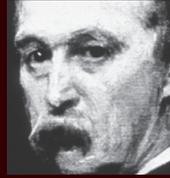
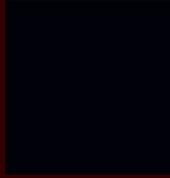
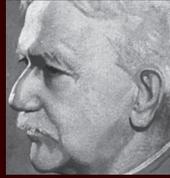


# Builders of Trust

Biographical Profiles  
from the  
Medical Corps Coin



# Builders of Trust

Biographical Profiles from the Medical Corps Coin



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Biographical Profiles from the Medical Corps Coin

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BORDEN INSTITUTE

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2011

*Dedicated to the men and women of the  
U.S. Army Medical Corps*





*Army Medical Corps*

EARLIEST CREST OF THE ARMY MEDICAL DEPARTMENT



DISTINCTIVE INSIGNIA OF THE ARMY MEDICAL DEPARTMENT REGIMENT



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## Foreword

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Today's Army Medical Corps plays a key role in a team of Army Medical Department (AMEDD) teams: eight corps with a long and distinguished history. The Medical Corps has always shouldered a wide range of responsibilities. Our officers provide compassionate, world-class care, ranging from the battlefield to the care of family members and retirees at home; they perform basic and applied research; uniformed physician educators teach and mentor the next generation of caregivers; they plan and implement preventive medicine programs; and—as has always been a critical duty since the inception of the AMEDD—Medical Corps officers provide staff advice throughout the Army on public health policies, on medical materiel development and fielding, and on medical care from the point of injury or illness through evacuation to recovery and rehabilitation at home station.

Just as we have many responsibilities in current conflicts and homeland defense matters, so did previous generations of Medical Corps officers take on weighty endeavors. Their diligence, insights, and compassion built the Medical Department's trusted reputation—a legacy often overlooked by current ranks of Army Medical Corps and other AMEDD officers, enlisted Soldier–Medics, and civilian professionals. They advised their commanders on how to keep soldiers healthy, and then did their utmost for each and every Soldier who puts his or her life on the line in defense of the Nation. They built an organization that could learn and improve. Uniformed members of the Army Medical Corps were principal proponents in bringing science to bear on medical problems with which the US Army and the US Military writ large—and the world—struggled; their

solutions often led civilian and academic colleagues, and changed the face of national defense, global health, and international commerce.

As we work on the challenges of our varied assignments, we not only stand on the shoulders of those who have gone before, but also we can learn how those who crafted our history faced similar challenges, the limits of science and resources, and how they delivered achievements wrought by determination, innovative intellects, and extraordinary devotion to duty. This series of narratives was undertaken as the first of a series of corps histories from which all AMEDD members and the public at large can draw encouragement and a broader perspective.

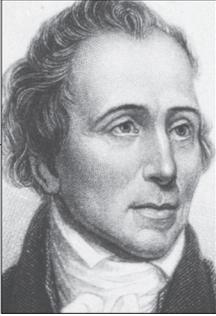
Excellence derives from many challenges and assumes many shapes; every insight into its creation inspires us all to reach similar heights and builds trust in our capacity to succeed.

*Lieutenant General Eric B. Schoomaker, MD, PhD*  
The Surgeon General and Commanding General  
United States Army Medical Command

# Builders of Trust

Biographical Profiles from the Medical Corps Coin





by *Stephen C. Craig*

## JOHN WARREN 1753–1815

### INTRODUCTION

The name Warren and the Harvard Medical School have been solidly linked for 238 years. A superb organizer and teacher, John Warren had a remarkably contemporary concept of graduate and postgraduate medical education when he founded that prestigious institution in the late 18th century. However, these academic gifts developed not in one of Britain's medical universities, but in the apprentice-based general practitioner tradition of that era. Moreover, they matured in a fledgling hospital department in an army whose very existence remained tenuous. His story and the beginning of medicine at Harvard are compelling for they unfolded during a time of social, political, and military upheaval that led to the establishment of the American nation.

### EARLY YEARS

John Warren was the youngest of four brothers—Joseph, Samuel, Ebenezer, and John—born in Roxbury, Massachusetts, near Boston on 27 July 1753. Their father, Joseph Warren, was an apple farmer and Calvinist who imbued his sons with a desire for education, a strong love of country, and an abiding hatred of oppression. Joseph entered Harvard the year John was born and, upon graduation, began a medical apprenticeship with Dr. James Lloyd in Boston.

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Although John was not a precocious youngster, he did well in grammar school under the Reverend Samuel Elliott and followed his brother Joseph to Harvard, entering in 1767 at the age of 14 years.<sup>1</sup>

It was at Harvard that his zeal for education—studying for the pure joy of learning—was ignited. John learned Latin and became a good classical scholar, was industrious, and developed an exceptional memory. He also became enamored with anatomy.<sup>2</sup> According to one Harvard Medical School history, John became the “leading spirit of the Anatomical Club, the members of which dissected and demonstrated the structures of the lower animals and studied bones of the human skeleton.” Harvard University was one of the few schools to own a human skeleton, but the club felt a complete human subject was required for study.<sup>3</sup>

Obtaining human bodies for dissection in 18th century America was not an easy task. Although there was no legal prohibition to dissection, the systematic dismembering of a human body tended to upset the general public tremendously. The Royal Governor could sentence a criminal to death and then dismemberment by a surgeon when the crime was sufficiently heinous, but those occasions were few and far between. If one needed a body for anatomical study, then other more surreptitious and dangerous methods had to be employed. Warren and his young colleagues kept a close watch on the disposal of deceased derelicts and criminals in the area and spirited away more than a few to their table.<sup>4</sup>

#### MEDICAL APPRENTICESHIP

After graduation in 1771, John apprenticed to older brother Joseph in Boston.<sup>5</sup> The method of medical education in British North America had become more organized, broader, and sophisticated during the previous decade. Preceptors began with anatomy and progressed to physic and a bit of other sciences. They employed more teaching aids, including illustrations, models, and anatomical preparations, and a greater emphasis was placed on reading the existing literature. The traditional 7-year apprenticeship was becoming shorter, but colonial physicians had broad latitude to determine when their charges were prepared for practice.<sup>6</sup> John Warren was apprenticed for 2 years with his brother, reading the few books in Joseph’s library, but receiving a great deal of practical work (e.g., preparing medicines, spreading plasters, dressing wounds, and attending patients).<sup>7</sup>

Where to practice was a thornier issue in 1773. Boston had plenty of physicians, some 21 for a population of about 16,000.<sup>8</sup> However, the death of a physician in the bustling port town of Salem and a letter of introduction from Joseph allowed John to fill the vacancy and practice with Dr. Edward Holyoke.

A busy practitioner and well-respected citizen, Holyoke encouraged young Warren, but building a lucrative practice of his own took time. John struggled to gather a large enough retinue of loyal patients to pay his bills.<sup>9</sup>

#### LIBERTY TRUMPS TREASON

Loyalty was an issue that many colonists, including the Warrens, were struggling with on a broader scale in 1773. Although Great Britain wanted loyalty from her American subjects, she also wanted revenues to defray the cost of maintaining and defending them, and insisted upon Parliament's right to tax the colonies at will. A series of Parliamentary Acts designed to do this either directly or indirectly was enacted, but met with vigorous protests and rioting, particularly in Boston. Colonial discontent waxed and waned through the late 1760s.<sup>10</sup> By 1770, the Boston Massacre notwithstanding, it appeared to observers in London that resistance to Parliamentary fiat had been subsumed by colonial greed for material comforts. But when Lord North, Chancellor of the Exchequer, decided to tax tea at three pence per pound, he found the tax overcame colonial thirst for tea. On the night of 16 December 1773, Boston's Sons of Liberty dumped the now hated tea into the harbor. Parliament responded with a series of acts in 1774 that they called Coercive—and colonists called Intolerable—which essentially closed the port of Boston, took control of the Massachusetts government, quartered British soldiers in Boston, and extended the province of Quebec to the Ohio River. Boston nearly exploded with indignation.<sup>11</sup>

In September 1774, while the First Continental Congress voted to stop all intercourse with the mother country, Joseph Warren introduced the Suffolk Resolves that called for disobedience to all of the Coercive Acts.<sup>12</sup> As Joseph Warren actively organized and led the patriot cause, John acted as scribe for the Committee of Correspondence. His letters went to Boston and New York carpenters, exhorting them—quite successfully—not to build barracks for soldiers of Royal Governor General Sir Thomas Gage. Also, at this time, John joined Colonel Timothy Pickering's militia regiment as surgeon.<sup>13</sup>

#### WAR WITH BRITAIN

Just after 21:00 hours on 18 April 1775, Dr. Joseph Warren—a member of the Provincial Congress and the Committee of Safety and one of the boldest and most intrepid of patriots—set in motion a series of well-planned events. The doctor had information from a source close to General Gage that in a few hours a large detachment of the King's troops would row across Boston's Back Bay to Cambridge and then march to the village of Lexington to capture John Hancock and Samuel Adams. From there, they would press on to seize military

stores in Concord. As Paul Revere, William Dawes, and other now anonymous riders spread the word across the countryside west of Boston, two lanterns glowed briefly in the steeple of the Old North Church, a signal to anxious patriots across the bay to prepare, form ranks, and march on Concord.<sup>14</sup>

Those patriots, the legendary Minutemen, were yeoman farmers who left plow and pitchfork and raced to the common defense. This rapid reaction force had been created by the Massachusetts Council in 1645 and, in reality, had 30 minutes to report for any emergency with weapon, powder, bullets, and knapsack.<sup>15</sup>

In the early morning light, Major John Pitcairn marched his column into Lexington and confronted Captain John Parker's Minutemen drawn up on the green. A British officer commanded, "Lay down your arms, you damned rebels!"<sup>16</sup> Then, a shot rang out. The perpetrator of the shot heard "round the world" remains unknown to this day, but it was followed rapidly by a crashing volley of British muskets.<sup>17</sup> The King's soldiers quickly re-formed marching order and moved west to Concord. There, they met six companies of militia drawn up on the far side of Concord's North Bridge. Animated by firm resolve, these provincials meant to hold their ground. A British volley delivered at but 50 yards distance was returned in kind. Stunned by this display of courage, the King's troops fell back into Concord and began a long and painful retreat to Charlestown.<sup>18</sup> By this time, more than 4,000 Minutemen and militia were converging on Concord, Lexington, Menotomy (now Arlington), and points in between. From behind stone walls and trees and in the open fields, the retreating British columns were harassed with deadly accuracy.<sup>19</sup> As Gage's battered troops pushed through Menotomy and dragged themselves the last 6 miles into Charlestown, John Warren was still trying to get to the fight. Notified of the British expedition at 09:00 hours, the regiment's commander dallied too long to cover the 16 miles into Charlestown before the British were snugly encamped, quite ironically on Bunker Hill.<sup>20</sup> John Warren's disgust at his commander's sloth can only be imagined. Like his brother, he was a fiery patriot who longed for the day when the "shackles of British tyranny" would be cast aside. Late to the battle or not, that day finally had come.

After the running engagement at Lexington and Concord, Gage found his command in Boston hemmed in by a growing provincial army, which during the night of 16 June 1775 began fortifying Bunker and Breed's Hills in Charlestown.<sup>21</sup> The following afternoon, John Warren and the citizens of Salem were alarmed by the sound of cannon fire and then the sight of smoke rising from a burning Charlestown. Gage had deployed General William Howe and 2,400 soldiers across the Back Bay to reclaim the strategic Charlestown Heights.<sup>22</sup> John wrote in his diary:

This day a day ever to be remembered by the United American Colonies. I was alarmed with the incessant report of Cannon which appeared to be at or near Boston, towards sun setting a very great fire was discovered nearly in a direction from Salem for Boston at the beginning of the evening news arrived that a smart engagement had happened in the afternoon at Bunker Hill in Charlestown, between the King's Regular Troops and the Provincials, and soon after we received Intelligence our Troops were repulsed with great loss and the Enemy had taken possession of the ground. . . . I was very anxious as I was informed that great numbers had fell on both sides, and that my Brother was in all probability in the Engagement. I however went Home with a Determination to take a few Hours sleep and then to go immediately for Cambridge with my Arms. According[ly] in the morning about two o'clock I prepared myself and went off on Horseback and when I arrived at Medford received the melancholy and dreadful Tidings that my Brother was missing. Upon the dreadful Intelligence I went immediately to Cambridge [and] enquired of almost every person I saw, whether they could give me any information of him. Some told me that he was undoubtedly alive and well, others that he was wounded and others that he had fell on the field; thus perplexed almost to distraction I went on enquiring with a Solicitude which was such a mixture of Hope and Fear as none but such as have felt it can form any conception of. In this manner I passed several days.<sup>23</sup>

It would be some days before John learned his brother's fate: with his commission as a major general unsigned on 17 June, Joseph had reported for duty on Breed's Hill with musket in hand to take his place in the redoubt under the command of Colonel William Prescott. Two British attacks were repulsed, but, during a third assault, the provincials ran out of powder and ball. The King's troops rushed over the fort and a musket ball ended General Warren's life.<sup>24</sup> Bereaved and angry, John was ready to cast aside the scalpel and take up the rifle, but others prevailed on him to take charge of the Cambridge Public Hospital. There, Warren had a short tour as senior surgeon and then was reassigned to the overflow hospital in Watertown.<sup>25</sup> At this juncture, there was no formal medical organization in the Massachusetts Provincial Army. Surgeons worked for the Committee of Safety. As a member of that committee, Dr. Benjamin Church attempted to achieve some order in medical services, but finding enough personnel, medicines, supplies, and equipment for the four general hospitals established by the end of June was an impossible task.<sup>26</sup>

Moreover, after Bunker Hill, the number of regimental surgeons and their hospitals grew; they wanted supplies and equipment from the general hospitals while remaining completely autonomous in their operations. Without an overall director of hospitals, the coordination of medical services and

supply languished amid these parochial jealousies and animosities as General Washington took command of the army on 2 July. The medical mess alarmed the new commander, and he urged John Hancock, President of the Continental Congress, to fix it post-haste.<sup>27</sup>

#### A STRUGGLING HOSPITAL DEPARTMENT

This resulted in the Hospital Bill of 1775 that established a Hospital (that is a Medical) Department for 20,000 men and authorized a Director General. The bill, however, was vague and left the relationship of the regimental hospitals and surgeons to the general establishment in limbo. Benjamin Church was appointed Director General of Hospitals, and he got the department off to a good organizational and administrative start; but, before the summer was over, he was found to be a frequent and informative pen pal of the British commander. The dismissal of the Army's first Surgeon General as a traitor left the department in turmoil.<sup>28</sup>

Washington ordered Isaac Foster, Senior Surgeon at Cambridge Hospital, temporarily to assume Church's duties. Warren replaced Foster as Senior Surgeon, and it appears that Warren also acted as Foster's Executive Officer.<sup>29</sup> John Hancock received a letter from Warren—who presumably had been directed to address the Congressional President—in early October concerning appointments to the medical department:

The suspension of the late Director . . . has put us into great confusion. . . . We have for some time been expecting warrants from the Continental Congress. We cannot obtain information whether the appointments are to receive the sanction of Congress, or whether the Director was invested with a discretionary power to make them. . . .<sup>30</sup>

This personnel crisis impacted on patient care, and Warren went on to describe the department's deficiency of medicines and the problems associated with them. He suggested it might be prudent to engage "some public institution for the purpose of prosecuting inquiries" into the medicinal value of American botanicals, and he noted of one of them, "the bark of the willow root has been found of late (and I have repeatedly experienced it) to answer many intentions of the Peruvian bark. . . ."<sup>31</sup>

The diagnostic errors of Warren and his colleagues from a modern perspective should not cloud the profundity of his message. In 1775, fever was a disease not a symptom and the mainstay of treatment was quinine found in cinchona bark. Coming from Peru, it was expensive and, with the war on, difficult to procure. The suggested alternative—salicin, derived

from willow bark—had been proposed 12 years earlier in the pages of the *Proceedings of the Royal Society of Medicine*.<sup>32</sup> Warren was on the cutting edge of 18th century medical progress, and his suggestion that Congress establish a pharmacological research and development capability is insightful for a man aged only 22 years.

Although Congress did not act on his pharmacological advice, they did select Dr. John Morgan, a leading Philadelphia physician and professor at the Philadelphia Medical School, to replace Church.<sup>33</sup> Morgan was an ambitious and conceited man, but he proved to be an intelligent, energetic, efficient, and well-intentioned Hospital Director who rose to the challenge at hand. He directed Apothecary-General Andrew Craigie to prepare an inventory of the department and badgered Washington, Congress, and local communities into filling deficiencies of instruments, supplies, and equipment. He worked to see that the hospitals were staffed with warranted officers who were competent surgeons by introducing a system of examination for surgeons, surgeon's mates, and hospital mates.<sup>34</sup>

Warren spent the winter of 1775–1776 examining surgeons mates for the army and supporting military operations engaged in strengthening army defenses and in hospital work.<sup>35</sup> Illness in the Continental Army had increased through the late summer with dysentery, diarrhea, typhoid, jaundice, and respiratory maladies—the usual diseases predominating in mobilizing men from widely dispersed locales and having them live in inadequate and unhygienic conditions. With the exception of dysentery, no epidemics occurred that winter. Smallpox, the greatest fear, was seen only sporadically in the late winter due to Washington's stringent precautions of medical inspection and isolation, and keeping refugees from Boston away from his troops.<sup>36</sup>

#### SURGEON ON CAMPAIGN

By early March 1776, Washington had fortified Lechmere Point and the heights around Boston with artillery. The Hospital Department prepared for the imminent battle; but, on 17 March, General Howe, now British commander in a city besieged by Washington and smallpox, boarded his army on Royal Navy ships and sailed to Halifax, Nova Scotia. Washington presumed Howe had set sail for New York and immediately began moving his army south to defend that city.<sup>37</sup> Warren and others took care of the sick in Boston, collected supplies, and examined medicines until 11 May when he—together with Drs. McKnight, Blanchard, and James Clark—left Cambridge for New York.<sup>38</sup> By the time Warren and his colleagues arrived on Manhattan, Morgan had taken over the King's College (now Columbia University) and new City Hospital, and established hospitals in the City Barracks and private homes.<sup>39</sup>

The defense of Manhattan revolved around control of the Hudson and East Rivers. To deny the British access to the Hudson, Washington depended on the Battery and on gun emplacements on Governor's Island and Red Hook and on Forts Washington and Lee. To cover the East River, he sent General Nathaniel Greene to fortify Brooklyn Heights on Long Island.<sup>40</sup> Greene requested a branch of the general hospital for support, and Warren was given charge of this unit with three surgical mates. Morgan also cautioned him that regimental surgeons could draw on the general hospital stores; but, if they did, they were to consider themselves as part of the hospital and under Morgan's authority.<sup>41</sup>

Admiral Richard Howe's flotilla of British and Hessian soldiers landed on Staten Island in New York Harbor on 2 July.<sup>42</sup> A week later, the Declaration of Independence was read to Continental troops, and Washington commented that he hoped those words would "serve as a fresh incentive to every officer and soldier to act with Fidelity and Courage."<sup>43</sup> On Brooklyn Heights, Warren lacked neither fidelity nor courage, but his patience with regimental surgeons was wearing thin.

The orders begin by giving full and uncontrollable latitude with regard to sending in patients that labor under putrid or infectious diseases,—to the regimental surgeons. . . . Hospital surgeons are to have no negative; but the latter can order none in, without the consent of the former—or, in my case, sending for the director general, to trouble him with any petty disputes upon the subject; and if I do not choose to give him that trouble, they gain their point. By these means, the regimental surgeons have the sole disposal . . . of all the sick in the whole army. . . . Hospital surgeons are quietly to submit to the imposition . . . are to be subservient to them, in taking care of their supplies, and delivering them out. If a general hospital is useless or unnecessary, I . . . wish to be dismissed; though I would by no means leave the army, until I had served as a volunteer in the approaching decisive battle.<sup>44</sup>

Morgan soothed his fiery subordinate by sending another surgeon, four mates, 500 additional bandages, and 12 fracture boxes to keep Warren at his proper post.<sup>45</sup> As British and Hessian troops invested Long Island from Gravesend, Washington shuttled more troops into Brooklyn Heights. The putrid fevers (diarrhea and dysentery) that Warren had mentioned had materially reduced Greene's command; even Greene was sick. General John Sullivan took command and directed the American left and center while General Stirling commanded the American right wing on Gowanus Heights.<sup>46</sup>

On 27 August, Howe outmaneuvered and routed Washington's army, leaving a thousand Americans dead or wounded, but he had not breached the main American fortifications nor shattered their resolve. Two nights later, Washington saved the rest of his army in a bold nighttime evacuation across the East River.<sup>47</sup> Warren and his assistants evacuated their casualties across the river, then up Manhattan to East Chester where a new hospital was established. Meanwhile, Morgan dashed to Newark to establish a hospital under Dr. Foster's direction, began a tedious evacuation from New York City, and then opened a 300-bed facility at Hackensack where medical supplies had been stored.<sup>48</sup>

Howe's glacial slowness allowed Washington to gain the security of Harlem Heights; but, by mid-October, British forces had flanked the Americans to the east, straddling the Boston Post Road and making the East Chester Hospital untenable.<sup>49</sup> Morgan withdrew Warren and his patients to Hackensack and established temporary hospitals in a handful of other towns.<sup>50</sup>

While Washington checked the British at White Plains, he was forced to retreat across the Hudson into New Jersey. These "fight and run away" tactics kept the army from being destroyed, but it caused continual disruption of patient care, evacuation, and medical resupply. Once in New Jersey, medical politics also added to Morgan's troubles.

Although in July 1776 Congress had published a new law regulating the Hospital Department, command and control ambiguities remained. They gave Dr. William Shippen control of the army hospital in the state of New Jersey while Morgan managed the same east of the Hudson River. With the entire army now in New Jersey, Shippen claimed he had, by virtue of Congressional decree, command and control of the entire Hospital Department. Morgan disagreed, but Congressional indecision allowed an ugly power struggle to ensue.<sup>51</sup>

By late fall of 1776, Washington had his army on the Pennsylvania side of the Delaware River, but had conceived a plan to strike one more blow at an enemy now widely dispersed across New Jersey before winter. The Christmas night attack at Trenton and the morning assault at Princeton on 3 January were resounding victories for the Continental Army before it went into winter quarters at Morristown, New Jersey.<sup>52</sup>

Dr. Morgan was dismissed from the Army in early January 1777, and Shippen ascended to Hospital Department Director.<sup>53</sup> Warren, who was now serving at the General Hospital in Philadelphia, found himself in a precarious position. By the rules of the time, Shippen was at liberty to void any appointment granted by Morgan and offer it to a surgeon of his own choosing. General Greene proposed a subdirectorship for Warren with apparent Congressional approval. But, in early February, Warren wrote to General Washington stating: "I am now only employed in this city by Dr. Shippen,

without any positive assurance of an appointment. . . . I beg your Excellency to excuse the trouble I give you . . . requesting . . . whether in the proposed arrangements I have been considered.”<sup>54</sup> Washington replied: “I can assure you it was ever my intention to take particular care that those who had filled their old stations with reputation should not be degraded in the new appointments.”<sup>55</sup> But, when the list of Congressionally authorized directors reached Washington’s desk, Warren’s name was not on it; instead, he was ordered to Boston to serve as senior surgeon at the new Military Hospital. Although his friends thought he had been misused—suffering under the black cloud of the Morgan–Shippen dispute—John could more easily assist in the welfare of Joseph’s five children. In Boston, too, he could seriously court and wed Abigail Collins, daughter of Rhode Island Governor John Collins. Professionally, the assignment would be a godsend in just a few years.<sup>56</sup>

#### MEDICAL POLITICS IN BOSTON

The war had split Boston’s medical community along political lines and crippled health care in the city. Joseph Warren and Dr. Miles Whitworth were dead, Benjamin Church had been exiled, and others (including John Jeffries) had fled with the British. Other Tory physicians, including James Lloyd, Sam Danforth, and Isaac Rand, Jr, continued to practice, but the city had lost one third of her doctors.<sup>57</sup> The void was waiting to be filled by young, talented Whigs such as John Warren. For the moment, running the hospital constantly stressed Warren’s resources and ingenuity even though the Eastern Department had become an inactive military backwater.

General Horatio Gates’ stunning victory at Saratoga that brought France into the war as an American ally was followed by a long and nearly devastating winter for the Army at Valley Forge.<sup>58</sup> American finances were also at low ebb in 1778. Warren wrote to the Massachusetts Legislature that his patients “for some days have not had an ounce of meat; not a stick of wood . . . for near a week not a vegetable; and scarcely any medicine for above a year.”<sup>59</sup> A few months later, he implored Samuel Adams and Congress to no “longer neglect the poor surgeons of the Eastern Department . . . surely Congress will not suffer themselves to be so imposed upon by the designing artifices of interested men . . . whilst those who cannot be personally heard are winked out of sight or forgot. We rely on the wisdom and justice of Congress, and particularly on your exertions in our behalf.”<sup>60</sup>

In 1780, despite political and economic trials, Boston’s medical and scientific communities began a renaissance in which the 27-year-old Warren was an acknowledged leader. He began a series of anatomical demonstrations for the physicians of Boston and the surgeons, mates, and apprentices at the

military hospital. Although surgical cases provided enough arms and legs (and were the most practical teaching aids to wartime surgeons), a deeper look into the body was more problematic because of the prejudice against dissection and the Commander-in-Chief's prohibition on dissecting dead soldiers.<sup>61</sup> Although Warren's classes were held in secret, and it is likely he anatomized several unclaimed bodies, they are the earliest example of formalized continuing education in the Army Medical Department.

In the spring of 1780, the Massachusetts Humane Society was founded. Unlike contemporary humane societies, it did not promote animal welfare, but rather that of their injured fellow men. Their mission was to recover "all persons who meet with such accidents as to produce in them the appearance of death, and promoting the cause of humanity by pursuing such means . . . as shall have for their object the preservation of life, and the alleviation of miseries." Warren was much involved with this rescue service/charity organization and the first attempts at artificial resuscitation in America. He also supported the erection of huts along New England's rugged coast to shelter shipwrecked sailors, and he helped design lifeboats and a leather life-preserver.<sup>62</sup>

John Adams and the Reverend Samuel Cooper established the American Academy of Arts and Sciences at Harvard in 1780. Its objectives were the study of agriculture, natural history, botany, chemistry, astronomy, and mechanical arts. Warren joined in 1781 and contributed a paper entitled "Large Tumour of the Abdomen Containing Hair."<sup>63</sup>

The Boston Medical Society was also organized in spring 1780. Its first meetings were concerned with regulating medical fee bills; but, one evening, at a meeting in the Green Dragon Tavern, Warren proposed establishing a medical school.<sup>64</sup>

#### THE BIRTH OF HARVARD MEDICAL SCHOOL

Warren's enthusiasm for this new project was so intense that, according to his son and biographer Edward, "he readily infected others with his own love of the science."<sup>65</sup> That was true enough, but Warren could not infect society members with any enthusiasm for establishing a medical college. Although Tory politics had faded in Boston, it remained strong enough to engender distrust and to goad personal jealousy. Dr. Isaac Rand, Jr., declared

That Warren is an artful man and will get to windward of us all. He has made a proposition . . . that . . . there should be a medical school . . . here and has nominated Danforth to read on materia medica and chemistry; proposed that I should read on the theory and practice of physic, and some suitable person on anatomy and surgery. He was immediately put up for the latter branches;

and after a little maiden coyness, agreed to commence a course. . . . But he will not stop there; he well knows that moneys have been left to the college for such an establishment as he is appointed to, and he is looking to the professorship.<sup>66</sup>

The money that Rand spoke of—1,000 pounds—had been endowed by Harvard alumnus Dr. Ezekiel Hersey of Hingham in 1770 to help support a Professor of Anatomy and Physic, and it had been accumulating interest ever since.<sup>67</sup> Warren was not a wealthy man at the time, had an increasing number of mouths to feed, and may well have had his eye on this prize. The following month, the Boston Medical Society voted to have Warren teach a course of anatomical lectures that winter. He did so at the military hospital; but, unlike those in the preceding year, they were made public and were attended by many literary and scientific men of the city—not an uncommon audience because all educated men of the 18th century knew some medicine. Harvard president Joseph Willard and the Corporation of the College were impressed and asked Warren to draw up plans for a course of medical studies. After consultation with Drs. Shippen and Benjamin Rush at the Medical Department of the College of Philadelphia, Warren sent his recommendations to the Harvard Corporation.<sup>68</sup>

This body voted in the fall of 1782 to establish three professorships and formed a committee to attend to the legalities of conferring M.D. degrees.<sup>69</sup> This was significant because an M.D. degree was not required to practice medicine nor was it even common in late 18th century America. At this same meeting, Warren was elected to the Chair of Anatomy and Surgery, and given superintendence of the other courses until their chairs could be filled. Dr. Benjamin Waterhouse accepted the Chair of Theory and Practice of Physic in December 1782; and, in May 1783, Dr. Aaron Dexter took the Chair of *Materia Medica* and Chemistry.<sup>70</sup>

#### A REMARKABLE TEACHER AND MENTOR

Warren's duties as professor were to "demonstrate the anatomy of the human body with physiological observations, and explain and perform a complete system of surgical operations."<sup>71</sup> He gave his first set of seven lectures over a 6-week period in the fall of 1783 in the basement of Harvard Hall. His first lecture introduced the course and methods of instruction and included a history of anatomy. From here, he moved to the study of the blood, arteries, and veins, then the nerves, lymphatics, bones, muscles, tendons, and viscera. These were followed by dissection of the eye, a more in-depth study of osteology, various surgical operations, and, finally, a short sketch of midwifery.<sup>72</sup>

By all accounts, Warren was an excellent instructor. One student commented that, “the driest bone of the human body became in his hands . . . the subject of animated and agreeable description.”<sup>73</sup> Dr. James Jackson later wrote that one of the “most peculiar charms” of Warren’s teaching was “derived from the animation of delivery, from the interest he displayed in the subject of his discourse, and from his solicitude that every auditor be satisfied both by his demonstrations and by his explanations.”<sup>74</sup>

Warren had a remarkable memory and tended not to use notes during his 2- to 3-hour lectures, but he did write down his discourses in long hand for posterity.<sup>75</sup> Across these pieces of parchment, Warren inscribed his enthusiasm—his passion for anatomy, physiology, and surgery: “The human body is an hydraulic machine,” he noted, “which subsists by constant and determined motion of its humors in proper vessels contained in itself [and] by which nutriment is conveyed for its support [and] increase [and] like other hydraulic machines is determined by the laws of motion. Anatomy treats [of] the structure of the several parts [and] physiology of the use of them. The connexion [sic] between these two sciences is evident, [and] you will easily perceive how much it will enliven the subject of our Anatomical Lectures with physiological observations.”<sup>76</sup>

He also left a portrait of a warm, personable, and understanding teacher: “Students usually desire to know what books are to be read on the subject. I may observe here, that there is no way so proper to acquire a knowledge of Anatomy as by . . . seeing a subject dissected.” But, sensitive to the anxiety of his students, Warren recommended they consult the anatomy texts of Haller, Cullen and Chiselden, *Monro’s Osteology*, and Douglas’ *Treatise on Muscles*—all leading textbooks of the era. Warren quoted from them, as well as from current medical authorities, including William Cullen and William Hunter. He often brought in clinical anecdotes to illustrate and enliven his lectures, and he urged physicians to refresh their memories on anatomy by attending a course or dissecting a body every 10–15 years.<sup>77</sup>

Warren was also an extraordinary surgeon. In the winter of 1782, he performed with success quite possibly the first disarticulation of the shoulder joint—a procedure Dominique Larrey (1767–1842) would perfect during the Napoleonic Wars—for a severe traumatic injury of the upper arm at the military hospital.<sup>78</sup>

#### AN EXPANDING EDUCATIONAL VISION FOR BOSTON

However, the early years of the Medical Institution at Harvard were not filled with harmony and light. As Dr. Rand predicted, Warren had his way at the university, but the struggle for medical authority and health care dollars

continued in and around Boston, fueled by Tory envy for the new Whig power and an economic depression. The Medical Society of Massachusetts, created in 1781 and controlled by those with Tory sentiment, challenged Harvard's authority to examine and certify physicians. The Society did not wish to share their prerogatives or the fees generated thereby. This fight lasted until 1803, when a Harvard degree—a Bachelor of Medicine—and a certificate from the Society were declared equivalent.<sup>79</sup>

Difficulties also arose when the Army Hospital closed in 1782 because there was no hospital in the Boston vicinity for practical student instruction. Warren, in charge of the state sick in the Boston Almshouse, proposed annexing this facility to the university for clinical teaching. The suggestion generated a firestorm within the suspicious Boston Medical Society; it voted against the idea, opining that the journey to the Almshouse was too far to be practical and that it was improper for students to be making rounds. They also noted “though the good of the University is the pretext, the [financial] interest of the gentlemen concerned is the real motive of their conduct.”<sup>80</sup> Clinical instruction remained in the offices of Boston's doctors, but Harvard's Medical Institution continued to thrive in the 1790s.

Warren's course was illustrated predominantly by wax models and anatomical preparations made at home using amputated limbs until 1790 when dissections were begun, but bodies were still difficult to obtain by legal means.<sup>81</sup> He expanded his lectures from 7 to 31 and had enough work to justify an Assistant Professor in Anatomy and Surgery in 1793. In 1800, Holden Chapel was renovated to accommodate medical lectures.<sup>82</sup> Warren also remained an active practitioner and stayed abreast of the current advances in therapeutics. During the outbreaks of 1796, 1798, and 1802, Warren treated yellow fever cases by heroic methods recommended by his friend and colleague Benjamin Rush: generous bleeding, purging, and mercury in the form of calomel. Warren wrote a treatise on the virtues of mercury titled *Mercurial Practice*, and, during outbreaks, took daily prophylactic doses of mercury that he thought were highly beneficial.<sup>83</sup>

Smallpox, of course, was an annual threat. Warren and his colleagues first learned of Edward Jenner's new method of using cowpox to vaccinate against smallpox from the Medical Repository of New York in 1799. Dr. Waterhouse successfully tested this technique on adolescent boys in 1802, an experimental study in which Warren was a senior advisor.<sup>84</sup>

By 1803, the availability of practical hands-on training had improved materially. The Boston Dispensary, a new Marine Hospital in Cambridge, and the State Prison in Charlestown had each opened its doors for clinical instruction.<sup>85</sup> Warren was now teaching an 8-week course to medical students in the fall and winter, and one anatomy course of 26 lectures to Harvard

undergraduates in the spring.<sup>86</sup> Both he and Dr. Dexter asked for Adjunct Professors to assist with the academic load in late 1808. The following year, John Collins Warren (John's oldest son) was appointed Adjunct Professor in Anatomy and Surgery, and John Gorham assumed the Adjunct Professorship in Chemistry and *Materia Medica* in 1810.<sup>87</sup>

In December of that year, the school moved to Boston, surprisingly into the same building that housed the Massachusetts Medical Society.<sup>88</sup> The passage of time appeared to have softened the animosity of the Society (as they now supported the school) and Almshouse directors approved formal clinical instruction that would be directed by Dr. James Jackson, the new Professor of Clinical Medicine.<sup>89</sup> Over the next 4 years, medical course work doubled, and 50 medical students were enrolled. More space was desperately needed, and Warren and his colleagues successfully petitioned the state legislature for financial assistance to build a respectable home of their own just off Boston Commons on Mason Street.<sup>90</sup> Warren saw the exterior of the building completed, but would never walk inside its finished halls. On 4 April 1815, in his 62nd year, he succumbed to pneumonia in his Boston home.<sup>91</sup>

## CONCLUSION

Certainly, John Warren lived the citizen-soldier ideal and, in doing so, helped create an American ethos, but so did John Cochran (the first untainted Medical Director who succeeded Shippen in 1781) and Jonathan Potts, a skilled surgeon in the Northern Department and our first competent Medical Purveyor. Purely apprentice trained, Warren's medical education was never polished in Edinburgh or London in the manner of other medical educators, including Morgan, Shippen, and Rush. So why does Warren stand apart?

As a junior military surgeon, Warren strove to keep abreast of medical advancements and hone his innate surgical talents. When the opportunity presented itself, as it did in Boston in 1780, to pass on his anatomical, diagnostic, and surgical knowledge and skills to his military medical colleagues and then to the medical students in that city, he accepted it with gusto! His enthusiasm for and his dedication to teaching and mentoring, and his philosophy that the education of a physician or surgeon is a lifelong endeavor—a continuing process that could be pursued quite adequately in America—separates John Warren from his peers. Six generations of Warrens have been associated with Harvard University and its medical school, an enduring institutional and family legacy to continuing medical education. But the roots of that legacy sprouted in an Army hospital and were nourished by an Army surgeon during some of the darkest days of America's struggle for independence.

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by *Thomas W. Frank*

## WILLIAM BEAUMONT 1785–1853

### INTRODUCTION

William Beaumont, the undisputed founder of American physiology, was a singularly unlikely scientist. Although this early 19th century physician was successful as an original investigator in one area of medical science, that did not cause him to challenge more generally the “science” upon which his calling was founded. He accepted what he had been taught without question and practiced the “heroic” medicine of his age from his very first days as a physician until his retirement from clinical practice. He was a man of uncompromising principles, perhaps even contentious, who possessed an acute business sense. Over the years 1823–1833, he conducted the most remarkable medical research heretofore produced on the North American continent, and he did so on the very frontier of American civilization. He was a curious and industrious man, one who took advantage of an unusual opportunity at a time when it was unusual to do so. Yet, as valuable and visionary as his contributions to physiology and medicine were, he was a man of many foibles and facets, a very human figure in the pantheon of Army medicine.

### EARLY YEARS

William Beaumont was born into a farming family of four boys and five girls on 21 November 1785 to Samuel and Lucretia Beaumont in Lebanon, Connecticut. William had an ordinary 19th century schoolhouse education and then followed his older brother Samuel to Clinton County, New York, in search of a nonagrarian livelihood. It is unknown why he

chose a career in medicine; but, in 1811, he apprenticed himself to Dr. Benjamin Chandler of St. Albans, Vermont. In 1800, there were only five medical schools in the country, and apprenticeship was the predominant mode of medical instruction through the first quarter of the 19th century. A precepting student would agree to assist his mentor physician in all things, including menial chores, in exchange for practical instruction and the use of the physician's library. This apprenticeship usually lasted from 2 to 5 years. Once he was fully qualified, the new physician would continue to serve his preceptor until the agreed-on debt was fully paid.

The quality of education obtained from such arrangements varied, although students generally sought out physicians with the best reputations, leaving truly poor practitioners without many pupils.<sup>1</sup> But, even a degree from a medical school did not ensure a high level of scholarship. Most medical schools had virtually no entrance requirements, other than requiring students to pay their fees; even literacy was not essential. So, despite a lack of formal didactic instruction, William Beaumont's medical education was as good as the majority of American physicians and probably better than most. Upon completion of his training, the new physician could seek licensure by sitting an exam before the county or state medical society. In June 1812, Beaumont passed his examinations administered by the Third Medical Society of Vermont. Shortly thereafter, on 8 September 1812, he crossed Lake Champlain to offer his services to the Army.

#### MILITARY CAREER

Patriotism and perhaps a sense of adventure likely prompted William Beaumont to join the Army as the War of 1812 began, and not prestige or money.<sup>2</sup> At this time, the status of military physicians was not very high. "They were without rank of any kind, were hardly more respected officially than the non-commissioned officers and did not really have as much authority, though constantly performing the most arduous duties."<sup>3</sup> Considering the general state of medical education, however, the Army Medical Department was fairly progressive in requiring written and oral examinations of potential candidates unless they were graduates of approved medical schools.<sup>4</sup> In November 1812, William Beaumont was given the rank of Brevet Surgeon's Mate in the Sixth Regiment; he would gain considerable experience as surgeon during the War of 1812.<sup>5</sup>

Beaumont's baptism of fire came at the Battle of York, the capital of Upper Canada. During this first American land victory of the war, he served with a force of regular infantry under Brigadier General Zebulon Pike against the weakly fortified British position. Beaumont's Sixth Regiment was in the

vanguard of the successful American assault on the town, but the British had left a fuse burning to the fort's magazine. Stones and boulders pelted the Americans in a horrific, deadly shower. Pike was mortally injured by this lethal debris, which killed and maimed far more soldiers than the battle.<sup>6</sup> The battle's aftermath gave Beaumont his first real taste of the horrors of war:

A most distressing scene ensues in the hospital—nothing but the groans of the wounded and agonies of the dying are to be heard. The surgeons wading in blood, cutting off arms, legs, and trepanning heads to rescue their fellow creatures from untimely deaths. To hear the poor creatures crying, 'Oh dear! Oh, dear! Oh, my God, my God! Do, Dr., Dr.! Do cut off my leg, my arm, my head, to relieve me from misery! I can't live, I can't live!' would have rent the heart of steel and shocked the insensibility of the most hardened assassin and the cruelest savage. It awoke my liveliest sympathy, and I cut and slashed for 48 hours without food or sleep. My God! Who can think of the shocking scene when his fellow creatures lie mashed and mangled in every part, with a leg, an arm, a head, or a body ground in pieces, without having his very heart pained with the acutest sensibility and his blood chilled in his veins.<sup>7</sup>

He also participated in the attack on Fort George during 25–27 May 1813. Beaumont embarked in one of the lead boats of a landing force on 27 May and described "bullets flying around my head like hail."<sup>8</sup> While treating the wounded after this engagement, Beaumont met his prospective mentor and advocate, Dr. Joseph Lovell, the surgeon for the 9th Regiment.<sup>9</sup>

Beaumont clearly admired Lovell, and the friendship they eventually formed would be among the most important relationships of his life. Nearly all of the medical cases treated by Beaumont were the fevers, pneumonia, and dysentery that typified a military encampment. He treated these with the methods he had been taught as an apprentice (bleeding, blistering, and purging); but, among these so-called "heroic" practitioners, there were different schools of thought. Some, like Beaumont, relied more on bleeding, sweating, and purging whereas others, such as Dr. Samuel Gilliland of the 11th Regiment, favored additionally giving "stimulant tonics"—alcohol-based liquids infused with herbs or bark, such as quinine, chamomile, or angostura. Beaumont never held his tongue when he felt he was in the right, and he wrote melodramatically of Gilliland's poor patients:

Behold the gasping, gasping mortals, how they die! From two to five in a day! Twenty-six in the course of two weeks out of four hundred. Can it be correct practice when, in the next regiment, out of six hundred, in an exactly similar situation and laboring under the same diseases, not one has died in the same

time under a diametrically opposite practice? No! Depletion by bloodletting and antimonial sudorifics and diaphoretics, and an entire disuse of all tonic medicines, is the proper plan of cure.<sup>10</sup>

Antimonials were potent emetics, and sudorifics promoted profuse sweating; both Beaumont and Gilliland favored puking, bleeding, and sweating. Gilliland perhaps sweated his patients less, purged their bowels a little more than their stomachs, and gave “stimulating tonics.” It is difficult for today’s physician to determine whose patients had the advantage. If there actually was higher mortality among Gilliland’s patients than Beaumont’s, it was almost certainly due to some factor other than Gilliland’s “stimulating tonics.”

