure to light followed by an alum bath. The relief was dried and placed in a hydraulic press with a lead plate to form a lead mold. The lead mold was filled with a colored gelatin, which was used as the 'ink' for the photograph, and pressed on paper. When the gelatin cooled, it glued to the paper and a print was formed. After hardening in the alum bath, the print was trimmed and tipped onto a mount. It could then be bound into a book. The prints were described as "the finest pictures ... perfect in light and shade, of exquisite

56. Otis to Moras, 25 January 1867, OHA 15.
57. Otis to Sinclair & Son, 17 August 1874; Otis to Fauntleroy, 22 May 1867; Otis to Bien, 19 September 1874, all OHA 15.
58. Otis to Barnes, 21 June 1874, OHA 15.
59. Otis to Sinclair and Son, 7 July 1875, OHA 15.

tone and brilliancy, and leaving nothing desirable but color to make complete pictures."[61] John Carbutt bought the American rights to the process. In Philadelphia, he established the American Photo-Relief Printing Company, and in 1871, he was able to begin printing.[62] Carbutt began working for the Museum that year, printing a plate for Woodward's *Report to the Surgeon General of the United States Army on an Improved Method of Photographing Histological Preparations by Sunlight.*[63]

The Museum, instead of sending Carbutt the original glass plate negatives, made the positive gelatin relief and shipped that. Otis wrote,

> "I shall send you on Monday the gelatine films of specimens 2749, and of 4170. These are designed for photo-relief prints to be numbered respectively Plates XIX and XLIV of the Second part of the Surgical History. Congress having directed a second edition of this work, the Surgeon General instructs me to order ten thousand two hundred (10,200) instead of five thousand one hundred (5,100)."[64]

Like the lithographers, Carbutt printed the plate page titles, tipped-in the photograph and returned a completed page for binding by the printers. Surprisingly enough, the cost for a reproduction as either a lithograph or a woodburytype was about the same. Otis said, "By either method the editions would cost about three hundred and fifty dollars for five thousand and a little less than double that amount for ten thousand copies."[65] Otis preferred to use woodburytypes, writing to Carbutt, "...I have regarded this

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60. Woodward to Moras, 3 July 1875, OHA 28.
61. Welling, William. *Photography in America: The Formative Years 1839-1900*, Albuquerque: University of New Mexico Press, 1987, p. 202.
62. Ibid., p. 204.
63. Woodward to Barnes, 4 March 1875, OHA 28.
64. Otis to John Carbutt, 12 September 1874, OHA 15.
65. Otis to Barnes, 24 November 1874, OHA 15.

process as most valuable for scientific illustrations, and have wished to largely avail of it."[66]

Unfortunately, in early 1875, Woodward began finding problems with his prints. Uneasy with the woodburytype, Woodward soon wrote to James R. Osgood and Co. of Boston, who had offered a competing process, the Heliotype, to the Museum the previous summer.[67] The same day, after writing to Osgood, Woodward wrote to Carbutt:

> I laid this matter before the Surgeon General yesterday. He was, of course, greatly surprised and annoyed, and will not authorize the commencement of any more plates unless this matter can be explained in such a manner as to guarantee the safety not only of the future, but of past work. For it must be admitted that the clean manner in which the gelatin film separates in these prints, and the apparent want of any incorporation of the ink with the face of the paper, is calculated to make us uneasy about the permanence even of those plates heretofore completed for our work, which as yet appear to be all right, and suggests the possibility that they may sooner or later crumble away from the paper.[68]

Woodward found problems with the next two plates that Carbutt shipped. On 4 March, Woodward reported on the situation to Dr. Barnes, recounting the difficulties with the plates received from December through February. He stated after meeting with Carbutt in Philadelphia:

> ...Mr Carbutt seems to think their condition due to the disturbing influence of the late unusually cold weather while they were being made, claims to have introduced such modifications in the process as will secure that future plates shall be fully equal to those formerly supplied, and

66. Otis to Carbutt, 15 February 1875, OHA 15.
67. Woodward to Osgood & Co., 12 February 1875, OHA 28.
68. Woodward to Carbutt, 12 February 1875, OHA 28.

expresses a willingness to replace free of charge all those which ultimately prove unserviceable. I gather, however, that his pecuniary ability to fulfil this offer, even if no other plates should spoil than the boxes above mentioned, will depend upon his continuing to receive work from this office.