Beaumont adhered to what he had been taught, presumably believing that this approach was the most efficacious; he performed no careful study of results. We now recognize that his remedies were seldom helpful and often harmful because the theories that supported their efficacy were baseless. His methods were no better than those of his colleague Gilliland, yet he passionately attacked Gilliland and practically accused him of murder. Beaumont was an ordinary practitioner of his day. He was not unusually skeptical of doctrine; he was simply naive to the scholarly controversies in academic medicine. Indeed, although heroic practices had been largely discredited in the medical literature by the twilight years of Beaumont’s practice, he continued to follow the same principles of treatment until the day he died.<sup>11</sup> It is precisely because Beaumont had not been trained at a university and steeped in one of the prevailing theories of digestive physiology that he was better able to study Alexis St. Martin with dispassion and objectivity.

Beaumont saw his last major action in the War of 1812 during the Battle of Plattsburgh and earned special recognition from the army’s medical director.<sup>12</sup> Following ratification of the peace treaty at Ghent in February 1815, the Army began to draw down, and Beaumont resigned his commission. He engaged in civilian practice in Plattsburgh from 1815 until 1818, when he applied to reenter the Army as a post surgeon.<sup>13</sup>

#### THE FISTULA, THE PHYSICIAN, AND THE DAWN OF CLINICAL RESEARCH IN THE ARMY MEDICAL DEPARTMENT

Beaumont’s first assignment was to Fort Mackinac (pronounced “Mackinaw”) in the Northwestern frontier. Here, a single event would secure his place in history. Mackinac Island was a frontier post of 195 officers and men, with a civilian population of about 250.<sup>14</sup> Every June, the island’s population swelled 10-fold when the Canadian fur trappers gathered to meet with their American purchasing agents. On 6 June 1822, in a store run by the American

Fur Company, an 18 year-old trapper named Alexis St. Martin met with an accident. Beaumont later described:

Alex Samata [sic], a Canadian lad about 19 years old,<sup>15</sup> hardy, robust and healthy, was accidentally shot by the unlucky discharge of a gun. The whole charge, consisting of powder and duck shot, was received in the left side at not more than 2 or 3 feet distance from the muzzle of the piece, in a posterior direction, obliquely forward and outwards, carrying away by its force the integuments more than the size of the palm of a man's hand, blowing the [sic] off and fracturing the 6th rib from about the middle anteriorly, fracturing the 5th, rupturing the lower portion of the left lobe of the lungs, and lacerating the stomach by a spicula of the rib that was blown through its coat, lodging the charge, wadding, fire in among the fractured ribs and lacerated muscles and integuments and burning the clothing and flesh to a crisp. I was called to him immediately after the accident. Found a portion of the lungs as large as a turkey's egg protruding through the external wound, lacerated and burnt, and below this another protrusion resembling a portion of the stomach . . . with a puncture in the protruding portion large enough to receive my forefinger, and though [sic] which a portion of his food that he had taken for breakfast had come out and lodged among his apparel. In this dilemma I considered any attempt to save his life entirely useless. But as I had ever considered it a duty to use every means in my power to preserve life when called to administer relief, I proceeded to cleanse the wound and give it a superficial dressing. After giving the wound a superficial dressing, the patient was moved to a more convenient place.<sup>16</sup>

Attempts to feed or medicate St. Martin frustrated Beaumont because everything invariably flowed out of the stomach. Small quantities of broth and liquids were administered per os supplemented with "nutritious injections per anus."<sup>17</sup> On 30 May 1823, he attempted to introduce medication through the stomach itself. "I gave a cathartic administered, it is presumed, as never medicine was before administered to man since the creation of the world — to wit, by pouring it in though the ribs at the puncture into the stomach."<sup>18</sup> Several authors have argued that this event first suggested to Beaumont the possibilities that St. Martin's gastrocutaneous fistula might offer for research and study, but it seems more likely that these ideas occurred to Beaumont gradually.

By the middle of 1823, the Mackinac community decided to return St. Martin to his home in Canada despite Beaumont's vehement objections. He claimed that St. Martin would never survive the arduous journey and, whether motivated by charity compassion or scientific curiosity, took St. Martin to his own house. There, he continued to minister to him and employed him as

a household servant in exchange for medical treatment, room, and board.<sup>19</sup> Numerous attempts were made to close the fistula, but all failed. Eventually, a natural valve of tissue formed to occlude the opening. This valve could be easily depressed to access the stomach, but it remained in a closed position by the stomach content, which also kept the gastric juice from flowing out.

In the autumn of 1824, Beaumont described St. Martin's fascinating case in one of his regular reports to Lovell, now Surgeon General. Beaumont wrote that he could "look directly into the cavity of the stomach, observe its motion, and almost see the process of digestion." He had "frequently suspended flesh, raw and roasted, and other substances in the hole, to ascertain the length of time required to digest each." He concluded that, "This case affords a most excellent opportunity of experimenting upon the gastric fluids and the process of digestion. I may therefore be able to hereafter to give some interesting experiments on these subjects."<sup>20</sup> Lovell, Harvard educated and well read in all branches of medicine, was impressed with Beaumont's observations and eagerly encouraged him to proceed with the work. Ultimately, Lovell recommended that Beaumont publish the experiments and also suggested how some of the experiments might be conducted. The role Lovell played in promoting, fostering, and assisting Beaumont cannot be overstated.<sup>21</sup>

When Beaumont conceived of his experiments, he had no understanding of the current state of knowledge and theory in digestive physiology, and was therefore nonpartisan in this hotly debated field. One school of thought believed digestion was a chemical process, with saliva and gastric juice helping to dissolve ingested food; another school of thought held that digestion was a mechanical process, with the grinding of the stomach contributing most to "chymification." Proponents of the latter theory suggested that gastric juice was only swallowed saliva and did not aid appreciably in digestion. Others thought that fermentation was part of the process. Lastly, there were "vitalists" who believed that some "vital principle"—neither chemical nor mechanical—facilitated digestion. Nineteenth century British surgeon John Hunter humorously described the state of affairs in gastric physiology when he wrote that "some physiologists will have it, that the stomach is a mill, others, that it is a fermenting vat, others, again, that it is a stew-pan; but, in my view of the matter, it is neither a mill, a fermenting vat, nor a stew-pan; but a stomach, gentleman, a stomach."<sup>22</sup> Beaumont probably became aware of these arguments through literature sent to him by Lovell, but he was wedded to none of them. Beaumont's first tentative experimental findings were published in the *Medical Recorder* in January 1825.<sup>23</sup>

He continued his work, and on 1 August 1825, he put varied foods on a string. At hourly intervals, Beaumont extracted the string to examine the

progress of digestion, recording the results throughout the day. By 5 pm, the remaining pieces had not changed since 3 pm, and Alexis was complaining of “distress of the stomach” and a headache. With “the boy complaining considerably,” Beaumont did not insert the pieces again.<sup>24</sup>

Beaumont’s subsequent experiments included comparing food digested within the stomach with food digested in gastric juice outside the stomach. He used “a gum-elastic (caoutchouc) tube” to draw off “pure gastric liquor, unmixed with any other matter, except a small proportion of mucus.”<sup>25</sup> He determined that the gastric juice had the same effect *in vitro* as *in vivo*, although digestion *in vivo* occurred at a faster rate. Beaumont attributed the faster digestion *in vivo* to the mechanical action of the stomach. Beaumont’s earliest observations led him to a hypothesis that he then tested. His conclusions were based solely on the results of his experiments, perhaps the most remarkable facet of his work. He was unschooled in orthodox science and working in an environment far removed from the hallowed halls of academia, yet he demonstrated the scientific method 35 years before Claude Bernard articulated it.<sup>26</sup>

After this second set of experiments, Beaumont was granted a 2-month furlough to see his family in Plattsburgh, which was very near St. Martin’s hometown. Seeking female companionship and the comforts of home, he took what Beaumont called “French leave.” “He has absconded and gone to Canada, at the very time I was commencing a number of more interesting and important experiments upon the process of digestion and power of the gastric liquors, and I very much fear I shall not be able to recover possession of him again.”<sup>27</sup> An author a bit more sympathetic to St. Martin suggested that, “Having been strung and pipetted and measured beyond endurance, he bolted back to the woods and lakes of his homeland.”<sup>28</sup> Returning to his hometown of Berthier, St. Martin found a wife, started a family that would eventually number 17, and resumed his career as a voyageur.<sup>29</sup> He was not to see Beaumont again for 4 years. The results of his second series of experiments were published in January 1826. Although his first article might have been considered a fascinating case report, his second article clearly demonstrated the elegant experimental design and cautious conclusions of a gifted scientist. It is now considered a landmark contribution to the annals of American medicine.<sup>30</sup>

Beaumont’s temper had not cooled. At Fort Niagara, he became embroiled in a case that earned him the personal censure of the President. He was attending a young lieutenant and gradually became convinced that the man was malingering. To prove his point, he prescribed a decoction so toxic it would have resulted in paroxysms of vomiting and caused his gums to swell and bleed. Beaumont reasoned that if the officer was not sick, he would not take

the medication. Beaumont went by to visit him later and found him perfectly comfortable, proof that he had not taken the medication and was a malingerer. Beaumont recommended a court martial for malingering and dereliction of duty. The officer was found guilty and was sentenced to dismissal from the service; sentencing required the approval of the President, John Quincy Adams. Adams found less fault with the conduct of the malingering officer than he did with that of the doctor. Adams reprimanded Beaumont for making an experiment “of more than doubtful propriety in the relations of a medical adviser to his patient.” He considered Beaumont’s action “a very improper test of the sincerity of the patient’s complaints” and disclosing “a mind warped by ill-will, or insensitive to its own relative duties.” Yet Beaumont was always confident of his own rectitude and issued a circular protesting the injustice of the President’s accusation. Incredibly, the incident appears to have had no affect on Beaumont’s military career. In fact, bearing no grudge, in February 1828, Adams signed Beaumont’s promotion to the rank of surgeon.<sup>31</sup>

From 1826 to 1829, Beaumont continued his military duties and also engaged in a profitable private practice. He enlisted the help of friends in the American Fur Company to look for St. Martin and ultimately found him. St. Martin returned with his family, and Beaumont continued his experiments. St. Martin and his wife performed the duties of servants in exchange for their room, board, and modest wages. All in all, St. Martin was to leave Beaumont four times during the course of their relationship. We do not know the full dynamics of their relationship.

Following his promotion to surgeon, Beaumont was assigned to Prairie du Chien, Wisconsin, where he remained for 4 years and was reunited with St. Martin. The 56 experiments he conducted there constituted some of the most significant research he ever produced. Probably due to feedback from Lovell and others, his methods and records of his observations had improved significantly. Despite working in a very challenging environment, Beaumont was doing world-class science. Beaumont examined the extent and speed of digestion *in vitro* and *in vivo* of a wide variety of foods while varying the temperature, but the incessant experiments were trying the patience of both St. Martin and his wife, both of whom were growing restless. Additionally, the financial support of St. Martin’s wife and family was probably causing the penny-pinching Beaumont as much gastric distress as he was inflicting on St. Martin—even if he could afford it. Eventually, Beaumont extracted a promise from St. Martin to return without his family and gave him enough money to visit his home in Canada.<sup>32</sup> Beaumont arranged a 6-month furlough. First, he traveled to Plattsburgh so that his wife could visit family. Then, he met St. Martin; together, they journeyed to Washington, DC. Lovell thought he

should consult some of America's leading scientists before planning future experiments.<sup>33</sup> Before departing, in October 1832, Beaumont bound St. Martin to a 1-year contract offering the neither generous nor niggardly salary of \$150 per year, as well as food and clothing, in return for which St. Martin was obliged "to obey, suffer & comply with all reasonable & proper orders or experiments" upon his stomach or its fluids.<sup>34</sup> A few medical ethicists have lauded Beaumont's contract with St. Martin as the first example of informed consent in human research, but the document was clearly intended more to protect Beaumont's "own investment and interests" than to ensure that St. Martin was well-informed and fairly treated.<sup>35</sup> Additionally, Beaumont persuaded Lovell to enlist St. Martin as a sergeant in the Army. In doing this, the economical Beaumont was probably looking for a way to have someone other than himself meet the expenses attendant to paying, clothing, feeding, and transporting his celebrated patient.<sup>36</sup> The contract significantly did not obligate Beaumont to pay St. Martin's salary himself, but stipulates that he must pay him or "cause him to be paid"; and the \$12 per month plus uniform expenses provided by the government to Sergeant St. Martin largely met Beaumont's contractual obligation.<sup>37</sup> Beaumont was not hurting financially at this point in his career. In addition to his Army pay, he had made shrewd property investments, saved money from his extensive moonlighting ventures, and was also receiving pay from the Indian Department for "special services." Nevertheless, he was always eager to avoid any decrease in the weight of his purse.<sup>38</sup>

On arrival in Washington, DC, Beaumont immediately solicited the help of many keenly interested physiologists, such as Robley Dunglison of Virginia, in choosing the best research problems to address. These experiments went beyond the Prairie du Chien work.<sup>39</sup> One outstanding question concerned the chemical composition of gastric juice. Dunglison analyzed the juice and concluded that it was a mixture of muriatic (hydrochloric) acid and acetic acid. Years later, it would be discovered that the acetic acid was merely a byproduct of digestion. Despite attempts to send samples of St. Martin's gastric juice to the best physiological chemists of the day, quantitative analysis was in its infancy, and it was not possible to determine the exact ratio of hydrochloric acid to acetic acid in the juice.<sup>40</sup> Proving that digestive juice was mostly hydrochloric acid answered only part of the question, however. Whereas Beaumont and others had proven that gastric juice could digest food both in vivo and in vitro, there were many scientists who maintained that gastric juice was nothing more than swallowed saliva. No one had compared the properties of saliva to gastric juice, a question Beaumont would tackle. Dunglison suggested that Beaumont immerse identical weights of lean beef in St. Martin's gastric fluid and his saliva. He found that the saliva did not digest the beef,

but the gastric fluid did. He then immersed masticated beef, which had been exposed to saliva in a 3:1 mixture of hydrochloric acid and acetic acid, and compared this with masticated beef in gastric fluid at the same temperature. After 9 hours, the gastric fluid digested the beef completely, whereas nearly half the original weight of solid remained in the acid mixture. Beaumont concluded perceptively that, in addition to hydrochloric acid, “probably the gastric juice contains some principle inappreciable to the senses or to chemical tests”; and, indeed, it would be four more years before Theodore Schwann would discover the enzyme pepsin.<sup>41</sup> This was to be Beaumont’s last series of experiments on St. Martin. By February 1833, Beaumont was at the end of his furlough. He wanted to prepare his results for publication, and his indulgent patron Lovell arranged to keep him assigned officially to the East Coast until his book was complete. Beaumont was growing accustomed to such special concessions, and these expectations were to cause him some difficulty when a new surgeon general took office.<sup>42</sup> At this point, Beaumont gave St. Martin permission to return to his family in Canada.<sup>43</sup> Throughout this period, Beaumont sought an endless succession of favors from Lovell who generally indulged him, and he also appealed to Congress for reimbursement of all expenses in caring for and experimenting on Beaumont, even asking for money to pursue more research. Congress, predictably, was less indulgent.

In December 1833, his book was published. It would sell 3,000 copies, and was enthusiastically received both in the United States and abroad. Careful reviews of the contemporary medical literature show that the importance of Beaumont’s work was quickly recognized, and his reputation was nearly instantaneously established.<sup>44</sup> The publication of William Beaumont’s book was a watershed, not only for the Army Medical Department, but also for the medical profession in general. Crucial to the understanding of gastric physiology, it was the first published example of the scientific method in practice in the United States. Furthermore, the clear support and encouragement of Army Medical Department leadership of the research efforts of an Army doctor enhanced the national reputation of Army medicine in academic circles. Napoleon’s army may have marched on its stomach, but the U.S. Army Medical Department marched to scientific prominence on the stomach of Alexis St. Martin.

Beaumont was ultimately assigned to St. Louis, where he hoped to continue his experiments on St. Martin. St. Martin, however, had no intention of leaving his snug Canadian fireside. Despite repeated tries to get him to return, they were never to see one another again. Thirty years after William Beaumont’s death, a young Canadian professor of medicine named William Osler heard that “fistulous Alexis,” an aged, penurious father of 17 children,

was still alive. Fascinated with the case, he tried to secure postmortem rights to St. Martin's stomach. He planned to donate the famous organ to the Army Medical Museum in Washington, DC. Although Alexis himself may have been receptive to the proposition, his family and community most decidedly were not. Upon his death on 20 June 1880, Alexis St. Martin's body was kept on view in his home for the uncommonly long time of 4 days, then brought to the church "in such an advanced state of decomposition that it had to be kept in its coffin outside the church door during the ceremony." The grave was dug deeper than normal, with a layer of rock to prevent body snatching.<sup>45</sup>

### TWILIGHT YEARS

Returning to St. Louis, Beaumont, with Lovell's consent, set up a private practice that consumed much more time than his military duties. He was soon among the most successful physicians in the city. Whereas an average country doctor earned about \$400 per year, Beaumont earned \$8,000, more than 10 times his Army salary. Despite this, Beaumont had no inclination to leave military service.<sup>46</sup> A sea change in the Army Medical Department leadership occurred in 1836 when Joseph Lovell died at age 48 and was replaced by the stern and dour Thomas Lawson. In personality, manner, and probably ability, Lawson was the antithesis of Lovell. Neither academically trained nor inclined, the niceties of science and research were lost on him. Furthermore, he was known to be mercurial and obstinate, hardly the type of man from whom Beaumont could expect much sympathy. Beaumont had also heard rumors that Lawson was highly resentful of Lovell's favoritism to Beaumont and was planning to move him away from St. Louis, which would have been devastating to his private practice. The self-righteous Beaumont then began a losing debate with his superior officer. Incensed, Lawson ordered Beaumont not to the suburbs of St. Louis, but to Florida, where the Seminole War was in full swing. Beaumont sought to resign, but Lawson refused his resignation until he obeyed the order. Beaumont appealed to some of the military friends he had made over the years—including a young, but influential, captain named Robert E. Lee—to intercede on his behalf. He even appealed to President Martin Van Buren. Ultimately, Beaumont's orders to Florida were withdrawn, and his resignation was accepted. Incredibly, he fought ferociously (but in vain) to recall his resignation and remain in St. Louis on active duty. He had no need of his military pay, but William Beaumont could not swallow pride in silence.<sup>47</sup>

Beaumont remained in practice in St. Louis for many years; but, as a physician, he continued to practice according to the precepts he had learned 40 years earlier. There is no evidence that his study of the science and physiology of digestion or his later experiments with St. Martin led him to apply the

latest thinking and theory to the other aspects of his medical practice.<sup>48</sup> Even in civilian life, controversy and conflict were never far from his side. He was frequently fighting with colleagues: disputes with the local medical society, squabbles over money with his partners, and even the occasional malpractice suit punctuated his postmilitary career. Throughout the remainder of his life, Beaumont continued to beg St. Martin to return, but Alexis would agree only if his family could come, too. To this, Beaumont never agreed, and Alexis never returned. In March 1853, Beaumont slipped and fell on some icy steps, striking his head hard. He was ill and bedridden for 5 weeks; and, on 25 April, he died.

The first in a long tradition of talented and dedicated clinician scientists who would wear the uniform of the U.S. Army, William Beaumont's groundbreaking, elegant research burnished the reputation not only of Army medicine but of American science. His weaknesses in training as a scholar were his strengths in research as an investigator. As Beaumont himself wrote in the preface to his book, his were: "experiments made in the true spirit of enquiry, suggested by the very extraordinary case which gave me an opportunity of making them. I have no particular hypothesis to support; and I have therefore honestly recorded the result of each experiment exactly as it occurred."<sup>49</sup>

#### WILLIAM BEAUMONT ARMY MEDICAL CENTER

On 19 December 1919, Congress honored William Beaumont when it named the new general hospital at Fort Bliss, Texas, in his honor. William Beaumont General Hospital opened its doors on 1 July 1921. A larger, more modern facility was redesignated William Beaumont Army Medical Center in April 1973.<sup>50</sup> Attesting to the importance of Dr. Beaumont's legacy outside the military, several civilian hospitals and even a hospital system have been named in his honor. It is also significant that the most prestigious award bestowed for original investigation by the American Gastroenterological Association is the William Beaumont Prize in Gastroenterology.<sup>51</sup>

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#### Notes

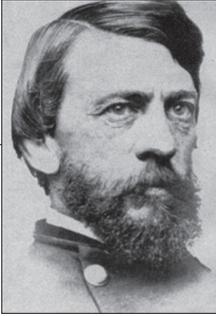
1. On medical education in the period, see: Ronald L. Numbers, ed., *The Education of American Physicians: Historical Essays*, Berkeley, CA: University of California Press, 1980; Richard H. Shryock, *Medical Licensing in America, 1650-1965*, Baltimore, MD: Johns Hopkins Press, 1967; Kenneth M. Ludmerer, *Learning to Heal: The Development of American Medical Education*, New York, NY: Basic Books, 1985.
2. Reginald Horsman, *Frontier Doctor: William Beaumont, America's First Great Medical Scientist*, Columbia, MO: University of Missouri Press, 1996:10.
3. Harvey E. Brown, *The Medical Department of the United States Army from 1775 to 1873*, Washington, DC: Surgeon General's Office, 1873:93.

4. Mary C. Gillette, *The Army Medical Department, 1773–1818*, Washington, DC: Center of Military History, United States Army, 1981:150.
5. Jesse S. Myer, *Life and Letters of Dr. William Beaumont*, St. Louis, MO: C. V. Mosby, 1912:40–41. Often newly commissioned officers, such as Beaumont, received “brevet” rank until authorized positions became available. Brevet rank was also used to recognize valor and achievement prior to the advent of military decorations.
6. The explosion killed 38 American soldiers and wounded 222. It is interesting to note that the destruction of the magazine, which would today be considered a tactical success, was in 1813 considered terribly unsporting. The angry American victors burned many of the public buildings in York, and it was in retaliation for this outrage that the British claimed the right to burn the public buildings of Washington, DC, later in the war. (J. MacKay Hitsman, *The Incredible War of 1812: A Military History*, Toronto, Canada: University of Toronto Press, 1965:23–27; A. J. Langguth, *Union 1812: The Americans Who Fought the Second War of Independence*, New York, NY: Simon & Schuster, 2006:232–235.)
7. Beaumont journal entry as transcribed in Myer, p. 45.
8. Horsman, p. 41; A. J. Langguth, *Union 1812: The Americans Who Fought the Second War of Independence*, New York, NY: Simon & Schuster, 2006:235.
9. Myer, pp. 54–55.
10. Genevieve Miller, ed, *Wm. Beaumont’s Formative Years, Two Early Notebooks 1811–1821*, New York, NY: Henry Schuman, 1946:13–14.
11. Estelle Brodman, “William Beaumont as a Physician,” *Wisconsin Medical Journal* 66 (1967): 272–276.
12. James Mann, *Medical Sketches of the Campaigns of 1812, 13, 14*, Dedham, MA: H. Mann and Co., 1816:271–272.
13. Horsman, pp. 62–66.
14. Nelson, p. 84.
15. The question of St. Martin’s age is a matter of debate. Beaumont himself gave different dates (Myer, p. 107; William Beaumont, *Experiments and Observations on the Gastric Juice and the Physiology of Digestion*, Plattsburgh, NY: F. P. Allen, 1833). See also Sylvio Leblond, “The Life and Times of Alexis St. Martin,” *Canadian Medical Association Journal* 88 (1966): 1211.
16. Myer, pp. 107–108.
17. Nelson, p. 110.
18. Ronald L. Numbers, “William Beaumont and the Ethics of Human Experimentation,” *Journal of the History of Biology* 12 (1979): 114; Nelson, p. 114; Horsman, p. 88.
19. Nelson, p. 117.
20. Horsman, p. 95.
21. Estelle Brodman, “Scientific and Editorial Relationships Between Joseph Lovell and William Beaumont,” *Bulletin of the History of Medicine* 38 (Mar–Apr 1964): 127–132.
22. William Osler, “A Backwood Physiologist,” in *An Alabama Student and Other Biographical Essays*, New York, NY: Oxford University Press, 1908:173. Osler erroneously attributes the quote to the 18th century anatomist William Hunter, when it was actually uttered

by William's younger brother, the surgeon John Hunter. Osler's misattribution has been perpetuated by subsequent Beaumont biographers.

23. Joseph Lovell (William Beaumont), "A Case of Wounded Stomach," *Medical Recorder* 8 (1825): 19.
24. Nelson, p. 128.
25. Horsman, p. 112; Beaumont, p. 126; Nelson, p. 132.
26. Nelson, p. 129. Claude Bernard and Henry Copley Greene, trans., *An Introduction to the Study of Experimental Medicine*, New York, NY: Dover Publications, 1957:24.
27. Nelson, p. 122.
28. Richard Selzer, "Alexis St. Martin," in *Confessions of a Knife*, New York, NY: Simon & Schuster, 1979: 122.
29. Sylvio Leblond, "The Life and Times of Alexis St. Martin," *Canadian Medical Association Journal* 88 (1963): 1211, p. 1207; Nelson, p. 130; Horsman, p. 114, Meyer p. 122.
30. William Beaumont, "Further Experiments on the Case of Alexis St. Martin Was Wounded in the Stomach by a Load of Buckshot, Detailed in the Recorder for January 1825," *Medical Recorder* 9 (1826): 94–97.
31. Meyer, p. 122; Horsman, pp. 117–118; Nelson, p. 134. Beaumont's easily bruised ego and contentious personality always found him at the center of controversy. He narrowly avoided a duel with a fellow officer over some perceived slight, accused a commander of drunkenness, and had at least two fellow physicians court-martialed. Yet, he also befriended some of the truly great men of his era. One of his biographers aptly noted of Beaumont that, although he "was unable to keep quiet about what he thought were faults or derelictions of duty among those with whom he worked closely, [he also] made some very good and close friends throughout his life; [and] some bitter enemies. It is to his credit that his close friends were often men of considerable ability and worth, while his enemies were frequently badly flawed. Beaumont's problem was that he never knew when to turn a blind eye to the flaws of those he had to work with" (Horsman, pp. 124–125).
32. Nelson, p. 180; Horsman, p. 144; Myer, p. 139.
33. Horsman, pp. 149–155; Nelson, p. 198.
34. Numbers, "Ethics," p. 117.
35. Henry K. Beecher, *Research and the Individual: Human Studies*, Boston, MA: Little, Brown, 1970:219; Carl J. Wiggers. "Human Experimentation as Exemplified by the Career of Dr. William Beaumont," *Alumni Bulletin*, School of Medicine and Affiliated Hospitals, Western Reserve University, September 1950, pp. 60–65, cited by Numbers, "Ethics," p. 113. Beaumont's ethics as regards his treatment of St. Martin has been a cause for much discussion.
36. Numbers, "Ethics," p. 117; Horsman, p. 149; Nelson, 199.
37. Copy of contract transcribed in Myer, p. 149.
38. Horsman, p. 151. Beaumont's parsimony was legendary. In 1839, at a time when his practice was yielding him the then princely sum of \$10,000 per year, a treasury department auditor sent him a bill for a meager \$6.96 to pay for the forage for an extra horse he had kept. Beaumont responded to the bill with vitriol: "I know my rights and privileges, and knowing shall endeavor to maintain them. I am the correct keeper of my own accounts and comptroller of my own conscience!" (Horsman, 243).

39. See Horsman, pp. 164, 172, for a different view.
40. Samples were provided to Benjamin Silliman in Philadelphia and Jacob Berzelius in Sweden.
41. Horace Davenport, *A History of Gastric Secretion and Digestion: Experimental Studies to 1975*, New York, NY: Oxford University Press, 1992:79.
42. Horsman, p. 169.
43. Horsman, p. 172.
44. Ronald L. Numbers and William J. Orr, Jr., "William Beaumont's Reception at Home and Abroad," *Isis* 72 (1981): 590–612.
45. Leblond, p. 1209.
46. Horsman, pp. 206, 214, 243; Meyer, p. 240.
47. Horsman, pp. 239–242.
48. Brodman, "Beaumont as a Physician," pp. 273–276.
49. Beaumont, p. 6.
50. War Department. General Orders No. 40, dated 26 June 1920, Encore, Susan, Sunny Stone and Adam Smith, William Beaumont General Hospital Historic District: Building Inventory Update, Ft. Bliss, TX: Conservation Division, Directorate of Environment, January 2007, p. 41.
51. Beaumont Hospital is a regional medical system in the greater Detroit, Michigan, area. It first opened with a 238 bed hospital in Royal Oak, Michigan, in 1955—Wikipedia ([http://en.wikipedia.org/wiki/William\\_Beaumont\\_Hospital](http://en.wikipedia.org/wiki/William_Beaumont_Hospital)); American Gastroenterological Association, William Beaumont Prize in Gastroenterology, established in 1976. "To recognize an individual who has made a major contribution that has significantly advanced GI basic or clinical research" (<http://www.gastro.org/wmspage.cfm?parm1=7247>).



by *Robert J. T. Joy*

## JONATHAN LETTERMAN 1824–1872

### INTRODUCTION

A Corps of Medical Officers was not established solely for the purpose of attending the wounded and sick; the proper treatment of these sufferers is certainly a matter of very great importance, and is an imperative duty, but the labors of Medical Officers cover a more extended field. The leading idea, which should be constantly kept in view, is to strengthen the hands of the Commanding General by keeping his Army in the most vigorous health, thus rendering it, in the highest degree, efficient for enduring fatigue and privation, and for fighting.<sup>1</sup>

In two sentences, Jonathan Letterman summed up the military rationale for having medical support for troops in the field. Who was Letterman, where did he learn military medicine, and why is he now recognized as “The Doctor to Armies”?

### EARLY YEARS

He was born in Canonsburg, Pennsylvania, on 11 December 1824. His father, Jonathan, was a well-known physician, and his mother, Anna Ritchie,

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was the daughter of a prominent Canonsburg merchant who was a trustee of Jefferson College. Letterman received his early education from tutors and entered Jefferson College in 1842, graduating in 1845.<sup>2</sup> He probably then did the required 3-year preceptorship in medicine with his father before entering the 1-year course at Jefferson Medical College in 1848.<sup>3</sup> The Jefferson Medical College had been founded by George McClellan in 1824 as the medical faculty of Jefferson College,<sup>4</sup> an association that ended in 1838 before Letterman entered.<sup>5</sup>

Jefferson Medical College, in Letterman's years of attendance (1848–1849), had an extraordinarily distinguished faculty. Robley Dunglison, friend and physician to Thomas Jefferson, taught *Materia Medica* and *Therapeutics*. Joseph Pancoast and Henry Mutter taught anatomy and surgery, respectively. Obstetrics and “Diseases of Women and Children” were given by Charles D. Meigs while Franklin Bache was the Professor of Chemistry.<sup>6</sup> All of these men had written extensively. Dunglison's *Human Physiology* and *Therapeutics and Materia Medica*, as well as his medical dictionary, were widely known. Pancoast's *Operative Surgery* and Mutter's *Operations and Surgery* were standard texts. Meigs, with *Obstetrics* and *On Females, Their Diseases and Remedies*, was the leading man in his field, whereas Bache was the co-author of the *Dispensatory of the United States*.

Jefferson not only had this superb faculty, but it also offered excellent facilities for dissection, and, with its attached outpatient dispensary, good clinical instruction. The school attracted many of its students from the Southern States, and was also a favorite of young Army and Navy medical officers who attended some of the lectures and did postgraduate studies. Indeed, William P. C. Barton—later the first Surgeon General of the Navy—while serving in Philadelphia, was not only the faculty, but was also Dean of the College from 1828 to 1830.<sup>7</sup>

Letterman graduated in March 1849 and took the examination for a commission in the Army Medical Corps in New York in May. Whether it was a military medical ambience at the College—Bache had served in 1812; Dunglison did chemical analyses for William Beaumont; and Usher Parsons, a famous Navy surgeon, had been on the faculty—or love of adventure, or the financial security of commission, we do not know just why he joined the Army.

The Army Medical Board that examined Letterman tested 52 candidates. In addition to a thorough review of didactic knowledge of medicine, it required “knowledge of Latin, of Physics or Natural Philosophy, of a given amount of Practical Anatomy in the form of dissection, and a certain amount of Clinical Instruction.” Of the 52 applicants, 18 withdrew, 7 failed the physical examination, and 1 was not a citizen and was rejected. Of the 26 remaining

applicants, Letterman was one of nine offered a commission, which he accepted on 29 June 1849.<sup>8</sup> Among those who took the examination with Letterman and who were also commissioned was William Alexander Hammond, later to become both famous and notorious.<sup>9</sup> Hammond and Letterman were to meet again.

## THE ARMY

Assistant Surgeon Letterman's first assignment (after a brief tour at Fort Monroe, Virginia) was to Fort Meade, Florida, from 1849 to 1853. The post was 46 miles south of Tampa. This was a few years after the Seminole Wars and the campaigns against the Creeks and Cherokees from 1835 to 1892.<sup>10</sup>

Thomas Lawson, the Surgeon General, required meteorological and medical reports from his doctors.<sup>11</sup> From 1819 to 1870, the Army Medical Department collected the only national weather data; medical theory at the time related the occurrence of contagious and infectious diseases to miasma and climactic conditions.<sup>12</sup> Letterman thus sent his reports from Fort Meade in 1852.<sup>13</sup> He noted that, "the quarters . . . do not turn the rain and give little protection from the cold." Letterman found that, "during the summer of 1850, sickness prevailed here to a great extent . . . owing to the position the camp occupied . . . upon the low ground upon the bank of the river. The intermittent fevers prevail to a considerable extent. Sulphate of quinine . . . used as an anti-periodic."<sup>14</sup>

He reported a case of dengue fever and that "dysenteries and diarrheas had been of frequent occurrence." Letterman autopsied one patient who died of chronic diarrhea. And, he noted, "Indians not being permitted to trade at this Post, I have not seen one since I have been here."

Letterman left Fort Meade in 1853 for a year of duty at Fort Ripley, Minnesota. In May of 1854, he was sent with a column of troops from Fort Leavenworth, Kansas, to Fort Defiance, New Mexico Territory, arriving in September.<sup>15</sup> He transferred to Fort Union, New Mexico, in 1855.

He reported to the Surgeon General from Fort Union in October 1856.<sup>16</sup> He was again concerned with facilities, and his reports—as do those of the other frontier surgeons—vividly documented the shabby and shameful conditions of those old western posts. "Water during a heavy rain not infrequently runs into and through some of the buildings . . . log houses, rotting . . . the men sleep outside when possible. The hospital, having a dirt floor, has not a room which remains dry. . . . I was obliged to use the tents and canvas to protect the property." He kept up with the medical literature, for he noted that, "several cases of erysipelas of the face . . . reliance placed upon the tincture of chloride of iron (as suggested in the London *Lancet*)."

In April 1857, Letterman was in the field with Colonel William W. Loring of the Mounted Rifles in a campaign against the Mogollon Apaches. On 25 May, the column fought Cuchillo Negro's band of Apaches, and, after a long patrol of the area, returned to Fort Union in August.<sup>17</sup> In September 1858, Letterman was transferred to Fort Monroe for a 6-month assignment and then served until December of 1859 in New York City as an Assistant Medical Purveyor.<sup>18</sup> He was then transferred to the Department of California; and, in 1860, he was in the field again under Major James H. Carleton against the Paiutes around the mining camps of Virginia City.<sup>19</sup> November 1861 found Letterman accompanying California volunteers for the Civil War to New York. And now, with Jonathan Letterman engaged in the Civil War, his great contributions to military medicine were about to begin.

#### THE CIVIL WAR

He was initially assigned as Medical Director of the Department of West Virginia; and here he became associated with two other men—the three of them to have a marked influence on the Army and its Medical Department in the next 2 years. Major General George B. McClellan commanded the Department of the Ohio. It is interesting to note that he was the son of Dr. George McClellan who founded Jefferson Medical College. William A. Hammond, who had left and then returned to the Army, was Hospital Inspector. The West Virginia campaign was short, supported the secession of Western Virginia from the Confederacy, protected the rail lines to the West, and resulted in Union victory by July 1861. McClellan's success led to his appointment as Commander of the Army of the Potomac after the Union disaster at Bull Run.<sup>20</sup>

In April 1861, the U.S. Sanitary Commission (USSC) was founded and soon began to agitate for reform of a medical department as ill-prepared to fight, as was the Union Army.<sup>21</sup> McClellan recognized the need for reform, supported the USSC, and Congress passed a reorganization bill in April 1862. The USSC was also instrumental in having Hammond appointed as Surgeon General at that time.<sup>22</sup>

McClellan began the Peninsular Campaign “On to Richmond” in March 1862. Over that summer, the “Seven Days” battles were fought; Lee was victorious, and McClellan eventually conceded defeat and retreated to Washington. The medical support for this campaign was a shambles. The USSC provided much of the evacuation system and medical supplies. In fairness to Medical Director Charles Tripler and the medical department, it must be noted that the Act of April 1862 had not yet been implemented. The medical corps was understaffed, had no military authority to direct ambulances and hospitals,

still had to use peacetime procurement regulations, and had never had general hospitals of the kind now required.<sup>23,24</sup> Nevertheless, public opinion demanded that something be done. And it was: on 1 July 1862, the day of the Battle of Malvern Hill, Jonathan Letterman was appointed Medical Director of the Army of the Potomac.

Newly promoted to Surgeon (Major), Letterman had been given clear orders by Hammond on 19 June. In part, they read:

1. You should satisfy yourself that the medical supplies are in proper quantity and of good quality. . . . The time has passed when the excuse of 'no supplies' will be accepted.
2. You will lay before the officers of the Quartermaster's Department your necessities in regard to transportation.
3. You will require all medical officers to be attentive and faithful in the discharge of their duties.
4. You will . . . arrange for the safe, effectual, comfortable, and speedy transportation of the sick and wounded.
5. You will hire such physicians, nurses, etc., as you may require, and as you can obtain on the spot.
6. You are authorized to call directly upon the Medical Purveyors . . . who will be directed to furnish you with every thing you may ask for, regardless of the supply-tables or forms.

And now, . . . I commit to you the health, the comfort, and the lives of thousands of our fellow-soldiers who are fighting for the maintenance of their liberties.<sup>25</sup>

Letterman immediately took charge of medical matters. He directed the dispatch of river boats up the James to evacuate the wounded; brought in rations for the patients, as well as fruit and vegetables to feed the many men who had scurvy; and secured tents to house the wounded and deployed surgeons to these tent hospitals. He prepared an Army Regulation on diet, camp sanitation, bathing, and preventive medicine and general hygiene. McClellan signed and issued it with dispatch.<sup>26</sup>

Letterman's impact was noted by Frederick Law Olmstead, Secretary of the USSC, who was with the Army:

Under the dry, taciturn and impenetrable manner, promising nothing, of the new Medical Director of the Army of the Potomac . . . was found to be concealed some influence by means of which whatever before had been impossible began to be thought possible, and to be tried.<sup>27</sup>

Through that July and August, the Army and its sick and wounded fell back on Washington to reequip, fill its vacancies, and train. The sick and wounded were dispersed to the general hospitals in Washington, with many being sent to hospitals in their home states.<sup>28</sup>

Letterman turned his attention to the most desperate need of the medical system—an ambulance corps. He noted:

Neither the proper kind nor the number of ambulances was in the Army at that time, but it was necessary, nevertheless, to devise such a system as would render most available, the materials upon the spot without waiting for the arrival of the additional number that had been asked for, only a portion of which ever came.<sup>29</sup>

Thus, Letterman established our modern field ambulance system, under the command and control of the medical department. Although the details of organization—and certainly the vehicles—have changed, the *concepts* are identical to those in force today.

McClellan, after the defeat in the Peninsula, was kept inactive, as was Letterman with him. Pope, with the Army of Virginia, fought the second Battle of Bull Run on 29–30 August and was defeated by Lee. The Letterman system was not really in place at the second Battle of Bull Run, nor was Letterman in charge, and the medical support was sadly deficient.<sup>30</sup>

In early September, McClellan was restored, Letterman with him, and Lee crossed the Potomac into Maryland. The Army of the Potomac moved to intercept him; and, on the rainy morning of 17 September 1862, the two armies met at Antietam. The military aspects of this “bloodiest day of the war,” of the Sunken Road, the Cornfield, the Dunkard Church, and Burnside’s Bridge, may be read elsewhere.<sup>20</sup> Lee’s repulse gave Lincoln political justification to issue the Emancipation Proclamation and contributed directly to England’s decision not to support the Confederacy.