I regret to say, moreover, that the inquiries I have made have increased the uncertainty first suggested to my mind by this accident, as to the permanency even of those Woodburytype plates which, when first prepared, appeared perfectly satisfactory. I have observed in a number of the oldest of Mr. Carbutt's plates which I have examined since the accident two forms of destructive changes: in some of them portions of the film of moderate size have separated either spontaneously or on slight handling, while in others great numbers of fine cracks have formed, resembling on a small scale those seen in old oil paintings, and in such prints, on a little handling, minute morsels of the film chip off. I have observed both these accidents in a few of the earlier plates prepared for the Medical history, and in a few sample prints procured from Mr. Carbutt (prior to any order being given to him for this office) which were perfectly free from these defects at the time they were first received and for a year or more subsequently. Insignificant as the number of such spoiled prints appear to be, they lead me to believe that molecular changes in the gelatine film of these prints may go on after they are dry, and make me fear that even those prints which now, several years after their preparation, appear perfectly sound are not secure against future destructive changes.

I need not say how much I regret to arrive at this conclusion, for the Woodburytype plates thus far prepared for our work by Mr. Carbutt, give a more faithful and accurate representation of the pathological specimens selected than could be obtained by any other method with which I am acquainted. It is only just to state that a portfolio in which a single proof from each edition

> hitherto prepared for the Medical history was placed when first received lies on a table near my desk, and that although these proofs have been much handled, not one shows as yet any signs of deterioration....[69]

Four days later, Woodward wrote to Carbutt that he had "received official instructions to the following effect: 'The Surgeon General directs that no more orders be given to Mr. Carbutt for execution, by ourself or Assistant Surgeon Otis, until the "Surgeon General may so direct"' which of course implies the indefinite postponement of any further work from us."[70]

The first editions of the *History* were illustrated mostly with the woodburytypes, but the second had many of them replaced. The second Surgical volume (1876), second Medical volume (1879), third Surgical volume (1883) and third Medical volume (1888) all have some tipped-in woodburytype prints since Woodward and Otis had purchased enough of some of the plates for both editions.

Since the work was designed as a "monument" to the medical staff, the Museum hired James R. Osgood & Co. to make heliotypes for some prints and substituted lithographs for others. The heliotype, or collotype as it was usually known, was another photomechanical process. The process used a glass sheet covered with gelatin which was then hardened. A second, photographically-sensitized gelatin layer was then painted over the first. The gelatin was exposed by a negative and developed in cool water and glycerine. The unexposed, and therefore unhardened by light, areas absorbed water and stayed moist. The hardened areas had become water repellent by exposure to light and so did not absorb water. Lithographic ink, which stuck to the hardened areas but not the moist ones, was then put on the plate for printing. The plate could be varnished to give it a photographic appearance, but this was not done for the *History*. Heliotypes reversed the images, but Woodward thought "this will not injure their truthfulness."[71]

69. Woodward to Barnes, 4 March 1875, OHA 28.
70. Woodward to Carbutt, 8 March 1875, OHA 28.
71. Woodward to Hayes, 29 December 1875, OHA 28.

Osgood worked mostly with Woodward, making prints of colons for the second and third Medical volumes. Otis and Huntington used their remaining stock of woodburytypes and then replaced them with lithographs by Sinclair and Son. Otis contracted with Osgood for heliotypes at $274.00 per 5100 but was not pleased with the quality.[72] He had most of the illustrations for the second and third Surgical done by Bien and Sinclair. Woodward used the process extensively for the second and third Medical books.

Photography, more than any other form of illustration, made the Museum's publications possible. Fewer than two hundred pieces of artwork were made for the *History*, while thousands of photographs were used. Photographs were not directly reproduced, though; halftone illustrations were not invented until 1880 and did not become common until after 1890.[73] The photographs of specimens and soldiers still had to be interpreted by the engraver or lithographer. Color was only possible when an artist's work was reproduced via lithography, and the nature of some of the medical illustration required it. By using all of the techniques of medical illustration, the Museum's staff produced a monumental work.

The first volumes

For the next five years, the two men continued working on the first book in each of their respective specialties. Otis pointed out to inquirers, "The Medico-chirurgical history of the British Army in the Crimea was not published, if you recollect till 1858, while the French statistics on the same subject only saw the light a few months ago."[74] Assistant Surgeons like Woodhull and Curtis helped produce catalogs of the three collections in 1866 and 1867, with brief descriptions of cases that could be expanded on and woodcut illustrations that could be reused for the *History*.