Letterman, returning as Medical Director under McClellan, had had but 2 weeks to restore the medical service from “the deplorable condition in which I found it. The officers worn out . . . a large portion of their supplies left behind . . . or thrown away by commanding officers on their way to join General Pope. It required to be entirely refitted before it would again be in proper condition.”<sup>31</sup> He ordered ambulances and medical supplies, and established field expedient hospitals in Frederick, Middletown, Burkittsville, and other small Maryland towns on the route of the march. In the rear of the battle line at Antietam, he established dressing stations and “hospitals” in houses and barns—the hospital tents had not come up with the supply trains.

The medical supply problem remained critical, but the remnants of the ambulance corps that he was able to reestablish worked very well. He arranged for the wounded to be taken by ambulance to railheads in Frederick and to schedule the hospital trains to Baltimore and Washington so as not to overcrowd the hospitals in Frederick. By 30 October, he had more than 5,000 Union and 2,000 Confederate wounded in 1,000 bed tent hospitals in Frederick. There had been over 23,000 casualties in the two armies from this one day of combat.

Letterman noted, as many military surgeons had before him, the decreased morbidity and mortality, especially from wound infection, when patients were kept in tents, rather than crowded into buildings. Letterman expressed another cogent reason for the tent hospitals that kept the patients with the Army:

I believe it is the correct principle, when the exigencies of the service will permit, that the sick and wounded should be kept with the Army, treated by their own surgeons . . . life in a general hospital tends to destroy the good qualities in a soldier . . . so well preserved by their comrades.<sup>32</sup>

The two fundamental issues—treat as far forward as possible and maintain unit integrity and morale—are now clichés of modern military medicine.

McClellan's failure to pursue Lee cost him his command in November, and Major General Ambrose E. Burnside took over the Army of the Potomac. Letterman used the lull after Antietam to improve his medical system. He reorganized the supply procedures:

I desire to reduce the waste which took place when a three months supply was issued to regiments; to have a small quantity given them at one time, and to have it at all times replenished without difficulty; to avoid a multiplicity of accounts, and yet preserve a proper degree of responsibility; to have a fixed amount of transportation set apart for carrying these supplies and used for no other purposes.<sup>33</sup>

What Letterman installed was a field medical depot system and the forerunner of what is now known as “push” logistics for a fixed table of allowances with the responsibility for resupply coming from the rear and automatically.

He then turned his attention to the assignment of his medical officers and to “devising some measures by which the wounded would receive the best surgical aid which the Army afforded.”<sup>34</sup> At this time, surgeons were assigned to their regiments; if the regiment was in action, they were overwhelmed

with casualties; if not, they sat idle. Furthermore, often, because they were political appointees, poorly trained surgeons were operating beyond their skill. Letterman saw this clearly:

On the field of battle, where confusion in the Medical Department is most disastrous [sic], it is most apt to occur, and unless some arrangement be adopted by which every Medical Officer has his station pointed out and his duties defined beforehand, and his accountability strictly enforced, the wounded must suffer.<sup>35</sup>

Letterman established a field medical hospital for each division of the Army, put the most competent surgeon in charge (with assistant surgeons in charge of supplies and records), and assigned three surgical teams with a senior and junior surgeon in each to do the operating. The three senior surgeons were to be selected “without regard to rank, but solely on account of their known prudence, judgement and skill.” One medical officer was to remain with each regiment “to establish themselves . . . at a temporary depot . . . to give such aid as is immediately required.”<sup>36</sup> What he had done was invent the modern system of echeloned medical care, with the least experienced physicians forward at primitive battalion aid stations and with the surgical specialists further to the rear in tent hospitals. The ambulance system and the litter bearers served as the transport links of the system.<sup>37,38</sup>

During the 2 months between Antietam and Fredericksburg, Letterman got married. Worn and weary from the battle, he had rested at the home of Mary Diggers Lee—it must have been a whirlwind courtship, for they were married that very month. Letterman was astonished to receive an elaborate silver service as a wedding present from his officers; he had not known how highly they respected him and cared for him.<sup>39</sup>

On 17 November, Burnside moved the Army of the Potomac to the Rappahannock River opposite Fredericksburg. The river was bridged with pontoons on 11 December and 2 days later Burnside ordered the fatal, foolish charge through the city uphill on Marye’s Heights against an entrenched Lee with his protected, hidden artillery. It was a military disaster and a medical success.<sup>40</sup>

Letterman had had time to plan, prepare, equip, and inspect. Eighteen field hospitals were in place with their surgical staffs ready. The ambulance corps was trained and staffed. During the battle, the forward dressing stations and some field hospitals were established in the buildings of Fredericksburg, the litter bearers moved the wounded to hospitals in the city, or the ambulances evacuated them back across the pontoon bridges to the hospitals on the

north bank. Wounded were evacuated day and night; surgeons operated continuously; and, one day after the battle, all casualties had been removed and had reached medical care. Beginning on 16 December, those who had been treated began to leave for the general hospitals in Washington by rail and river steamer.<sup>41</sup> Approximately 110,000 Union troops fought that day; 1,300 were killed in action and another 1,500 were missing. Letterman's medical service had more than 9,000 wounded to care for. Once again, the Army of the Potomac retreated; but, perhaps the soldiers' morale was improved as Letterman reported, "they saw that if men did fall in a battle from which we gathered only the bitter fruits of defeat, the medical department had become more able than before to fulfill its important duty."<sup>42</sup> The Letterman system had had its fair trial, and it had worked.

As the Army of the Potomac lay in its camps that winter, Letterman introduced his last reform. He established a corps of Medical Inspectors, with standard reporting and inspecting forms, so that morbidity and mortality data would be collected, supplies accounted for, and the competency of the medical officers evaluated. He emphasized the enforcement of preventive medicine measures; the inspectors were to impress the medical officers that, "their duties . . . are not confined to prescribing drugs, but that it is . . . of the highest importance to preserve the health of those who are well. The prevention of disease is the highest object of medical science."<sup>43</sup>

He had an eye to posterity as well. Surgeon General Hammond had established a Medical Museum and had directed the preparation of a medical history of the war.<sup>44</sup> Letterman, in requesting that the reporting forms be used, told his physicians the information would have a future use. "The medical and surgical history of a battle is a subject of deep interest to the profession and to humanity . . . much valuable information may be contributed by the earnest attention of medical officers to the advancement of science."<sup>45</sup>

The Army of the Potomac had another new commander in spring 1863. Major General Joseph Hooker was the new "On to Richmond" hope—hopes that Lee broke in April and May at Chancellorsville. Letterman's medical service did competent work. Evacuation of the wounded was made more difficult by the terrain of the wilderness and by the chaos of Hooker's defeat. Field hospitals came under artillery fire, and ambulances could not move on choked roads. Medical officers and supplies were captured; but, in general, the wounded were treated and evacuated despite the difficulties that occurred when the Army retreated. Letterman had established his tented field hospitals on the north bank of the Rappahannock. They cared for 9,500 wounded, and, for the first time, he was permitted to keep them with the Army rather than continue their evacuation to general hospitals in Washington. Letterman

arranged for medical officers, supplies, and food to be sent through the Confederate lines to care for 1,200 wounded Union prisoners.<sup>46</sup> Ten days later, he arranged, through command channels, for them to be evacuated to Union lines with his ambulances.

Lee marched into Maryland and Pennsylvania that June, and the Army of the Potomac—now commanded by Major General George G. Meade—went to find him. Those armies met at Gettysburg on 1 July 1863; and, for 3 days the issue was in doubt, finally to be resolved in the defeat of Pickett's charge at "the high water mark of the Confederacy."

Letterman had been ordered to leave his ambulances, medical wagons, and supplies behind. He protested, but to no avail. On 1 July, Meade ordered all his supply trains to the rear, eventually to place them 25 miles from the battlefield.<sup>47</sup> Hospitals were located miles from their divisions. As a result, most of the carefully constructed medical system was not used during the battle; indeed, Meade permitted only some of the ambulances and hospitals to come forward even *after* the battle was over. It rained on 4 July, and the wounded lay in the open. Only the XII Corps, whose commanding general had not obeyed Meade's order, had its full complement of medical equipment. In this corps, the Letterman system worked perfectly. Thus, at Gettysburg, although medical supplies were adequate, thanks to their transport by the regimental surgeons, the hospital tents and ambulances were not in place until several days after the battle. Eventually, over 20,000 Union and Confederate wounded were evacuated by 22 July.<sup>48</sup>

Gettysburg was Letterman's last battle. He requested reassignment, left the Army of the Potomac in January 1864, and served as Medical Inspector of Hospitals in the Department of the Susquehanna for 1 year. He was succeeded by Thomas A. McParlin, who tried to carry on his system, with more or less success.<sup>49</sup> It may fairly be said that the complete system was not routinely used until James T. Ghiselin became Sheridan's Medical Director in 1864.<sup>50</sup> However, Ghiselin had an advantage that Letterman did not: the ambulance corps now existed in law. As early as 1862, Hammond had tried to have Secretary of War Stanton establish an Army-wide hospital corps and ambulance system. Major General Halleck, the General-in-Chief of the Army, did not agree and Stanton supported him. The Letterman system, which he modified slightly in August 1863, was eventually made law by an Act of Congress in March 1864.<sup>51</sup> Even though Letterman was consulted on the bill, by the time it passed he was effectively removed from the center of affairs.

Letterman had never been promoted beyond the grade of Major, even though McClellan twice and Hammond once had recommended brevet promotions. When it became known that he was leaving the Army of the

Potomac, all its medical officers petitioned the Senate requesting his promotion to Colonel. The petition reviewed Letterman's accomplishments and concluded:

For the man who has benefitted so much by his ability, by his untiring zeal, our department, we . . . claim no extraordinary tribute, we merely represent for the sake of the Armies of the United States that he be honored with the rank . . . granted to the heads of other departments in the field.<sup>52</sup>

No action was taken. In December 1864, Letterman resigned from the Army to enter business in California. He was not in good health after Gettysburg, and it is possible that the removal and pending court-martial of his friend, Surgeon General Hammond, was a precipitating factor. It was likely that friends of Hammond would not fare well at the hands of Stanton.<sup>53</sup>

#### AFTER THE ARMY

Letterman's business affairs did not prosper, and he returned to medical practice in San Francisco. He served as Coroner of San Francisco, as Surgeon General of California, and as a member of the Board of Medical Examiners of the University of California.<sup>54</sup> He published his *Medical Recollections of the Army of the Potomac*<sup>1</sup> in 1866, which has become a classic text in military medicine; much of what he wrote is still applicable today.

His wife died suddenly in 1867, leaving him with two young daughters. His friends noted a decline in his health dating from that time, coupled with increasing disability from chronic gastroenteritis. He died in San Francisco on 15 March 1872. Among his attending physicians was William Hammond. In 1906, his body was transferred to Arlington Cemetery, where he now lies.

#### CONCLUSION

Jonathan Letterman had been in the Army for 13 years before the Civil War. His assignments at the lonely garrisons of the frontier army, his experience of field service in Indian campaigns, and his staff training as a supply officer had all fitted him for the job he was given. But some genius for organization, some special insight for medical support in combat, lifted him above his colleagues and allowed him to make his superb contributions to military medicine. Letterman gave to every army in the world the present field medical service system: an ambulance evacuation *system*, an echeloned surgical resuscitation and treatment *system*, a centralized field medical supply *system*, a preventive medicine inspection *system*, a field medical records *system*, and a tented field hospital *system*. And, he established the precedent that all of this should be controlled and commanded by medical officers.

Letterman's system has saved untold numbers of lives on countless battlefields, not only in the care of the wounded, but also in his insistence on preventive medicine. As he said:

More soldiers die by disease than by violence, and if a Medical Staff can secure their health, its officers contribute largely to the success of a campaign. First, that the Commanding General should have an Army upon whose health he could rely. Second, that those who might be wounded should be in a condition to bear the shock and the operation . . . with every prospect of recovery.<sup>55</sup>

Hear then, both the medical organizer and the compassionate physician speaking. Doctor to Armies yes, but equally, Surgeon to Soldiers.

#### Notes

1. Jonathan Letterman, *Medical Recollections of the Army of the Potomac*, New York, NY, 1866:100.
2. Harriet Brinton, *Focus on Washington County*, Washington, PA, 1980, II, p. 43. For a brief history of Jefferson College, see James B. Donnelly, *200 Years W and J*, Washington, PA, 1980.
3. Bennett A. Clements, "Memoir of Jonathan Letterman, M.D.," *Journal of the Military Service Institution of the United States* 4 (1883): 250–287, p. 251.
4. Washington L. Atlee, *Reminiscences of the Earliest Days of Jefferson Medical College*, Philadelphia, PA, 1873:4.
5. George M. Gould, *The Jefferson Medical College of Philadelphia*, Vol. I, New York, 1904:85.
6. *Ibid.*, p. 107.
7. Edward L. Bauer, *Doctors Made in America*, Philadelphia, PA, 1963, p. 25.
8. Harvey E. Brown, *The Medical Department of the United States Army From 1775 to 1873*, Washington, 1873, pp. 198–201.
9. For the interesting career of W. A. Hammond, see Jack D. Key, *William A. Hammond*, Rochester, MN, 1979, and Bonnie E. Blustein, *A New York Medical Man: William A. Hammond*, PhD dissertation, University of Pennsylvania, 1979.
10. For a description of the life of an Army doctor during the Seminole Wars, which was probably much like Letterman's 10 years later, see James F. Sunderman, *Journey Into Wilderness*, Gainesville, FL: University of Florida, 1963.
11. Thomas Lawson and Samuel Forrey, *Statistical Report on the Sickness and Mortality in the Army of the United States*, Washington, 1840.
12. Edgar E. Hume, "The Foundation of American Meteorology by the United States Army Medical Department," *Bulletin of the History of Medicine* 8 (1940): 202–238.
13. Richard H. Coolidge, *Statistical Report on the Sickness and Mortality of Army of the United States . . . January 1839 to January 1855*, Washington, 1856:330–333.

14. Malaria is the most likely diagnosis of “intermittent fevers.”
15. James M. Phalen, “The Life of Jonathan Letterman,” *Military Surgeon* 84 (1939): 62–66.
16. Richard H. Coolidge, *Statistical Report on the Sickness and Mortality of Army of the United States ... January 1855 to January 1860*, Washington, 1860:221–222.
17. Robert M. Utley, *Frontiersmen in Blue: The United States Army and the Indians 1848–1865*, New York, NY, 1967:155–157.
18. Medical supply officer, responsible for purchasing, contracting, and some aspects of quality control.
19. Utley, note 17, pp. 221–222.
20. Shelby Foote, *The Civil War*, New York, 1958, Vol. I, pp. 69–70. For the best synoptic military history of the war, see his three volumes, Vol. II, 1963 and Vol. III, 1974.
21. See William Q. Maxwell, *Lincoln’s Fifth Wheel*, New York, NY, 1956, for the history of the U.S. Sanitary Commission. An inside view of the USSC is in Allan Nevins and Milton H. Thomas (eds.), *The Diary of George Templeton Strong: The Civil War*, New York, NY, 1952.
22. Louis C. Duncan, “The Strange Case of Surgeon General Hammond,” *Military Surgeon* 64 (1929): 98–110, 252–262. Also see Blustein, note 9, for an extended discussion of these events.
23. Rudolph Bloom, “Surgeon Jonathan Letterman,” *Army Medical Bulletin* 42 (October 1937): 77–85.
24. For a general account of the Union Army medical system, see George W. Adams, *Doctors in Blue*, New York, NY, 1952.
25. Clements, note 3, pp. 252–253.
26. Letterman, note 1, pp. 12–15.
27. Reports of Frederick L. Olmstead, p. 160, in United States Sanitary Commission, *Hospital Transports*, Boston, MA, 1863.
28. Emory Upton, *The Military Policy of the United States*, Washington, DC, 1911:402–415.
29. Letterman, note 1, pp. 23–30.
30. Horace C. Cunningham, *Field Medical Services at the Battle of Manassas*, Athens, GA, 1968.
31. Letterman, note 1, p. 33.
32. *Ibid.*, p. 143.
33. *Ibid.*, p. 51.
34. *Ibid.*, p. 57.
35. *Ibid.*, p. 58.
36. *Ibid.*, pp. 58–63.
37. For a detailed description of this plan as it later evolved in 1864, see *The Medical and Surgical History of the Rebellion, Part III, Surgical History*, Washington, DC, 1883, II, Appendix, 903–914. (Hereafter given as MSH.)
38. Letterman, of course, did not invent the tent hospital or the forward aid station. For a discussion of Queen Isabella’s tent hospitals of 1484, see Fielding H. Garrison, *Notes on the History of Military Medicine*, Washington, DC, 1922, pp. 95–97. Surgical care at the battle edge was systematically developed by Dominique Jean Larrey in the Napoleonic wars. See

Robert C. Richardson, *Larrey: Surgeon to Napoleon's Imperial Guard*, London, UK, 1974. Letterman's contribution was to organize, structure, and link separate operations into a system.

39. Clements, note 3, p. 268.
40. The best modern description of the Letterman system at Fredericksburg is Gordon W. Jones, "The Medical History of the Fredericksburg Campaign: Course and Significance," *Journal of the History of Medicine and Allied Sciences* 18 (1963): 241–256.
41. For Letterman's own report on Fredericksburg, see *MSH, Part I, Medical History*, Washington, DC, 1876, I, Appendix, pp. 92–104.
42. Letterman, note 1, p. 91.
43. Letterman, note 1, p. 98.
44. Robert S. Henry, *The Armed Forces Institute of Pathology: Its First Century*, Washington, DC, 1964, is the best source for the history of these two projects of Hammond.
45. Letterman, note 1, pp. 114–115.
46. *Ibid.*, pp. 138–139.
47. *Ibid.*, pp. 153–156.
48. Jonathan Letterman, "Report on the Operation of the Medical Department During the Battle of Gettysburg," in *MSH, Part I, Medical History*, 1876, I, Appendix, pp. 140–142.
49. For McParlin's reports, see *MSH, Part I, Medical History*, Washington, DC, 1876, I, Appendix, pp. 148–178 and pp. 202–206.
50. For Ghiselin's reports, see *MSH, Part I, Medical History*, Washington, DC, 1876, I, Appendix, pp. 223–226.
51. The correspondence, regulations, and law are in *MSH, Part III, Surgical History*, Washington, DC, 1883, II, pp. 931–943.
52. Clements, note 3, pp. 270–271.
53. Duncan, note 22.
54. Clements, note 3, pp. 273–274.
55. Letterman, note 1, p. 112.



by Lisa M. Budreau

## JOHN SHAW BILLINGS 1838–1913

### INTRODUCTION

John Shaw Billings died on 11 March 1913 at the age of 73 while serving as Director of the New York Public Library, which he had organized after his retirement from active military service. Colleagues were quick to remember the former Lieutenant Colonel as a tall, serious man who seldom smiled and whose life was one of “work, work, work.” Such was his joy and his pastime, and, with his death, this prodigious man left an extensive range of accomplishments from which the medical profession continues to benefit.

Billings, an unusually prolific physician-scientist, was also an Army surgeon who served in the Civil War and, after the conflict, became the Director of the Library of the Surgeon General’s Office, later the Army Medical Library, and ultimately the National Library of Medicine. During his 25 years as director, Billings expanded the holdings into the largest collection of medical literature in the world, and published the first volumes of *Index Medicus*<sup>1</sup> and *Index Catalogue*,<sup>2</sup> while overseeing publication of *The Medical and Surgical History of the War of the Rebellion*.<sup>3</sup>

In addition to increasing the size of the Surgeon General’s Library from 600 volumes in 1865 to 50,000 by 1873, he also drafted plans for the organization and construction of The Johns Hopkins University Hospital in 1873. Billings served as medical adviser to the trustees of the Hopkins estate and played a key role in determining the organization, philosophy, and faculty of The Johns Hopkins Medical School.

Billings started publication of *Index Medicus* in 1879 as a monthly

guide to current medical literature, and authored several reports on hospital administration and the training of personnel that are regarded as classics. With his longtime friend and assistant, Dr. Robert Fletcher, he began publication of the monumental *Index Catalogue* of the library in 1880, which ran to 16 volumes when Billings retired in 1895. This last project occurred at the same time he was intently supervising the compilation of vital statistics for the U.S. censuses of 1880 and 1890. Billings' innovative idea that data could be recorded on a single card by punching small holes in it, then sorting and counting the cards by mechanical means, led to the production of the first modern keypunch machines in general use by 1910.

### EARLY YEARS

Billings was born on 12 April 1838, in Cotton Township, Switzerland County, Indiana, and spent the first 10 years living there, as well as in New York and Rhode Island. When asked about his childhood, Billings later claimed it was that of an ordinary farmer's boy, but added that he also spent time reading everything he could lay his hands on. "I managed to get a dollar for subscription to a little lending library in a book shop," he recalled, adding that he was "quite sure that I did not want to be a farmer."<sup>4</sup>

Billings' immense energy, accompanied by his limitless initiative, appear to have significantly contributed to a long list of lifetime successes that began in his youth. He graduated from Miami University in Oxford, Ohio, in 1857, where he received a B.A. with the second highest honor in his class. The following year, Billings began his studies at the Medical College of Ohio, the tenth medical school in the country. To help pay his bills, he cleaned and maintained the college's dissecting rooms and performed odd jobs as necessary. It was an austere time forced on him by his financial condition.

When faced with a choice of his dissertation topic for graduation, Billings chose "The Surgical Treatment of Epilepsy." This experience would have an unforeseeable impact on Billings' life and profession, in that it revealed to him the vast amount of time and labor required to search through many volumes of medical books and journals for items on a particular subject. Indices of such books and journals were generally unreliable, and there was no library in the United States that held much of the medical literature available. Instead, medical researchers intent on conducting a thorough investigation found it necessary to travel to Europe's largest cities to complete their work.

### WARTIME SERVICE

By the fall of 1860, Billings had graduated as a doctor of medicine and was preparing to enter into surgical practice as an assistant when the Civil

War intervened. He applied for a commission in the Union Army's Medical Department and appeared before the examining board in September 1861. By the following April, the 24-year-old, who passed first amongst the group of candidates, found himself appointed Assistant Surgeon. The First Lieutenant was also placed in command of several hospitals in the Washington, DC, area, where his medical administrative abilities were quickly tested.

Billings was a skillful operator by this time and, as such, he had developed a reputation for his surgical treatment of urethral strictures. On 9 May 1862, he was directed to take charge of the establishment and operation of Cliffburne Hospital in an old cavalry barracks on the hills behind Georgetown. Union Hospital was abandoned, and all equipment and patients moved to this new hospital. With the use of hospital tents, Billings soon had a hospital of 1,000 beds; and, by late August, he received orders for transfer to a new general hospital in West Philadelphia, later known as Satterlee General Hospital. Before joining his new post, he was married on 3 September 1862, in St. John's Church in Georgetown, to Kate M. Stevens, daughter of the Hon. Hester L. Stevens, a former Congressman from Michigan. They would remain together for nearly 50 years.

Billings served as Executive Officer at the West Philadelphia hospital until the end of March 1863, when he was ordered to the Army of the Potomac, at the time grouped around the village of Falmouth, Virginia, across the Rappahannock from Fredericksburg. He reported for duty to Medical Director Jonathan Letterman and was assigned to the 11th Infantry in Sykes' Division of Meade's Corps. General Hooker was preparing a turning movement that became the battle of Chancellorsville and brought the young surgeon his first operations in the field.

Billings served with the division hospital, alternately occupied with operating on the wounded and moving them and the hospital equipment to the rear as Lee drove Hooker back. Contemporary historians have noted Billings' descriptions regarding the complexities of operating a field hospital and transporting the wounded with a retreating army. These difficulties were increased because of the alleged inadvisability of bringing the ambulance trains across the Rappahannock River fords.

Whenever he traveled, Billings wrote daily to his wife, Katharine, about his work and the sights and sounds of the battlefield. She faithfully saved all of his letters as a legacy for their children, and it is from these eyewitness accounts that we can so vividly imagine events. He wrote:

My experience in Chancellorsville was that of handling wounded without an ambulance corps, and getting them off when the troops were falling back. It is

one thing to provide for wounded when the troops are advancing and leaving the hospital behind, and quite another thing to fall back with your wounded when the troops are retreating.<sup>4(p.24)</sup>

In contrast, the attack on Marye's Heights was efficiently served by the ambulance corps.

After Chancellorsville, Billings camped and marched with the Army on their month-long approach to Gettysburg and then participated in that July battle, where he was detailed as surgeon in charge of the Second Division field hospital. He later described the Civil War experience as "a postgraduate course in surgery, with the service in camps and hospitals, with battlefields for the great clinic—a long, weary course."

During his service at Gettysburg, Billings performed surgical operations, looked after transportation, obtained supplies, buried the dead, and, by most accounts, ended up with the best-managed hospital in the Union Army. He remained there until 22 July, when he was invalided back to Washington for 30 days sick leave to recover from the strain of his work. During this period, he was sent to New York with the Seventh Infantry, which had pitched camp on Fifth Avenue. He was reassigned to hospital duty on Bedloe's Island in New York Harbor, and then in February 1864 was placed in charge of an extraordinary expedition to Haiti to rescue 371 survivors of a group of freed slaves who had been resettled there and swindled in the process.

At the end of March 1864, he returned to the Army of the Potomac, and served as Medical Inspector, roaming a wide front and living through the Wilderness and Spottsylvania, Cold Harbor, and the siege of Petersburg. His time was spent largely collecting statistics, dispatching ambulances and supplies, collecting pathological specimens, and supervising the transfer of wounded. In December 1864, Billings was transferred to the Surgeon General's Office in the War Department, where he remained for 30 years.

For the next 10 years, his office hours were filled with the drudgery of requisitions, invoices and receipts, bills of lading, treasury allotments, and auditors' decisions. After his office day, he spent long hours over microscopy, comparative anatomy, the history of medicine, and the German language. In the field of microscopy, he investigated the possible cryptogamic origin of certain cattle diseases and published his observations. In August 1868, the Surgeon General issued a circular calling for a detailed semiannual report on the sanitary condition of his post from each station surgeon, including in the first report a description of the post itself with its buildings and surroundings. From these reports, Billings compiled his *A Report on Barracks and Hospitals, with Descriptions of Military Posts*<sup>5</sup> (1870) and later his *A Report on the Hygiene*

of the United States Army, with Descriptions of Military Posts<sup>6</sup> (1875). A tribute to his growing reputation was his assignment as a “Consulting Surgeon” to the Secretary of the Treasury, in 1869, to assist in the reorganization of the Marine Hospital Service. He served in this capacity until 1874. The Secretary gave great credit to Billings for the new organization based on army standards and, its highly increased efficiency. By this time he was regarded as the foremost authority on public hygiene in the country, with a further high reputation in hospital construction.

Shortly after Billings’ detail in the Surgeon General’s Office, he was given charge of the office library, with the property accountability involved. With the rapid growth of the library, a clerical organization for its administration grew up in the main office in the Riggs Bank Building on Fifteenth Street and Pennsylvania Avenue, while the library collection was housed in assigned space in the Army Medical Museum, the new name given to the old Ford’s Theatre on Tenth Street, under the direct charge of Dr. Thomas A. Wise. It was not until December 1883, when Billings was appointed curator of the Army Medical Museum and librarian of the Surgeon General’s Office, that the library office was moved to the Tenth Street location. In the meantime, the first catalog to bear his name was issued in 1873; and, in 1876, he published the *Specimen Fasciculus of a Catalogue of the National Medical Library*.<sup>7</sup> The enthusiastic reception of this work by the medical profession of the country spurred the work on the *Index Catalogue*, the first volume of which appeared in 1880. This is no place to speak of the monumental character of this great work, nor of its epochal influence. The first series of the *Catalogue*, completed in 1895, will remain a more lasting tribute to Billings’ name than any monument of stone that will be raised in his memory. Yet, Billings’ work was more than a catalog; it opened the resources of the library to those not on site. It was a precursor to today’s databases of articles that allow knowledge to be accessed. He also oversaw the government’s first official military history, *The Medical and Surgical History of the War of the Rebellion, 1861–65*. That six-book set compiled hundreds of case reports and operational reports, and had what data could be assembled for analysis. The science of those days looks antiquated now, but the publication of data allowed for the best analysis possible, and later generations could learn not just about clinical cases, but also about how the Medical Department coped.

With the passing years, he had been advanced to a captaincy in the Medical Corps on 28 July 1866, to major on 2 December 1876, and to lieutenant colonel on 16 June 1894. (He had already earned the brevet of lieutenant colonel on 13 March 1865 for his wartime service.) In these same

passing years, the library had grown from a few thousand volumes until it ranked with the largest in the world.

#### BUILDING NEW MEDICAL FACILITIES

In June 1876, Billings accepted the position of medical advisor to the trustees of The Johns Hopkins Fund, the purpose of which was the erection in Baltimore of a hospital that was to be the nucleus for a medical school for the University. Skipping details, Billings drew the ground plans for the hospital, made a tour of the famous hospitals of Europe, and drew up a detailed memorandum on the proposed scope of the institution, with a discussion of its departments and services. His plans were adopted practically unchanged. Billings' connection with hospital construction began with various post hospitals of the Army, and included a cooperation in the planning for the Marine Hospital Service, for the National Soldiers' Home, for the Memphis City Hospital, and for the Peter Bent Brigham Hospital in Boston. Because of the decision to build only with the income of the Fund, the hospital was not completed until May 1889, at a cost of somewhat over a million and a half dollars. Billings' official connection with this work ended in August 1889. Meanwhile, he was carefully drawing plans for the proposed medical school. He was instrumental in securing the first members of the new faculty in 1889—Dr. William H. Welch (of Norfolk, Connecticut) and Dr. William Osler (Professor of Medicine at the University of Pennsylvania)—and had much to do with selecting the remaining brilliant men who made up the first faculty. In addition, he had lectured there himself on the history of medicine.

Shortly thereafter, Billings was approached with an offer to become director of the University of Pennsylvania Hospital and of a hygiene laboratory to be constructed, and he became professor of hygiene on the University faculty. Billings accepted, provided that he could remain with the Washington Library until the first series of the *Index Catalogue* was completed. Under this arrangement, he began the plans for the laboratory, and, with the 1891–1892 session, began his lecture courses on hygiene and vital statistics. The laboratory was completed in February 1892.

With the first series of the *Index Catalogue* completed in June 1895, and with 33 years of service to his credit, Billings was ready to retire from the Army and throw himself into his contract with the University of Pennsylvania. His retirement effected, he moved to Philadelphia in October 1895, where, however, his incumbency of the new post was of short duration.

#### LIBRARIAN TO MILLIONS

At that time, only three large public libraries existed in New York City—the

Astor, the Lenox, and the Tilden—each the gift of an estate to the city. In May 1895, the three agreed to merge, with the combined collections to be known as the New York Public Library. The trustees of the new foundation voted to invite Colonel Billings to be superintendent. With the consent of the university authorities, he resigned his professorship (effective 1 June 1896) and accepted the New York position for the same date.

The plans for the new library included erecting a new central building and establishing numerous branch lending libraries throughout the city. Billings moved to New York in September 1896 and immediately began administrative planning, but a building site was obtained only in 1897. In the meantime, Billings had carefully examined the plans of leading libraries in the United States and Europe. In April 1897, he drafted a pencil sketch that formed the basis for the final plans. In the meantime, he was faced with the gigantic task of reclassification and recataloging the consolidated collections. In this work, he used the Army Medical Library system of an author catalog for official use and an alphabetical index catalog of both authors and subjects for public use. In 1900, there was a further consolidation of numerous free circulating libraries with the New York Public Library, and, in 1901, Billings conducted the negotiations with Andrew Carnegie, who provided over five million dollars to furnish 65 branches of the main library. It was not until May 1911 that the new building was opened to the public, and Colonel Billings did not long survive the completion of his cherished plans. The death of his wife on 19 August 1912 was a serious blow to him. During the last two decades of his life, he had two serious conditions that brought him to the operating table a number of times. A cancer of the lip developed in 1890, which was controlled after two operations. Then, in 1900, he was first operated on for biliary calculus, and, in 1906, his gallbladder was removed. His death on 11 March 1913 was from pneumonia, following an operation for urinary calculus. After funeral services at St. John's Church in Georgetown, on 14 March, his remains were interred in Arlington Cemetery.

## CONCLUSION

It is hard to do justice to the qualities of Colonel Billings and his energy, innovative thinking, and exceptional qualifications in a number of fields. Some have even questioned why this great man was apparently never considered for the post of Surgeon General of the Army. It was not from lack of administrative ability. Undoubtedly, the determining factor was that only shortly before his retirement did he attain a military grade that would warrant his consideration for the position of Surgeon General.

Physically he was a tall man of powerful build and commanding appearance in his prime, with a handsome head, a straight nose, and clear blue

eyes. In manner, he was quiet, patient, and professional, with a cool detachment and isolation of mind that gave the impression of a distant manner. When not so preoccupied, he showed himself not devoid of humor and possessed of a vast amount of gentle sympathy. Medical history will always give Colonel Billings a high place amongst those who have practiced the profession.

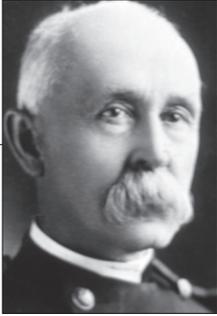
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2. *Index-Catalogue of the Library of the Surgeon-General's Office, United States Army*, Washington, DC: Government Printing Office, 1880–1961. Published in 61 volumes in 5 series from 1880 to 1961.
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by *Richard M. Prior*

## GEORGE MILLER STERNBERG 1838–1915

### INTRODUCTION

Brigadier General George Miller Sternberg served as the 18th Surgeon General of the U.S. Army from 30 May 1893 to 8 June 1902. He was combat tested in the American Civil War and the campaigns against the Native Americans on the frontier. His lifelong interest in infectious disease would define him as one of the premier medical scientists of his day and as “America’s first bacteriologist.” As Surgeon General, he established the Army Medical School, led the Army Medical Department through the Spanish American War, and appointed the Yellow Fever Commission.

### EARLY LIFE

George Miller Sternberg was born on 8 June 1838 in Otsego County, New York. He was educated at Hartwick Seminary, where his father served as a Lutheran minister and as the principal. Having a natural talent for math and sciences, Sternberg elected to pursue a career in medicine in lieu of the clergy and graduated from the College of Physicians and Surgeons of New York (the present-day Columbia University School of Medicine) in 1860. He aspired to be a small town physician and practiced medicine for 1 year in Elizabeth, New Jersey.<sup>1</sup>

### CIVIL WAR SERVICE

When hostilities in the American Civil War broke out on 12 April 1861, Sternberg volunteered for military service. He was appointed an Assistant

Surgeon, U.S. Army, on 28 May 1861. Quickly assigned to a tactical unit, Sternberg served as an Assistant Surgeon in the Second Division of the Army of Northeastern Virginia in the First Battle of Bull Run.<sup>2</sup>

After a long day of battle, with the Army of Northeastern Virginia disorganized and losing, the Second Division (led by Colonel Ambrose Burnside) was counterattacked by Confederate forces.<sup>3</sup> While retreating from the battlefield, Sternberg found over 100 sick and wounded in an abandoned church and quickly began caring for them. As the day progressed and the battle was lost, Sternberg and the church fell into Confederate hands. Sternberg was notified that he was now a prisoner of war and was permitted to continue treating the wounded in exchange for a signed oath stating that he would make no attempt to escape for 5 days. At the end of the 5-day period, Sternberg had been transported to Centreville, Virginia, where he made a hasty and successful escape. It took him several days to traverse the 25 miles to Washington, DC, where he reported on the battle and rejoined his unit, which was shortly assigned to the Army of the Potomac.<sup>4</sup>

In 1862, Sternberg participated in two major battles at Gaines' Mill and Malvern Hill. In August, he became ill with typhoid fever and was evacuated north. During his recovery, he was assigned as the executive officer of the U.S. General Hospital in Portsmouth, Rhode Island. Wound care methods of the day called for reuse of dressings. During an epidemic of wound infections, Sternberg and his colleagues traced the cause to the recycled dressings and ceased the practice. Thus began Sternberg's fascination with infectious disease and epidemiology.<sup>5</sup>

Sternberg was then assigned to New Orleans with the board of health until January 1864, supporting the development of campaigns to attack the Confederacy from the southwest. He then had a short tour of duty as the officer in charge of the hospital in Cleveland, Ohio, until the conclusion of the war.<sup>6</sup>

#### FRONTIER PHYSICIAN

Sternberg was next assigned to the frontier in Kansas. Sternberg would yet again find himself caring for soldiers in combat as a part of campaigns waged on Native Americans. But perhaps the most significant event of Sternberg's years at the frontier was his participation in the cholera epidemic of 1867.

Cholera is a bacterial infection spread through contaminated food and water. In severe forms, cholera can, as it often did in 1867, cause rapidly dehydrating diarrhea and vomiting that can lead to death in a short period of time—in as little as 12 hours. Untreated disease was fatal in 50% to 70% of cases and would remain a public health problem until there was widespread

understanding of sanitary techniques and the advent of antibiotics.<sup>7</sup> The spread is limited through good hygiene and field sanitation practices.

Sternberg's experiences are included in the *Report on Epidemic Cholera and Yellow Fever in the Army of the United States, During the Year 1867*. Sternberg took an active role in not only treating the disease with rehydration and chloroform, but recounted his efforts to determine the spread of the epidemic and to improve the hygiene of the camp. Ultimately, the disease would claim over 350 victims at Fort Harker, including Sternberg's first wife.<sup>8</sup>

In Kansas, he became involved in a number of varied scholarly pursuits, building a laboratory in his quarters. His interest in geology and fossils produced a collection of specimens that was eventually donated to the Smithsonian Institution. He became a pioneer in the development of microscopes capable of photography. He developed, patented, and sold the Sternberg Automatic Heat Regulator, now better known by its common name, the thermostat.

#### A PREMIERE EXPERT ON YELLOW FEVER

In June 1870, after 4 years in Kansas, Sternberg was reassigned to Fort Columbus, Governors Island, New York Harbor. He was joined by new wife Martha, who, after his death, would write one of his first biographies. Fort Columbus was a headquarters for Department of the East, an indoctrination center for new recruits, contained an ordnance depot, and had been historically significant in the protection of New York Harbor.

It was during 1870 that Sternberg would be exposed to another of the epidemics that would continue to guide and define his life. That summer, 157 of the 722 residents of Fort Columbus were stricken with yellow fever, and 49 died.<sup>9</sup> Sternberg chronicled his experience tracing the epidemiology of the disease in the attempt to understand its cause in an article for the *American Journal of the Medical Sciences* titled "Nature of the Yellow Fever Poison."

Yellow fever is caused by a mosquito-borne virus, with a wide range of symptoms from very minor illness to widespread circulatory failure and shock.<sup>10</sup> By engaging in multiple blood meals, a mosquito can spread the disease from person to person, commonly in areas that are population dense. At the time, there were two competing theories regarding the cause of the disease. One was the Germ Theory, which stated that diseases are caused by microbes such as viruses and bacteria. The other was the Miasma Theory, which stated that disease is caused by bad air. The Germ Theory would not become widely accepted until German physician Robert Koch's "postulates" were published in 1890, ten years after the Fort Columbus epidemic. Upon completing his own epidemiological analysis of the outbreak at Fort Columbus, Sternberg wrote of the conclusions he had drawn about the origin of the disease:

There are three agents, to one of which we must refer the poison, which, by its action upon the human system, produces yellow fever:

- (a) A volatile inorganic matter
- (b) A lifeless organic matter of the nature of a ferment, which, by catalytic action, is capable of transforming, otherwise harmless substances, present in the earth, or the atmosphere into the materies morbid of yellow fever.
- (c) A living germ, capable under favorable conditions such as to heat, moisture, etc, of rapid self-multiplication, and acting, either directly, or indirectly by catalytically transforming other substances into the efficient cause of the disease.

That the poison is of the latter nature is, I conceive, the only theory consistent with the observed facts. . . .<sup>11</sup>

Sternberg would conclude his tour at Fort Columbus not long after the outbreak and would have very short and uneventful follow-on assignments in Boston and New Orleans. In September 1872, Sternberg was assigned to Fort Barrancas in Pensacola, Florida, the site of a battery protecting the Pensacola shipping channels. Fort Barrancas was the site of several outbreaks of yellow fever in 1873, 1874, and 1875.

Sternberg managed the outbreaks in 1873 and 1874, and understood that preventive measures would be required to protect the health of the command and the city of Pensacola. Working with the post commander, he ensured that enough supplies had been ordered to sequester the entire command at Fort Pickens until the fall frosts, while infected patients would remain at Fort Barrancas. Coupled with a strict quarantine on ships that traveled from endemic areas to Pensacola, this strategy had minimized the spread of the disease in 1873 and 1874. In 1875, the S.S. *Von Moltke* was inbound from Havana and was approached by a boatful of soldiers from Fort Barrancas looking for Cuban whiskey. Mosquitos in the vicinity transmitted the disease from the stricken Cuban sailors to the soldiers, resulting in an epidemic that would kill many of the 354 people who succumbed to the disease.<sup>12</sup> Sternberg himself would become one of the ill and would spend the remainder of 1875 convalescing. This would, however, give him the physiological advantage of being immune to the disease, allowing his future research efforts to intensify.

Sternberg would continue to mature as an author, theorist, and subject matter expert on yellow fever. He wrote an article about the Florida outbreaks in the *New Orleans Medical and Surgical Journal* and spoke about them at the national American Public Health Association meetings of 1875, where he continued to argue for a germ as the cause, even in the absence of microscopic

evidence. Because yellow fever is caused by a virus, it could not be detected by optical microscopes. His reputation as an expert on the subject was cemented with his publication of “A Study of the Natural History of Yellow Fever” also in the *New Orleans Medical and Surgical Journal*.

After almost a year of rehabilitation and leave following his near death from yellow fever, Sternberg spent much of 1877 and 1878 at Fort Walla Walla, Washington, supporting campaigns against the Native Americans in the West both in the field and in garrison, including performing surgery under combat conditions. He continued research in his makeshift laboratory and worked to advance concepts of disinfection to prevent illness. During this time in the West, Sternberg and his wife became friends with a French couple who had agreed to teach them their native language as a cultured diversion from life on the frontier. Sternberg would quickly become fluent in French, which would allow him in the future to translate and learn from key pieces of French medical literature.

In 1879, Sternberg was summoned back to Washington, DC, by Surgeon General J. K. Barnes and was ordered to report to the National Board of Health to work with the Havana Yellow Fever Commission. Sternberg spent several months in the endemic area of Havana, attempting to isolate the cause of the disease. Although he was not successful in identifying the yellow fever virus, he did have some accomplishment in proving what yellow fever was not.

#### PROMINENT SCIENTIST

Sternberg spent part of 1880 in New Orleans working on replication of Italian studies that claimed to identify the cause of malaria as *Bacillus* bacteria. Because malaria is caused by the *Plasmodium* parasite, Sternberg would not be able to reproduce the results. It was at this time, however, that Sternberg isolated the bacteria *Streptococcus pneumoniae*, the causative agent for pneumonia, by injecting his saliva into the blood of rabbits. Simultaneously, Louis Pasteur and Carl Friedlander would each identify the bacteria and claim that they were the first to make this important discovery.<sup>13</sup> Sternberg would maintain that he made his discovery several months before Pasteur.<sup>14</sup>

In 1881, Sternberg was transferred to Fort Mason in San Francisco, California. He continued researching bacteria on his own time and at his own expense. He was one of the first in the United States to identify and photograph the bacteria responsible for causing tuberculosis. He wrote and delivered a paper in 1881 to the American Association for the Advancement of Science that was one of the first to theorize the concept of phagocytosis, the process wherein white blood cells destroy and engulf foreign bacteria. This discovery was credited to Russian biologist Elie Metchnikoff, but was contested by

Sternberg in a 1914 letter to the editor in the *Journal of the American Medical Association*.

In 1880, Sternberg translated Dr. Antoine Magnin's 1878 book *Les bactéries* into the first text on bacteria in the English language. To improve the work, Sternberg added several chapters and many of his own photographs.<sup>15</sup> The book would continue to advance Sternberg's hypotheses on bacteria and germ theory that, although controversial at the time, are widely accepted today. It would provide in a concise manner what took handfuls of scientific papers to understand prior to its publication.<sup>16</sup>

In 1883, Sternberg petitioned Surgeon General Murray to be relieved of his patient care duties and assigned as a scientific researcher on a full-time basis. He apprised the Surgeon General that he had conducted his research on his own time and funded it out of his pay, while a full laboratory sat unused at the Army Medical Museum in Washington, DC. He assertively stated, "I would further respectfully represent that my Army service has been mostly at remote posts; that I have seen my fair share of epidemics and Indian wars."<sup>17</sup> He was assigned as the attending examiner and surgeon of recruits in Baltimore, where he would serve for 1 year. This assignment proved to be beneficial to him in that it afforded him access to The Johns Hopkins University medical library and various others in Washington, DC. It was in The Johns Hopkins laboratories that Sternberg would work with William H. Welch, who would have a large role in revolutionizing American medical education while dean of Johns Hopkins Medical School and would remain a lifelong colleague.

In 1885, Sternberg was given the Lomb Prize, a prominent award for contributions to the science of public health, for his essay "Disinfection and Individual Prophylaxis Against Infectious Diseases." In this monograph, Sternberg took issue with the popular idea that deodorizing agents are disinfectants. He used this essay to again assault the notion that bad air causes disease, but reflected on the value of bad odors as a warning of an infectious substance. He then cataloged many of the common disinfectants of the day and made recommendations to those tasked with disinfecting during specific disease outbreaks.<sup>18</sup>

In that year, Sternberg was chosen by the Surgeon General to represent the United States at a medical convention in Europe. This allowed Sternberg to meet with his colleague Louis Pasteur and discuss the latter's work on developing the rabies vaccine. He also was shown how to isolate the *Plasmodium* parasite in the blood of malaria patients by Italian physicians Ettore Marchiafava and Angelo Celli. Upon his return, he would educate Johns Hopkins physicians on how to microscopically identify the malaria parasite to

confirm their diagnosis. He made a similar trip to Europe in 1886 and was able to demonstrate to Koch his method of identifying *Pneumococcus* in saliva and reproduced his experiments injecting the bacteria into rabbits.

Sternberg would spend the next several years traveling to endemic yellow fever areas investigating, and ultimately refuting, the claims of those who had thought they had identified the cause. He had made several attempts during these visits to conduct field research and find the agent himself, but was hampered by the lack of available cadavers of recently deceased yellow fever victims, because the fear of the disease prompted the authorities to expeditiously bury the dead.

In 1890, Sternberg had just been promoted to lieutenant colonel, and his advocates (including prominent politicians and businessmen) argued that he was a strong candidate to replace Jedediah Baxter as Surgeon General. Despite their efforts, Baxter was replaced by Charles Sutherland, and Sternberg was reassigned as the medical purveyor in San Francisco. In 1892, while in San Francisco, Sternberg wrote *A Manual of Bacteriology*, a 900-page textbook that included sections on classification and morphology of bacteria, culture preparation techniques, pathologic bacteria, and a number of his personal photographs of various microorganisms. It was through the publication of this text that Sternberg would begin correspondence with Walter Reed. Reed was 13 years junior to Sternberg, had a similar career path, and had nearly identical research interests. Reed wrote of the book, "How an Army medical officer, in the midst of daily routine work, could have written so excellent and exhaustive a work, I can't understand."<sup>19</sup>

Sternberg spent 1892 in New York as an assistant to the Special Cholera Committee, where he would work on limiting the spread of the disease. Upon learning of Surgeon General Sutherland's retirement, he made his interest in the position well known and wrote to President Cleveland to inform him that he wished to be considered. Sternberg received a telegram on 30 May 1893 that he had been appointed Surgeon General and was thereby promoted to the rank of brigadier general, completely bypassing colonel.

#### PREWAR CONTRIBUTIONS AS SURGEON GENERAL

One month after his appointment, Sternberg established the Army Medical School. Sternberg argued civilian schools did not adequately prepare a new physician to assume the role of an Army officer and nor did they adequately prepare physicians for the public health challenges that they would face in military practice.<sup>20</sup> Sternberg's statement introducing the concept of the school claimed:

A special education is needful to prepare a medical man to undertake the responsibility of protecting the public health. The Army medical officer is the health officer of his command, but the young graduate seldom is equipped with the knowledge or experience necessary for efficient action in this position.<sup>21</sup>

The location selected to house the school was the Army Medical Museum located in Washington, DC, on what is presently the site of the Smithsonian Hirshhorn Museum. The first group of five students attended classes from November 1893 to March 1894. During Sternberg's tenure as Surgeon General, several other classes would graduate before the Spanish American War would suspend operations from May 1898 to fall 1902.<sup>22</sup>

The school curriculum contained a variety of medical, military, and public health topics. The institution had a role in evolving medical school curricula—as it developed new topics, such as bacteriology and surgery—that were not common to medical schools of the times. The school had a vibrant research program that contributed to the public health of the nation, in addition to that of the Army. The school would change locations and names several times over the years and would evolve into the current-day Walter Reed Army Institute of Research.

Sternberg's professional writing continued at an intense pace during his first several years as Surgeon General. In 1895, Sternberg published *Immunity, Protective Inoculations in Infectious Diseases and Serum-Therapy*, a 323-page textbook that discussed what was then known about immunology and concepts related to the vaccination or potential vaccination of 22 of the most concerning infectious diseases of the day. He also updated and revised *A Manual of Bacteriology*, republishing it as *A Textbook of Bacteriology*.

Sternberg took an interest in the affairs of hospital corpsman, the predecessors to modern-day combat medics. He instituted small group training at individual posts to compensate for the fact that many corpsmen had not attended the Army's hospital course. The Army Medical Department began to consider doctrine on employment of corpsmen in the field and instituted training that would prepare them for combat against the Native Americans, including litter drills and first-aid.<sup>23</sup>

In 1897, Sternberg was elected as President of the American Medical Association. In his presidential address in Chicago in 1898, Sternberg spoke of the need for physicians to continue to develop as scientists and share their knowledge with the public. He argued for the evolution of medical education, stating that physician instruction should not be limited to lectures and reading, but should include laboratory work and human

cadaver dissections. He encouraged his colleagues to be careful with their conclusions and to rely on facts.<sup>24</sup>

During the first 6 years of Sternberg's tenure as Surgeon General, the operational tempo of the Army was light and allowed him time to focus on improving medical education, the Hospital Corps, field sanitation, and hospital conditions, and institute the widespread deployment of Wilhelm Roentgen's revolutionary new X-ray technology. This period of quiescence would also keep the Medical Corps small, with a meager 192 medical officers prior to the beginning of the war; only 100 would be available for field duty.<sup>25</sup>

#### SPANISH AMERICAN WAR

In 1898, the United States was engaged in a dispute with Spain over the autonomy and government of Cuba. After a failed Cuban revolt in 1895, Spain was working to quell a guerilla insurgency there. The heavy-handed Spanish counterinsurgency was unpopular in the United States. As a demonstration of American naval power and as an attempt to show support for American interests in Cuba, President McKinley sent the USS *Maine* to Havana harbor. On 15 February, the *Maine* exploded, killing 266 sailors. Powerful newspaper moguls of the time, such as William Randolph Hearst, blamed Spain for the deaths, and popular sentiment propelled Congress on 25 April to declare war on Spain in an attempt to help Cuba gain its independence.<sup>26</sup> The war would last until September and would claim 345 killed in action/died of wounds, and a staggering 2,565 died of disease.<sup>27</sup>

At the declaration of war, the Army Medical Department was critically short and looked to contract staff to fill wartime needs. Sternberg hired 650 contract physicians, whom to some extent would fail to meet his high standards due to their poor educations, poor understanding of Army preventive medicine and sanitary policies, lack of influence with Army line officers, and a lack of motivation.<sup>28</sup> He appointed Dr. Anita Newcomb McGee of the Daughters of the American Revolution as Assistant Surgeon General, charged with finding and hiring 1,700 female nurses willing to serve the Army on a contractual basis.

Nor were there any dentists assigned as a permanent part of the Army. Sternberg endorsed a plan by Captain William Otway Owen, a dentist who was serving as an assistant surgeon, to open the Army's first overseas dental infirmary in the Philippines. Owen and another dentist who was serving as a hospital corpsman treated over 300 patients and provided the first official reports of dentistry in the field.<sup>29</sup>

Sternberg had to develop an evacuation system to transport the sick and wounded from Cuba to the port cities of the United States and then to general hospitals. He obtained authorization for three hospital ships: the *Relief*, *Olivette*,

and *Missouri*. Although various ships in past campaigns had been detailed to transport the wounded, these ships were the first ships to be specifically outfitted for this purpose. Sternberg was concerned that the ships would be suborned for other purposes, and gave the *Relief's* commander very specific instructions as to which regulations he was to invoke if a superior attempted to take the ship from him.<sup>30</sup> Railroad ambulance trains were procured to transport the sick and wounded from ports in Tampa, Florida, to the general hospital located at Fort McPherson, Atlanta, Georgia.

It was well known that the nature of warfare in the 19th century was such that there would be greater numbers of dead and incapacitated from illness than from wounds inflicted in combat, and Sternberg was concerned that cramped, unsanitary conditions favored repetition of this phenomena in the current war. Mobilization camps were stricken with epidemics of typhoid fever, dysentery, and diarrhea that Sternberg attributed to “ignorance on the part of officers of the elementary principles of camp sanitation. ...”<sup>31</sup> He attempted to improve conditions by issuing a circular reminding medical officers of their preventive medicine responsibilities, but space constraints in the camps limited appropriate interventions. It was not until auditors from the Secretary of War closed the camps that conditions would improve. Sternberg issued instructions designed to improve water quality in an attempt to limit the spread of typhoid fever, which was having a devastating effect on the overall health of commands.

Word of the poor sanitary conditions and the amount of disease suffered by troops was a popular news and editorial item of the day, prompting outrage from the public. In response to the pressure, President McKinley charged General Grenville Dodge on 8 September 1898 with forming a commission to investigate every bureau of the Army for neglect or incompetency in addressing the health and welfare of soldiers during the war. The “Dodge Commission” sought testimony from 495 witnesses and delivered its final report 5 months later. Although Sternberg was not mentioned directly by title or name, the commission stated clearly that the Army Medical Department was not prepared for war. The condition of camps was not consistent with Army Regulations. There were not enough trained physicians who were in the requisite physical condition to go to war, and there were not enough medical supplies to meet the Army’s needs. The commission recommended a larger medical corps, a reserve corps of professional nurses, and a year’s stock of the medicine and supplies needed for war.<sup>32</sup>

#### THE YELLOW FEVER COMMISSION

In response to the threat that yellow fever posed to the Army while it occupied Cuba, Sternberg appointed a medical board to establish itself in the

country to “pursue diseases prevalent on the Island of Cuba and especially of yellow fever.”<sup>33</sup> He selected four physicians for the task: Major Walter Reed, and Contract Surgeons James Carroll, Aristides Agramonte, and Jesse W. Lazear. They tested the two predominant theories of yellow fever transmission. The first theory stated that the disease was caused by fomites transmitted by infected clothes and bodily fluids. The second theory was that it was caused by mosquitos. The group decided that, before they could ask anyone else to risk their own health by submitting to their experiments, they must first expose themselves, resulting in the deaths of Lazear and later Carroll.<sup>34</sup>

Reed and his colleagues became convinced that the disease was caused by the mosquitos. A series of experiments exposing some nonimmune individuals to the mosquitoes and protecting some nonimmune individuals from mosquito bites established conclusively that mosquitos were indeed the vector. In 1901, this discovery resulted in aggressive mosquito destruction and protection measures employed by Major William C. Gorgas that rid Havana of yellow fever for the first time in 200 years. Later, Gorgas and his team would essentially eradicate mosquito-borne illness from Panama, allowing the construction of the Panama Canal.<sup>35</sup>

#### THE FORMAL INCORPORATION OF NURSES AND DENTISTS

The Army had entered the Spanish American War with essentially no plan to employ nurses or dentists and had to quickly create solutions during the war. The Dodge Commission chastised the Army for “nonrecognition in the beginning of the value of women nurses and the extent to which their services could be secured.”<sup>36</sup> This prompted a movement that Sternberg supported to create a permanent nurse corps. The Army Reorganization Act of 2 February 1901 established the Army Nurse Corps (female), a small organization that lacked rank or status until after World War I.

Although the Dodge Commission report did not address the need of dentists in the Army, the Act also authorized the hiring of 30 contract dentists who would be attached to the Medical Corps. On 3 March 1911, the Dental Corps would be established as a permanent part of the Army.<sup>37</sup>

#### AFTER THE ARMY

Having reached maximum allowable age, Sternberg was forced into retirement on 8 June 1902. He became interested in improving the housing of the poor, in particular the African Americans who had lived in Washington since the end of the Civil War. In 1897, while Surgeon General, he was chairman of the subcommittee on permanent relief and sanitary dwellings of the poor and would continue urging low-cost housing.

Sternberg continued to be active in the scientific and academic communities, although at a slower pace. In 1903, he published the textbook *Infection and Immunity with Special Reference to the Prevention of Infectious Diseases*. He also served as the Chair of Preventive Medicine at the George Washington University Graduate School.<sup>38</sup>

Sternberg died from a presumed myocardial infarction at his home in Washington on 3 November 1915. He was interred at Arlington National Cemetery and, on 5 November 1919, a large memorial was placed at his grave.

## CONCLUSION

As Surgeon General, Sternberg is remembered for his passion for improving education in the profession of medicine and promoting scientific research. He led the Army Medical Department through war and took tangible actions from lessons learned to improve the organization, managing the addition of nurses and dentists to the Army. His fervor for medical research resulted in the end of yellow fever as one of the deadliest infectious diseases in the world.

Perhaps more importantly, George Miller Sternberg was one of the first infectious disease physicians in the United States. Although his death preceded Alexander Fleming's discovery of penicillin in 1928 and Ernst Boris Chain's and Norman Heatley's methods of mass-producing penicillin in the 1940s, he remained hopeful for cures. In the preface of his 1893 book *Immunity, Protective Inoculations in Infectious Diseases and Serum-Therapy*, he wrote:

. . . Medicine is eminently practical in its aims, and practicing physicians, as well as intelligent laymen, are apt to meet every announcement of a new discovery in pathology with the question 'Does it aid in the cure of disease?' Heretofore, the bacteriologist has been compelled to admit that the demonstration of the specific cause in a considerable number of infectious diseases, which has been obtained through his researches, has not resulted in the discovery of a specific treatment for these diseases. At the present moment we are in possession of experimental data which opens up to us a vista of possibilities in specific treatment unsuspected a year or two ago.<sup>39</sup>

As a scientist and physician, Sternberg's tenacity, vision, and optimism—coupled with his scientific discoveries—had a significant effect on the understanding of infectious disease, resulting in nothing short of a renaissance in medicine.

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by *John R. Pierce*

## WALTER REED 1851–1902

### INTRODUCTION

Walter Reed remains today, more than 100 years after his death of appendicitis, one of the best known, respected, and revered names in American medicine. It had not started out that way for the youngest child of a backwoods Methodist minister. As opposed to his friend Jefferson Randolph Kean, the great-great-grandson of Thomas Jefferson, Walter Reed was the first in his family to achieve national attention, which really only came in the last months of his life.

### EARLY YEARS

Reed was born on 13 September 1851 at Belroi near Gloucester, on Virginia's middle peninsula. His parents, Lemuel Sutton Reed and Pharaba White Reed, were North Carolinians. During this period, most Methodist ministers moved every year or two usually near the end of November, after the annual Methodist Conference. At the time of Walter's birth, Reverend Reed was the pastor of the Bellamy Methodist Church; the building is still in use today. Over the years, the Reed family lived in many districts, circuits, and parishes in southeastern Virginia and North Carolina.

When the Civil War broke out in April 1861, young Walter, not yet 10 years old, was living with his family in Liberty, Virginia, on the eastern slope of the Blue Ridge Mountains in Bedford County. Two of his older brothers, James and Thomas, joined other locals and signed up with the Bedford Light Artillery serving in the Confederate Army. Although both survived the war, they were

not immune to its personal tragedy and hardships. James, a first sergeant, had his shattered hand amputated in a field hospital during the Battle of Antietam in 1862. In 1864, half of Thomas' entire unit was given furlough at one time under a scheme to keep the men from leaving the Army at the end of their enlistment. It was wintertime, and there was a lull in military activity. Despite the fact that he had no shoes, Thomas Reed walked 75 miles in the cold and snow to a railhead to catch a train home. An officer, in a history of Parker's Battery, wrote, "I might describe the barefooted men going home on furlough from East Tennessee. Tom Reed started through the snow with his feet tied up in rags, and when, after a tramp of many miles, he reached the cars at Bristol, they were bare and bleeding. A little girl, standing in a door-way, saw him, and burst into tears, and gave him a pair of socks."<sup>1</sup>

After the Civil War, Reverend Reed moved his family to Charlottesville, Virginia, in part so that his boys could avail themselves of the university. Shortly after their arrival, his wife unexpectedly died. Walter's response at age 14 was to immerse himself in his new educational opportunities, because exposure to formal schooling was limited during the Civil War. He made up for lost time quickly, as evidenced by his admission, at age 15, to the University of Virginia. His admission was based on an unusual exception granted partially on the knowledge that his two older brothers, James and Christopher, were already enrolled. After a successful year of studying Latin, Greek, and a course called History and Literature, he realized that his father could not support all three boys for the several years usually spent earning the traditional Master of Arts degree. Confronted with this problem, Walter developed a plan of action, an ability that would later in life allow him to devise a remarkable series of medical experiments whose results literally changed the world. At age 16, his plans were not quite so elaborate, but he summoned enough courage to confront the formidably bearded elders of the medical faculty with a bold proposal. If he passed all the courses, would they award him an M.D. degree regardless of the time it took or his age when he finished? They hardly took him seriously, but did agree.

#### GRADUATION AND PERSONAL LIFE

On 1 July 1869, just a little over 2 months shy of his 18th birthday, Walter Reed graduated, standing third in a class of 10 remaining from an original intake of 50 students. He was, then and now, the youngest person to ever graduate from the University of Virginia School of Medicine. The University of Virginia had no hospital for clinical training, so he went to Bellevue Hospital Medical School in New York. His older brother Christopher went along to New York to study law. In another year, Walter had earned his second M.D. degree, although it was not awarded until after he had reached the ripe old age of 21.

Following completion of the courses and hospital work at Bellevue, Reed worked in a number of positions in and around New York City: Randall's Island, Long Island, and Brooklyn. On a trip home to visit his remarried father now living in Murfreesboro, North Carolina, he met and fell in love with a charming young woman, Emily Lawrence.<sup>2</sup> Having held several different positions in New York, Reed decided he needed a more stable income if he was going to ask for Emily's hand in marriage. It is unclear exactly what else might have influenced his decision, but he decided that the U.S. Army would provide that steady income. He began preparing for the grueling examinations for a commission in the Army Medical Corps.

In February 1875, he took the 5-day examination, passed, and accepted his commission on 2 July. After a brief assignment at Willet's Point, Long Island, New York, he was unexpectedly assigned to the western frontier. Well ahead of their original plans, 20-year-old Emily and 24-year-old Walter decided to go ahead with their marriage. His father performed the ceremony on 25 April 1876. After a brief honeymoon in Harrisonburg, Virginia, Walter left his bride and, as military families often do today, the soldier reported to his assignment in Arizona first; and his wife returned to her family in North Carolina, with plans to join him later.

In fall 1876, just 7 years after the completion of the transcontinental railroad, 20-year-old Emily Reed rode the train, alone, across country. When Reed met her in San Francisco, he sported a new moustache, one he would wear for the rest of his life. From there, they traveled by steamer to San Diego and then endured a 23-day buckboard ride over 500 trackless miles to Reed's new assignment at Camp Lowell, Arizona Territory, near Tucson. Adding to the difficulties of their life on the frontier was the fact that Congress did not pass an Army appropriations bill for 1877. Thus, for the first 11 months of that year, no one in the Army was paid. The proud young couple had to borrow from their families to get by.

#### PURSUIT OF JOB OPPORTUNITIES

His next posting, Camp Apache on the White Mountain Apache Reservation, was located on the south bank of the White River in east-central Arizona. According to his friend, Lieutenant Thomas Cruse, Reed "was at that time the greatest wag and joker that I ever saw" and "the instigator of many humorous and boisterous table conversations" while dining in the officer's mess.<sup>3</sup> Cruse also said that, if anyone at their mess was destined for future greatness, no one would have selected Reed.

During the first 18 years of marriage, Reed and Emily moved about 15 times throughout the western frontier interspersed with assignments back

east, had two children, and generally made—as scores of other young Army couples did—as comfortable a life as they could. Not the shy and retiring type, Reed would avail himself of the local medical community, if there was one, to broaden his horizons and expand his knowledge. Promoted to captain in 1880, it was during a brief period of duty at Fort McHenry in Baltimore during late winter and spring 1881 that he took advantage of the opportunity to audit lectures in physiology at Johns Hopkins University.

It would be another 10 years before Reed got the opportunity to return to the frontlines of medical discovery and delve into the new knowledge and techniques that were revolutionizing the medical world. He did not, however, wallow in self-pity for his lack of opportunity and exposure to the brass and hierarchy of Washington. Between 1882 and 1887, Reed was assigned to three different locations in Nebraska: Fort Omaha, Fort Sidney, and Fort Robinson. He used some of the cases of erysipelas that he saw at Fort Sidney in his first scientific publication. “The Contagiousness of Erysipelas” was published some years later in the *Boston Medical and Surgical Journal*, the predecessor of *The New England Journal of Medicine*. While at Mount Vernon Barracks near Mobile, Alabama, where he was assigned from 1887 to 1890, Reed, in addition to other duties, cared for about 400 Apache Indians, including their great chief, Geronimo.

#### LATER ACCOMPLISHMENTS AND ASSOCIATIONS

In fall 1890, Reed was granted a leave of absence to take the graduate course in bacteriology and pathology that William Henry Welch was giving in the Department of Pathology at the new Johns Hopkins Hospital. When Reed walked into the new Johns Hopkins Hospital, opened just the year before, he embarked on the opportunity of a lifetime. He was wise and energetic enough to take full advantage of it. The school year, from 1890 to 1891, was a catalyst in Reed’s life, preparing the way for his great accomplishments a decade later.

During this time, Reed began his association with Dr. James Carroll, who, despite his medical degree, remained a sergeant in the Army. Born in England in 1854, Carroll immigrated to Canada in his early teens, where he worked as a woodsman for several years before coming to the United States and enlisting in the Army in June 1874. He served as a private, corporal, sergeant, and hospital steward, with numerous assignments on the western frontier. During his third enlistment, at age 30, he became interested in the field of medicine and began a quest that culminated 7 years later when he was awarded the M.D. degree from the University of Maryland in April 1891. While doing postgraduate work in bacteriology at Johns Hopkins Hospital, Carroll worked under Dr. Welch and

assisted Walter Reed with his laboratory work. Unknown to Reed and Carroll at the time, this was the beginning of what would define their life's work. Several years later, Carroll was assigned to the Army Medical Museum in Washington, DC, to again work for Reed.

In fall 1891, after completion of his courses, Reed must have been very disappointed and probably even discouraged to be ordered back to the western frontier, this time to the cold and snow of Fort Snelling, Minnesota. He was there for a year and then became attending surgeon in the neighboring St. Paul. Again, not letting any opportunity go to waste, collaborating with local science and biology teachers, he established a laboratory and kept in practice by giving lectures on clinical microscopy and bacteriology.

In spring 1893, George Miller Sternberg's selection as Surgeon General turned out to be a watershed in Walter Reed's career. Reed was recalled to Washington to join the faculty of Sternberg's new Army Medical School. One of the factors in Reed getting the assignment was geography: he lived closer to Washington (Minnesota) than the other candidate (California), and it would cost the Army less to move him. He was promoted to major and named curator of the Army Medical Museum. He was given additional duties as Professor of Clinical and Sanitary Microscopy at the new Army Medical School. Reed had no experience as a teacher of physicians, but had a wealth of experience in the field environment that Sternberg knew would be needed, as the fledgling school tried to turn civilian doctors into Medical Corps officers.

#### LIFE IN WASHINGTON

Reed's time in Washington, DC—much faster-paced than life on the frontier—was filled with many stimulating opportunities. He became an active member of the Medical Society of the District of Columbia and joined the faculty of the Columbian University Medical School, now George Washington University. There, he taught night classes to supplement his Army income. He became a delegate to the American Public Health Association. In summer 1896, Reed was sent to investigate a smallpox epidemic in Key West, where he met and befriended Jefferson Randolph Kean. In a few years, Reed became a trusted troubleshooter for General Sternberg, whose faith in him would later pay off beyond either of their wildest dreams.

Late in the evening of 13 February 1898, a massive explosion tore apart the battleship USS *Maine* while she was at anchor in Havana harbor, killing 266 Americans. Walter Reed had been stationed in Washington, DC, for 5 years and now wanted to go with the troops to Cuba for the ensuing war with Spain. Because he was not immune to yellow fever and had become such a trusted assistant for the Surgeon General, his request was denied.

It was “America’s splendid little war.” U.S. troops landed in Cuba on 22 June 1898 and, by 17 July, the Spanish had surrendered, effectively ending the Cuban campaign. Overall, during the Spanish American War, less than 400 men were killed in action or died from wounds, whereas more than 2,500 died of disease. The fact that most of the disease deaths occurred in troops who never left the relative safety of the United States was a sad and terrible scandal. Typhoid or a poorly understood typhoid-like illness was the devastator.

Surgeon General Sternberg appointed Major Reed to head a board of three doctors to investigate this tragedy. The other members were two experienced volunteer physician-soldiers, Major Victor C. Vaughan (Dean of the University of Michigan Medical School and a veteran of the campaign in Cuba, where he had suffered from yellow fever) and Major Edward O. Shakespeare. For almost a year, they made exhaustive observations with extensive and intensive study of each camp’s outbreak of disease. The board produced an extraordinarily well-researched and documented account of the conditions that allowed typhoid to take hold in the camps. Reed and his colleagues established in a convincing way that water was not responsible, but that fingers, filth, flies, and food were.<sup>4</sup> They developed the concept of the typhoid carrier state in healthy individuals and eliminated the diagnosis of typhomalaria as a disease entity. Most importantly, they focused the bright light of science on the responsibility of the military commander to protect the troops from disease.

## YELLOW FEVER

At the conclusion of the Spanish American War, the U.S. government planned to occupy Cuba for 4 years. One of the many challenges was managing the tropical diseases prevalent on the island, especially yellow fever. American doctors who had fought the scourge in their port and river cities for over a century would now be able to confront the dreaded and mysterious disease on what many considered its home turf.

Yellow fever is an acute hemorrhagic disease caused by the yellow fever virus. The virus belongs to the *Flavivirus* group, which includes the West Nile and dengue fever viruses. Infection results in a wide spectrum of disease, from mild symptoms to severe illness and death. Yellow fever is an arboviral disease, meaning that it is transmitted to humans by an arthropod (insect or tick) vector.

Most victims experience an acute illness normally characterized by fever, muscle pain, backache, headache, shivers, loss of appetite, nausea, and vomiting. In most patients, the illness will not progress beyond these symptoms, and they improve and recover. However, some will develop jaundice, severe abdominal pain, vomiting, and bleeding. A fraction will develop liver and renal failure that lead to death.

The year 1900 was expected to be a “yellow fever year” in Cuba because, in the previous year, the epidemics had been mild. The majority of the American soldiers were susceptible to the mysterious, as far as cause and transmission, and deadly yellow fever. The dreadful scourge had a penchant for altering the course of history. Yellow fever is credited with wiping out Columbus’s second expedition, as well as over 25,000 French troops sent by Napoleon to quell an uprising in Santo Domingo in 1801. This devastating loss, which included his brother-in-law, influenced Napoleon’s decision to sell the Louisiana Territory to the United States in 1803.

An epidemic of yellow fever that began in Cuba in May 1900 caused Sternberg to call on Walter Reed once again. Sternberg appointed another Board of four physicians whose orders were published on 24 May “for the purpose of pursuing scientific investigations with reference to the infectious diseases prevalent on the Island of Cuba.” The words “yellow fever” did not appear in the official orders. It is possible that the failure to mention yellow fever in the published orders was a political decision in order not to offend the Cubans, or to avoid arousing concern among U.S. government leaders or the public about the recurrence of more yellow fever and possible deaths in Cuba. Continuing deaths in an occupation army after the fighting was over did not set well with anyone.

The Board consisted of Walter Reed, 48, as chairman; his laboratory assistant now a contract surgeon, Dr. James Carroll, 46, was second in charge. Dr. Jesse Lazear, 34, and Dr. Arisitides Agramonte, 32, were the additional two members. Lazear had become an expert on malaria and the *Anopheles* mosquito under William S. Thayer’s guidance at Johns Hopkins. Agramonte, who had been trained medically in the United States, was assumed, as a native Cuban, to be immune to yellow fever. Agramonte, an experienced pathologist, and Carroll had both worked with Reed at the Army Medical School. Agramonte and Lazear were already on duty in Cuba as contract surgeons.

On 25 June 1900, Reed and Carroll arrived in Cuba anxious to get to work, but also to see their first clinical cases of yellow fever. Reed had been to Cuba earlier that year but yellow fever was quiescent at the time. Reed’s army buddy, Jefferson Randolph Kean—who was assigned in Cuba—had come down with yellow fever just 5 days before and had been isolated in the huts for infectious cases that were separated from the main buildings of the hospital at Columbia Barracks, the large American Army post 6 miles from Havana. Although in the early stages of his illness, Reed was relieved to learn during his visit that Kean’s case appeared mild, and his chances for recovery good.

Under guidance from General Sternberg, the Board’s first task was to try and isolate a bacterium that had been reported as the cause of yellow fever. They were unable to isolate the germ and felt sure it was not the agent of the

disease. Not surprised by this failure, Reed turned in another direction in his investigations, toward trying to determine yellow fever's transmission. There were several paths to pursue.<sup>5</sup>

Conventional wisdom of the day indicated that yellow fever was spread by fomites, classified as all contaminated objects or materials from yellow fever patients (clothing, bedding, furniture, etc.). Reed knew that there were many facts that did not support the fomite theory. He also knew that an insect vector was being widely discussed, but he was equally skeptical about this possibility. What he did know with certainty was that both of these theories had to be thoroughly tested. Reed's plans for his experiments were brilliantly conceived, but, as is almost always the case, they depended on the previous work and current assistance of others, both direct and indirect.

Reed was acquainted with the work of both Ronald Ross (a British Army major and physician who had discovered in 1897–1898 that the mosquito was the transmitter of malaria) and Cuban physician Carlos Finlay, who for years had been trying to prove that yellow fever was transmitted by mosquitoes. Reed also knew Henry Rose Carter, Chief Quarantine Officer for the U.S. Marine Hospital Service, forerunner of the Public Health Service. Carter concluded (based on cases of yellow fever occurring in the two small, rural communities of Orwood and Taylor, in north central Mississippi) that, a building or place could not be infected and that the infectious agent, “leaving the patient must undergo some change in the environment before it is capable of infecting another man.” He thought this period was about 2 weeks and called this the period of “extrinsic incubation.”<sup>6</sup>

Reed had been planning to return to Washington around 1 August to complete the typhoid board report. Shakespeare's death on 1 June that year and Reed's mission to Cuba left Vaughan to work on the report alone. The night prior to Reed's departure, a meeting was held with the Board to discuss human experimentation with mosquitoes. No laboratory animals were known to contract yellow fever, so human subjects would have to be used. They felt they could not ask others to accept risk that they were not willing to share.

Lazear, who had taken mosquito eggs provided by Carlos Finlay, was in the process of raising and breeding them. Reed knew that Finlay had tried over many years to transmit yellow fever by the bites of mosquitoes; in more than 100 attempts, Finlay did not have convincing success. Reed must have been reassured that nothing significant would happen in the couple of months he would be away. Regrettably, he was tragically wrong.

After some initial fits and starts, Lazear became proficient in raising his mosquitoes. On 11 August, he began human experimentation on himself and another Army physician. They were bitten by mosquitoes that had been

“loaded” by feeding on yellow fever patients during the acute phase of their illness; both remained well. Lazear did seven additional inoculations with loaded mosquitoes without producing illness. On 27 August, Carroll was bitten in order to feed a failing mosquito. Within a few days, he was deathly ill with yellow fever, although he would slowly recover.

With Carroll incapacitated and Reed in Washington, Lazear (who was not a commissioned officer, but a contract surgeon and that for only 6 months) was free to proceed unchecked. Convinced that Carroll’s case was caused by his mosquito, Lazear sought to have another soldier bitten by the same mosquito that had downed Carroll. Although Sternberg and Wood knew about the plans for human experimentation, none of the other military officers in Cuba did, meaning, of course, that their permission to experiment on their soldiers had not been granted. On his own, Lazear asked, and Private William H. Dean freely volunteered, to subject himself to mosquito inoculation. He developed yellow fever, but, fortunately, his case was mild.

Although no document exists as evidence, Reed almost certainly wrote or cabled Lazear ordering him to cease his unauthorized experiments. There is evidence that he only partially complied. In what is almost certainly continued self-experimentation, the Board’s laboratory notebook, written in Lazear’s hand, records a guinea pig being bitten by a loaded mosquito on 13 September. Five days later, Lazear was sick with yellow fever, and, a week later, he was dead. Lazear’s notebook documentation is most likely that of his own demise. There is no record of the Board doing any animal experiments. Lazear almost certainly used the term guinea pig to cover up his own self-experimentation in the face of Reed’s order to desist.

Reed returned to Cuba shortly after Lazear’s death and quickly restored order. He was able to decipher and understand Lazear’s puzzling notations in his small laboratory notebook and realized that the only persons that sickened from mosquito bites were those whose mosquito had been incubating at least 12 days after loading.<sup>7</sup> This corresponded to Carter’s extrinsic incubation period and was surely the key that would unlock the door. Surgeon General Sternberg wanted Reed to present the preliminary results before the annual meeting of the American Public Health Association in Indianapolis at the end of October. Reed spent a frenetic 2 weeks preparing the report for presentation and subsequent publication. But, before he was off to Indiana, at Kean’s urging, Reed went to see the Governor General of Cuba to request the needed funds for his further planned experiments.

The remarkable Leonard Wood, a Harvard-educated physician turned soldier who had received the Medal of Honor for his heroic participation in the campaign that resulted in the surrender of Geronimo, was the Governor

General of Cuba.<sup>8</sup> Reed outlined his plans and requested the funding. Wood readily agreed, and provided Reed and the Board with \$10,000 to build the carefully designed experimental camp, obtain the necessary supplies, and provide \$100 in gold to each of the volunteers. Another \$100 was added if they came down with yellow fever. Reed assured Wood that each volunteer's consent would be obtained in writing before experiments were conducted.<sup>9</sup>

After Reed presented their paper in Indianapolis, it was—by today's standards—published instantly.<sup>10</sup> Back again in Cuba in early November, Reed went quickly to work, acquired the land, and had his experimental location built to his specifications, naming it Camp Lazear in honor of his fallen comrade. Controlled experiments were conducted with human volunteer subjects to test the fomite and mosquito transmission theories. Within three short and amazing months, the first phase of their experiments was completed.

Reed presented their second paper with a tribute to Jesse Lazear on 6 February 1901 at the Pan American Medical Congress in Havana.<sup>11</sup> Their conclusions about yellow fever have stood the test of a century of time and have never been disproved or even modified in any significant way. Their most important conclusions were that the mosquito serves as the intermediate host for yellow fever, transmitting the disease to the nonimmune after having previously fed on the blood of those sick with this disease. An extrinsic incubation period of about 12 days or more is required before the mosquito is capable of conveying the infection. Yellow fever is not conveyed by fomites; and the spread of yellow fever can be most effectually controlled by measures directed at mosquito control.

Major William Crawford Gorgas, Medical Corps, was the Chief Sanitation Officer in Havana and had been an interested observer of the Board's work. Although not convinced that the mosquito was the only route of yellow fever transmission, he immediately began mosquito control measures in Havana. From February 1901, Gorgas dispatched his "small army of inspectors" throughout Havana. Their success was beyond anyone's wildest imagination. Within 3 months, application of the Board's findings would all but rid Havana of yellow fever for the first time in over 150 years. In all of Havana, there were 12 deaths in January and February before Gorgas got to work, but only 6 deaths the remainder of the year. By September, not only were there no deaths, but also there were not even any new cases. Yellow fever that had ruled Havana for 150 years was essentially wiped out in 150 days. The world was astounded, but not everyone believed, as evidenced by the problems Gorgas had several years later in Panama.

Following completion of the experiments at Camp Lazear, Reed and Carroll returned to Washington, DC. There was still work to be done in Cuba,

but Reed would never return to the site of his greatest accomplishments. Carroll did return to Cuba later that year.

In August, September, and October 1901, Walter Reed produced six new cases of yellow fever. His work clearly demonstrated that the specific agent of yellow fever was destroyed or at least inactivated by heating to 55°C. He also proved that the agent of yellow fever was a filterable agent and not a toxin in the blood of yellow fever patients. Carroll's research demonstrated the first cases of experimental transmission of a viral disease from one human to another. This completed their planned experiments, and Carroll returned to Washington with the work of the Yellow Fever Board done.<sup>12</sup>

#### CHANGING THE WORLD

The results of their work would change the world. Thousands of lives would ultimately be saved. Millions of dollars in property would also be saved from destruction with the knowledge that fomites could not convey yellow fever. During the Spanish American War in July 1898, the entire Cuban town of Siboney was destroyed to “save” it from yellow fever. The control of mosquitoes and the diseases they carried (yellow fever and malaria) made possible the construction of the Panama Canal and its extraordinary impact on commerce and politics. The Yellow Fever Board's amazingly successful work concluded in late 1901 and has stood for more than 100 years as the most precedent-setting and outstanding clinical research ever done by the Army Medical Department, with unsurpassed effects on public health and commerce.

The genius of the Reed Board was the conduct of its experiments with precise, accurate, and meticulous attention to detail. In addition, they made extraordinarily good decisions based on a thorough evaluation and use of the available knowledge. In addition to all of this, they were also remarkably lucky, in that none of their volunteers died, which could have slowed or even stopped their work. They obviously had little, if any, control over their patients' survival; even today, with all of the sophisticated equipment, tests, and therapies available, the yellow fever survival rate is essentially unchanged from a century ago. The unfortunate Cuban Juan Guitéras, who tried to repeat the Reed experiments, had three deaths within eight cases produced. One of his volunteers who died was Clara Maass, an American nurse. Using the same basic therapeutic techniques, the Reed Board had none in their 22 cases. The unique accomplishments of the Reed Board included proof that yellow fever was transmitted by mosquitoes and not by fomites, that this was the first evidence of a viral disease in man (although the organism would not be discovered for another 30 years), and that informed consent was introduced into human research.

## LATER YEARS

Recognition, honors, and speaking invitations flooded Reed. Major Jefferson Randolph Kean and other friends of Walter Reed campaigned for him to succeed George Miller Sternberg as Surgeon General of the Army, but apparently he was never seriously considered. In June 1902, Colonel William H. Forwood was named to succeed Sternberg.

By fall 1902, it was clear that Reed's health was suffering. After work on 12 November, he was unable to teach his evening class. Two days later on Friday, he thought that he had appendicitis and was seen by Major William Borden, his close friend and commander of the Army Hospital at Washington Barracks (now Fort Leslie J. McNair). Major Borden agreed, and they discussed the possibility of operating the following week.

Reed went home, and by Sunday was actually feeling better and was able to receive friends that afternoon. His temperature went up Sunday night, and the next day he walked into the hospital, but never walked out. At 11:00 a.m., he was operated on by Major Borden. Borden was dismayed at what he found, saying that Reed's symptoms "in no way indicated the gravity of the . . . trouble." There was hope for several days that he might recover, but peritonitis developed; without antibiotic, yet to be discovered, it was futile.