Otis produced another monograph, *Circular No. 2: A Report on Excisions of the Head of the*

72. Otis to Osgood, 13 October 1875; 23 February 1876, OHA 15.
73. Welling, *Photography*, p. 263-4.
74. Otis to Lyster, 25 September 1865, OHA 15; the Crimean war was from 1853-1856.

Femur for Gunshot Injury in January 1869. For the femur excision report, Otis had assembled the artistic team he preferred to work with. J. Bien had produced the lithographs and H.H. Nichols had produced the woodcuts over the preceding five years. The amount of people working on such a large task was never very big. The maximum staff Otis had working on the project was "one medical officer, one clerk, and sixteen hospital stewards, occasionally aided by one acting assistant surgeon."[75]

The following year saw the publication of the initial parts in both the Medical and Surgical volumes of the *History*. Unfortunately an odd system was adopted: Woodward's book was designated Part I, Volume I Medical History, and Otis' work became Part II, Volume I Surgical History; for the sake of convenience they will be referred to here as first Medical, first Surgical, et cetera.

Barnes credited Secretary of War Stanton with promoting the publication to Congress; on 8 June 1868, Congress appropriated money and authorized the Government Printing Office to print five thousand copies of each volume. Work began on 3 March 1869, and by November 1870 the books were completely done. Barnes, in his ornate style, states, "Through the liberality of the Government, in its beneficent pension laws, it has been found practicable to obtain accurate histories of many thousand wounded or mutilated men for years subsequent to their discharge from service. As in the official returns of the casualties of the French and English Armies in the Crimean War, the cases were dropped when the men were invalided, pensioned, or discharged from service, this information was considered peculiarly desirable."[76] Barnes's point, that these volumes were the first long-term follow-ups of surgical cases, sets the stage for the development of modern medical studies conducted on groups over a period of years. Otis concurred with Barnes, stating, "Much important and otherwise unattainable information regarding the ulterior consequences of the more important and rare injuries has been collected by private correspondence with invalided soldiers and their surgical advisers. More than fifteen hundred cases have

75. *MSHWR*, Surgical I, p. xxvi.
76. *MSHWR*, Medical I, p. viii.

been examined in this way."[77] Otis also credited the "former medical officers of the Confederate army" for providing much information. He was also able to use Confederate hospital records that had been captured by the Union. Occasionally, Otis would even advertise in newspapers for information on specific cases. But the lion's share of information came from pension records. "[T]he principal sources from which the remote results of wounds, injuries, and operations were ascertained, were the reports of pension examiners, and communications from the surgeons general and adjutants general of States."[78]

Otis had changed the format and content of his volumes in the five years since *Circular 6* was published. The volumes were not arranged into one volume of graver injuries and one volume of lesser injuries, followed by a historical summary and a discussion of lessons learned. Nor were cases of injuries discussed followed by a separate discussion of treatments as in *Circular 6*. Instead, "As nearly as practicable, the wounds and injuries and surgical disease of each region of the body have been arranged together, as the simplest and most natural order that could be adopted. The most interesting clinical histories have been printed in full, or in abstracts including the attainable essential details, and the remaining cases, or sometimes the whole number of cases of the class, are set forth in tabular statements." In other words, each area of the body would have its wounds described and treatments discussed. Otis opened his book with a daily chronological summary of the battles and engagements the Army fought. Then he examined wounds of the upper body. Due to space limitations, in the first Surgical volume only the head, face, spine, and chest were included.

Whenever possible, the clinical histories were credited to the doctor who had treated the patient, preferably in his own words. After the information was presented, Otis discussed it, drawing conclusions and pointing out relevant facts. He was still planning to finish the Surgical section of the *History* in two volumes, but had been forced to move the 'Wounds and Injuries of the Head and Trunk' to the second

77. *MSHWR,* Surgical I, p. xix
78. Ibid.

Surgical volume due to space considerations.[79] Otis's volume was heavily illustrated with woodcut engravings, lithographs and chromolithographs of patients and specimens.

While compiling his research, Otis considered the lessons of the war still useful:

> That the experience acquired during the war should have added largely to every subject connected with military surgery was not to be anticipated. But it may be safely asserted that, in many directions, it has advanced the boundaries of our knowledge. ... [W]hile, before the war, there were few surgeons who chose to undertake operations on the great vessels [the arteries in the neck], there are now thousands who know well when and how a great artery shall be tied. ... Without further illustration, we may claim that the additions to surgical knowledge acquired in the war are of real and practical value.[80]

Therefore, while "we must perhaps be content to wait until some genius as sublime as Newton's shall explain the laws of life by a generalization as simple and perfect as the law of gravitation, before the physiological sciences shall be recognized among the strictly exact sciences," Otis was confident that the study of the war wounded would advance medical science.[81]

Woodward, in contrast with Otis, continued his plan of doing a volume "consist[ing] of a series of statistical tables presenting a summary view of the facts embodied in the monthly reports made to the Surgeon General with regard to the Sickness of the Army, the Deaths, and the Discharges from service on surgeon's certificate of disability." He could do so because, unlike a surgical case that could take years for the final resolution of the injury, most medical cases ended relatively quickly. "The writer regrets greatly the necessity of publishing first these dry and severe details, in which it can hardly be expected the

79. Ibid., p. xxxii.
80. Ibid., p. xxix.
81. Ibid.

general medical reader will be able to take much interest. This course was rendered imperative, however, by the fact that in the subsequent volumes it will frequently be necessary to refer to statistical considerations, which could not be accurately done until the tabulations of the present volume were complete; and the tabulations having been completed, it appeared a duty to place them as soon as possible at the disposal of the other students of this subject, throughout the world." By doing the statistical work first, Woodward was able to report the primary cause of death in the Union Army was diarrhea and dysentery. As a result, he would concentrate the whole of the second Medical volume on those diseases (although he had planned to discuss all types of disease in the second volume and save a 'somewhat detailed account of the General Hospital System' for the third volume).[82] Woodward did not use any illustrations in his first volume except for charts and graphs.

In his statistics, Woodward included the fiscal year following the war, ending on 30 June 1866, "because, although after the close of the war the great volunteer army was disbanded with unprecedented rapidity, the unsettled state of the country rendered it necessary to keep a certain number of volunteer troops in service for some time after the cessation of actual hostilities, and it was thought that tables showing the sickness and mortality from disease during the year of peace following the war would be valuable for comparison with the diseases and deaths of similar bodies of troops in the same regions during the period of active operations."[83]

Woodward split his statistics to show the differences between 'White' and 'Colored' troops. His justification was a humanitarian one:

> The propriety of endeavoring to present separately such facts as it has been possible to collect, with regard to the sickness and mortality of Colored Soldiers, would appear too obvious to require extended remark in this place. Aside from all considerations of a scientific or historical

82. *MSHWR*, Medical I, pp. xiii, xlii, xliii, xxiv.

nature, motives of humanity would seem to dictate that the statistics should be presented in the form most likely to render them serviceable as a contribution to our knowledge of the influence of race-peculiarities of disease. These motives acquire, if possible, additional importance from the fact that several thousand Colored Men still continue to form a part of the United States Army.[84]

Woodward's volume closed with a 365-page appendix of the battlefield reports and maps sent in by the doctors during the war. These are the reports and maps that Brinton had planned to use in his surgical history. Woodward and Otis compiled and edited them, observing "either a chronological or geographical sequence in the arrangement of the documents, in order to approximate a connected narrative."[85]

Writing during a memorializing age when much of Washington was being filled with statues of war heroes, Barnes hoped, "In carrying out the intentions of Congress, it has been my earnest endeavor to make this Medical and Surgical History of the War, not only a contribution to science, but an enduring monument to the self-sacrificing zeal and professional ability of the Volunteer and Regular Medical Staff; and the unparalleled liberality of our Government, which provided so amply for the care of its sick and wounded soldiers."[86] It seems that his wish came true; in 1875, Congress authorized the printing of another five thousand copies of the History, reserving four thousand for its own use and giving only one thousand to the Surgeon General.[87] This distribution system was not the best. Dr. A. T. Bartlett, a contributor to the Museum, contacted Otis for a copy of the History. Otis "referred him to his representative Mr. Morrison, but as he apprehended, being a republican, his application was

83. Ibid., p. xx.
84. Ibid., p. xiii.
85. *MSHWR*, Medical I Appendix, "Note by the editors."
86. Joseph K. Barnes, “Prefatory,” *MSHWR*, Medical I, p. ix.
87. *MSHWR*, Surgical I, 2nd ed., Memorandum, p. 2.