At the time of Reed's illness, the Secretary of War had stated in his annual report, still in press, that Reed would, by law, become a Lieutenant Colonel within a few months. The Secretary also said that he would ask the President to authorize Reed's appointment to Assistant Surgeon General with the rank of Colonel. Neither promotion nor recognition came to him. There were no family members present when Walter Reed, 51, died during the early hours of 23 November 1902.<sup>13</sup> He was buried in Arlington National Cemetery. Kean selected his burial site, and the inscription on his marker, paraphrased from an honorary degree from Harvard, "He gave to man control of that dreadful scourge yellow fever."

Major William Borden, Reed's colleague and surgeon, spent the next 6 years after Reed's death on a mission to honor his friend. He was intent on naming a new hospital facility in the District of Columbia after Reed. It was Borden's desire to combine the Army Medical School, the Army Medical Museum, the Surgeon General's Library, and a new hospital facility on a single campus. After several years of intense effort, Borden obtained the funding in 1905, and the first patients were transferred from Washington Barracks to the new Walter Reed United States Army General Hospital on 1 May 1909. When Borden first told friends about his ideas for a new campus to include a new army hospital, many thought that he was dreaming; for years after its completion, many referred to the new facility as "Borden's dream." The success of "Borden's dream" is history.

## CONCLUSION

In the years following the death of Reed, an unsightly debate arose over the significance of the contributions made by the principal characters (Reed, Finlay, Carter, Gorgas, and even Sternberg) to the discoveries made in Cuba. Feelings tended to run along political and nationalistic lines. Those who saw the American intervention in Cuba after the sinking of the USS *Maine* as an armed invasion by unwanted, unneeded, and arrogant bullies were inclined to give Carlos Finlay, whose work was indeed brilliant, credit for the discovery that mosquitoes transmit yellow fever. Those who saw America's participation in the conflict an unselfish act of aid and assistance to a beleaguered and repressed neighbor tended to give the U.S. Army Board and Reed credit for providing the convincing proof where Finlay had fallen short.

Americans, chief among them was Jefferson Randolph Kean, wanted to preserve the accomplishments and memory of Reed. Kean spent a good portion of the rest of his life writing, speaking, and, in any other way possible, defending the primacy of Reed.<sup>14</sup> Cubans defended Finlay and said that Reed had merely validated Finlay's previous discoveries. Each side claimed for their man, "the conquest of yellow fever." Henry Rose Carter (who knew all the principal characters because he was in Cuba the entire time), placed the events in proper historical perspective when he said, "Few scientific discoveries—medical or otherwise—are in their entirety the work of any one man. He who puts the capstone on the completed structure gets—as he should—the credit for it, but the foundation and walls may have—and generally have been—built by many hands."

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## Notes

1. J. A. Graves, *The History of the Bedford Light Artillery*, p. 39.
2. Emily later changed the spelling of her name to Emilie, apparently because she thought it was more sophisticated. Her grave marker in Arlington National Cemetery, placed at a time when both of her children were alive, spells her name Emily.
3. T. M. Fink, "Before Yellow Fever and Cuba, Walter Reed in Arizona," *Journal of Arizona History* 42 (2001): 181–200.
4. A 239-page abstract of the typhoid report was published in 1900 and is most likely the report that Reed was called back from Cuba to complete in August 1900. The two-volume, 1,600-page *Report on the Origin and Spread of Typhoid Fever in US Military Camps During the Spanish War of 1898* (Washington, DC: Government Printing Office, 1904), was published in 1904 when Vaughan was the only surviving member of the Board.
5. Debates over the cause of yellow fever had raged for over a century. Josiah C. Trent reveals the following in his 1946 series of articles in the *North Carolina Medical Journal*: "The nature of the disease became a matter for discussion and dispute, often warm, but not often as heated as that which occurred between two physicians of Kingston, Jamaica. Doctors

Williams and Bennet of that town engaged in an argument as to whether yellow fever was an “inflammatory disease”; the argument culminated in a duel on December 29, 1750, in which both physicians were killed.” *North Carolina Medical Journal* 7 (1946): 69–71. “Thumbnail Sketches: The Story of Yellow Fever II. Eighteenth-Century Physicians and the Yellow Fever.”

6. The results of their research were published in the *New Orleans Medical and Surgical Journal*, May 1900, the month the U.S. Army Yellow Fever Board was established.
7. There are known to be two laboratory notebooks associated with the Yellow Fever Board. A notebook in Lazear’s blouse pocket when he died was secured after his death and given to Reed who deciphered it and came to a better understanding of the extrinsic incubation period. It disappeared after Reed’s death and has never been found. There was an additional laboratory notebook that was used by Lazear and several others, including Reed, to record various experiments and other data about the work of the Board. This notebook is in the possession of the New York Academy of Medicine.
8. At the start of the Spanish American War, 38 year-old Captain Leonard Wood, Medical Corps, U.S. Army, was the White House physician and a good friend of the Deputy Secretary of the Navy, Theodore Roosevelt. Their friends and contacts enabled them to obtain appointments as colonel (Wood) and lieutenant colonel (Roosevelt) of the 1st Volunteer Cavalry Regiment, later famously known as the Rough Riders. Following an illness in the chain of command above them, Wood was promoted to brigadier general, U.S. Volunteers, and Roosevelt became colonel of the regiment just before the climactic battle at Kettle Hill (popularly known as the Battle of San Juan Hill). After the war, Wood remained in Cuba to become governor general, and Roosevelt returned to the United States to be elected Governor of New York and Vice-President of the United States.
9. The U.S. Army Yellow Fever Board is credited with being the first research group to get informed consent from their volunteers prior to subjecting them to medical research, thus opening the door to more ethical clinical research.
10. W. Reed, J. Carroll, A. Agramonte, and J. Lazear, “The Etiology of Yellow Fever: A Preliminary Note,” *The Philadelphia Medical Journal* 6 (1900): 790–793.
11. W. Reed, J. Carroll, and A. Agramonte, “The Etiology of Yellow Fever—An Additional Note,” *JAMA* 36 (1901): 431–440.
12. The last two publications of the Yellow Fever Board were W. Reed, J. Carroll, and A. Agramonte, “Experimental Yellow Fever,” *American Medicine* 2 (1901): 15–23; W. Reed and J. Carroll, “The Etiology of Yellow Fever—A Supplemental Note,” *American Medicine* 3 (1902): 301–305.
13. Emily Reed was so overcome by her husband’s illness that she was under doctor’s orders not to visit him in the hospital. Their son Lawrence was on active duty in the Army assigned overseas; their daughter had visited her father, but was not there when he died.
14. Senate Document No. 822, *Yellow Fever—A Compilation of Various Publications*, 61st Congress, Washington, DC: Government Printing Office, 1911.

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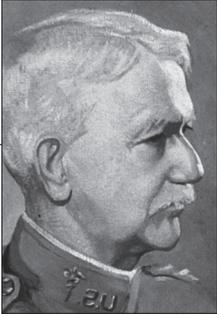
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by *Carol Byerly*

## WILLIAM CRAWFORD GORGAS 1854–1920

### INTRODUCTION

William Crawford Gorgas witnessed dramatic changes in the fields of military and medical science during his lifetime, and was instrumental in some of the most important developments in the history of military medicine. His life spanned the American Civil War and World War I, during which time the American military evolved from black powder, horses, and a collection of state militias to a national, industrialized army employing motor transport, heavy artillery, and air power. During the same period, medicine transformed from an ineffective and often feared practice of bleeding and purging to a scientific and respected profession employing bacteriology, antiseptics, and X-ray technology.

As an Army medical officer and sanitarian from 1880 to 1918, Gorgas was part of the generation of medical officers who learned to apply germ theory and modern sanitation methods to control diseases that had plagued armies for centuries, such as dysentery, typhoid, and typhus; and, as Army Surgeon General during 1914–1918, he directed the expansion of the Medical Department to meet the challenges of modern industrial warfare. Gorgas is best known, however, for driving yellow fever from Cuba after the Spanish American War and for making the Isthmus of Panama safe enough for the United States to construct the Panama Canal.

In addition to standing at the nexus of military command and medical practice, Gorgas also represents the complexities of the times, in that he was a southerner during the height of Jim Crow segregation, but also embraced Progressive Era views concerning the power of science, education, and

government to improve people's lives. He also loved the military, but spent his career in the noncombatant role of maintaining the fighting force. Although universally described as genial and gracious, modest and reticent, William Gorgas did not shy away from controversies that would question his science, undermine his authority, challenge his character, or test his resolve.

#### FAMILY AND CHILDHOOD

Marie Gorgas wrote that, if yellow fever was not the best man at her wedding, it was at least an usher. The disease played a key role in Gorgas' life even before he was born because his mother, Amelia Gayle, the daughter of a former Alabama governor, and his father, Josiah Gorgas, an army officer from Pennsylvania, met when his mother fled to an army arsenal where Josiah was stationed during a yellow fever epidemic in Mobile. The two married in 1853, and William, the first of their six children, was born the next year. Although a northerner and graduate of West Point, Josiah sided with the South during the Civil War, serving as chief of ordnance in the Confederate Army, and young William spent his formative years in the Confederate capital of Richmond, Virginia. William pursued a military career against his father's wishes and (when he could not get into West Point) chose a medical path to the Army. He graduated from the University of the South (Sewanee, Tennessee) in 1875, received an M.D. degree from Bellevue Medical College in New York City in 1879, and was then commissioned as an assistant surgeon in the Army Medical Corps on 16 June 1880.

Like his parents, Gorgas met his wife, Marie Cook Doughty, during a yellow fever epidemic, this one at Fort Brown on the Texas-Mexico border in 1882. When she got yellow fever, Gorgas treated her until he, too, fell ill, and as the two convalesced, they fell in love. In a mirror image of his parents' marriage, the southerner Gorgas married northerner Marie in September 1885, and began a partnership of military life and fighting disease. The couple had acquired permanent immunity to yellow fever, which enabled Gorgas to become an expert on the disease as they lived on posts from Texas to North Dakota to Florida. In many ways, Marie was a partner in his work. She was more than a dutiful Army wife, and traveled with him on many of his public health campaigns around the world and served as hostess to the scores of visitors who came through her husband's posts. His only child, Aileen, married one of his assistants, W. D. Wrightson, and Gorgas wrote to other members of his family daily. He was promoted to captain in 1885 and major in 1898. To yellow fever, one colleague later observed, "he owed wife, opportunity, fame and great place, and the personal immunity which enabled him to walk without fear in the shadow of death."

## CUBA

Gorgas emerged from obscurity during the Spanish American War when he was sent to Siboney, Cuba, in July 1898, to run a yellow fever camp. Yellow fever was one of the most intimidating tropical diseases at that time, with mortality rates ranging from 10% to 60%. Symptoms included high fever, chills, headache, jaundice, and, in the worst cases, internal hemorrhaging causing the horrifying *vomito negro* or black vomit. Yellow fever was also terrifying because no one knew the cause. In 1898, experts believed that “filth” caused many diseases, including yellow fever; thus, when the army departed the camp at Siboney, they burned everything to the ground, including unused supplies, to eliminate any source of disease.

Despite efforts to sanitize Havana and other areas to control disease, yellow fever continued to threaten the American mission in Cuba so that in 1900, Army Surgeon General George M. Sternberg appointed a commission (headed by army bacteriologist Major Walter Reed) to investigate the cause of the scourge and how to prevent it. In a dramatic series of experiments beginning in June 1900, the commission proved that yellow fever was spread not by filth, dirty bed linen, or bad air (miasma), but by infected female *Aedes aegypti* mosquitoes, which carried the pathogen from person to person with their bites.

It was now up to Gorgas as the chief sanitary officer of Havana to implement the findings. After a heartbreaking attempt at developing a vaccine in which three volunteers died, Gorgas determined to rid Havana of mosquitoes. With the support of the military governor of Cuba, General Leonard Wood, and other medical officers, Gorgas went to work surrounding all yellow fever patients in screening to prevent mosquitoes from biting them and spreading their infection to others. His team fumigated every building in Havana to kill adult mosquitoes and identified water sources where mosquitoes bred. They also drained, screened, or oiled the surfaces to prevent the growth of mosquito larvae.

Results appeared within months. Yellow fever cases in Havana fell from 1,400 in 1900, to 37 in 1901, and none in 1902. In addition, malaria deaths decreased from 375 in 1900 to 77 in 1902. Reed and Gorgas were thrilled at their success. “All honor to you, my dear boy,” Reed wrote Gorgas. “You have succeeded in throttling the epidemic . . . and it is to your everlasting credit as an energetic health officer who saw his opportunity and grasped it.” Gorgas demurred that, by proving the mosquito was the transmitter of yellow fever, “Yours was the guiding hand in the whole matter.” He told Reed, “I am very happy to shine in the more humble role of being the first to put your discovery to extensive practical application.” From then on, the names of Reed and

Gorgas were linked in the fight against yellow fever; and, in 1903, Congress recognized both men by promoting them to colonel outside of the general promotion order. Tragically, however, Walter Reed did not live long enough to fully enjoy his success, but died of infection after an appendectomy in November 1902.

#### PANAMA

Despite his death, Reed's science endured. As President Theodore Roosevelt prepared to take on the construction of the Panama Canal, Gorgas asked Surgeon General Sternberg to assign him to the project of applying the mosquito control methods he had developed in Cuba. Sternberg agreed and sent Gorgas to Egypt to consult with the British about mosquito control on the Suez Canal and to Paris to discuss the health problems the French had encountered in the 1880s in their failed attempt to build a canal. During France's prior enterprise, more than 22,000 people had died and one-third of the workers were sick annually. However, Gorgas believed that new scientific knowledge (including the Reed Commission's work and British medical officer Ronald Ross's 1897 demonstration of the mosquito transmission of malaria) would enable him to succeed where the French had failed. He soon found that political opposition would be fiercer than the mosquitoes.

In early 1904, Gorgas traveled to Panama to determine what resources he would need to tackle yellow fever and malaria. Instead of fighting insects in a single city such as Havana, he now faced a battleground of two small cities separated by 500 square miles of jungle and swamp. He, therefore, developed a million-dollar proposal for a program similar to the one he had executed in Havana. Skeptical of the need to control mosquitoes and concerned about costs, the Panama Canal Commission thought Gorgas should be cleaning up filth in the cities, instead of chasing insects, and authorized only \$50,000 and a staff of seven. Marie Gorgas later wrote that, when her husband and his team faced "the mighty task of ridding this jungle of disease," they did so with "little more than their own hands and their own determined spirit to work with."

Gorgas' public health department staff found mosquito larvae in almost every house in Panama, but the Commission repeatedly refused and often ignored his requisitions for an army of inspectors and a mountain of supplies to fight the problem. The Commission's position initially seemed reasonable because, as the project began, there was no yellow fever in the zone. Gorgas, however, knew that as thousands of nonimmune workers arrived—people who had never been exposed to yellow fever—the disease would take hold. He was right. The first yellow fever case appeared on 21 November 1904, with six more in December. The first deaths came in January, two of the six new cases.

Gorgas fought the disease by screening patients and killing mosquitoes, but he did so with inadequate resources. As the epidemic spread, so did fear, and tension between Gorgas and the Panama Canal Commission mounted. By mid-1904, three-fourths of the American employees had fled, and Roosevelt's canal project was at a standstill. He replaced the entire commission, but the new members were equally skeptical of Gorgas' approach. Gorgas stood firm, however, convinced that science would bear him out. He also knew that his team's reputation as sanitary officials would be ruined if he backed down. He told a colleague, "Gorgas and yellow fever are incompatible." Despite the firm support of the Army Surgeon General, Robert M. O'Reilly, and a campaign by the American Medical Association and other scientists on behalf of Gorgas' anti-mosquito program, in June 1905 the new commission recommended that Gorgas be relieved.

Before he replaced Gorgas, President Roosevelt conferred with two experts, bacteriologist William H. Welch of The Johns Hopkins University, and Alexander Lambert, a New York physician, friend, and hunting companion. Both men stated clearly that Gorgas was the best person for the job, and, at a private meeting at the president's home in Oyster Bay, New York, Lambert warned Roosevelt that the whole canal project rested on his decision: "If you fall back upon the old methods of sanitation, you will fail, just as the French failed. If you back up Gorgas and let him pursue his campaign against the mosquitoes, you will get your canal." Roosevelt took the advice and admonished the commission to give Gorgas the support he needed.

Now Gorgas' public health department attacked yellow fever with warlike zeal. Weapons included city ordinances outlawing the harboring of mosquitoes, hundreds of tons of insecticides, miles of lumber and copper screening to screen in windows and doors in all homes and other buildings throughout the Canal Zone, and several thousand workers. They fought simultaneously on several fronts: identifying, quarantining, and screening all victims of yellow fever to prevent the spread of the disease; killing as many adult *Aedes aegypti* mosquitoes as possible; and destroying their larvae and breeding areas. They also continually inspected the work to ensure its effectiveness. Gorgas now spent about \$2 million annually, \$90,000 on screening alone, compared to his original budget of \$50,000. As the year progressed, Gorgas and his team could again watch yellow fever cases decrease from 62 in June, to 42 in July, to 27 in August, to 7 in September, and then 3 in October. The last yellow fever death in the Canal Zone occurred in November 1905.

After getting yellow fever under control, Gorgas turned to an even greater menace to the canal project: malaria. Although it did not have as high a mortality rate as yellow fever, Gorgas told a medical conference in 1906 that

it was more important because “the amount of incapacity caused by malaria is very much greater than that due to all other diseases combined.” Malaria—caused by plasmodia parasites in the blood that feed on and destroy red blood cells—produces fevers and chills, and clogs victims’ arteries and organs. Mosquitoes also transmit malaria; but, unlike the urban, domestic *Aedes aegypti* of yellow fever, the malarial *Anopheles* were country cousins that preferred swamps and forests, and this made them much more difficult to find and destroy. As Marie Gorgas explained, “Making war on the yellow-fever insect is like making war on the family cat, while a campaign directed against the malarial parasite is like fighting all the beasts of the jungle.”

Public health department researchers investigated the reproductive processes, feeding habits, and flight range of the female mosquitoes. After discovering that the *Anopheles* disliked bright light and rarely flew more than 200 yards, workers needed only to cut grass and drain standing water for a relatively short distance around inhabited areas to effectively reduce malaria. The mosquito work was prodigious, however: in 1908, the “*Anopheles* brigade” for Panama City cut 2.5 million square feet of weeds and grass, oiled 5,182 pools, and fumigated more than 5 million cubic feet of homes and buildings. Physicians also administered quinine to reduce plasmodia in the blood, which both reduced transmission rates and helped people regain strength enough to get back to the canal project. The program paid off. Hospitalization rates for malaria plummeted from a high of 821 per 1,000 in 1906, to 282 in 1908, to just 76 in 1913.

The Canal Zone became so safe that Roosevelt traveled to Panama in November 1906, and returned home with high praise for Gorgas and other officials. In a special address to Congress, Roosevelt equated them with military heroes, “entitled to the same credit that we would give to the picked men of a victorious army.” The defeat of yellow fever, he said, would “stand as among the very greatest conquests, whether of peace or of war, which have ever been won by any of the peoples of mankind.” Gorgas was thrilled: “I do not think that an army medical officer ever had such recognition in a Presidential message. . . . I have had greater recognition and success than I ever expected.”

New water and sewer systems and rat patrols removed many other sources of disease in Panama, but further threats to the army of canal workers remained, chief among them industrial accidents and pneumonia. In 1906, Gorgas reported that “pneumonia is by far the heaviest cause of death among the employees.” He blamed the workers’ poor standard of living. “They seldom have more clothing than they have on their backs,” he said, and, with the daily rains, “when they come home in the evening their clothing is soaked” so that they become chilled while sleeping at night. This and poor nutrition, he believed,

were “amply sufficient” to cause pneumonia. Gorgas introduced places for workers to dry their clothes and sought to reduce crowded housing by moving laborers out of large barracks into shacks scattered throughout the zone. Deaths from pneumonia did fall from 416 in 1906 to 47 in 1913, but the problem persisted and would challenge Gorgas throughout his career. In 1914, he explained to a business club in Cincinnati: “That poverty was the greatest single cause of bad sanitary conditions was very early impressed upon me.” Gorgas told his audience that if he again encountered situations such as in Cuba or Panama, and could impose only one public health measure, “I would select that of doubling wages.” Taxing those wages just reduced workers’ income, however, so he also supported political economist Henry George’s proposal of a single tax on land that he believed would “increase wages without increasing the burden on labor. Thus it will lower death rates and increase health and efficiency rates.” Gorgas was such a strong advocate of the measure that in 1920, the Single Tax Party considered him as its candidate for president of the United States.

Gorgas worked in Panama until 1913; but, despite his successes, the years 1907–1914 were often troubled. In 1907, Roosevelt appointed Colonel George Goethals to run the Panama Canal project, setting the stage for discord between the two colonels. The reasons for this hostility are not completely clear, but a primary source of dispute was Goethals’ objection to the cost of public health projects. As disease rates fell, Goethals transferred mosquito mitigation measures such as grass cutting and ditch cleaning from the public health department to the quartermaster’s department, which accomplished the work at lower cost, but, much less satisfactorily, according to Gorgas. In a rare show of public criticism, in a 1915 speech, Gorgas (then Surgeon General) suggested that the removal of anti-mosquito work from his department was responsible for the persistence of malaria in Panama.

Having developed a passion for fighting tropical disease, in 1913, Gorgas traveled to Guayaquil, Ecuador, known as the “pest hole of the Pacific,” to advise on the prevention of yellow fever and plague. The following year, he traveled to South Africa at the request of the British government to make recommendations on improving health conditions for workers in the diamond mines. Measuring his efforts in Panama against French experience, Gorgas estimated that he had prevented the loss of 70,000 lives; preserved the health of three times as many people; and had saved \$80 million, half of it in hospital costs. He even succumbed to hyperbole in his book *Sanitation in Panama*, published in 1915: “The discovery of the Americas was a great epoch in the history of the white man. . . . The demonstration made at Panama that he can live a healthy life in the tropics will be an equally important milestone in the history of the race.”

With the completion of the Panama Canal in 1914, tributes to Gorgas' work came from near and far. President Woodrow Wilson named him Army surgeon general that year, and Congress, in March 1915, followed with the unprecedented step of promoting him to major general.

#### ARMY SURGEON GENERAL

William Gorgas received fewer accolades during his tenure as Army Surgeon General. Wilson had appointed Gorgas more for his success in Cuba and Panama than for his administrative ability, and some medical officers complained that the new surgeon general had not been around troops for more than a decade. Gorgas admitted that he preferred fighting disease in the field to struggling with bureaucracy from a desk, and assigned Colonel (later Major General) Robert E. Noble to handle the day-to-day administration of the Medical Department.

Gorgas wrote his book on Panama during his first year in office, and then, in 1915, the Rockefeller Foundation asked Gorgas to lead a mission to fight a typhus epidemic burning in war-torn Serbia. Secretary of War Newton Baker, however, told the surgeon general he could not go to Serbia as an officer—active or inactive—of the U.S. Army because it would violate United States' neutrality in the European war. Disappointed, Gorgas told his sister, "I would like to have tried so big and so useful a project. . . . I feel the desire of the old soldier to die with my boots on." The following year, Gorgas did secure a four months' leave of absence to participate in a Rockefeller Foundation yellow fever campaign in Central and South America. This may have reaffirmed his preference for the field because in January 1917, he made plans to retire. Events overtook him, however, and in the face of increased German aggression, the United States prepared to enter World War I and Gorgas stayed on.

Now he had his big project: recruiting and training a dramatically expanded Medical Department for American participation in the world war. As the Army grew, so did the Medical Department, from five to twenty-three administrative divisions with hospital-bed capacity increasing more than tenfold from about 9,500 beds to 120,900 beds at the Armistice. Gorgas was able to use his prestige and position to recruit thousands of physicians to serve in the Medical Department, many of them among the best in their field. The number of medical officers increased from 2,000 to 30,000, and nurses from 400 to 21,000, while enlisted strength grew from 7,000 to 281,000, larger than the entire prewar army. Gorgas also continued to modernize the Medical Department, establishing the Army School of Nursing in 1918 and a new tuberculosis hospital in Denver, Colorado, the same year.

Centuries of warfare demonstrated that more soldiers died of disease than combat. But recent advances in medicine and public health—such as improved camp sanitation, water purification methods, and vaccines against typhoid and tetanus—convinced Gorgas and others that this no longer need be the case. Gorgas reported that army health conditions in 1916 were, “in all respects satisfactory,” and that the medical record for troops of the Mexican Punitive Expedition was “specially creditable.” However, he and his medical officers knew they were up against difficult odds, because disease thrived on mobilizing armies. In response, they recommended numerous steps to prevent disease outbreaks, such as reducing crowding in the barracks, gradually introducing trainees to military training so as not to stress new civilian recruits, constructing detention camps for individuals exposed to infectious diseases, and creating quarantine camps for the sick. Such measures took time and money, though, and the War Department General Staff, desperately trying to get a well-trained and well-equipped army to France, rarely approved their recommendations.

As Gorgas and others feared, by November, camps across the country began to report epidemics of measles and mumps, which were often followed by deadly pneumonia. The epidemics slowed mobilization and interfered with training and transport schedules. The measles toll alone numbered more than 48,000 hospital admissions, at least one million “noneffective days” among soldiers, and 30% of all 1917 mortalities, making it the leading cause of death in the army that year. As the general staff and line commanders continued to ignore Gorgas’ recommendations to mitigate the epidemics, he turned to sanitary inspections to convince them to change policies. As Gorgas inspected the troubled camps in November and December 1917, he fired off pointed memos to the Chief of Staff of the Army outlining the deficiencies. From Camp Funston in Kansas, Gorgas called for quarantine and observation camps, charging: “Action now being delayed by post commander. . . . Urgent that action be taken at once.” The press learned of these inspections, and on 19 December the *New York Times* announced, “Gorgas Reports Troops at Camps Crowded, Ill-Clad.” His report became a political football.

Worried and angry families demanded better care for their sons and husbands, many blaming the Medical Department because the epidemics were in military camps, but not in civilian communities. Congress summoned Gorgas and Secretary of War Newton Baker to respond to these charges, and their dueling testimony revealed the rifts between the War Department and Medical Department leadership. Appearing before Congress on 25 January 1918, Gorgas resisted blaming soldiers’ sickness and mortality on the general command’s failure to take his advice. He was eager, however, to have congressional support for his request for increased resources; and, when asked

what held up his recommendations to increase housing facilities at some camps, Gorgas responded, "I know of no reason except getting a decision on it from the General Staff." The next day, the *New York Times* summarized the hearing in a headline stating: "Gorgas Ascribes Deaths to Haste," with the article reporting that, "in its haste to answer the call from France and England the Government sent many young Americans to their death from disease, caused by overcrowding of cantonments and inadequate hospital and nursing facilities, General Gorgas testified."

Alarmed, Secretary Baker adamantly defended the Wilson Administration at the Medical Department's expense when he appeared before the Senate committee the following Monday. He told Congress that Gorgas, "has the unqualified support, and he knows he has, of every officer in the War Department from the Secretary down." He insisted that the army had complied with most of Gorgas' recommendations, and suggested that the problems were due to incompetent medical officers. On the other side of Capitol Hill, members of the House Committee on Military Affairs tried to fix blame for the poor conditions in camps. One representative asked Gorgas, "If there has been any lack of health conditions [in the camps], and any blame is attached to anyone, it would be chargeable to you, would it not?" and on one of the worst days of his life, the surgeon general responded, "Yes." He later confided in a letter, "Just at present I am having a pretty hard time. All my friends seem to have deserted me & everybody is giving me a kick as I pass by."

Recriminations subsided as the epidemics waned and war mobilization proceeded, but the episode had left its mark. Secretary Baker and the General Staff resented Gorgas and his Medical Department's resort to external political influence. For his part, Gorgas resented medical officers' lack of control over health conditions in the camps. When the United States entered the war, Gorgas was the Medical Department's only general, and only 3% of the Medical Corps held colonel's rank. Gorgas believed that medical officers needed increased rank to give them the power and authority to better protect the health of the troops; equalize their status relative to physicians in other armies; and to increase their pay and benefits, thereby making the Medical Corps more attractive to civilian physicians.

In early 1917, Gorgas was concerned that American medical officers, especially those like Captain William Welch who, despite his stature in the National Academy of Science, would be subordinate to Allied medical officers who were colonels and generals. Gorgas brought a contingent of medical leaders before Army Chief of Staff Peyton C. March to propose an increase in rank; when March failed to support the idea, they turned to their allies on Capitol Hill who introduced legislation in July 1917 to assign advanced rank to army

medical officers. Gorgas did not immediately press for passage of the legislation, saying, “we have to whip the Germans, and everything has to be secondary to that.” But, with measles and pneumonia in the camps and the ensuing criticism of the Medical Department, he became less reticent and went up the political hierarchy, soliciting support from the commander-in-chief. When President Wilson wrote a letter supporting increased rank, Chief of Staff March angrily cautioned Gorgas and his colleagues on their “pernicious activity” on behalf of the legislation and recommended a presidential veto of the measure. Although Gorgas became “much depressed” about March’s opposition, he stood firm, and Wilson did sign the legislation into law.

Gorgas had again gone around Baker and March and won, but his willingness to use political influence further frayed relations between them. As Gorgas approached the mandatory retirement age of sixty-four in the fall of 1918, he hoped Baker would ask him to continue as surgeon general. The country was deep into the war and a deadly influenza epidemic was sweeping across the country devastating civilian and military communities alike, so continuity in leadership would be reasonable. Instead, Secretary Baker sent Gorgas on an inspection tour of the American Expeditionary Forces’ (AEF) medical services in France in September 1918, and without consulting Gorgas, proceeded to name a new surgeon general, Colonel Merritte Ireland, at the time Chief Surgeon of the AEF. Gorgas learned about his replacement in the newspaper, but he spent his sixty-fourth birthday on the American front lines during the battle of Meuse-Argonne, and was no doubt gratified to pass his last days in the Army “with his boots on.”

## FINAL YEARS

Upon retirement from the Army in 1918, Gorgas returned to his passion of fighting disease. He joined the Rockefeller Foundation to chair its International Health Board’s Yellow Fever Commission, and traveled with Marie and other members of his Panama team to South America where he advised on yellow fever prevention, agreeing to return to Peru in 1921 to serve as its Director of Sanitation.

In spring 1920, Gorgas and Marie sailed for England to plan a campaign to investigate yellow fever in West Africa. However, on 30 May, while in London, Gorgas suffered a stroke. Hearing of Gorgas’ illness, King George V traveled to his hospital bed to confer upon him the Knight Commander of the Order of St. Michael and St. George. Thus recognized, and with his wife at his side, the old sanitarian died on 3 July 1920. The British honored Gorgas with a funeral at St. Paul’s Cathedral, and Marie brought him home to a hero’s welcome, where he lay in state in Washington, DC, before his burial at Arlington Cemetery.

During a memorial service in January 1921, Gorgas' life and achievements were publicly considered by Washington luminaries, including fellow Alabamians; representatives from France, Britain, Cuba, Panama, and other Latin American countries; members of Congress; Secretary of the Navy Josephus Daniels; Secretary of War Newton Baker; and Surgeon General Ireland. Secretary Baker, with whom Gorgas had had a contentious relationship at times, was perhaps the most eloquent. The secretary said it was appropriate that Gorgas had died on foreign soil, because "he had become a citizen of the world." He also spoke of Gorgas' youthful spirit, and how, "If indeed, as was the fact, he was born in one age and lived into another, he became the adopted child of the younger age." Gorgas, Baker said, "remained to the last[,] hospitable to new ideas and . . . [was] as little trammelled by preconceived ideas or traditions as any man I have ever known."

#### MEMORIALS

For all of his fame, Gorgas never became a rich man and left an estate of only \$20,000. In recognition of his service to the nation, Congress honored Gorgas in 1924 by authorizing a lifelong pension for Marie Gorgas, who wrote a biography of her husband titled *William Crawford Gorgas, His Life and Work* (1924). When she died in 1929, Marie was buried next to her husband at Arlington. William Gorgas received many other honors in both life and death. Seventeen colleges and universities, including Oxford University and four institutions in Latin America, awarded him honorary degrees. He was a member of more than twenty medical and professional organizations, and elected officer for several, including president of the American Medical Association in 1909 and vice president of the Association of Military Surgeons in 1910. The Association of Military Surgeons established the Gorgas Medal, which to this day, is awarded annually to a medical officer for outstanding contribution to preventive medicine. The War Department recognized Gorgas' war work with the Distinguished Service Medal and, in addition to his British knighthood, Gorgas was also honored by France and Belgium. The nation continued to pay homage even after his death with portraits, memorial postage stamps, and other tributes. Perhaps the most appropriate and enduring honors were the Gorgas Memorial Institute for Tropical and Preventive Medicine in Panama, which Panamanian and American medical officials established in 1921, and the renaming of the Ancon Hospital in Panama the General Gorgas Hospital that Congress approved in 1928. The Medical Corps coin continues to honor excellence in military medicine in the twenty-first century by invoking the lifetime of service and accomplishments of General William Crawford Gorgas.

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by *Carol Byerly*

## WILLIAM T. FITZSIMONS 1889–1917

### INTRODUCTION

Given what we know about Lieutenant William T. Fitzsimons, he likely aspired to greatness, but he never could have imagined that someday his name would grace one of the largest and most advanced military hospitals in the world, Fitzsimons Army Hospital in Denver, Colorado.<sup>1</sup> Before he could make any significant contribution to medical science or to Army medicine, the twenty-eight-year-old physician was killed on 4 September 1917. The young lieutenant became the first American officer to die from enemy fire in World War I when he was bombed in a German air attack on an American army hospital assigned to the British Expeditionary Forces at Dannes-Camiers in Pas-de-Calais, France. For Americans, Fitzsimons' death came to signify the sacrifices of war, in particular the contributions of civilian physicians who, throughout the nation's history, have joined the Army Medical Department in the country's time of need.

### EARLY YEARS

Fitzsimons was a son of the American heartland, born in Burlington, Kansas, on 18 April 1889 to John I. and Catherine Fitzsimons. He had four sisters, Julia, Marie, Katherine, and Helen, and one brother, G. K. Fitzsimons. William Fitzsimons attended St. Mary's College, where he was remembered as "a thoroughly good, Catholic boy, a student of high ability, and a pleasant, companionable friend." He graduated from the University of Kansas in Lawrence, receiving an A.B. in 1910 and an M.D. from the University's School of Medicine at Rosedale (now part of Kansas City, Kansas) in 1912. As a senior,

he interned at the German Hospital of Kansas City from 1 December 1911 to 30 May 1912 and after graduation was a house physician at St. Mary's Hospital in Kansas City from 1 June 1912 to 26 May 1913. Presumably in an attempt to find broader experience in the world and in medicine, the young physician went East, where he specialized in surgery at Roosevelt Hospital in New York City from 1 June 1913 to 5 September 1914.

#### WARTIME VOLUNTEER

Just as Fitzsimons' surgical training was ending, war broke out in Europe. Although the United States remained neutral during the early years of the war, several relief agencies organized programs to provide medical and humanitarian assistance to military and civilian victims in Europe. Eager to help, eager to learn, or perhaps fearing he would miss the excitement of what was in 1914 assumed to be a brief war, Fitzsimons volunteered for one of these first such humanitarian missions.

One of 30 American physicians and nearly 100 nurses, Fitzsimons departed on 7 September 1914 on what the *New York Times* called "the most completely equipped Red Cross ship that ever sailed on a mission of mercy to any part of the world." The *American Red Cross*, a steamship converted from the Hamburg-American line, was funded by private donations, and loaded with medical and surgical supplies and food. Referring to the victims of the German invasion of Belgium in August 1914, Robert W. De Forest, vice president of the American Red Cross (ARC), said that, "in the United States we have absolutely no idea of the situation in Europe. It is a calamity that is almost inconceivable." Like authors Ernest Hemingway and John Dos Passos, who drove ambulances for the Allies before the United States entered the war, William Fitzsimons joined the ranks of Americans who would see the calamity and suffering firsthand as they served in noncombatant roles. Fitzsimons volunteered first as one of a staff of six surgeons in the 250-bed ARC American Women's War Hospital in Paignton, England, a town on the English Channel. He then became director of the Red Cross Unit with the Belgian Field Hospital at La Panne, France.

In a *Military Surgeon* article, "Penetrating Gunshot Wounds of the Chest" (1916), Fitzsimons reported on his work at the hospital in England in which he treated twenty-eight cases of gunshot wounds to the chest over several months. Fitzsimons noted that, while few civilian physicians would have ever seen thoracic wounds from artillery shells and shrapnel, the battlefield gunshot wounds were often similar to those encountered in civilian practice. He summarized the characteristics of the wounds, various complications, treatments and outcomes, and proudly advised readers that his work had been supervised by Sir William Osler, the famed British physician, who "was

intensely interested in these cases and examined them himself at frequent intervals." Fitzsimons' experience indicated that aspirating the lungs of patients with respiratory difficulties or persistent high temperatures was beneficial, but that entering the chest surgically should not be performed until a diagnosis of a serious infection such as empyema had been confirmed. With his skills enhanced, Fitzsimons returned to the United States in December 1915, and began private practice in Kansas City with staff positions at St. Mary's Hospital and the faculty of the Kansas City Medical School. He was also appointed to the Kansas City Board of Health.

Meanwhile, as war raged on in Europe, the U.S. Congress initiated military preparedness measures in 1916, in case the nation joined the maelstrom. Such action was seriously needed because the War Department was not prepared to fight a modern, industrial war an ocean away. In 1915, the regular Army had only 440 medical officers, and the Medical Reserve Corps and National Guard had only 2,750 physicians. Based on a calculation of seven medical officers for every 1,000 soldiers, an army of two million would require 14,000 medical officers. The National Defense Act of 1916 provided for a gradual increase in Army strength, including the Medical Corps, and authorized the ARC to organize fifty base hospitals out of major universities and urban hospitals centers for use by the Army and Navy, and to recruit and train nurses for wartime service as well. These steps meant that the Medical Department was better equipped for World War I than it had been for previous wars; but, when the United States entered the war in April 1917, the War Department still faced the daunting task of recruiting enough medical officers to care for the more than four million young men that streamed into the training camps.

#### WARTIME SERVICE

Federal officials were no doubt delighted to have men like Fitzsimons, who had already seen the war and were familiar with the very latest military medical and surgical techniques. Upon his return home, Fitzsimons had continued his connection with the military, and on 27 March 1917, he received a First Lieutenant's commission in the Medical Reserve Corps. Just days after the American declaration of war, Fitzsimons reported for active duty in response to the War Department's call for physicians for service. As General John J. Pershing, Commander of the American Expeditionary Forces in France, demanded an increasing number of soldiers, it seemed that most of the 146,500 medical doctors living in the United States (an American Medical Association estimate) might be required for mobilization.

Some physicians, like Fitzsimons, responded to the need with alacrity. These volunteers may have been inspired by patriotism or angered by stories

of German atrocities, such as the torpedoing of the *Lusitania*, or they may have joined the war effort to advance their professional and organizational interests. Men like Rupert Blue, head of the U.S. Public Health Service, expressed an almost ghoulish excitement about the opportunities of war. “The practices of emergency surgery are being tried out on a scale so vast as to baffle the imagination,” he noted, so that “when this war shall have ceased, the finest body of medico-sanitary soldiers that the world has ever seen will be returned to civil practice.” Blue concluded, “This war of wars is moulding the destiny of the entire medical profession.”

Army Surgeon General William C. Gorgas, a national and international hero for his work in conquering yellow fever in Cuba and the Panama Canal and former president of the American Medical Association, employed his reputation and vast network of medical colleagues to build up the Medical Corps. He personally recruited the elites of the medical profession to serve as leaders and mentors, calling on them to bring their medical knowledge and prestige to the flag. He succeeded in enlisting men such as Harvey Cushing, a pioneer in neurosurgery at Harvard; Simon Flexner of the Rockefeller Institute, whose work greatly improved medical education in the country; William Welch, a leading bacteriologist at Johns Hopkins; and Victor Vaughan, a public health expert at the University of Michigan. He also called on William and Charles Mayo of the Mayo Clinic; George Crile, a leading surgeon from Western Reserve in Cleveland; and Hugh Young, a nationally known urologist, to assist him. With so many renowned medical officers in the Medical Corps, Army medical historian Fielding Garrison remarked, “the elite of our American profession flocked to the colors.”

Unlike Fitzsimons, many rank and file physicians and surgeons were reluctant to volunteer. In addition to the physical risk of military service, Army Medical Department employment could mean personal sacrifices because many doctors in private practice stood to lose income and patients while they were away from home. To attract these hesitant physicians, the Medical Department not only emphasized the familiar values and images used by Army recruiters—patriotism, national service, adventure, manliness, honor, courage, and “doing one’s bit”—but they also promoted the opportunities for research and professional advancement. They portrayed army service as an opportunity to practice medicine on an unprecedented scale and to gain experience not available in private practice. In addition to emphasizing nonpecuniary rewards, Gorgas took steps to increase Medical Corps status by raising requirements for medical officer commissions, above those set by most states for medical licenses. Consequently, joining the Medical Corps offered an opportunity to serve with the best doctors in the country. Applicants had to be U.S. citizens, aged twenty-

two to fifty-five years, graduates of an approved medical school with at least one year in a postgraduate hospital internship, in possession of a state license, and “of good moral character and habits.” Officers also had to pass physical fitness and professional examinations designed to screen out unfit or inexperienced applicants.

Although physicians of all backgrounds wanted to serve, some were not welcome in 1917–1918. Reflecting the racial and gender discrimination prevailing in American society at the time, the War Department limited opportunities for African Americans and females. Even the shortage of medical officers in 1918 did not induce the Medical Department to recruit women or African American physicians. Instead, the army refused medical commissions to women despite repeated petitions from women’s groups. Although Gorgas enlisted the American Medical Association and its *Journal of the American Medical Association* to recruit physicians across the country, he refrained from using the African American *Journal of the National Medical Association* for similar purposes.