unsuccessful." Otis recommended adding him to the Surgeon General's distribution list.[88] Surprisingly, extra copies of the second edition were still in stock in the Surgeon General's Library during World War II.[89]

Continuing the project

The second Surgical book came out in 1876, six years after the first volume and eleven years after the end of the war. The same year Woodward was promoted to full Surgeon, thirteen years after being appointed Assistant Surgeon.[90] The rest of the *History* had been authorized by Congress in June, 1872, but Otis and his staff were unable to complete the remaining 1800 pages in the two years for which they had appropriations. Congress renewed their appropriation in June, 1875, with provisions made for a second edition, which was printed at the same time as the first. Six presses ran for four weeks at the Government Printing Office in early 1876 to print both editions.[91] Woodblock engravings, lithographs, chromolithographs (colored lithographs), and woodburytype and heliotype photomechanical prints were all utilized to illustrate the book, as they would be in the third Surgical and second and third Medical volumes. Continuing his survey of war wounds by body area, Otis covered injuries of the abdomen, pelvis, back and upper extremities (arms and hands) in this book. The amazing scope of the book can be seen from the 88,741 cases of wounds of the upper extremities reviewed, 817 of them in detail.[92]

When President Abraham Lincoln was assassinated, Museum doctors performed his autopsy. Contributing to the knowledge of head wounds, Otis gave Lincoln a semi-anonymous entry in the *History*:

Another case of alleged fracture by contre-coup of both orbital plates of the frontal by the

88. Otis to Crane, 5 June 1876, OHA 15.
89. Wyndham Davis Miles, *A History of the National Library of Medicine: The Nation's Treasury of Medical Knowledge* (Bethesda: US Department of Health and Human Services, 1982), p. 286.
90. Woodward to Thomas M. Vincent, 29 July 1876, OHA 28.
91. Otis to Crane, 26 February 1876, OHA 15.

transmitted shock from the perforation of the occipital by a pistol ball, has been much commented on: Case. --A. L-----, aged 56 years, was shot in the head, at Washington, on the evening of April 14th, 1865, by a large round ball, from a Derringer pistol, in the hands of an assassin...[93]

Otis devoted over a full page of small type to Lincoln's injury and autopsy.

Woodward followed Otis by three years and put his second book out in 1879, "with much labor and after serious interruptions" such as the Centennial Exposition. The topic of diarrhea and dysentery had proven larger than he had expected in 1870. The "alvine fluxes," as Woodward referred to them, took up the entire volume, forcing him to move to a third book the rest of the diseases that affected the army. Woodward felt that the discussion of the rest of the diseases, the camp fevers and scurvy among others, would not be discussed as exhaustively as the fluxes which caused 1,739,735 illnesses with 44,558 deaths in the Union Army alone.[94] Woodward's 314-page exploration of the pathology and almost 200-page discussion of treatments, including local bloodletting, antimony, castor oil, opium, alum, arsenic, and enemas, are a massive statement of medical knowledge at the time of the war.[95]

Woodward labored, as had every physician before him, under the difficulty of not knowing what caused disease:

Undoubtedly, the chief reason why our best preventive measures fall so far short of our needs is because we have so little exact knowledge of the causes of disease. I know it is fashionable for certain sanitarians to talk flippantly in public addresses, as if we knew all about these causes, and I am often moved by scorn and pity at the complacency with which they utter their platitudes. [96]

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92. *MSHWR*, Surgical II, p. III.
93. *MSHWR*, Surgical I, p. 305-6.
94. Hemmeter, “Joseph Janvier Woodward,” p. 640.
95. *MSHWR*, Surgical II, p. iii-x.
96. Woodward to Bowditch, 19 January 1876, OHA 28.