As soon as the United States declared war on Germany, the British Foreign Minister, Arthur Balfour, arrived in Washington to ask for hundreds of thousands of soldiers to fill the Allies’ battered lines on the western front. “We need men, men, men,” he said. With few infantry or artillery units ready for combat, the War Department immediately agreed to send six base hospitals to serve with the British Expeditionary Forces. One of these was Base Hospital No. 5, organized by the Red Cross out of Harvard and commanded by Lieutenant Colonel Robert U. Patterson (later to be Army Surgeon General). During its activity from 1 June 1917 to 20 January 1919, the hospital cared for more than 45,000 patients, most of them British soldiers. As an individual augmentee, a “casual,” Fitzsimons had left Kansas City on 14 June 1917 and arrived in Liverpool on 12 August. Impressed by his experience, commanders immediately ordered Fitzsimons to work at Base Hospital No. 5; but, sadly, his service in the American army would be brief.

On the night of 4 September 1917, Fitzsimons and another American officer, Captain Wallace J. Jakes, visited the Canadian machine gunners club less than a mile from the hospital. While walking back to their camp, the men observed that the clear, moonlit night was “an ideal Boche evening.” They were right. In his detailed account of that evening’s events, Base Hospital No. 5 commander Patterson explained what happened. Fitzsimons was returning to his tent with several other officers when they heard “a heavy detonation” in the distance, followed by another closer explosion. Then, wrote Patterson, “the distinct sound of an airplane motor was heard immediately overhead, and almost at once the dropping of bombs occurred in the hospital area.” The first

two bombs landed among the hospital tents, one within a few feet of Fitzsimons' tent, killing him instantly and covering him with debris. The bombs also wounded First Lieutenants Clarence A. McGuire, Rae W. Whidden, Thaddeus D. Smith (all Medical Corps officers), and Private Hiram P. Brower who was on sentry duty near the officers' tents. Lieutenants Whidden and Smith subsequently died of their wounds. According to Patterson, Private Brower was the last person to speak to Fitzsimons who had asked him what was happening just before the bombs landed.

Other bombs killed three enlisted men that night—Privates Oscar C. Tugo, Rudolph Rubino, Jr., and Leslie G. Woods, all medics—and wounded five other enlisted men, a nurse, and twenty-two British patients. Patterson also reported that, “the conduct of the entire personnel of the hospital was most creditable. There was no confusion,” he explained, “and the injured were all promptly removed to the operating pavilion, where, by three o'clock in the morning, every case had received whatever medical and surgical treatment was necessary.” He added that personnel had moved swiftly to carry the bodies of Fitzsimons and the other dead to the mortuary.

#### POSTHUMOUS RECOGNITION

As newspapers reported the details, the attack dramatically brought the war to the American homeland. Some people were especially outraged that the Germans would target medical facilities. Major Paul Woolley, another medical officer at Base Hospital No. 5, said, “the attack could not have been a mistake, for there was nothing of military value near the hospital tent in which [Fitzsimons] was working.” Fitzsimons' mother said that she “hardly could believe it true that the Germans had killed her son, who [was] engaged in work of mercy.” Following the attack, Theodore Roosevelt wrote a scathing editorial that appeared on the front page of the *Kansas City Star*, denouncing the German Empire's brutality as a “deliberate policy of wickedness,” and its “systematic campaign of murder against hospitals and hospital ships.”

In an effort to conserve precious transport space during the buildup of U.S. troops, the War Department decided to bury the American dead temporarily in France instead of sending them home immediately. In keeping with this policy, Fitzsimons was buried in the British cemetery at Étapes, France, but was later removed to the U.S. Military Cemetery at Bony (Aisne), France. In the 1920s, the War Department offered to reinter the American war dead in the United States, but the Fitzsimons family declined this offer and left their son buried forever in France.

Fitzsimons quickly became a symbol of American military service and sacrifice. When the Cathedral of Kansas City celebrated a solemn high Mass of

Requiem for the young medical officer, so many people arrived that thousands were forced to stand outside during the ceremony. Dean Mervin T. Sudler of the University of Kansas School of Medicine gave a eulogy at the school, noting that Fitzsimons' "voluntary return to France was made in sight of the fact that he had seen that Great War in all of this hideousness." He also praised Fitzsimons' sacrifice, saying "any country is safe when such high ideals are held and practiced by its young men."

The Kansas City region honored Fitzsimons in numerous ways. In May 1922, a William T. Fitzsimons Fountain was dedicated at Paseo and 12th Streets, paid for by donations raised by hundreds of citizens; another community memorial to Fitzsimons and his fellow war dead was constructed at Paseo and 47th Streets. Additionally, the city's American Legion Post named itself the Fitzsimons Post in his honor. In 1923, St. Mary's College dedicated a Memorial Arch in memory of alumni who had fought in the war, with special honors going to Fitzsimons and nineteen others who paid the supreme sacrifice. A tablet at the University of Kansas Memorial Stadium also honors the 130 students and faculty members who died in World War I, including Fitzsimons. On the day of his death, Fitzsimons' superior officers had recommended him for promotion to captain, a motion supported by Representative William Patterson Borland of Missouri, who introduced legislation to award him the promotion posthumously. Although Congress did not pass Borland's bill, the National World War I Museum in Kansas City nevertheless "promoted" Fitzsimons in bronze on its wall honoring the city's fallen by listing him as "Capt. William T. Fitzsimons." Across the country in New York City, Roosevelt Hospital also honored Fitzsimons by inscribing his name on a memorial tablet in the staff room.

In 1920, the War Department awarded what may have been the highest honor to Fitzsimons when it renamed its General Hospital No. 21 in Denver, Colorado, the William T. Fitzsimons Army Hospital. General Order No. 40 recognized Fitzsimons as a "skilled surgeon and the first officer of the United States Army killed in the World War," and stated that the action "also fittingly commemorates the eminent services rendered by the civil medical profession of America as members of the Medical Corps of the Army during the World War."

It was a high honor. Although the Army often names its hospitals after medical officers, with Walter Reed in Washington, DC, and Letterman in San Francisco being perhaps the most notable, they often disappear after the wartime emergency has passed. This was not the case with Fitzsimons. It became the Army's premier tuberculosis hospital during a time when the disease still preyed on soldiers, sailors, and veterans. During the interwar period, Fitzsimons also cared for military families in the Rocky Mountain region, as well as other government employees working on New Deal programs during

the Depression. In the late 1930s, the War Department used New Deal funds to construct a modern, state-of-the-art hospital on the Fitzsimons campus and dedicated the new structure just four days before the attack on Pearl Harbor. Consequently, during World War II, Fitzsimons was one of the largest, most modern hospitals in the world—a veritable city comprising 322 buildings on 680 acres complete with traffic lights, a post office, fire department, pharmacy school, dental shop, and chapel. With about 3,500 beds, Fitzsimons provided more than one million patient-days of hospital care in 1945 alone.

By the 1950s, as tuberculosis began to yield to antibiotic therapies, Fitzsimons became an Army Medical Department center for diseases of the lungs and thoracic surgery; it also cared for the sick and wounded from the Korean War. Fitzsimons again took center stage in 1955 when President Dwight D. Eisenhower was treated there for more than five weeks after suffering a heart attack while in Colorado. This occasioned yet another honor for William Fitzsimons when the president's wife, Mamie Eisenhower, unveiled a portrait of the young medical officer.

Fitzsimons cared for thousands of sick and wounded soldiers, sailors, and Marines from the Vietnam War; it also sent relief missions to that country. As the Defense Department contracted in the late twentieth century, Fitzsimons escaped several closure threats; but, during a round of base closings in the 1990s, Fitzsimons' military mission was terminated and the campus transferred to civilian control. Having retained its association with the Fitzsimons family, the Department of Defense invited William's nephew, the Most Rev. George K. Fitzsimons, to the medical center's closing ceremony in 1999. In a sense, the closure also returned William T. Fitzsimons to civilian status. The new campus, which houses the University of Colorado Health Sciences Program and the Colorado Science and Technology Park for private enterprise, is now called the Fitzsimons Life Science District. As part of the conversion to civilian status, the administration renamed most of the post's commemorative (i.e., military) street names in order to conform to the Denver street grid, but a new parkway around the campus was designated the Fitzsimons Parkway, continuing to honor the young physician's contribution to his country.

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#### Note

1. The Army General Hospital No. 21 in Denver was established in 1918, renamed Fitzsimons General Hospital and ultimately Fitzsimons Army Medical Center, and closed by the Department of Defense in 1996.

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by *Kenneth M. Koyle*

## STANHOPE BAYNE-JONES 1888–1970

### INTRODUCTION

History loves heroes. Sometimes historic figures are remembered and defined by a single heroic act or accomplishment—a moment of courage and bravery “above and beyond the call of duty” or a discovery that garners world acclaim. Often, however, excellence is not defined by any single great achievement, but by consistently undertaking every task with focused professionalism. Such is the case with Stanhope Bayne-Jones, a man who made no remarkable medical discoveries and whose battlefield bravery was commendable but fell short of the conspicuous gallantry that would elevate him above his peers. Instead, his life of service, dedication, and unflagging initiative would be his legacy.

### EARLY YEARS

There was something of a medical tradition in the Jones family—Stanhope’s grandfather, Dr. Joseph Jones, had been a prominent surgeon in the Confederate army during the Civil War, and his father, Samuel Stanhope Davis Jones (who went by Stanhope, the name he would pass on to his son), had graduated from the University of Louisiana medical school at the top of his class. Stanhope Jones married Amelia Bayne, a New Orleans socialite, in 1887, and their first baby, a boy they named Stanhope Jones, Jr., was born on 6 November 1888. Two more children, a daughter Marian and a son Thomas, soon followed.

Medicine was not necessarily a lucrative profession in the nineteenth century, and Stanhope Jr. was not a child of privilege; in fact, he endured a

tragic childhood characterized by loss and abandonment. His mother died of complications after giving birth to his younger brother when Stan (as he was known throughout his youth) was four years old, and his father committed suicide after an ill-fated coal mine investment left him financially destitute and distraught the following year. Stan was separated from his three-year-old sister and infant brother as the orphaned children were farmed out to relatives.

Stan landed at the home of his grandfather Jones, who had trouble dealing with the boy's hyperactive, rambunctious, and often rebellious personality. Those who met the red-haired youth around the turn of the twentieth century were unlikely to envision a future of prestige and academic eminence. Despite his inauspicious beginnings, he would prove his detractors wrong. Stanhope Bayne-Jones would become a leading proponent of scientific progress as American medicine embarked on a century of unprecedented growth and development. He eventually matured into a well-rounded leader with diverse expertise, a clear understanding of his own strengths and weaknesses, and a knack for building effective teams, but the path to maturity began with youthful curiosity in and around New Orleans.

Joseph Jones had enjoyed a more prosperous medical career than that of Stan's hapless father, and Stan found much in his grandfather's large home to spark his scientific interest. Dr. Jones had established himself not only as a physician, but also as a medical researcher in the nascent days of scientific medicine. He served as a professor of chemistry and clinical medicine at Tulane University, and he maintained a well-equipped laboratory in his home. The house was a veritable museum, with artifacts from around the world and a substantial library. Stan remembered his time in his grandfather's house fondly, and the diverse academic milieu left a lasting impression. His propensity for science might have been nurtured to an earlier realization in such a place, but it was not to last. In 1896, just two years after Stan arrived at the benefic house, Dr. Jones died of a stroke. In his first six years, Stanhope Jones had lost three parental figures.

After the passing of Dr. Jones, Stan went to live with his maternal uncle, T. L. Bayne. For the next few years, he was moved (often abruptly) between relatives from both of his deceased parents' families. A deep animosity festered between the Jones family and the Bayne family, stemming from T. L. Bayne's role in disclosing the financial mismanagement of Stan's father. The Jones children became pawns in an ugly competition between the two adversarial families. His childhood was so tumultuous that by adulthood, even Stan had lost track of where and with whom he had lived.

In 1902, T. L. Bayne shipped thirteen-year-old Stan Jones across Lake Pontchartrain to a small boarding school called Dixon Academy to begin his

classical education. He studied French, Greek, and Latin, and he struggled to overcome a kind of mathematical dyslexia that would plague him throughout his life. He returned to his mother's family that Christmas and was surprised to learn that he had been hyphenated. His maternal relatives had added their own name, Bayne, to his surname of Jones, with nary an explanation. Henceforth, he would be Stanhope Bayne-Jones. At first, he was self-conscious about the unusual name, even resentful; but, in time, he accepted it and came to consider it as a bridge between the two clans that had raised him.

Dixon Academy was a stepping stone, but Stan would need a more substantial academic foundation if he were to continue the Bayne tradition of a Yale education. In 1905, the Baynes sent him west to California to attend the Thacher School, a prestigious preparatory school established by a former Yale faculty member. Stan thrived at Thacher and excelled in almost every academic area. He graduated in June 1906 and spent the summer traveling, visiting relatives from New York to Mississippi.

At Yale that fall, Stan found that his exceptional standing at Thacher did nothing to set him apart from the distinguished student population, most of whom had graduated from equally prestigious Eastern prep schools. Unable to elevate himself through academics, he competed for and won an editorial post at the campus paper. Gregarious and affable, he was even tapped to become a member of the elite and secretive Skull and Bones society. He enjoyed his time at Yale and developed a group of lifelong friends by the time he graduated in 1910.

## MEDICAL STUDIES

Yale provided Bayne-Jones with a solid undergraduate education, but he had no intention of stopping there. He had known since childhood that he wanted to go into medicine, and he set his sights on the most prestigious medical school in the country, Johns Hopkins in Baltimore. But his relatives back in New Orleans urged Stan to come home and enroll at Tulane's medical school instead—Stan was eligible for a scholarship at Tulane because his grandfather had been a professor there. Stan acquiesced and entered Tulane medical school in the fall of 1910.

Stan was dissatisfied by what he considered to be a second-rate education at Tulane. He still dreamed of Johns Hopkins, and, after a year in New Orleans, he begged free of his family ties and began working on a transfer to the better school. He wrote to Hopkins professors William H. Welch and W. H. Howell requesting admission to the second-year class, and they approved on the condition that he make up the required first-year classes that had not been offered at Tulane. This he did over the summer at Rush Medical College

in Chicago, and, in September 1911, he completed his final examinations at Rush, lingered in Chicago a bit longer than he was supposed to, and reported to Johns Hopkins several days late for his interview with the admissions board. The board took pity on the nervous young student—or perhaps they saw in him some hint of the greatness he would later achieve—and he was admitted to Johns Hopkins.

William Welch was already a dominant figure in American medicine when Bayne-Jones arrived at Hopkins, and he would long be revered as one of the country's most eminent professors. He went beyond the routine teaching of medicine, instilling both an appreciation for history and a spirit of innovation in his students. Welch, another Skull-and-Bones Yale, became a mentor to Stan. He was so admired by his young protégé that Bayne-Jones rented a room above Welch's bachelor quarters in Baltimore and even positioned his bed directly above Welch's, "in order to absorb any radiations of genius that might ascend in the night."<sup>1</sup> Stan was entering the world of American medicine at an important turning point, a point when the traditional, humanistic medicine of the past was giving way to a new type of medicine with an intensely scientific focus. Welch was a prophet of this new medicine, and Bayne-Jones an eager disciple.

Stan quickly determined that the scientific aspects of medicine held the most appeal for him, and he definitely preferred the microscope over the scalpel. Surgery was a dramatic and exciting field in 1910, with effective anesthesia and aseptic practices allowing safer and more invasive surgeries than had ever been possible before, and Johns Hopkins had the renowned surgeon William Halsted to teach the latest techniques and principles. But Stan had fainted during his first exposure to surgery at Tulane the previous year, and he became so nauseous while watching Halsted cut into a patient that he nearly fell off the observation bleachers. Surgery was clearly not his bailiwick.

The direct patient care involved in general practice was more agreeable for Bayne-Jones, and he enjoyed going out to the poor neighborhoods of Baltimore where Hopkins set up free community clinics. But a summer spent working with his cousin William Crawford Gorgas in the Panama Canal Zone between his second and third years of medical school showcased his talent for research. The young apprentice impressed the experienced doctors working for Gorgas when he correctly identified a microscopic parasite that the others had missed. Stan accompanied Gorgas on inspections of mosquito control operations along the canal, giving him a glimpse of the preventive medicine field that would later dominate his practice.

Bayne-Jones graduated from Johns Hopkins Medical School at the top of his class in spring 1914. He had studied with some of America's most eminent physicians and teachers, and he had gained broad and valuable experience

that would serve him well as a doctor. He stayed on as an intern, continuing to learn from the world-class physicians of that institution, as well as from the patients he treated. He contemplated his future as a doctor, and the decisions that lay ahead—he could go back to New Orleans and open a practice, as was expected of a new physician, or he could try to make his way in the burgeoning field of medical research. Bellevue, the old and prestigious New York hospital, offered Stan a residency. He declined and instead accepted a Johns Hopkins appointment as a resident pathologist. This would lead to a master's degree in pathology, pushing him farther down the road to laboratory research.

In August 1914, Stan and the rest of America received news that war had broken out in Europe. President Wilson professed America's neutrality and kept us out of the war for the first few years, but as the months passed and the European adversaries settled into a bloody stalemate, America's isolationist predilections began to fade. In June 1915, Bayne-Jones received a letter from Gorgas, who was then Surgeon General of the Army, asking him to consider applying to the Army Medical Reserve Corps. He quickly agreed and submitted his application; a week later, he was examined by a selection board and on 7 August he was commissioned. As a medical reservist, Stan could only be called to active duty if he consented; but, in spring 1916, he volunteered to serve with the Punitive Expedition going after Pancho Villa in Mexico. He reported to a National Guard training camp in Maryland; but, a few weeks later, he was hospitalized with infectious hepatitis. The unit deployed without him, and he would have to wait another year for his chance to serve as an Army doctor.

Bayne-Jones spent the next year continuing his pathology residency at Johns Hopkins. Coincidentally, that same year, Hopkins built a large, new pathology lab. Along with the new lab came a new division of the pathology department, the Division of Bacteriology and Immunology. The school appointed their promising young resident, Stanhope Bayne-Jones, as the director of the new division. To help him prepare for the new assignment, Johns Hopkins sent Stan to Columbia University for an intensive six-month apprenticeship under Dr. Hans Zinsser, considered to be the top bacteriologist in the country at the time.

After his six months of study at Columbia, Stan returned to Johns Hopkins and stepped into his new role as director of an academic division. His indefatigable work ethic ensured his success in the demanding position, and the experience helped hone the managerial instinct that would become his hallmark in later life. His successful tenure as Director of Bacteriology and Immunology would be short-lived, however, truncated by world events.

## SERVICE IN THE GREAT WAR

When America entered WWI in April 1917, Welch asked Bayne-Jones to stay at Hopkins to train new bacteriologists for the Army. Stan initially agreed and went to Washington to tell his cousin, Surgeon General Gorgas, that he would like to serve in that capacity. But when Gorgas told Stan that the British were desperately short of doctors and pleading for American help, and that a medical ship was embarking for England in five days, Stan immediately accepted the call. On 8 May 1917, he was aboard the SS *Orduna*, sailing into the Atlantic and a dangerous, uncertain future.

Stan deployed as part of Base Hospital No. 4 out of Cleveland; but, as soon as the unit established its treatment facility in France, he requested an assignment with the frontline troops. Within a few days, he reported to the 69th Field Ambulance, 23d Division, British Expeditionary Forces, not far from Ypres, Belgium. He huddled in muddy holes with British doctors during artillery barrages, suffering the same hardships as every soldier on the Western Front—a month or more without a change of uniform, infestation with lice, and the interminable filth and horror of trench warfare. He became a regimental surgeon for the British Army's 11th Battalion Sherwood Foresters, and, in that capacity, he began to learn about the tedious but important administrative requirements of military medicine. Commenting years later about the importance of the sometimes mundane business of preventive medicine, Bayne-Jones would point out that the common preoccupation with dramatic cures and life-saving surgery misses the point—wars are won by healthy soldiers, and, if soldiers require such heroic measures, they are already ineffective. Better to keep them healthy in the first place, instead of merely restoring them to health after they have already been taken out of the fight. Thus, he came to recognize the value of preventive medicine and public health.

Bayne-Jones cherished the time that he spent working with the soldiers and civilians in Europe during WWI—the only time in his life that he maintained a regular medical practice treating patients. He thrived on the excitement of combat, and he loved having the opportunity “to take care of the men where they are in the most trouble.”<sup>22</sup> For a short time, he even lost interest in the scientific medicine of Johns Hopkins, enthralled as he was by the action and humanity of the front lines. He served in the trenches through the horrific Battle of Passchendaele, employing a brutal, primitive form of medicine to save as many lives as he could in such an unforgiving environment. He must have finally overcome his queasiness, because amputations and other trauma surgeries became common tasks.

In the fall of 1917, the British division that Stan was supporting moved from Flanders to Italy to counter the increasing German threat there. They

suffered through a miserably cold winter, scratching shallow pits in the frozen ground to improvise shelter from the elements and the enemy artillery. The following spring, the American Expeditionary Forces (AEF) arrived in France, and Stan was ordered back to Paris to join his own country's troops.

By now, he was a hardened veteran, having spent nearly a year in some of the worst combat conditions of the war. But, in Paris, he was posted to the AEF's medical laboratory under his old mentor Hans Zinsser, now serving as a colonel in the medical corps. He enjoyed the clean environment and intellectual challenges of the lab; but, before long, he was yearning for the action, excitement, and professional fulfillment of the front. He used his connections to get reassigned, and, on 29 March 1918, he was released from his laboratory position and ordered to the 26th "Yankee" Division north of Soisson. He would again serve as a battalion surgeon, in the thick of the fighting. He spent his first six weeks with the Americans on continuous frontline duty and was promoted to regimental surgeon.

In July, his division was transferred to the Marne, finding the rubble of once picturesque French villages, their citizens suffering under the fatigue of four years of unrelenting warfare. After moving to another sector, Stan opened the only civilian medical practice he would ever hold, caring for the children of the Lorraine region. When the 26th Division pushed into the St. Mihiel Salient that fall, Bayne-Jones proved his worth as an adroit and experienced battlefield surgeon. He established aid stations and casualty collection points, positioned litterbearers and ambulances, and ensured that his regiment's medical assets were in the right place at the right time to support the fight. Stan continued to follow and support his regiment through the final months of the war. He was leading a litter team down a ravine toward a wounded man at 1100 hours on 11 November 1918, the time and date specified for the armistice to take effect. A burst of German machine gun fire made them dive for cover; then the guns fell silent, and the war was over.

Stan remained in Europe for six months after the armistice, serving as a sanitary inspector for the allied army of occupation in Germany. He enjoyed the respite after a year and a half of hard combat duty, but he quickly grew restless and anxious to return home. His wartime service reflected his whole life. There were no specific instances of heroism above and beyond the call of duty in his record, yet his service was exemplary because of his consistent, tireless dedication to doing the very best he could for those in his care and his willingness to take on the most challenging assignments. His long months on the front lines had yielded three awards of the Citation Star (later redesignated as the Silver Star) for gallantry under fire, along with the French Croix de Guerre and the British Military Cross. When at last the Chief Surgeon of the

Third Army called Stan in to give him his orders to return home, he dismissed him with all the fanfare of a teacher releasing a mediocre student at the end of a school day: “Goodbye, Major. You haven’t been any trouble.”<sup>3</sup>

#### ACADEMIC MEDICINE

With that paltry sendoff, Stan finally headed home. He returned to a country in transition, jubilant about the victory in Europe but unsure of the next step. A postwar economic depression gripped America in 1919, and another type of depression gripped Stan and many other returning veterans as they struggled to put the war behind them and move on with their lives. Johns Hopkins offered Bayne-Jones a position—not the directorship he had held before the war, for that job had been filled by another professor—but rather a one-year appointment as an associate professor of bacteriology. Soon, he regained his laboratory skills and rekindled his interest in scientific research. He started teaching again, and something, perhaps the camaraderie of the wartime Army, gave him a new appreciation for the company of other people. He was thirty years old and ready to settle down.

In fall 1920, Stan met Nannie Moore Smith, a radiology technician at Hopkins. Nan was also a war veteran. She had been in France with a Johns Hopkins hospital unit at the same time that Stan was there, but their paths did not cross until they were both back at Hopkins. She was a forceful woman, blunt and direct in her speech, with a work ethic equal to Stan’s. She was also solemn, even humorless according to some who knew her. Shared interests led to an intellectual connection between Nan and Stan, and, in June 1921, they were married. She took his hyphenated last name, and in return she gave him a new cognomen: B-J. From that time on, only his family and oldest friends would refer to him as “Stan” or “Stanhope.” To Nan and all their new acquaintances, he was B-J.

The 1920s were a tumultuous time for the new couple and for all of America. During Prohibition, B-J used his scientific expertise and his laboratory supply connections to become a self-proclaimed “braumeister,” brewing beer in his home and entertaining distinguished friends. In 1922, the University of Rochester in New York built a new medical school and hospital, and the dean asked B-J to be the head of the bacteriology department. He accepted, and for the second time took on the challenge of building an academic department from scratch. During his time at Rochester, his talent for management drew him out of the laboratory and into the administration of the department. The formidable challenges of his position in the medical school consumed nearly all of his time, yet he simultaneously took on the presidency of three professional organizations: the American Association of Immunologists, the Society of

American Bacteriologists, and the New York State Association of Public Health Laboratories.

Marital problems surfaced during his busy time at Rochester, brought on partly by an apparent inability to conceive children and partly by unbalanced devotion to professional pursuits over family. A six-month separation was seen by many friends as the end of the marriage, but instead it brought reconciliation and a new dynamic in their relationship. B-J and Nan would press on together as lifelong partners in his ever-growing medical career.

In 1931, an offer came from Yale to head up a new laboratory and serve as a professor of bacteriology. Yale had changed since B-J's time as a student twenty-one years earlier. Some of the changes were disconcerting to the older Yalies, as new students criticized the classical education that had defined earlier generations of gentlemen, questioning authority with brash cynicism, and suggesting that fascism and communism held some potential benefits. Other changes, however, were far more positive. The dean of the medical school, an abrasive and unpopular old codger but an effective administrator, was rebuilding his program into a top-notch, state-of-the-art institution. He brought progressive thinkers like B-J into the faculty to help him achieve his goals.

When B-J and Nan arrived at Yale, they became deeply involved in the lives of the school's medical students. B-J served as the faculty "dorm master" for a residential campus community known as Trumbull College. This made Nan the de facto headmistress, a calling she undertook with vigor. She became a counselor, confidant, and surrogate mother to many of the young men in Trumbull, and these encounters made her and B-J keenly aware of the challenges faced by Depression-era college students. B-J helped his students find jobs on campus to help cover their expenses, but one of their biggest concerns—and a great irony—was that the medical students could not afford medical care if they became ill. B-J took a bold step to help them solve this problem. During a time when universal health insurance was a hotly debated concept within the medical community, B-J risked the opprobrium of the American Medical Association and many of his medical colleagues by establishing a private hospitalization service plan through which Yale students could contribute \$10 to receive full medical care from the faculty of the medical school. Although this was just one of many small, voluntary health care plans across the country, it was indicative of the public concerns about rising medical costs in the 1930s, and it helped pave the way for larger and more sophisticated collective health care programs.

Bayne-Jones excelled at Yale, and, in 1935, a faculty committee elected him dean of Yale's School of Medicine. He guided the school through the financial straits of the Great Depression with a deft managerial hand,

cultivating relationships with prominent businesses and steadily increasing the grants coming into the school from charitable foundations.

One of these foundations, the Jane Coffin Childs Memorial Fund for Medical Research, provided an enormous endowment for research into cancer and other prominent diseases. This would set B-J on a long association with cancer research over the ensuing decades, a calling that gained personal importance as he watched several friends succumb to the disease.

In 1940, B-J resigned as the dean of Yale's medical school, ostensibly to devote full time to the management of the Childs fund and other personal pursuits, but primarily over a disagreement with the school over the acceptance of corporate money for research. He regretted giving up his deanship, but he did not allow any idleness to creep into his always busy life. He continued his duties as a professor of bacteriology, and he became the editor of a new journal, *Cancer Research*. He served on two committees of the National Research Council and as a board member for the Rockefeller Foundation.

#### SERVICE IN ANOTHER WAR

Late in 1940, Lieutenant Colonel (later Brigadier General) James Simmons, the Army Surgeon General's Chief of Preventive Medicine, spearheaded the creation of an organization of civilian experts on infectious diseases with the goal of preventing disease outbreaks like the influenza pandemic that had ravaged the Army at the end of World War I. Established in January 1941, the Board for the Investigation and Control of Influenza and Other Epidemic Diseases (soon renamed the Army Epidemiological Board) brought together some of the best minds in medical research. As Surgeon General James Magee stated, the board would capitalize on "the scientific resources of the country to assist . . . in the control of influenza and other epidemic diseases which will undoubtedly arise in our expanding Army."<sup>4</sup> The board was comprised of several smaller commissions, with Bayne-Jones appointed as the director of the Commission on Epidemiological Survey. He sent teams of researchers across the country to identify disease hazards and prevent them from growing into epidemics.

In 1942, concerns about the possibility of deadly typhus epidemics led to the creation of the United States of America Typhus Commission. Typhus was rare in the United States, but it was common in developing countries overseas and had been a significant killer of soldiers since the earliest days of organized warfare. Millions of Europeans had contracted the disease during World War I, and many expected similar devastation during the current war. By 1942, there were new tools with which to fight typhus, most notably the chemical insecticide DDT (dichlorodiphenyltrichloroethane) and a mechanical

dust gun used for efficient disinfection, but internal conflicts kept the Typhus Commission from achieving its full potential. As an executive-level, joint organization comprised of personnel from the Army, Navy, State Department, and U.S. Public Health Service, relationships among the commission members “were intricate, often experimental, and sometimes difficult.”<sup>5</sup> In August 1943, the director of the commission, Brigadier General Leon A. Fox, recognizing that he could not quell the disharmony among his subordinates, magnanimously stepped down. Simmons elevated B-J to the position, getting him promoted to Brigadier General in February 1944.

Under Bayne-Jones’ subtle but effective leadership, the Typhus Commission expanded its activities across the world and saved countless lives by stopping epidemics early. Most of those saved were civilian refugees and liberated prisoners of war in the shattered communities where World War II had cast its terrible shadow. In the winter of 1943, the Typhus Commission stanching a major outbreak of typhus among the downtrodden refugees of Naples, “an extraordinary episode in the history of preventive medicine” not only because an epidemic was squelched, but also because it happened in the middle of winter and with a war raging all around—the two environmental aspects most likely to propagate sickness.<sup>6</sup> The commission’s remarkable success in controlling the fearsome disease continued among the prisoner of war populations in Germany and Japan, where outbreaks with devastating potential were stopped cold.

#### MEDICAL ADMINISTRATOR

Seeing public health as his medical specialty (to the extent that he had one), B-J took an interest in the provision of health care to the disadvantaged. After World War II, B-J accepted a new job in Manhattan, taking on the extremely challenging position of President of the Board of Governors of New York Hospital and Cornell Medical College, a tenuous association between the school and the hospital fraught with animosity and distrust from both sides. In this position, he supported initiatives to provide care to poor families, including a controversial program to provide low-cost, fixed-fee diagnostic services for the people of Manhattan in a hospital-run clinic called the Vincent Astor Diagnostic Service. This brought opposition from organized medicine, exemplified by the New York medical societies that decried “unfair competition” from the clinic and fee-setting by the hospital. B-J was an active member of these societies, and he used his connections and some creative legal maneuvering to get around the opposition and build the clinic into a long-standing fixture in the New York medical system, still serving that city more than 60 years later.

In spring 1953, B-J retired from the board presidency, having accomplished the harrowing and thankless task of bridging the gap between the hospital and the medical school. The Army had called him again, this time to direct their medical research program. He and Nan settled into Washington that summer, and would contentedly spend the rest of their lives there. As both the director of medical research and a member of the Army Scientific Advisory Panel, B-J was at the heart of medical and scientific innovation in the 1950s. He took great pride in writing ambiguous, open-ended research grants that allowed scientists to pursue interesting and beneficial research on their own terms.

In 1956, he retired from his post as the director of medical research, and focused on work with the Department of Health, Education, and Welfare. A year later, he was appointed as chairman of an advisory committee for the National Institutes of Health (NIH), helping that organization to manage a budget that had doubled in 1957 and was continuing to grow. The NIH director was Dr. James A. Shannon, who had worked with Bayne-Jones on the Army Epidemiological Board during World War II. Shannon personally suggested Bayne-Jones as the chairman of his new advisory group and was thoroughly pleased with the results. The advisory group only functioned for a year; but, in that time, they established the fiscal principles that guided the budgetary decisions of the NIH for years to come.

His advisory role with the NIH dovetailed with one of B-J's lifelong interests: the study and prevention of cancer. In 1962, Surgeon General Luther Terry asked B-J to serve as his personal representative on the Surgeon General's Advisory Committee on Smoking and Health. Once again, B-J found himself in the role of organizer, arbitrator, and leader. The advisory committee was made up of ten of the top medical and scientific experts in the country, representing a wide spectrum of specialties. Their egos tended to match their noted prominence in their respective fields, and tension was inevitable. According to one historian, "Bayne-Jones, the senior member of the committee and a seasoned administrator and negotiator, had to use all of his considerable military and administrative experience to ensure that the process led to scientific consensus."<sup>7</sup> The committee's report was issued a year later, and it led to drastic changes in the way Americans viewed cigarettes. What had been seen as a benign, or even healthy, social convention was now indicted as a direct cause of cancer. Surgeon General Terry, himself a cigarette smoker, dropped the habit just before announcing the committee's findings. A year later, the Federal Cigarette Labeling and Advertising Act was signed into law, restricting the advertising of tobacco and requiring a warning to be displayed on cigarette packages. The long-term impact of the advisory committee's report

makes this episode one of B-J's most significant contributions to public health and preventive medicine.

Although preventive medicine was the focus of B-J's medical career, he continued to cultivate other interests as well. An avid student of history, B-J supported the establishment of the National Library of Medicine on the grounds of NIH in the 1960s and soon became a fixture in the facility. He spent countless hours there during the twilight of his life, working on the history of the Army Medical Department for a series of books about World War II. He chaired the advisory editorial board for the Preventive Medicine portion of the series, which totaled eight stout volumes, and he authored several original historical essays. His final work was a concise, but insightful introductory history of preventive medicine in the Army, published in 1968, two years before his death.

In 1966, B-J packed up his impressive collection of papers—thirteen cartons amassed over an enormously prolific lifetime—and donated them to the National Library of Medicine. Soon after, he sat with renowned oral historian Harlan Phillips to record his reminiscences, a process that took most of a year to complete. He survived a heart attack in late 1969, but the experience left him severely weakened. He died peacefully in his home 20 February 1970, waiting for a ride to the library to continue his work. Nan was with him that morning, a faithful partner to the very end. She died in December 1976 and was buried with him in Arlington National Cemetery.

Only a fraction of his life had been dedicated to the direct care of patients, but Stanhope Bayne-Jones had saved innumerable lives through his capable management of important programs of research, education, and preventive medicine. His life was not marked by any single conspicuous or momentous achievement; instead, his greatest legacy is his life itself—a life devoted to optimizing the efficacy of scientific medicine.

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## Notes

1. Albert E. Cowdrey, *War and Healing: Stanhope Bayne-Jones and the Maturing of American Medicine*, Baton Rouge, LA: Louisiana State University Press, 1992:36.
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by *Sanders Marble*

## JAMES STEVENS SIMMONS 1890–1954

### INTRODUCTION

James Simmons began his career as a laboratory officer, and his interests progressed into tropical medicine research. His work evolved into preventive medicine and public health, and he received both a Ph.D. and a Doctorate in Public Health. As the Army Medical Department's (AMEDD's) leading preventive medicine physician, he was appointed head of preventive medicine in 1940 and guided Army preventive medicine throughout World War II. Army medicine was organized as surgery, medicine, psychiatry, or preventive medicine, so his responsibilities were immense; by war's end, the Preventive Medicine Division had one-sixth of all military personnel at the Surgeon General's Office. Simmons' strong professional credentials brought him access to civilian expertise lacking in the Army. Upon retirement, he became Dean of the Harvard School of Public Health to build the public health field and train another generation.

### EARLY YEARS

James Stevens "Steve" Simmons was born on 7 June 1890 in Newton, North Carolina, the son of a pharmacist. He grew up in Graham, North Carolina, and attended Davidson College, graduating in 1911. After attending

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the University of North Carolina's medical school (then a two-year institution, like many in the South), he transferred to the University of Pennsylvania for two more years study. He did a residency (not then typical) at the University of Pennsylvania Hospital, becoming Chief Resident. He also worked at the William Pepper Laboratory of Penn, the oldest clinical laboratory in the United States.

He joined the Army in October 1916, attending the Army Medical School for four months. His first assignment was as officer in charge of the camp hospital laboratory at Fort Bliss; this was at the end of the Punitive Expedition against Pancho Villa, and Simmons received the Mexican Border Service Medal. Through World War I, he would serve in the United States, first heading a laboratory at Fort Bliss, then commanding the Southern Department Laboratory at Fort Sam Houston; in September 1918, he was sent to New Haven, Connecticut, to organize a laboratory for service in France, but the Armistice came before the unit was ready. Instead, he was put in charge of a Special Field Laboratory for Meningitis where he experienced the frustration not only of meningitis, but also the pandemic influenza. From January 1919, with less than two years service, he was in charge of the laboratory at Walter Reed General Hospital. In June 1920, he married not the girl next door, but the girl from across the street in Graham, Blanche Scott.

For the next ten years, he was an outstanding laboratory officer, working at Letterman General Hospital, Tripler General Hospital (his first exposure to tropical medicine), Fitzsimons General Hospital, and in the laboratory at the Army Medical School, then the AMEDD's leading research organization. There, he devised the Simmons citrate agar, and also defined the limitations of mercurochrome as a skin sterilizer and intravenous agent against pyogenic infections. From 1920 in Hawaii, he used his labs for research, ultimately publishing some ninety articles, chapters, and books.

In 1928, his career turned decisively into tropical medicine: he was assigned for two years as President of the Army Medical Department Research Board in Manila, Philippine Islands, and produced basic research on dengue and malaria.<sup>1</sup> Four more years at the Army Medical School followed, now in charge of laboratories and broadening into preventive medicine and clinical pathology; as Professor of Bacteriology, he held Walter Reed's old job. At this time, he also earned a Ph.D. in bacteriology at George Washington University and edited a mammoth textbook *Laboratory Methods of the United States Army*. (It would go through six editions and be the standard for over a decade.) Working with other Medical Corps researchers honed working with others and delegating; he might be in charge, but knew he could not do everything. He then went to Panama for two more years as president of the medical research

board, which had moved there, and from which he would write on malaria in Panama. It was in the 30s that his career broadened, with contacts from Army medicine to civilian medicine, not just in tropical medicine but as the Federal Representative to the National Board of Medical Examiners, working with the American Public Health Association, helping devise the National Formulary, and joining the National Malaria Society.

#### FROM SCIENTIST TO ADMINISTRATOR

In 1936, his next assignment showed him a very different side of the Army: he was Assistant to the First Corps Area Surgeon. His main responsibility was the reserves and how to mobilize for war, but he also oversaw health in the Civilian Conservation Corps camps in the First Corps area. First Corps Area was based in Boston, and he also studied for a Doctorate in Public Health at the Harvard University School of Public Health.

As the Army's only D.P.H., it made perfect sense that his next assignment was as Chief of Preventive Medicine in the Surgeon General's Office—but such was his reputation as a laboratory officer that he had already been considered as the Chief of Laboratories. He was a natural fit for preventive medicine: he viewed it as “more constructive” than curative medicine and thought disease prevention “should logically be the primary objective of the medical department of any armed force”; he took his job to be “the maintenance and conservation of the health of the Army through the prevention and control of infectious diseases and the elimination of sanitary, occupational, and other health hazards.” He thought about the work in three categories: general measures to safeguard health (such as selecting healthy recruits in the first place, and providing healthy food and making Army facilities sanitary); measures against a long list of specific diseases; and research to support both of these. Yet, while he was the Chief of Preventive Medicine, at first he was the only member.

#### 1940–1941: Before the War

On reporting to Washington, DC, in February 1940, he found the United States only very gradually mobilizing. In his early days in Washington, he had time for outside duties, such as being a visiting lecturer at Johns Hopkins, representing the Army on the District of Columbia's Advisory Committee for Venereal Disease Control, and being a member of the President's Committee on Inter-American Medicine and Public Health.

But he needed to build the preventive medicine office to cover his increasing responsibilities, not just more personnel in the expanding Army, but the increasing range of topics that were classified as preventive medicine. The Protective Mobilization Plan foresaw building up the preventive medicine

section, and his civilian contacts were immediately useful, either serving themselves or telling him whom to recruit. His first assistants were sanitary engineers rather than physicians, showing his recognition that preventive medicine involved more than doctors. Throughout World War II, Simmons would reach for whomever had the skills needed for the work, whether it was sanitary engineers, enlisted medical technicians who might even be female (a far cry from the Medical Corps, which was until 1943 all male and of course all officers), or local laborers to do antimalaria work. He later commented that utilizing the nonphysician scientific specialties was one of the three major lessons of the war, and that the Sanitary Corps had made the preventive medicine effort possible.

An early move (two weeks after the Germans occupied Paris) was to contemplate public health in occupied countries and how the medical department should work with Civil Affairs and Military Government activities. In parallel, he was thinking about military health amid the civilian populace in the United States: military personnel needed protection from endemic diseases. That brought into play malaria suppression (malaria was still common in the South) through the Office of Malaria Control in War Areas and work with the Public Health Service alongside state and local health departments.

Another early responsibility was industrial hygiene and health; the Army was building a number of munitions plants and would be responsible for the health of the workers even if they were privately operated. Emergency response to accidents, healthy working conditions, and protection against toxic materials were the key problems that Simmons had to coordinate. Less than a year after Pearl Harbor, there were 250 Army-operated plants with over a half-million workers and 150 private plants to supervise; the numbers would rise markedly during the war. There were no personnel in Washington, DC, to handle the workload, and Simmons persuaded Johns Hopkins University (already running a School of Hygiene and Public Health for the Army) to perform the work. The organization he built evolved into the Army Environmental Hygiene Agency, which has since evolved.