When neither Woodward nor Otis survived to complete the final volumes in their series, the Surgeon General was forced to find replacements for them. Upon Otis's death in 1881, his third volume was finished by Dr. David L. Huntington, who replaced him as Curator of the Museum. Another University of Pennsylvania graduate, he had served during the war with Grant and Sherman. After the war, he served at various posts and was in charge of the Soldier's Home in Washington from 1875 until 1880.[97] Huntington completed the volume, much of which was probably already done, in 1883. Huntington said, "no change in, or deviation from, the original plan has been attempted; that, so far as known, his [i.e. Otis] wishes and intentions with regard to the arrangement and development of the History have been scrupulously regarded." Huntington was helped by the Museum's chief clerk, C.J. Meyers, who had been assisting on the *History* since its beginning. As Otis had desired, the third book covered the lower extremities, the legs and feet. Sections on bullets, operations and treatments, surgical tools, surgical diseases, and anesthetics were included. The section on anesthetics contained the interesting conclusion that ether and chloroform "were used in no less than eighty thousand (80,000) instances."[98] The book ended with a “brief historical sketch of the Medical Staff” explaining how the Army's system was modified for the war. The final part, with some of the engravings dating from *Circular 6*, is a comprehensive overview of the large-scale evacuation of the wounded that was first practiced during the Civil War. Huntington, echoing Barnes's wish of thirteen years earlier, said, "It is hoped that its short-comings may not seriously impair or detract from the beauty and harmony of the masterpiece, which must remain a living monument to the intelligent industry, perseverance, and professional learning of the late Surgeon GEORGE A. OTIS."[99]

Woodward died on Sunday, 17 August 1884, after a series of illnesses. He was succeeded in his

97. Albert Allemann, “Huntington, David Low (1834-1899)” in Howard A. Kelly and Walter L. Burrage, *American Medical Biographies* (Baltimore: Norman, Remington Company, 1920), p. 581.
98. *MSHWR*, Surgical III, p. 887.

work by Dr. Charles Smart, another veteran of the war. Smart had not wanted the assignment. "In July, 1883, the late Surgeon General CRANE expressed to me his desire that I should undertake the *Third Part* of the work; and, in view of my reluctance to assume this heavy responsibility, he gave me to understand that his wish in this instance was intended to carry the weight of an order." Crane imposed no conditions on the contents of the book except that the plates that Woodward and Faber had begun working on so long ago were to be used. Smart adhered to Woodward's original plan for the third volume published in 1888. He used most of the volume to discuss fevers such as malaria, typhoid, typhus, measles, smallpox, scarlet fever, yellow fever and mumps. All of these were considered the ‘miasmatic fevers.' Miasmas were thought to be emanations from the toxic ground that caused diseases. Smart continued the historic error of grouping diseases by their clinical effect on the body as these diseases have little in common. After the fevers, Smart looked at other diseases common to armies, such as scurvy, consumption (tuberculosis), and pneumonia. A short chapter included perennial military problems such as nostalgia (depression due to homesickness), army itch (an ill-defined skin disease), alcoholism and venereal disease.[100] The book closed with the valuable, and even then historic, discussion of general hospitals that Woodward had worked on twenty-three years earlier in *Circular 6*. This final volume brought to a close the Museum's main interest in the Civil War, an ending underscored by the Museum's move into a new building near the Smithsonian Castle.

It is difficult to say how useful the *History* was. Some dismissed it as a "mere compilation of other people's writings."[101] But there was enough interest in the set to require a second edition even before the first had been distributed. Although Woodward felt that more attention was paid to their work in Europe than America, contemporary reviews of the volumes were favorable. *The Philadelphia Medical*

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99. Ibid., p. iii-iv.

100. The rate for white troops was 8.2% versus 8.7% before the war. The rate for colored troops was considerably lower at 3.38% for syphilis and 4.39% for gonorrhea. See *MSHWR*, Surgical III, p. 891.

101. Henry, *The AFIP*, p. 89, quoting the *Washington Sunday Herald*, 1 April 1883.

Times had a typical response, "We think that a just pride will be felt by the American medical profession, and indeed by our countrymen generally, in these admirable volumes." George Shrady's editorial in the *Medical Record* concluded:

> These documents illustrate the real medical history of the war. They are most interesting and valuable historical records, and indicate a high degree of intelligence, not alone professional, but administrative, military, and comprehensive. They show that the profession of the country, whether trained in the army, in metropolitan centres, or sparsely and recently settled districts, was capable of grasping and dealing with the great emergency in which the country found itself suddenly involved. They breathe the purest spirit of humanity irrespective of politics, and reveal a high degree of cultivation of both mind and heart. They indicate a degree of medical culture beyond what we are apt to acknowledge in our periodical onslaughts on the medical colleges. More than this, they display the acute practical common-sense of the American *mind* which often rises to the level of genius. The war developed first-class soldiers, and first-class military surgeons, out of what, at first sight, and to a European, would have seemed the most unpromising and even hopeless material.[102]

Only two slightly critical reviews are preserved in the Museum (which did keep critical notices). One British reviewer from *The Lancet*, thought "Dr. Otis criticises (sic) with some little asperity certain statements made by Professor Longmore..." *The North Western Medical and Surgical Journal* felt "both volumes are as handsome as they are valuable, except the bindings which are only worthy of a cheap

102. “Reviews and Book Notices,” *Philadelphia Medical Times*, 26 April 1873; George F. Shrady, “The Medical and Surgical History of the War of the Rebellion,” *Medical Record*, 15 April 1873. Copies in OHA 18: Curatorial Records: Notices of Army Medical Museum Publications, 1865-1881.

novel."[103]

Although Otis frequently referred to himself as the editor of his volumes, this simplistic view does not acknowledge the massive amount of information digested and the great knowledge that both Otis and Woodward brought to their task. Woodward and Otis were writing just at the dawn of a great revolution in medical thought and can hardly be held accountable for not foreseeing the basic tools and principles of modern medicine. No one could have predicted the x-ray. Woodward certainly laid some of the foundations for pathology and histology in his work, while Otis clearly showed that a conservative approach to surgery aided the patient. The careful and extensive research that he and Otis did, reviewing literally everything written on a topic, would never be equalled again and is certainly not possible now. The great pathologist Rudolf Virchow said of the *History*:

> Whoever takes up and reads the extensive publications of the American medical staff will be constantly astonished at the wealth of experience therein found. The greatest exactness in detail, careful statistics even in the smallest matters, and a scholarly statement embracing all sides of medical experience are here united, in order to preserve and transmit to contemporaries and posterity in the greatest possible completeness, the knowledge purchased at so vast an expense.[104]

William Gerry Morgan, president-elect of the American Medical Association, wrote in 1930 that the *History* "is still a valuable source of information for the physician whether in the military service or in civil practice."[105] Dr. John C. Hemmeter, author of *Diseases of the Intestines*, surveyed Woodward's work

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103. “Reviews and Notices of Books, *The Lancet*, 30 August 1873, p. 303; “Reviews and Book Notices,” *The North Western Medical and Surgical Journal, 3*, p. 484. Copies in OHA 18: Curatorial Records: Notices of Army Medical Museum Publications, 1865-1881.

104. Henry, *AFIP*, p. 90.

105. William Gerry Morgan, "Contributions of the Medical Department of the United States Army to the Advancement of Knowledge," *Military Surgeon*, 1930, *66*, (6; June), 779-790, p. 781.

on the second Medical volume in 1923. Hemmeter concedes that Woodward did not realize that bacteria caused dysentery and diarrhea, but points out that neither did anyone else in the 204 years that passed between Leuwenhoeck's sight of bacteria through a microscope and Woodward's publication of his work. Hemmeter continues, "In America, it was largely due to Surgeon General Geo. Miller Sternberg (1838-1915) and to J.J. Woodward that American medical schools were led to accept the great importance of bacteriology as an absolutely necessary science for the understanding of diseases. ...J.J. Woodward deserves the credit for his diligent and penetrating research into the bacteriological literature of the world of his day, for the direct applications of this science to the causation and treatment of intestinal diseases."[106] Victor C. Vaughn, author of *Epidemiology and Public Health*, wrote to Hemmeter, "I do not think that you can say anything too eulogistic of Woodward. He certainly was far ahead of his time and the *Medical and Surgical History of the War of the Rebellion* is a monument to his learning and industry."[107]

Certainly the philosophy of the *History* survived, even though its exact format -- a survey of the entirety of medical literature and discussion of hundreds of individual soldiers' cases -- became less possible and less necessary. The Surgeon General's Office produced the fifteen-volume *Medical Department of the United States Army in the World War*. The Army's Center for Military History produced the large series *Medical Department U.S. Army World War II* and individual volumes on specific medical aspects of both the Korean and Vietnam wars. The Textbook of Military Medicine series, currently being produced by the Surgeon General's Office's Borden Institute,[108] mostly draws lessons from the Vietnam and Iraq wars, but displays its lineage by including information on gunshot wounds abstracted from the *History*. The *History*, intended as a reference work and a monument, succeeded as both and remains a unique history, even now that advances in medicine and surgery have made much of

106. Hemmeter, "Joseph Janvier Woodward," p. 639.
107. Ibid., p. 643-4.

its hard-won knowledge obsolete.[1]

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108. For more information on current publications, see http://www.bordeninstitute.army.mil/.