One of President Roosevelt's prewar moves was to extend America's Atlantic defensive perimeter by trading elderly warships to the British for bases. The United States lacked any information on medical conditions in places such as Greenland or Bermuda, and Simmons ordered medical surveys. That led to a division in his office to gather medical intelligence. Coordinating with G-2 was something new for the AMEDD, but it made sense, and the results were published throughout the AMEDD. They were also sent to the School of Military Government to inform officers about conditions where they would be operating.

At the end of 1940, another of Simmons' ideas came to fruition. He had been collaborating with a wide variety of civilian medical experts and suggested a formal organization to tap their expertise as needed. On 27 December 1940, Surgeon General James Magee approved the establishment of a Board for the Investigation of Influenza and Other Epidemic Diseases in the Army; in January 1941, the Secretary of War approved it. During the course of World War II, it created ten subpanels, with over 100 leading civilian experts who were readily accessible to the Army for their expertise. The organization became the Army Epidemiological Board, then the Armed Forces Epidemiological Board. While it was his last accomplishment of 1940, it was emblematic of what made him the right man for the job: he had the scientific background to be a credible ambassador from the Army to civilian medicine, he had the contacts in civilian medicine, and he "thought outside the box," looking outside the Army for necessary expertise. To be fair, Simmons was doing in microcosm what the Federal Government was doing in many areas. The National Defense Research Committee (from mid-1941 the Office of Scientific Research and Development [OSRD]) was established in June 1940 on to coordinate civilian research for wartime use; OSRD had many elements, and Simmons was the Army's representative to its Committee on Medical Research. The National Research Council also had a Division of Medical Sciences, and Simmons worked with them where appropriate.

In 1941, work with the Public Health Service absorbed much of his time. Congress was debating controlling prostitution around military bases so venereal disease would not reduce military effectiveness, and on 11 July the May Act was passed. It allowed the Secretaries of War and the Navy to work with local authorities to prevent such prostitution, and, alongside the local and state authorities, the Army would be working with the Public Health Service.<sup>2</sup> The situation was fairly delicate because the Army could declare areas for enforcement, but lacked law enforcement authority over civilians. Another development in 1941 was the addition of an Armored Force Research Laboratory (AFRL) to test what we would now understand as ergonomic factors in armored vehicles, as well as (for instance) engine exhaust in confined spaces. It seemed to fit with industrial hygiene, and the AFRL was put there. Simmons was delighted when the Army Epidemiological Board handled its first case. They were quickly called, identified the problem, and made recommendations.

Tropical medicine was also a major topic of the year as the United States developed defensive bases in the Caribbean. The National Research Council recommended chemical prophylaxis against malaria, meaning the Army needed to secure supplies of the new antimalaria drug atabrine. Simmons also sought

to get a tropical medicine course added to the Army Medical School to train doctors, but the Army Medical School was too small to handle the number of physicians required; cooperation with Tulane and establishing a course somewhere in the tropics were both recommended. It could not have been hard to persuade Simmons, and, in two months, there was a 4-week tropical medicine course. It turned into a back door of sorts; the Army Medical School had been told to discontinue its advanced course, and late in 1941 the course became “Tropical and Military Medicine,” doubled in length, and covered basic subjects of military medicine.

## WORLD WAR II

1942

The first full year of war brought challenges of a worldwide war, the concomitant mobilization, and reorganizations as the Army (and the Federal Government) grappled with new problems. For the Army, mobilization was probably the biggest problem because both volunteering and the draft expanded. New training camps were built, and men crowded into existing facilities. Sewers and water supplies were taxed and overtaxed, and organizations such as the Fish and Wildlife Service cooperated with the Army in keeping water supplies pure. Hastily built kitchens were operated by hastily trained cooks, and there were outbreaks of food poisoning. Simmons bolstered the Sanitary Engineering Branch, and worked with the quartermasters and engineers on facilities. Peacetime space requirements also had to be compromised: no longer would each man have 72 square feet of barrack space, but sometimes as little as 40 square feet. Simmons remembered the problems of the pandemic influenza, and how the General Staff had overruled the Medical Department in 1917 on space. One function of the Army Epidemiological Board was providing outside scientific support for the Medical Department in its arguments with the rest of the Army; but, during World War II, things were again too urgent. Instead, construction caught up with demand, and there was also no pandemic.

Reorganizations brought Simmons more responsibility, for instance, when all matters about venereal disease were grouped under Preventive Medicine. He probably cared less about that than being put in charge of all laboratory functions, both sanitary and diagnostic, during one of the 1942 reorganizations. However, Simmons was not empire building. He deprecated the seemingly incessant reorganizations and just sought an effective structure:

Heard a rumor that Hugh Johnson's son & another civilian from Sears  
Roebuck—neither doctors—are working in Somervell's office on the

reorganization of the Surgeon General's Office & that with no consultation of our office they are changing the organization limiting it to 4 services. This will probably upset the applectart for my excellent Service. Why can't they let things work for a while without tearing them to pieces. I have a smooth effective organization—the best – but every few weeks there's something to be readjusted because someone topside gets a notion—without taking the trouble to see what's going on. Most discouraging.

Greater responsibility did not, however, bring higher rank. As early as April 1942, Simmons' remarkable work was noticed, and he was nominated for a star. The nomination was approved up to the White House, but was halted there because President Roosevelt felt there were too many generals in Washington.

With reorganizations in the background, Simmons had to cope with the greatest crisis for preventive medicine. In February 1942, there were many reports of jaundice among soldiers after yellow fever vaccinations. In 1940, Simmons had pushed through yellow fever vaccination for all troops who were deploying to areas where yellow fever was suspected; since there was an effective vaccine, and the disease had high morbidity, high mortality, and long recovery times, vaccination was the obvious solution. Yet now, when the Army was sending more soldiers to tropical regions, vaccination apparently caused jaundice. The situation was unclear, and Simmons was getting long-distance telephone calls at home reporting more cases; he called for the help of the Army Epidemiological Board and after only five weeks the problem was identified not as the yellow fever vaccine, but the fact that the vaccine contained inadequately heat-treated human blood serum. New production methods were implemented and another laboratory put to work. Since the risks of "jaundice" (soon correctly identified as infectious hepatitis) were far lower than those of yellow fever, the interim step was taken of only vaccinating those going to regions where yellow fever was endemic. (Simmons dismissed as "a very silly attempt to dodge responsibility" the suggestion that soldiers choose whether to be vaccinated.) Production of the new vaccine was soon adequate and wider vaccination could be resumed before the year was out.

Simmons' attempts to look ahead led him to establish not only a medical intelligence organization, but also to act on that intelligence. In July 1942, he saw the lack of information on epidemic typhus in Europe, North Africa, and the Middle East, all areas where the Army would likely have to fight. Meanwhile, producing an effective typhus vaccine was proving difficult, and the Army's need would be vast since immunization would require multiple doses and vaccinating Americans would not protect local employees, nor wholly end the threat to Americans. In August, he proposed an interservice

group to go abroad and investigate typhus; in the staffing process, that idea was expanded to include non-Army personnel, go beyond Europe, and oversee typhus control rather than simply gather information. Soon, the United States of America Typhus Commission was established by Executive Order, drawing in Army, Navy, Public Health Service, and civilian personnel. It would have an uneasy status, working with military headquarters and various U.S. agencies and United Nations organizations, and requiring them to spend their own funds on typhus prevention and control efforts, but answering to the Secretary of War. However, it would prove extremely effective, not least because DDT (dichlorodiphenyltrichloroethane) was available to kill lice. The Commission would oversee typhus control measures at the outbreak in Naples, Italy (1943–1944), and through widespread prophylactic treatments to Prisoners of War, Recovered Allied Military Personnel (the term for liberated Allied Prisoners of War), civilian refugees, and concentration camp survivors would prevent typhus raging across Europe from 1945 to 1946. (In recognition for his work in establishing the Commission, Simmons was awarded the United States of America Typhus Commission Medal in 1944.)

Through the war, Simmons attended a number of professional conferences. They kept him in touch with colleagues in an age long before email and when even long-distance telephone calls were scarce. Such contact kept him abreast of research, allowed informal meetings to lay the groundwork for official agreements, and let him present the Army's work to professional audiences that could spread it further. And since physicians were exempt from the draft, presenting an attractive picture of Army preventive medicine helped recruiting, always vital and always a chore. Thus, Simmons' professional memberships and recognition (for instance, as a Fellow of the American College of Physicians) allowed him greater reach among physicians and, through physicians, to the American public: his professional attainments themselves vouched for the quality of medicine in the Army. But he kept in mind he was heading the work, not doing it all. When the American Public Health Association awarded him the Sedgwick Medal, he accepted it "with the full realization that in so doing I am only acting as its custodian for the Medical Department of the Army."

#### 1943

In 1943, a major focus was on conditions abroad. Military travel ran the risk of bringing diseases and vectors back to the United States, and quarantine regulations had not kept up with developments, especially for air travel. Simmons again took the lead on an intergovernmental panel between the War Department, Navy Department, and Public Health Service. The advance of allied forces led to other concerns, especially civilian health abroad, whether it

was a liberated country or an occupied one. While civil affairs work was under the Provost Marshal General, medical training for civil affairs officers (and medical officers for civil affairs work) was obviously a Medical Department responsibility. Since most of the work was preventive, it logically led to the Civil Public Health Division under Simmons. The work ranged from food supplies (both adequacy and safety), to diseases, to sanitation—the usual gamut of public health—and Simmons engaged a range of personnel, including Public Health Service officers and even civilians who were never commissioned. After the invasion of Sicily, Simmons took comfort that “our plans are all ready for civilian relief and rehabilitation – both during the period of military government and through the Health Commission of the Office of Foreign Relief and Rehabilitation.”

Another growing emphasis for the year was chemical and biological defense. There was a medical element to these, and since they involved prevention of damage or disease, the responsibility was given to Preventive Medicine. Initially, most work was done by civilian research groups because there was a threat to the general U.S. population; but, in 1943 and 1944, the military took more interest. Chemical defense work had been largely a responsibility of the Chemical Warfare Service, but the physicians working there helped design protective equipment and developed treatment procedures. Ironically, the only call for gas defense came when an American cargo ship loaded with mustard gas (for potential retaliatory use) was bombed in Bari, Italy. Biological warfare was put under the Special Protection Unit, and worked on protective gear, decontaminating and disinfecting equipment, vaccines, antitoxins, and antibiologics.

Simmons did his best to stay informed on what was happening in the field, and took two lengthy trips in 1943. In February he spent two weeks in Central America looking at conditions along the Pan-American Highway; he also took the opportunity to lay plans for teaching and training the locals in tropical medicine. From mid-August to early October, he traveled to England, Africa, the Middle East, and India inspecting preventive health work as it was actually happening. Amid the official work and travel, Simmons undertook the editing of *Global Epidemiology: A Geography of Disease and Sanitation*, and he also traveled to professional meetings. At the American Public Health Association meeting, he was presented the Sedgwick Medal because “he has done more than any other single individual to make the science of public health effective in maintaining the manpower which our nation has mobilized for the defence of freedom.” The Army had recognized his work by promoting him to brigadier general in March, and there had even been talk of nominating him to be the next Surgeon General. Simmons wrote, “God knows I don’t want it . . . at least

6 important people offered to back me for it—including Tom Parran. Needless to say I declined.” Since Simmons and Parran had their disagreements, it is a testament both to Parran and to Simmons that he could earn such support, and it shows a side of Simmons that is hard to capture in words. He was a kindly man with a sense of humor; while he sat through (and presided over) innumerable committee meetings during the war, he had a knack for drawing a cartoon that punctured tension and got people moving.

1944

The last major reorganization was at the beginning of 1944; Preventive Medicine was raised to the status of a service, on par with personnel or the practice of medicine. With roughly one-sixth of the Surgeon General’s staff, it made sense for Preventive Medicine to be a full service, and it told the men toiling at their duties that the importance of their work was recognized. Most of Simmons’ innovations for the war had happened, and he was running an efficient organization that meant he could keep his eyes on the horizon. The war was far from over, but planning ahead meant looking not only to diseases in Japan (and thus developing a vaccine for Japanese B. encephalitis, which was begun in 1944 and ready well before U.S. troops fought on Okinawa in 1945), but also planning for civilian public health in occupied Japan. Another part of the vaccine program was also coming to fruition. An influenza vaccine had been developed for testing in 1942, and versions were tested in the winters of 1942–1943, 1943–1944, and 1944–1945. Finally, a version that protected against influenza strains A and B was ready, and the whole Army was vaccinated for the 1945–1946 season. Despite an epidemic, the Army suffered fewer cases than during the 1944–1945 season.

He looked beyond the war and was advocating better support for medical research, specifically in the AMEDD, but also in the civilian world. He made recommendations to Surgeon General Norman Kirk in August, and was the AMEDD’s voice to Congress, testifying to the Sub-Committee on Wartime Health and Education that the AMEDD needed a formal research structure after the war. He noted what research had delivered during the war, but pointed out that this was fortuitous and that research funding between the wars had fluctuated wildly, including to negligible levels. As befitted a preventive medicine physician, Simmons argued that national security rested on a healthy populace and healthy military. Research was crucial, and while the Army should do some research, it should also collaborate with civilians where possible.

Another research success would later turn out to have substantial drawbacks. Part of the effort against insect-borne diseases was in repelling insects (and the Army developed better insect repellents) and another angle

was insecticides. Pyrethrum proved to be effective, but the 1944 crop failed due to drought in British Kenya. Simmons thought it fortunate that DDT proved itself at the same time and would claim in his diary “the whole DDT research, testing for toxicity & initiation of production originated in my office.” He thought DDT would “prove to be the outstanding medical advance made during this war. It will exceed even penicillin in its ultimate usefulness in the preservation of health and the saving of human lives.” He included DDT in his lectures and through the *Saturday Evening Post* talked straight to the American public. Simmons probably reflected the common view of his generation of tropical medicine workers, amazed at the possibilities of DDT and enthusiastic about the chance to save lives. He certainly downplayed the possibilities that DDT would annihilate insect life and the plants that depended on insects for pollination, but he realized the germ of truth in the wild rumors that DDT could kill (among other useful insects) bumblebees and thus affect crops. He welcomed a board to study DDT and insect control, but personally thought that DDT was “like the breath of God.”<sup>3</sup>

1945

In early 1945, he traveled with Surgeon General Kirk and a large party to the Pacific to examine the medical situation there. Simmons’ main point was making sure a good man headed the medical section of the occupation, again planning ahead before Japan was even defeated, let alone occupied. In March and April, he visited Europe, this time looking at an occupation that was already happening as the Allies advanced rapidly across Germany.

Japan’s sudden collapse after the atomic bombs meant that demobilization sped up dramatically. Simmons had to work with dwindling resources. (On inspecting the space allotted in the Pentagon, he mordantly noted “looks adequate for our shrinking numbers.”) In September, he was already contemplating his retirement, but he stayed on to oversee demobilizing his preventive medicine personnel and to continue preventive medicine work on the demobilizing GIs to protect the American public. In November 1945, he was awarded the Distinguished Service Medal. He continued his outstanding work, and on 31 October 1946 he retired from the Army.

#### AFTER THE ARMY

He continued his public health and preventive medicine work; to him preventive medicine was more than the military conservation of manpower, it gave the fullness of life. In 1942, he had become president of the Harvard School of Public Health alumni; in November 1944, discussions about becoming Dean were finalized, to take effect when he could hand over his

Army responsibilities. With major financial backing from the Rockefeller Foundation and Harvard, in two years he had doubled the school's faculty and students, was guiding it toward independence from the medical school, and also emphasizing international students—in his seven years there, the school graduated students from 73 countries. He taught a class on international public health and envisioned a “Bridge of Health” from Harvard around the world. He continued an interest in military public health and argued that public health was a weapon for national defense. To Simmons, having a healthy nation would provide strong soldiers and defense workers. He also continued publishing, not just his speeches but substantial chapters and articles.

He stayed in touch with the AMEDD in various ways. He was on the board of the Army Medical Department Research and Graduate School until his death. He also remained a consultant to The Surgeon General on preventive medicine, and, during a 1954 tour of the Far East for the Army, he suffered a heart attack. He returned home and resumed work, but that summer he suffered a second heart attack and died on 31 July 1954. The Army had a series of Steve Simmons Memorial Lectures at Walter Reed, and his friends endowed the James Stevens Simmons Professor at the Harvard School of Public Health.

## CONCLUSION

Simmons' career showed the importance of an excellent technical grounding in his field of laboratories and bacteriology, but also the importance of seeing his work in the bigger picture of both tropical medicine and public health. As a senior officer, he showed the flexibility to reach “outside the box” and mobilize civilian medical expertise (and nonphysician expertise) to solve urgent problems. Given an immense scope of responsibility, he trusted his subordinates and patiently built up an organization large enough to handle the mission. His Distinguished Service Medal citation could fairly say:

In all major undertakings of the War Department and Army during the war, measures for protection of health were devised and put into action in some form before critical needs arose. . . . Beyond the successful development of Army preventive medicine, he stands out as one of the most original and effective guardians of the health of the nation. By protection of the health of the Army, he has contributed directly to the winning of the war. By dynamic conservation of the health of human beings in time of war, his contribution has enduring value in time of peace to the welfare of the nation.

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Notes

1. *The Army Medical Bulletin 1929* has background and a synopsis of the work of the Army Medical Research Boards in the Philippines, including précis of the published papers.
2. The Surgeon General of the United States, Dr. Thomas Parran, Jr., was an antivenereal disease campaigner and had written the book *Shadow on the Land* (1937) about syphilis and co-authored *Plain Words About Venereal Disease* (1941). Simmons' journal shows unkind comments about Parran's attitude in meetings. The official history (*Organization and Administration*, 104) notes a "rift" between the Public Health Service and the Army due to Parran's work and attitudes, going so far as suggesting it was only healed by the external threat of the war providing a common enemy.
3. The long story of DDT and the environment need not be chronicled here, but the World Health Organization coordinated a massive effort to annihilate *Anopheles* mosquitoes, largely through DDT, into the 1960s. The publication of *Silent Spring* in 1962 was not the first time concerns were aired.

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by *Jane C. Morris*

## ALBERT JULIUS GLASS 1908–1983

### INTRODUCTION

The practice of military psychiatry was still in its infancy when Albert J. Glass began his twenty-two-year career as an Army psychiatrist in June 1941. Although great strides had been made in the field of psychology over the past century, the procedures for treating soldiers who suffered psychological trauma in warfare had remained relatively static. Throughout his career, Glass focused on developing new methods to address combat-related psychological stress, which goes by several names, including psychoneurosis, exhaustion, and shell shock. These methods included treating traumatized soldiers close to the front line (forward treatment), instituting policies to help prevent the onset of combat-related psychological trauma (for example, rest and recuperation, or R&R), and innovations in leadership training.

Glass's contributions to the understanding and improvement of psychiatric care stemmed from research into past wars and his experience in the field. He studied the history of military response to combat-related psychological trauma from the Civil War onwards to identify weaknesses and successes, documenting medical records and descriptions of soldier care. Throughout his career, Glass drew on his findings and collaborated with Army officers and fellow psychiatrists to develop a system of care based on three crucial elements: the chain of command (officer commanders), the chain of support (noncommissioned officers), and the chain of concern (chaplains and unit medical personnel). They concentrated on applying this system to their knowledge of combat psychiatry, with emphasis on treating and preventing

combat-related psychological trauma.

Albert Glass and his contemporaries were educated during an especially exciting period of time in the fields of psychiatry and psychology. The widespread interest in the workings of the human mind that followed the teachings of Sigmund Freud and Carl Jung led to a revolution in how people perceived their relationships and their environment. The generation of military psychiatrists and scholars who shaped mid-twentieth century policy brought with them knowledge of the past and a vision for the future. Albert Glass focused on lessons that could be learned from the past and policies that could be improved to meet the challenges of modern warfare.

Albert Julius Glass was born in Baltimore, Maryland, on 25 June 1908 and died at the Bethesda National Medical Center on 17 March 1983. He received his Bachelor of Science degree from the University of Maryland School of Pharmacy in 1928 and his M.D. degree from the University of Maryland School of Medicine in 1932. He entered active service from the Army Reserves on 2 June 1941, eventually achieving the rank of colonel, and served during World War II in northern Africa and Italy. Following the war, Colonel Glass was assigned to the Far East Command as Theater Consultant in Neuropsychiatry, where he remained throughout the Korean War.

During the 1950s and 1960s, Glass continued his military career at several military hospitals. From 1956 to 1961, he served in the Professional Division of the Office of the Surgeon General and as Armed Forces Representative to the Mental Health Council at the National Institutes of Health. In 1954, he began a long affiliation with Walter Reed Army Institute of Research, where he established the Division of Operational Research in Military Psychiatry in 1963. After retiring from military service, Colonel Glass accepted an appointment at the University of Oklahoma as Director of the Oklahoma Department of Mental Health and taught clinical psychiatry and neurology. He was a Fellow of the American Psychiatric Association and continued to be active in the mental health field for the remainder of his life.

As an Army psychiatrist, Colonel Glass's mission was to conserve the military fighting strength by providing a system whereby soldiers were treated for mental distress and returned to duty as soon as possible. The goal to maintain an effective fighting force, he believed, depended on professional education, support, and care. Glass emphasized the importance of training soldiers to understand what is expected of them so they can react consistently during tense battlefield conditions. He stressed the values of sustaining morale, sharpening leadership skills, and promoting group identification as the means to accomplish mission goals while maintaining maximum psychological health among the fighting troops.

## LESSONS LEARNED FROM PAST WARS

In order to discover how to improve psychological health in the Army, Albert Glass studied American history with an eye for how soldiers with psychological trauma were treated, where they convalesced, and how they adapted to postwar life. What he found greatly influenced his theories and policies, and he was determined to take advantage of lessons that could be applied to improving soldier care in the modern Army.

Although the effects of psychological trauma on Civil War soldiers did not carry the same terminology as we now use, the traumatic psychological experiences that men endured were no less significant. The horrors that the soldiers experienced, both psychological and physical, were recorded in medical records, literature, and personal accounts. For years afterward, Civil War veterans from both sides of the conflict displayed terrible repercussions from their experiences, as reenacted in Stephen Crane's *Red Badge of Courage* (1895).

Glass found that, in the descriptions of psychological trauma during the Civil War, cowardice and poor discipline were blamed for casualties. Sixty years would pass before a clinical explanation for combat-related psychological trauma emerged and shell shock was recognized (monocausally) as resulting from the concussive effects of exploding bombs. The important step was that psychological trauma was acknowledged as a result of injury rather than a lack of moral character.

The period between the Civil War and World War I brought great strides in understanding psychological reactions to stress. Much more was known about the workings of the mind in 1914 than in 1861, and with a greater understanding came a cultural shift toward treating traumatized soldiers as patients rather than as outcasts. Before World War I, soldiers with psychoneuroses were routinely discharged and sent home or transferred to institutions like the Government Hospital for the Insane in Washington, DC (now St. Elizabeth's Hospital).

Glass found that separation from fellow troops often had a negative effect on a soldier's psyche. Away from his buddies, those whom he had trained with, fought with, and shared fear and comfort, he was cut off from his support system. Glass discovered that this phenomenon was universal and did not change from war to war; soldiers and medical staff throughout history described similar symptoms.

World War I provided an unforeseen opportunity for research into combat-related psychological trauma when shell-shocked soldiers, trapped in trenches in France, could not be evacuated. Here, troops experienced continuous, intense artillery explosions without the possibility of relief. The symptoms of

shell shock thought to result from concussive damage to the central nervous system, however, were not limited to soldiers exposed to artillery fire. Most soldiers who were exposed did not develop symptoms, even those with severe head trauma, and some who were stationed far from battle lines, did suffer shell shock. Clearly, there was a dynamic at work that had yet to be identified.

The search for an explanation for shell shock led to questions of other possible causes. There was a purely practical reason for finding a treatment for shell shock: at one point during World War I, more soldiers were discharged for psychiatric reasons than were recruited. As the cost of psychological trauma became more clearly understood and records analyzed, policymakers searched for treatment solutions.

When the peace following “the war to end all wars” failed and World War II broke out, conditions on the battlefield evoked scenes from World War I. Very little analysis of how to improve on treatment methods for psychologically traumatized soldiers had taken place between the wars, so the opportunity to benefit from lessons learned was lost. During the first years of World War II, despite preinduction screening, psychiatric casualties increased nearly 300% over the First World War.

In some areas, especially on the Mediterranean Front, attempts were made to evaluate experiences from World War I to see if the long-standing policy of rearward hospitals could be improved on. The practice of treating soldiers at the front lines, made necessary because of trench warfare, was attempted and proved successful. Colonel Glass, who was serving in the Mediterranean, witnessed firsthand the success of forward treatment, as well as its effect on unit identification and cohesion.

General Omar Bradley was impressed with the success of forward treatment. He ordered a holding period of seven days for psychiatric patients and mandated that the word *exhaustion* replace *psychoneurosis* (which was often abbreviated by soldiers to the pejorative *psycho*) as the official initial diagnosis for combat-related psychiatric cases. This change in terminology, from shell shock to psychoneurosis to exhaustion (and much later to include the related condition, PTSD [posttraumatic stress disorder]), reflected the increasing sensitivity to a soldier’s resilience and the Army’s determination to make a distinction between combat-related psychological trauma and mental illness. However, for the most part, forward treatment did not become the norm until the Korean conflict.

Forward treatment is defined in *War Psychiatry*<sup>1</sup> as “immediate, brief, simple interventions such as rest and nutrition in a safe place as near the battle lines as possible, with an explicit statement to the soldier that he will soon be rejoining his comrades.” The objective was to make an early assessment, while the

soldier's symptoms were still fresh, rather than wait until symptoms had become fixed, risking increased possibility of long-term consequences. As a result, the number of patients who required hospitalization dropped significantly.

Forward treatment is based on four principles:

1. Proximity, treating the soldier as close to the battle line as was safely feasible;
2. Immediacy, as quickly as possible;
3. Simplicity, with adequate rest and nutrition; and
4. Expectancy, making sure he knows he is not mentally ill and will be rejoining his fellow soldiers as soon as he is able.

In *Combat Exhaustion*,<sup>2</sup> Glass noted that, “the longer the patient remains away from his unit, in time and distance, the more vulnerable he becomes. . . . He is removed from the sustaining influence of his organization and is no longer motivated by their attitude and standards.” However, in severe cases, such as when a soldier had been in battle for several months and his unit had lost members of the original group, he “must be evacuated to rear-ward hospitals and given a more prolonged relief from battle.”

#### APPLYING LESSONS LEARNED TO POLICY IN KOREA

After serving in World War II, Glass was assigned to the Far East Command three months after North Korea invaded the Republic of Korea (South Korea) on 25 June 1950. As Theater Consultant in Neuropsychiatry, Glass was well placed to implement what he had learned through experience and study of past wars. Forward treatment and preventive psychiatry were foremost in the policies he recommended in Korea. These policies contributed to the high success rate of treating combat-related psychological trauma, and nearly 90% of cases were returned to duty. Glass described the value of learning from the past in *Psychiatry in the Korean Campaign*<sup>3</sup> as “well-known principles of combat psychiatric management without having to learn it all over again, the hard way.”

By the mid-twentieth century, the global nature of warfare influenced public awareness and opinion of how soldiers were affected and treated for psychological stress. From newsreels in theaters to radio and television programs, the horrors of war were introduced into the public's daily life. On the battlefield, the nature and extent of warfare also underwent changes. Increasingly destructive weapons produced more severe casualties that needed medical treatment. In addition, innovations in transportation and communication produced faster and more efficient troop movement and improved strategic flexibility. The confluence of warfare and technology thus brought the misery of combat-related stress into the civilian arena.

Combat psychiatry was at the forefront of academic discussion. In 1949, Colonel John Caldwell, Neuropsychiatric Consultant to Army Surgeon General Raymond W. Bliss, wrote an essay titled *Combat Psychiatry*.<sup>4</sup> Drawing on successful treatment of combat-related psychological trauma in the Mediterranean Theater, he outlined what could be taken from that experience for use in modern warfare. The article, which became the model for Glass's policy in Korea, focused on forward treatment; centralized screening within units; and avoiding hospitalizing soldiers, which often carried the stigma of mental illness.

Lessons learned during World War II relating to leadership and leadership training quickly surfaced during the Korean War. The confluence of modern psychology and contemporary warfare created a unique environment in which for the first time as policy, command leaders were expected to take into consideration a soldier's psychological condition. Although division psychiatrists had been established during World War I and increased in number in World War II, by the time of the Korean conflict, mental health staff were embedded in Army divisions and instructed to work with commanders to prevent and treat combat-related psychological stress.

Addressing leadership problems in past wars, Glass supported policies that would improve unit cohesiveness. He pointed out that the mechanics of interpersonal relationships were complicated and must take into consideration the fact that humans cannot tolerate chronic threat for extended periods of time. Understanding the relationship between leaders and soldiers, Glass addressed specific qualities that produced the most effective commanders. New policies that recognized the psychodynamics of troop cohesion were established through the chains of command. Building on group identification, commanders were trained to recognize symptoms of psychological distress and take action to prevent further harm. Strong leadership involved knowing how to help prevent and manage combat-related psychological stress.

In *Leadership Problems of Future Battle*,<sup>5</sup> Glass merged contemporary psychological theories with military leadership training. By studying the nature of stress, Colonel Glass outlined the roles people play when faced with the possibility of impending doom. During prolonged anticipation of catastrophe, which he called the "*pre-impact period*," most people become immobilized as they come to grips with their inability to prevent disaster. However, Glass noted that, in a small minority, the fear dynamic could bring out a sharp focus that enabled rapid analysis of data and the ability to make quick decisions. It was among this minority, Glass pointed out, that the greatest leaders could be found.

Reevaluating the characteristics of ideal leadership, Colonel Glass and other policymakers focused on instituting new training criteria for officers.

Glass believed that, in addition to the ability to focus under extreme pressure, great commanders understood unit interrelatedness and the need for individual soldiers to contribute to the welfare and effectiveness of the group. If a soldier displayed signs of combat-related psychological stress, Glass noted, the commander was instructed to do everything in his power to prevent the soldier from believing that he was a failure. If a soldier were evacuated to a rearward hospital and after a few days felt better, he could conclude that he had failed his unit, a conclusion that often compounded emotional distress. An ideal leader would be able to determine whether a soldier needed positive feedback, forward treatment, or evacuation to a distant hospital.

Instituting psychiatric care at the unit level required adjustments not only in the physical field, but also in the traditional concepts of command behavior. What some commanders had historically considered to be “hand holding” and not acceptable behavior for fighting men underwent reevaluation after World War II. Research dispelled the previously held philosophy that ideology and personal glory were at the root of a soldier’s fighting resolve. In *Psychotherapy in the Combat Zone*,<sup>6</sup> Glass emphasized that soldiers instinctively fight for their buddies and that “success in therapy is largely determined by the degree with which the psychiatrist identifies with the needs of the combat group, as opposed to his participation with the desires of the individual.”

Preventive psychiatry, including R&R, became a benchmark of Army policy in Korea and addressed the relationship between mind and body. Commanders were trained to be aware of signs of trauma and how to intervene. In *Preventive Psychiatry in the Combat Zone*,<sup>7</sup> Glass wrote, “Human effectiveness in combat is largely determined by an interaction of both somatic and psychic forces.” He pointed out that by understanding the interrelationship between mind and body in battle, commanders could more effectively maintain the fighting strength of their units.

Glass saw the new leadership policies as an investment in an individual soldier’s mental health, as well as for Army effectiveness, because troops often returned to duty with increased energy and resolve. An additional element to maintaining resilience and strength was the policy of granting leave. After a prescribed period of time fighting in Korea, soldiers were granted time away from the combat zone. Bases were set up in Japan to provide a break from the stresses of battle. R&R have remained an important policy in troop care since the Korean conflict.

#### APPLYING LESSONS LEARNED TO CIVILIAN PSYCHIATRIC INSTITUTIONS

The shift in focus toward leadership training and preventive care at the unit level had a significant impact beyond the military after the Korean

War. Based on the same principles as forward treatment, communities began creating local care centers for the mentally ill. Before 1950, most psychiatric care had been confined to public or private mental asylums located in rural areas. Doctors diagnosed patients with often outdated criteria and prescribed treatments that seem barbaric today. The shift toward community mental health care centers during the 1960s and 1970s reflected an attitude of acting on lessons learned in the care of psychological illness through the microscope of war and applying those lessons to civilian policy. It also reflected more therapeutic drugs being available.

In 1955, Glass addressed what could be learned from theories of combat psychiatry and applied them to civilian mental health care. He pointed out similarities among people afflicted with psychological stress, regardless of its source: powerlessness, isolation, and anticipation of doom. The difference between combat and noncombat stress, Glass wrote in *Combat Psychiatry and Civilian Medical Practice*,<sup>8</sup> is that in battle, “there is a telescoping of events within a brief period which exerts an increased demand upon the adaptive resources of the individual. The slower and more unconscious physiological and psychological processes usually sufficient for civilian adjustment are necessarily accelerated in order to cope with the abrupt environmental changes in battle.”

In *Military Psychiatry: Areas of Interest and Responsibility*,<sup>9</sup> Glass expanded on lessons learned from combat-related psychological stress: “The more civilian psychiatry becomes oriented toward prevention, the more it has borrowed the techniques of military psychiatry.” As Director of the Oklahoma Department of Mental Health after retiring from the Army, Glass continued to apply lessons learned to the treatment of psychiatric patients. He set up community centers in Oklahoma that integrated marginally mentally handicapped individuals into society. Communities began developing programs aimed at prevention, early intervention, and educating the public, all of which reduced the number of patients institutionalized.

Glass further addressed the merging of civilian and military objectives in the treatment of mental illness in *The Role of Military Psychiatry in the Development of Community Mental Health Centers*.<sup>10</sup> Isolation from society, like isolation from a military unit, Glass noted, often deepened a patient’s psychological trauma. Largely through efforts of Glass and his colleagues, integration, rather than isolation, became the standard for treating most mental illnesses. In 1963, federal legislation created a nationwide program aimed at providing local services “to include inpatient, outpatient, emergency, partial hospitalization, and consultation and education...with provisions for continuity of care, so that patients can be readily moved from one treatment service to another when indicated.”

## CAREER LEGACY

It is understandable that, after a war is over, a conflict in which many soldiers have died and many more have sustained life-changing physical or psychological injuries, some people prefer to put the experience in the past and try to forget it. The problem with that, Glass demonstrated, is that the valuable reservoir of knowledge gained through experience is lost to a future that could benefit from its lessons.

Forward treatment, leadership training, and preventive psychiatry seemed to reduce the number of psychiatric casualties measured in each successive twentieth century war. Albert Glass commented in 1974 that, “according to authoritative reports, military psychiatry in the Vietnam conflict achieved its most impressive record in conserving the fighting strength.” Indeed, according to early reports, there had been ten times more psychiatric casualties in World War II and three times more in Korea than in Vietnam. However, there was an elusive combat-related psychiatric trauma that would grow to surprising levels as the century drew to a close. During the decades after Vietnam, a large number of veterans developed symptoms that are now known as PTSD.

According to the National Institute of Mental Health, “PTSD is an anxiety disorder that can develop after exposure to a terrifying event or ordeal in which grave physical harm occurred or was threatened.” Researchers have found that there can be biological changes in the brain as a result of intense fear. People who develop PTSD often continue to experience the natural “fight-or-flight” response when they are no longer in danger. A soldier with PTSD often has symptoms of reliving trauma in flashbacks, causing nightmares, irritability, numbing, and avoidance.

Although PTSD is not a new disorder, research into what caused persistent symptoms experienced by Vietnam veterans led scientists to examine the etiology of PTSD. Over the past forty years, much has been learned about how the disorder develops and what can be done to treat sufferers. Many of the data that are used to study PTSD today were not available in Albert Glass’s time, but the spirit in which he pursued treatment for soldiers with combat-related psychological trauma is reflected in the Army’s commitment to address anxiety disorders. Glass contributed to the body of knowledge upon which today’s PTSD research is based, largely through his analysis of shell shock and his observation that the numerous symptoms related to combat-related stress can be physiologically based, and that a soldier’s close proximity to his buddies is often a major step in healing.

Throughout his military career and beyond, Dr. Glass addressed combat psychiatry in publications, symposia, and speeches with a gift for describing, in laymen’s terms, the nature of combat trauma. His contributions to the field

of psychiatry, both in the Army and in civilian life, were recognized through the awards he received and the conferences he was invited to address. His words reflected a passion for providing the best care possible for psychiatric patients, attention to challenges that accompanied the increasingly devastating weaponry of the twentieth century, and humility in his collaboration with colleagues. Among Colonel Glass's many awards were the Bronze Star (1945), the Legion of Merit (1951), the Gorgas Medal (1959), the Army Commendation Medal (1961), and the Oak Leaf Cluster (1963).

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### Notes

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by *Robert B. McLean*

## LEONARD D. HEATON 1902–1983

### INTRODUCTION

Leonard Heaton was one of the finest surgeons the Army Medical Department has ever produced. Technical excellence brought him the opportunity to prove his leadership, which he did on the tragic date of 7 December 1941. Administrative talents in a senior Regular Army physician were too important to waste during the war, and he learned much from his time commanding a general hospital and a hospital center. Recognizing a leader's responsibility to be a clinician, he renewed his surgical education, and passed the general surgery boards as a colonel and Chief of Surgery at Letterman General Hospital. His leadership and clinical excellence made him a natural commander at Walter Reed General Hospital, where he operated on President Eisenhower and led the Army Medical Department into medical diplomacy. As Surgeon General, he led the Army Medical Department from 1959 to 1969, including the bloodiest years of the Vietnam War, before retiring with 43 years of Federal service.

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## THE EARLY YEARS

Leonard Dudley Heaton was born on 18 November 1902 in Parkersburg, West Virginia, to a devout Baptist family. His father was in insurance, his mother's family had a floral business, while his paternal grandfather was editor of the local morning newspaper. His upbringing was very religious and strict, and his brother, a Baptist minister, became one of the most powerful leaders of the church in North Carolina.

As a high school sophomore, he transferred to Lansing, Michigan, where he graduated from the local high school. It was there during World War I as a student, while working in a drug store behind the soda fountain, that he developed his initial interest in medicine. No one in either his father's or mother's family had served in either the military or had ever been a physician. The old pharmacist in Lansing talked medicine to him by the hour, and, before long, medicine became Heaton's life's dream. In 1919, he entered premed at Denison University, Granville, Ohio, and in 1922 he entered the Louisville School of Medicine, Louisville, Kentucky, graduating in 1926, and was inducted into the Alpha Omega Alpha Honorary Medical Society.

Never wealthy, a decision to marry led Heaton to investigate how, as an intern, he could support a wife. Army internships were relatively new and paid \$263 a month—a relatively good income in 1926. Thus, two weeks following graduation, he married Sara Hill Richardson, who was ever at his side to charm generations of military medical officers. One month later, in August 1926, he entered the second intern class at Letterman General Hospital, San Francisco, California.

As it is today, the Medical Corps of 1926 was a completely volunteer force. Heaton's orders read that, as 1st Lieutenant, Medical Corps Reserve, at the end of one year he would either join the Regular Army or be released "forthwith" from active duty. Applying for a Regular Army commission, he was required to meet a rigorous selection board and be directly questioned and graded upon his internship performance. In 1927, he became a Regular Army 1st Lieutenant, Medical Corps; as he said, looking back, "a very proud moment." At Letterman General Hospital, he became interested in surgery and determined that he would actively pursue this specialty for the rest of his life.

In 1927, simply wanting to be a surgeon and becoming a qualified surgeon were many, many years apart. Initially, he was assigned for five months to the Army Medical School, a building that became the Walter Reed Army Institute of Research on the Walter Reed campus, where he was indoctrinated in entomology, parasitology, basic chemistry, and preventive medicine, since at least every seven years all active military medical officers could expect to serve in Panama, the Philippines, Puerto Rico, or Hawaii. His instructors were from the

Spanish American War era. Carlisle Barracks, Pennsylvania, was then the home of the Army Medical Department. Here, he underwent rigorous military training for six months. There were daily 26-mile rides by horse, including totally caring for his horse—the jeep of the day. Battalion/regimental drill or Division Aid Station classes and field maneuvers on the Gettysburg battlefield were required, and eventually a class rebellion ensued. So many members of his class decided to resign that the Surgeon General, Merritte Ireland, had to come up from Washington to convince class members of the importance of field training.

Remember that, in 1927, there was no obligation—no payback. General Heaton compared the year 1927 with later, saying, “We as students had received nothing from the government, no paid education, no paycheck. We stayed because we wanted to, and this was before the Depression of 1929, when physicians made very good money in private practice. There was hard-nosed discipline in the regular service, and they stayed ‘for pure love of the service.’” After 1929, and until World War II approached, military medical positions were greatly sought and always oversubscribed; the services could pick and choose, and promotion was very slow. It would be noted that most of the senior regular World War II medical leaders were originally trained in the 1920–1930 Army internships, and the strict field environment provided by the Army programs developed in Washington, DC and Carlisle, Pennsylvania.

Following a short assignment to Fort Knox as a general medical officer, he was assigned to William Beaumont General Hospital to spend a year in the surgical service. This was on-the-job training: a preceptorship. He spent his year in septic surgery, an experience in preantibiotic days, and urology. He describes his time as, “It was sort of a teach yourself what you’re supposed to do, the best way you knew how.”

Heaton hoped to go to Gorgas Hospital, Panama, for formal surgical training; but, this did not happen, and he was ordered instead to Schofield Barracks, Hawaii, again as a general medical officer. As the years passed, he was eventually transferred to Tripler Hospital in Hawaii, and there he began to play golf with a Colonel Robert Patterson. During his golf games, he would often mention his great desire for surgical training. In time, Colonel Patterson returned to the mainland and was selected the Army Surgeon General. Soon thereafter, orders came assigning Heaton to Fort Sam Houston, San Antonio, Texas, for surgical training. In 1932, the current Brooke Hospital had opened in 1908. Now began the second period of Heaton’s life—his training as a surgeon.

At Fort Sam Houston, he studied and practiced surgery under Lieutenant Colonel (later Major General) Raymond Bliss. He and Bliss wrote an interesting paper on 2,100 appendectomies performed over a period of 69 months—a rate of 30 cases a month for five and three-quarter years.

In 1933, Heaton's only child, Sara Dudley, was born. From 1932 to 1937, he trained under Bliss. When reassignment orders reached him, sending him to Fort Francis E. Warren, outside Cheyenne, Wyoming, he felt that he was "being banished." When he arrived at Fort Warren in January 1937, the temperature was  $-20^{\circ}\text{F}$ . He knew he had to meet a new challenge, serving the 1st and 20th Infantry Regiments and the 76th Field Artillery. He worked daily in this old 175-bed hospital to serve his new patients. Most of his friends there, he reflected, were either captured or lost in the Philippines during the early days of World War II.

In late 1937, he was required to appear before an actual promotion board where he was questioned in detail on military and medical subjects. Finally, after nine years as a captain, he was promoted to major. A military medical career officer at that time might expect promotion to major at 10 years, lieutenant colonel at 20 years, and colonel at 26 years of service.

In 1940, he returned to Hawaii where he became Chief of Surgery at the hospital at Schofield Barracks, at that time larger than Tripler General Hospital. The same fortune that sent him to Hawaii sent his later close friends, Majors (later Brigadier Generals) James Gillespie and Jack Schwartz, to the Philippines, Bataan, the Death March, internment, and eventually brilliant postwar professional careers in internal medicine and urology.

The times were quiet, and there had been seven reassignments in ten years when, on 7 December 1941 at 0800 hours, Heaton was confronted with a situation which only his long years of training and self-discipline prepared him to manage. While leaving his quarters near the Schofield Station Hospital, he saw a threatening aircraft flying very low and with flashing edges of the wings that reminded him of our country's unpreparedness for war. A .50-caliber Japanese bullet, later recovered from the palm tree behind which he had thrown himself and his wife, became a memento of that occasion.

## WORLD WAR II

War had come and, as Acting Commander and Chief Surgeon of the largest Army medical facility in Hawaii, Major Heaton reacted decisively and quickly before the casualties appeared. His now-favorite palm tree was across the street from the hospital, and he immediately cleared the hospital beds and assembled his surgical and triage teams. Twenty-four hours and over 200 operations later, he stood watching the sunset, not completely sure of what had occurred, yet inwardly secure in the knowledge that his surgical teams had done their best.

Unfortunately, the principles of military surgery were not taught at that time in civilian institutions and similar errors may recur today. The surgical

results obtained at Tripler Hospital and the US Navy Hospital, Pearl Harbor, by hastily recruited civilian surgeons were such that President Franklin Roosevelt created an Investigating Commission, headed by Dr. Isadore Ravdin, Professor of Surgery at the University of Pennsylvania (later President of the American College of Surgeons and the first Army Medical Corps Reserve Major General) and Dr. Perrin Long, Professor of Surgery at The Johns Hopkins University. They were ordered to Hawaii to investigate the less than satisfactory surgical results in our war wounded. As an example, Tripler had 12 cases of gas gangrene in amputation patients due to tight primary wound closures performed by civilian surgeons. Significant in their report were the outstanding care and results accomplished at the Schofield Barracks under Heaton. Major Heaton had adhered to the principles of battle surgery, and had added the application of sulfanilamide powder into abdominal and surface wounds. This practice and its results justified Dr. Long's confidence in the local use of the drug and was followed by him recommending its widespread military use to President Roosevelt. The local use of sulfa during World War II developed from this episode, and it was not until the advent of systemic penicillin that our methods of treatment were modified. Dr. Ravdin and Major Heaton developed early the friendship and surgical camaraderie that were to associate them years later in a dramatic operation to save the life of President Eisenhower.

For the next six months, Heaton wondered about the fate of his two old friends, Jim Gillespie and Jack Schwartz, in the Philippines, while the armies of Japan marched closer and their navy again approached Hawaii, climaxing in the Battles of the Coral Sea and Midway. During this period, Mrs. Heaton and their young daughter were evacuated by ship to the mainland with other military families, evading a Japanese submarine posted between Hawaii and California. Hawaii was an island preparing for invasion, and Heaton was in the midst of the medical support. War did change promotion times and methods, so that by January 1942, he was a lieutenant colonel and soon received the first Legion of Merit medal awarded to a medical officer for his service on 7 December 1941.

Now seemingly identified as a man of action, resourcefulness, and clear thinking, during the summer of 1942, he was transferred to the continental United States, where he was to become Port Surgeon of New York Harbor, an assignment not much to his liking—a rest cure, if you will, from the active combat role he had been playing. He rested about 24 hours at this job before, aided and abetted by a friend in the Office of The Surgeon General, he was transferred to Woodrow Wilson General Hospital, in Staunton, Virginia, to act as Executive Officer. This hospital was one of the hasty cantonment types built for only World War II that were used for a generation.

By now, the Army Medical Department was rapidly expanding, with the inclusion of thousands of civilian physicians, and the tightly knit little Corps, as known to Heaton, vanished. Yet, the sense of continuum by the regulars remained, for they knew they would remain responsible for the future, when all others returned to civilian practice.

#### THE 160TH GENERAL HOSPITAL

Heaton remained at Woodrow Wilson from March 1942 until March 1944, now doing minimal surgery and principally learning to command a large hospital. In March 1944, he assumed command of the 160th General Hospital, then forming in Atlantic City, New Jersey. The unit consisted of persons from all over the United States rather than from a specific civilian hospital and was called a “scrambled” hospital. The 160th was given the Dennis Hotel for a headquarters and received its field training at Fort Dix. Patients were sent to the hotel for only minimal care. Within 60 days, the unit was to be prepared for overseas deployment. In late April, his unit, aboard the *Queen Elizabeth*, made an unaccompanied crossing of the Atlantic, hoping the Queen would continue her record of outrunning German submarines. Landing safely in Scotland, they replaced the 59th General Hospital at Stowell Park, outside Chichester, and about 50 miles west of London. The 59th moved to embarkation ports, for crossing to the continent.

Heaton’s hospital was designated as a neurosurgical center; yet, because Dr. Dwight Harken of Boston was on his surgical staff, it also became known as a heart center, with removal of the first foreign body from the heart during combat operations. Eventually, over 800 foreign bodies were removed, with a 20 percent return to duty rate. By June, his team was ready and, following the Normandy landing on 6 June, they were never rested again.

The 160th General Hospital was Heaton’s fondest wartime memory. It was a close group of professionals that worked well together; so well, in fact, that Heaton stood out as a superb leader, much to his regret. With the continued medical build-up, it was inevitable that he should be moved up. Now a full colonel, he was placed in charge of the 802nd Hospital Center, one of five hospital centers in England and Scotland. Controlling Southampton and southeast England, he was responsible for receipt and distribution of all casualties from the continent. The center contained 12 general hospitals, four station hospitals, and ambulance trains, for a total of 20,000 beds, and with an assigned strength of over 12,000 officers and men. His hospital center eventually cared for 57 percent of all US casualties evacuated to England, receiving 200 fresh casualties per day, and an additional 500 to 600 patients for in-transit care during their evacuation to the United States.

One day, General Eisenhower's personal physician, Colonel (later Major General) Howard Snyder, came to briefly visit his headquarters. Caught in a freak snowstorm, this brief visit was turned into a three-day stay. During this visit, a new life-long friendship was formed, which, years later, was also to contribute to the saving of President Eisenhower's life. Major General Snyder remained Eisenhower's personal physician throughout Ike's time as president; yet, gradually, as Snyder left the scene, Heaton assumed the role.

#### AFTER WORLD WAR II

The war over, Heaton needed a new assignment. His old friend and teacher Raymond Bliss (now the Deputy Surgeon General) had a special job for him. In conjunction with Colonel Michael DeBakey, then Surgical Consultant to The Surgeon General, Bliss had just begun the development of formal Army residency training programs, and Heaton was his choice to be Chief of Surgery at Letterman General Hospital. It was Bliss' and DeBakey's goal that the Army should never again (as in World War II) have to depend so completely on acquiring board-certified surgeons from civilian life, and should produce its own specialists and, eventually, its own consultants.

At this time, very few Regular Army officers were certified by the specialty boards; certainly Colonel Heaton was not. In fact, he liked to point out he did little actual surgery after 1942, and now, three years later, when others could sit back, retire, and feel proud of their wartime record, he felt "inadequate, ill-trained, and unqualified to accept the position." It should be noted that Heaton was one of the Regular Army's best surgeons, but most had been in command positions, few had taken board examinations, and some were returning from years in captivity. Heaton accepted Bliss' challenge to formulate a surgery training program, while simultaneously preparing himself for his own Board examinations.

Arriving at Letterman, he quickly formed a relationship between that institution and Stanford University, which existed until Letterman closed, and especially with Dr. Carleton Mathewson, Jr., its Surgical Professor. As General Bliss had taught him trauma surgery pre-World War II, Dr. Mathewson taught him surgery post-World War II. Heaton attended "Dr. Matty's" lectures, went to his Journal Club, dissected in his anatomy lab, and read-read-read. "Matty" operated with him and shortly a fully trained surgeon was reborn on the American scene. "Matty" had served in the Army, going into Europe with the Anzio beachhead landing, and operating under the most grueling wartime conditions. He had earned his right to be called a military surgeon.

Heaton passed his American Board of Surgery examination in 1948, at age 46, and the surgical training program at Letterman became secure. Colonel

Sam Seeley of Walter Reed, Colonel Clint Lyter of Madigan, and Heaton of Letterman all took their examinations at the same time, so that one of the three was the first board-certified surgeon in the Regular Army in 1948, with the other two right behind.

Following rapidly upon his successful accomplishment of surgical certification, Heaton was promoted to brigadier general, but was permitted by Bliss, now Surgeon General, to continue practice at Letterman. He became deputy commander as well as Chief of Surgery, until 1950, when he received his second star and assumed command of Letterman through 1953. During his period of command, the Korean War erupted on the scene. Thus, many of his residents moved into front-line surgical units, and Tripler and Letterman received the principal direct flow from the battle zone. During this period, he actively renewed his friendship with Dr. Ravdin, and was accepted as a member of the Pacific Coast Surgical Society and the Halstead Surgical Society. After nearly nine years at Letterman, Surgeon General George Armstrong called upon him to return to Washington to assume command of Walter Reed Army Medical Center.

#### WALTER REED ASSIGNMENT

Now began a period of very active surgery for Heaton, as he had agreed to command only if he had access to the operating rooms. General Armstrong gave his consent, and thus began a 16-year career in Washington and an association that made him forever a part of Walter Reed. Determined that his hospital should be second to none, he began an active campaign to make Walter Reed first among federal hospitals. This was aided, somewhat, by circumstances: first, the election of General of the Army Dwight D. Eisenhower as President of the United States; second, by the entrance of his old friend Major General Howard Snyder as Presidential physician; third, by the first-rate team of top specialists he assembled at Walter Reed; fourth, by the outstanding care he personally rendered to members of Congress; and lastly, the attention brought to him by the President's illness and its successful surgical outcome at Walter Reed. By the time he left Walter Reed in 1958, his hospital was known around the world, and the availability of this institute for care of our allies became part of our national policy. Walter Reed also became the principal medical facility for members of Congress and the Cabinet.

Eisenhower had met Heaton once at Letterman, and, after becoming president, only at his yearly physical examination, when Heaton greeted him at the hospital. There was nothing to suggest that a deep friendship would build over the years. On September 1955, Eisenhower, while visiting his mother-in-law in Denver, suffered a severe heart attack. He was admitted to Fitzsimons General Hospital for care, but Howard Snyder was immediately on the phone

to Heaton to plan the president's continued treatment and eventual return to Washington. Heaton immediately dispatched Colonel Tom Mattingly, chief of cardiology at Walter Reed, who, in cooperation with Dr. Paul Dudley White, managed Eisenhower's recovery, and the president returned six weeks later to the White House. Ike received his follow-up care at Walter Reed, and many nationally circulated photographs show him visiting the hospital. This was the first time the national press became aware of Heaton.

Eisenhower was anticoagulated following his heart attack. On Friday, 8 June 1956, Heaton's most difficult 24-hour period began. While vacationing at a friend's home along the Rappahannock River, he was called by General Snyder and told to report immediately to Washington, as the president was quite ill and needed him. A small plane was sent and was forced to land in an open field, since there was no available airport. By 1 pm, he was being rushed by police escort through the streets of Washington to Walter Reed, where the president had been taken.

General Snyder had cared for the president's painful abdominal bouts for years, and these were normally relieved by an enema, but not this time! Ike had had a previous appendectomy as a young officer, and only a short time earlier on an X-ray, Heaton had made the diagnosis of regional enteritis. How fortunate for the United States that Crohn had not described this entity years before, because today Ike would be considered unfit for military service. Upon examination, Heaton had no doubt that the president was suffering from intestinal obstruction. Ike's life was at great risk, especially now, only nine months following a severe heart attack. To operate upon a sitting President of the United States is a rare medical event, especially in view of Ike's decision to run for a second term in spite of his heart attack. This knowledge was known only to a few individuals, and Heaton was one.

As the patient was being resuscitated and stabilized, Heaton summoned his surgical team. Dr. Isadore Ravdin came immediately from Philadelphia, as did Dr. Brian Blades, Professor of Surgery at George Washington University, and Dr. John Lyons of Washington, all close friends and colleagues. Heaton's regret was that Dr. Mathewson was in California, too far to be called. Each arrived, gave his opinion, and were in agreement. When asked how he felt as he prepared to operate on the Commander-in-Chief, Heaton said, "He, by this time, was no longer just the Commander-in-Chief but also the President and he was a friend." By Heaton's definition, operating on a friend is the most difficult of challenges. Their relationship had changed during Ike's visits to the hospital following his heart attack.

At 1 am, 9 June 1956, faced with a president who might bleed from anticoagulation and only nine months from a severe heart attack, the operation

began, with Dr. Ravdin acting as first assistant. Heaton had, by this time, become the first military member of the American Surgical Association, a prestigious honor. His operation on the president lasted only 1 hour and 54 minutes, yet a litany of “Monday morning quarterbacks” pounced upon the team as soon as the surgery was completed, debating what was found as well as the surgical decision. They had found a burned-out regional enteritis with an area of thickened, contracted bowel in the terminal ileum, with proximal distention. Ileotransverse colostomy in continuity was performed. This functioned well throughout the president’s life, and the findings years later, at postmortem, revealed the old area of regional enteritis and the patent bypass. Ike never suffered from his problem again and was on a normal diet for essentially the remainder of his life. General Heaton and the president were meticulous in informing the public about his condition, and Heaton reported the case fully at a meeting of the Southern Surgical Association.

Following surgery, when most surgeons might withdraw and relax, Heaton was obliged to face a national press conference. Here, he was confronted with such questions as, “Can he run again?” Heaton’s answer of “yes” put the nation’s fears at rest. Heaton liked to note that Ike signed 107 bills while convalescing for 21 days. The surgery was followed by a warm friendship between the two families that continued until Mrs. Eisenhower’s death. Both couples, their wedding anniversaries within a few days of each other, subsequently spent these times together when they could, either directly or by phone.

Later, Heaton was to care for General of the Army and Secretary of State George C. Marshall, whose home he later occupied at Pinehurst, North Carolina. He performed surgery on Secretary of State John Foster Dulles and cared for him until his death from carcinoma of the bowel. In September 1956, President Somoza of Nicaragua was shot by an assassin. President Eisenhower immediately sent Heaton and a surgical team to his side, but, unfortunately, surgery could not save his life.

General Omar Bradley also became a friend as Walter Reed Hospital cared for his first wife during her last days. Heaton eventually knew, cared for, or was associated with most of the five-star generals of World War II. At this time, he was also caring for the family of then Vice President Richard Nixon. His patients’ names read like a who’s who of Congress: Representatives Mendel Rivers and Edward Hébert, Senators Richard Russell, John Stennis, Robert Taft, Jr., Strom Thurman, Henry (Scoop) Jackson, and John McClellan.

In 1955, a new Surgeon General was to be appointed, and many felt that Heaton would be appointed by the president. President Eisenhower, however, selected Major General Silas B. Hays, then Deputy Surgeon General, when

Heaton expressed his desire to remain at Walter Reed. This allowed Heaton to build Walter Reed to its position of eminence and to be available to care for the president, while establishing himself as a nationally renowned physician. His surgical stature has never been surpassed, and undoubtedly was the reason for his subsequent tenure of 11 years, beginning in 1959, as the Army Surgeon General, having been appointed by two Republican and two Democratic presidents. He truly proved that medicine knows no politics, to the greater good of the country and its armed forces.

Now, for the first time in years, Heaton could not operate every Monday, Wednesday, and Friday. Yet, throughout his time as Surgeon General, the resident surgical staff at Walter Reed could always count on a first-rate assistant at least once a week. He was always ready, over a post-op cup of coffee, to review cases and discuss battle surgery and its principles.

#### THE FIVE PILLARS

When Heaton became Surgeon General, he outlined what he called his five pillars of military medicine:

1. The Art of Medicine: direct patient care, including curative and preventive medicine
2. Field Medicine: particularly combat readiness, and combat research and development
3. Medical Education and Training
4. Medical Research and Development
5. Medical Administration and Management.

He always felt that every military medical officer should have a basic knowledge of each pillar and that the Medical Corps can only be effective if all five elements are strong. Therefore, all elements must be actively enhanced and specialists maintained in each area. His mission was always “to care for the soldier and his family.”

Heaton emphasized that field medical experience with the Army should begin early. “I thought that, if we could get these young officers out of the general hospital system where we were training them, and give them a taste of the real Army which we see on the various posts of this country, we could retain them much more effectively than having them stay in the locality of the general hospital, where they had no contact whatsoever with the Army or Army life.”

Under Heaton, the MUST (medical unit self-contained, transportable) hospital was developed and first used in combat. Under his leadership and organization, Congress was persuaded to fund and build 17 new major Army

hospitals; five additional hospitals were under construction, and funds to start the new 1,200-bed Walter Reed were obtained—twenty-three Army hospitals: what a magnificent legacy for future patient care!

Possibly no Surgeon General ever tried so long to retire as did Heaton. Neither Congress, the Administration, nor world circumstances seemed to permit him to do so. In 1963, as things began to heat up in the Republic of Vietnam, it was important to have as a friend the government of Thailand. One evening, Heaton was requested by the Secretary of State to fly, in secret, to Thailand to care for its dying Prime Minister. Although he went in secret, the Thai government made widely known to their nation the gesture of the United States in sending General Heaton, President Eisenhower's physician, to care for its leader. Although the Prime Minister died, Heaton was awarded Thailand's highest military award. He was asked to establish a surgical and nursing program in the Royal Thai Military Medical College. This he did, thereby establishing bonds of goodwill between Thailand and the United States that were only disturbed by the fall of the Republic of Vietnam. In 1959, Heaton became a lieutenant general, the first physician ever so designated. The grade was created only for him, and all future Army Surgeons General were to revert to major general. With the assistance of Representative Mendel Rivers of South Carolina, a bill was subsequently passed placing all three surgeon generals at the three-star level. Heaton was given the pen used to sign this great forward step for all service medical departments.

The year 1962 saw the United States go to DEFCON 3 and face the Cuban missile crisis. Without doubt, we were prepared to move militarily, and the Army Medical Department mobilized rapidly in Florida. Colonel (later Lieutenant General) Charles Pixley was selected by Heaton to command the medical units so mobilized. Fortunately, they were never needed; yet, this marked only the first of many commands given Pixley by Heaton. Later, the 68th Medical Group in Vietnam and the Medical Field Service School, Fort Sam Houston, would follow.

In 1964, Heaton was alerted to a new surgical situation. The Secretary of the Army asked him to call upon General of the Army Douglas MacArthur (who Heaton had previously known) and specifically examine him. Heaton was shocked to see MacArthur markedly jaundiced and with a very severe debilitating pruritus. Furthermore, he had bilateral indirect inguinal hernias "clear down to his upper thighs that contained much of his intestinal contents." Prevailing upon MacArthur to return to Washington for surgery was very difficult due to MacArthur's strong feeling about politics, the events of the Korean War, and the Washington scene. Eventually, he came to Walter Reed and underwent a cholecystectomy and common duct exploration, performed

by Heaton with the assistance of Brigadier General Thomas Whelan and Major Gary Wratten, a Walter Reed resident. In 1966, the latter was to be the first American military physician to die in combat in Vietnam, and the annual Gary Wratten Surgical Seminar was founded at Walter Reed by Heaton in his memory. Stones were found in both the left and right hepatic ducts and in the gallbladder and, as Heaton said, “clear down to the duodenum – never saw anything like it.”

MacArthur did exceptionally well; his jaundice cleared, the pruritis vanished, and just when it appeared that this grand old soldier would survive, he suddenly bled from varicosities, necessitating a splenorenal shunt. MacArthur was described as a courageous and cooperative patient throughout. Unfortunately, when all again seemed to be resolving, he obstructed 11 feet of intestine located in his hernia. Although he survived the resectional surgery, it was all too much for the stout old soldier, and the nation mourned the passing of another national figure. General of the Army MacArthur’s last known request was passed to President Johnson by General Whitney. He had said, “I have seen many units of many nations in action, but I have never seen one to surpass in cohesion and efficiency that which has been administered to me under General Heaton. The doctors, nurses, and corpsmen have been magnificent. I shall urge General Wheeler [Chairman of the Joint Chiefs of Staff] to confer upon General Heaton an Oak Leaf Cluster to his Distinguished Service Medal when I see him Tuesday.” MacArthur’s exact words were transcribed for President Johnson directly to the citation of the Distinguished Service Medal, one of four Heaton received during his career.

In 1965, Sir Winston Churchill died, and Ike was asked by Lady Churchill to come to England. This was to be Ike’s last return to England, and Heaton went along with his friend. Ike had had a mild stroke and was afraid he might not speak clearly over the radio to the people of England and the world. He delivered one of the most memorable of memorials. As the years went by, Heaton operated upon his friend on two other occasions, once for a cholecystectomy and during his last hospitalization for intestinal obstruction due to an adhesion. This last operation followed Ike’s fourteenth cardiac arrest. At the end, Heaton was Ike’s window to the outside world, and he visited daily to report on Washington. Ike survived nearly nine months at Walter Reed, but eventually succumbed to heart failure. General Heaton was selected as an honorary pallbearer, along with the General of the Army, Omar Bradley, Generals J. Lawton Collins and Alfred Grunther, Admiral Arthur Radford, and Ike’s brother Milton. Due to the funeral, Heaton was forced to send his regrets to the Royal College of Surgeons that he could not attend their annual meeting, at which he was to have become an honorary fellow. He did accept that singular honor one year later.

## CONCLUSION

I have specifically avoided discussing Heaton's activities in conjunction with the war effort in the Republic of Vietnam, and our massive medical involvement from the earliest days of 1963 to his retirement in 1969, at the height of our involvement, since that story would represent a lecture in itself. Suffice it to say that Heaton made this action into the most successful military medical effort to date in world history. I would prefer, rather, to speak of him as a combat surgeon. I was fortunate to be assigned to the 93rd Evacuation Hospital in the Republic of Vietnam in 1966, during a period when Heaton's son-in-law, Major Preston Mason, was our radiologist. General Heaton, each year during the conflict, visited all of our combat hospitals and made bedside rounds, both to teach and to learn first-hand what was needed. I well remember him at the soldier's bedside, his warmth, his interest, and also his complete relaxation in returning to his first love—combat surgery.

After his final retirement in 1969, upon completion of 43 years of active federal service, General Heaton had another love to which he was devoted. Working closely with Representative Hébert of Louisiana, he was influential in the legislation to establish the Uniformed Services University of the Health Sciences (USUHS), which was finally approved by Congress. Since the University's inception, he served as a regent, and was highly instrumental in securing his long-time friend, fellow surgeon, and consultant to the Army Surgeon General, Dr. Tony Curreri, as the first president. His guidance as to curriculum, purpose, military medical philosophy, and steadfastness of support has been a significant reason that USUHS is what it is. Congress established the Heaton Fund for Surgical Excellence at USUHS to promote surgical studies. The surgical professorship also bears his name. General Heaton looked forward to the day when the first USUHS graduate rose to become the Surgeon General of one of the services, and I suspect that he quietly hoped it would be the Surgeon General of the Army. Lieutenant General Heaton died 10 September 1983 at Walter Reed Army Medical Center.

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by *Daniel W. Gower, Jr.*

## SPURGEON HART NEEL, JR. 1919–2003

### INTRODUCTION

Spurgeon Neel is best remembered as a U.S. Army aviation medicine pioneer. His programs, innovations, helicopter modifications, and procedures were crucial to the establishment of aviation medicine, resulting in the rescue and evacuation of soldiers from the battlefield, helping to reduce casualties and giving hope to many wounded soldiers. Neel was a man of few words and strict adherence to the rules. However, he was a caring, concerned commander and leader. He loved to be with the soldiers and understand what they were charged with accomplishing on a day-to-day basis, so he could better serve their medical needs. Neel was a man of great insight and vision. One of his lasting contributions was his complete mastery of the medical requirements necessary to design, build, and deploy the new utility helicopter destined to radically change medical evacuation on the battlefield. His work in the staffing and approval of design requirements for the UH-1 “Huey” left an indelible mark on the lives of countless soldiers wounded in the Vietnam War.

### EARLY YEARS

Born on 24 September 1919, in Memphis, Tennessee, to Spurgeon H. Neel, Sr. and Leola Pearl Neel, Spurgeon spent his childhood in Memphis and graduated from Messick High School. While attending Messick High School, Spurgeon was active in the Junior Reserve Officer Training Corps and became interested in a military career. He was named the outstanding cadet in the city of Memphis, the first from his small high school.

Spurgeon entered Memphis State University, where he studied pre-medicine subjects, planning to become a U.S. Army officer. In 1939, during his college years, he met and married Alice G. Tortl of Memphis. The couple was blessed with two children, Spurgeon Hart Neel III and Alice Leah Neel. Neel received his medical degree from the University of Tennessee, College of Medicine, and completed his internship at Methodist Hospital in 1943.

#### JUNIOR OFFICER

Following his internship, Neel entered military service. He completed a three-month residency program in radiology at Santa Ana Army Air Base, California, in 1944 and served at three Army Air Force bases from November 1943 until August 1944. Sent to Europe, he was assigned to the 69th Infantry Division and commanded a medical company attached to a regiment. The 69th fought for 86 days in the Rhineland and Central Europe campaigns, advancing quickly against patchy German resistance, and met the Russians on the Elbe River. He particularly recalled one episode:

I was on the wrong side of the Remagen Bridgehead, and I was stuck there with a regiment as the collecting company commander for three days and it was only 150 yards [across the river to ambulances]. Boy, with helicopters we could really have taken care of these guys. As a result they went into the German hospitals there and they got amputated. The Germans didn't have the antibiotics. We were furious. We thought they were mutilating our soldiers. Then we looked into their wards and they were amputating their own. That's all they had. They used toilet paper for bandages.

As a junior officer, Neel was retained in the Army as longer-serving men were demobilized. He became surgeon of an antiaircraft battalion, was assigned to the 57th Field Hospital, and was surgeon of the 1st Constabulary Brigade during the military government of Germany. In spring 1947, Neel was rotated home and took command (as a major, but during an extreme shortage of medical officers) of the 30th Medical Group, then at Fort Benning, Georgia. He left the service for six months, then returned and—still a major—was briefly chief of surgery and chief of medicine at the Fort McPherson Station Hospital.

Neel had served with Army Air Force units, but his real time in aviation medicine started when he was assigned as the division surgeon to the 82nd Airborne in October 1949. Having earned his parachute wings in 1949 at Fort Benning, Neel developed what he valued most—rapport and credibility with those he served and treated. He joined the 82nd Airborne Division wearing Glider Wings, but those meant nothing to the paratroopers of the division, and,

as a result, he was not invited to meetings and often was left out of decision-making. Scrambling to get enough money to attend any training in that period between wars was no different then than now. He relied on then Lieutenant Colonel William Westmoreland to get the funds for him to attend jump school at Fort Benning. In his own words, when he returned to Fort Bragg with his shiny new wings, he suddenly became a medical expert in all things airborne. From then on, everything was “downhill.” Even though he was outranked by other Medical Department officers on the division staff, he was still the division surgeon—airborne-qualified—and they reported through him to Lieutenant Colonel Westmoreland and the division commander, Major General Hickey. He also became “clannish,” as he reported in his article, “The Airborne Soldier,” stating that he really “didn’t enjoy jumping out of airplanes, but he sure liked being around people who do.”

Early in his career, Neel’s passion became aeromedical evacuation, developing and implementing the procedures and equipping the helicopters that would carry out the missions. In 1949, an early responsibility as the division surgeon was chairing a board that conducted tests and made recommendations about medical evacuation by helicopter. The board concluded that helicopter evacuation was both feasible and desirable, and made specific recommendations concerning further development.

After his tour with the 82nd, Neel became the first Army graduate of the U.S. Air Force School of Aviation Medicine at Randolph Air Force Base, Texas, in March 1951 and graduated from the Command and General Staff College. He started early writing about activities in his field of expertise. He wrote five articles about airborne medicine while with the 82nd. One article, evaluating the problems of jump refusal and jump injury, received the Louis Livingston Seaman Award from the Association of Military Surgeons of the United States as the best military medical essay of the year.

As Chief, Field Medical Service Branch at the Medical Field Service School during 1952–1953, Neel developed the procedures, based on the Korean War experience, that led to the establishment of helicopter ambulance medical detachments and recognition of helicopter evacuation as a medical mission. These teams are still the basis of today’s helicopter ambulance companies.

In early August 1953, Neel was sent to Korea and was briefly the chief of operations for the Eighth Army Medical Section; this was as Operation Big Switch brought back over 3,000 American prisoners of war, with more than 1,000 of them as patients. After six weeks, he returned to commanding the 30th Medical Group, now in Korea, and handling the hospitals and rear-echelon medical units in Korea. The fighting was over, but there were still several divisions in case the Communists attacked again.

In 1953 and 1954, Neel developed the first helicopter ambulance company on a provisional basis and molded it into an effective, functioning unit. The operating procedures he established for that unit are the basis of today's operations. During that Korean tour, Neel published "Medical Considerations in Helicopter Evacuation" in the *U.S. Armed Forces Medical Journal*, which established a basis for integrating helicopter evacuation into medical service operations. He followed up with five articles on aviation medicine and medical evacuation during 1954–1957, including one in a nonmilitary journal, taking his expertise to a larger audience. The articles explored various facets of aviation medicine and medical evacuation, establishing his credentials as an expert and showing his enthusiasm for the subject. They also showed how important he thought rapid evacuation was for the patients.

In 1954, Neel established the Eighth Army Aviation Medicine Program, the prototype of today's Army-wide program. On 10 June 1954, he received the Military Occupational Specialty of 3160 (Army Aviation Medical Officer), the first medical officer to do so. He would also write three articles on the Eighth Army's overall medical program.

#### ASSIGNMENTS IN WASHINGTON, DC

Reassigned back to Washington, Neel had various staff assignments. He was briefly in the Hospitalization and Operations Division at the Office of The Surgeon General. Then, an aviation section was created, and he became the head through 1955. He briefly worked on physiology and pharmacology research, but he was too important to the medical aviation program and was brought back. As the Medical Department's aeromedical evacuation expert, in January 1955 Neel was the obvious choice to serve on the Department of the Army board that conducted design competitions to select the new standard Army utility helicopter. Each proposal was subjected to complete medical evaluation before consideration of other functions and factors. Of roughly one dozen competitive proposals, the Bell candidate was selected. This aircraft ultimately became the UH-1 "Huey."

In 1956, Neel established and became the Chief of the Aviation Branch Medical Plans and Operations Division, at the Department of the Army level. There, he was instrumental in establishing flying status for aviation medical officers. (On 20 September 1955, he had become the first aviation medical officer to receive flying status. He designed and justified the Aviation Medical Officer Badge, and, on 28 May 1957, was the first person to be awarded the badge.) Neel established the formal program for board certification of Army medical officers in aviation medicine and was then the first Army student to matriculate in the specialized aviation medicine program.

Neel achieved a Master of Public Health degree from the Harvard School of Public Health, cum laude, in 1958 in military survival medicine. The degree program was used as the basis for medical instruction at the Strategic Air Command Survival School and military jungle survival training in Panama; it was also translated for use by several Latin American countries.

#### DEVELOPING ARMY AVIATION MEDICINE

In 1960, Neel completed a residency program in aerospace medicine at the U.S. Air Force School of Aerospace Medicine and became a Diplomate of the American Board of Preventive Medicine for his work in aviation medicine. He would ultimately become a Fellow and Vice President of the American College of Preventive Medicine, a Fellow and President of the Aerospace Medical Association, and a Fellow of the International Academy of Aviation and Space Medicine.

During his 1960 through 1964 tour of duty at Fort Rucker, Alabama, starting in the aviation medicine department in the hospital, Neel further added to contributions in the area of aeromedical evacuation by developing the crash rescue Operation Flatiron into a highly sophisticated system. The system has served as a model for such rescue operations Army-wide and is now used throughout the United States in civilian applications.

As post surgeon and hospital commander at the U.S. Army Aviation Center, Fort Rucker, Alabama, from 1961 to 1964, Neel established the U.S. Army Aeromedical Research Laboratory, became the first director of the Department of Aeromedical Education and Training in the U.S. Army Aviation School, and established the formal Aviation Medicine Consultation Service. In addition, he coordinated the design and initiated construction of Lyster Army Hospital, which has a specialized aviation medicine capability. He received the McClellan Award in 1962 from the Army Aviation Association of America for his work in aviation safety.

Neel clearly had a future as a senior leader, and he was sent to the Industrial College of the Armed Forces in 1964. There, he studied management and wrote his thesis on management aspects of the Department of Defense blood program. He also found time to earn an M.S.B.A. from George Washington University, receiving his degree in 1965.

#### TWO TOURS IN VIETNAM: 1965–1966 AND 1968–1969

Neel's professional skills were coupled with his broad and varied command and staff experience during his two tours of duty in Vietnam, in positions of extreme responsibility, and enabled him to participate in the major decisions regarding medical support of the allied forces. From 1965 to 1966, he was the

USMACV (U.S. Military Assistance Command, Vietnam) Surgeon and Senior Adviser to General Westmoreland. During 1968–1969, he returned to Vietnam and served as commander of the 44th Medical Brigade; Surgeon, USARV (U.S. Army Vietnam); and subsequently, as Surgeon, USMACV.

As surgeon, USMACV during 1965–1966 (under his old friend and mentor William Westmoreland), Neel developed requirements for and coordinated introduction of medical air ambulance units during the buildup. He established initial operating and medical regulating procedures, and established the Saigon branch of the Far East Joint Medical Regulating Office, which managed patient movements within and from the Republic of Vietnam.

Neel coordinated the U.S. Army aeromedical evacuations for the all supported forces and Vietnam civilians. Neel described this in an article, “Army Aero-Medical Evacuation Procedures in Vietnam,” with implications for rural America. The resulting Military Assistance for Safety and Traffic program used many of the procedures developed in Vietnam and became a prototype for life-flight programs across the United States.

Neel also lectured on Army aeromedical evacuation at several major medical and civic organizations at local, state, and national levels. By mid-summer 1967, it was apparent that the helicopter’s impact on field medical doctrine and organization was not transitory. The near-exclusive reliance on the helicopter ambulance had virtually eliminated the battalion aid station (and often the division clearing station) from the chain of evacuation when a hospital was within the same flying time.

Many medical officers with combat experience in Vietnam agreed that relying on helicopters would not be unique to Vietnam and that the fundamental system needed to change. A hundred physicians were interviewed in the field, often under combat conditions, for their recommendations; their reports were analyzed, along with the critiques that had been solicited over the previous two years. It was apparent that realignment of personnel and organization was needed for more efficient use of medical assets. The consensus was that there were too many physicians in tactical units to fully utilize their talents. The 1st Infantry Division tested a new organization for six months from October 1967, and the conclusion was that the number of physicians in a division could be reduced from 34 to approximately 12 without impairing the quality of medical care available to the troops. Several unit surgeon positions were eliminated, and the medical battalion was moved from the support command to division control, with the infantry battalion medical platoons under its direct command. Thus, the medical battalion commander controlled all medical resources. The test was important, but not adopted by all units. Exact utilization of medical officers varied with each division and brigade;

but, by the end of 1970, all were operating under the general concept that physicians should not be assigned to combat and combat support units.

Neel concluded that the preferred organization for employing and controlling military medical resources was the vertical medical command and control system, which reached its epitome in Vietnam. He maintained that medical service is an integrated system, with its treatment, evacuation, hospitalization, supply, service, and communications components. It is not a subsystem of logistics, nor a subsystem of personnel. He never changed his mind, either. Always a champion of the Army Medical Department, Neel firmly believed that the best manager and commander of the medical systems on the battlefield, as well as inside “brick-and-mortar” organizations, was and always should be a medical officer surrounded by quality medical service corps staff and allied science officers. His leadership in Vietnam was recognized with the Gary Wratten Award in 1967 from the Association of Military Surgeons for his contributions in field medicine.

Between his Vietnam tours, Neel had just two years back in the United States as director of Plans, Supply and Operations at the Office of The Surgeon General, from 1966 to 1968. There were many things to be coordinated. A building program was renovating some Army hospitals and building a new one per year; Congress was expanding the Dependents Medical Care Program; automatic data processing equipment (computers) was appearing in the supply system and in some hospitals; equipment was in short supply and had to be prioritized as the Army expanded for the war; the new Medical Unit Self-Contained, Transportable equipment had to be fielded; a hospital center was built in Japan to handle medium-term casualties from Vietnam. The budget increased 52% in those two years, and patients in Army hospitals in the United States roughly doubled. The medical supply system to Vietnam had to be overhauled, and President Charles DeGaulle had demanded that the United States remove all military forces from France in 1967. It was a busy two years for Neel.

Back in Vietnam as commander of the 44th Medical Brigade, Neel renewed the push for centralizing medical logistics under the commander, who is responsible for the health of the command. As he put it, “One must be responsive and responsible to those for whom he provides services.” He worked hard to wrestle the logistical support away from the 1st Logistical Command. As he put it, “We need 100% fill of supplies at the bedside all the way from Vietnam back to the States, and the logisticians are satisfied with 80% or 90% . . . if I reported that only 48% of the patients we had were being fully cared for, I’d have been fired. However, the commander of the 1st Logistics Command was able to report that 48% of his 2½-ton trucks were non-operational, and no big deal was made out of it.”

Neel knew how to play personalities, and biding his time for the right moment was one of his strong points. As the commander of the 1st Logistics Command rotated out, he saw his chance, got in front of then General Westmoreland, and got the Medical Brigade moved out from under the Logistics Command and brought under the direct control of the Army Headquarters in Vietnam. He then set out to make it work for those who needed it most, the wounded soldiers coming from the battlefields of Vietnam. But he was not only wrangling about logistics; he oversaw the range of the medical support, from preventive medicine to casualty care.

#### DEPUTY SURGEON GENERAL U.S. ARMY, 1969–1973

Neel had far different responsibilities in the United States. While combat in Vietnam would ultimately decline (although 1969 would be the war's bloodiest year for the United States), there were many wounded who needed long-term care—at a time when the Congress was expanding care for dependents. Drug use among soldiers also increased markedly, and many needed medical treatment. Medical care was advancing in other ways. For instance, the Army began organ transplants, and the planning and support of such new programs required oversight.

The end of the draft also caused substantial problems; the supply of medical professionals was no longer guaranteed, and they not only had to be recruited, but also they needed to be retained. This led to a number of programs to most effectively utilize medical personnel (for instance, widening the scope of non-physician administrators to free physicians), but also expanding graduate medical education. Because this brought in physicians to get the training, and required them to stay in the Army for several years after training, it helped, but it also allowed the Army to retain physicians in the teaching positions.

Medical practice was also changing, with physician assistants developing to handle less acute patients who needed professional care, but not the direct attention of a physician. There were also reorganizations in the Army, and Neel was the senior Medical Department representative on the committees.

#### COMMANDING GENERAL, U.S. ARMY HEALTH SERVICES COMMAND, 1973–1977

As one of the principal staff officers conducting the Steadfast Study, which ultimately resulted in the establishment of the U.S. Army Health Services Command, Neel was an ideal candidate to take command. Health Services Command took the general hospitals that had previously been under The Surgeon General and added the station hospitals that had previously answered to post commanders; now all medical facilities (including dental and veterinary)

would be under a single commander. Neel now had the flexibility that a medical commander enjoyed when medical resources were at his or her call.

Health Services Command would be the pinnacle of Neel's Army career. Here, he was not only responsible for health care, but also he could be responsive. Neel's highest priority was always the physician and other health care providers being available, trained, and responsive to the needs of their patients—regardless of the situation. He took that responsibility to heart when it came to planning and informing his superiors about how he envisioned taking care of the soldiers and their families. Neel knew the system, and he knew how to make it work—not just for him, but for “our patients,” as he put it.

Even while he was commanding hospitals in the United States, Neel knew how he affected soldiers in the field. He was acutely aware that the soldiers in combat relied on his hospitals for medical care of their buddies. He knew their morale was higher, knowing that if they were to be injured or wounded, the same speed and efficiency would be applied to their case as was applied to their brother's. Neel knew this also applied at home when a mother took her ill child to the clinic; he wanted the best of care to be provided by able, well-trained physicians, and adequately supported by efficient staff members.

Establishing a new command always has challenges, but Neel led through an exceptionally difficult time. Personnel were in short supply, but nobody wanted less medical care, and he did not want to have less care available. He reorganized where he could, closing Valley Forge General Hospital and opening Eisenhower Army Medical Center. He shifted as much care as he could to outpatient clinics, rather than inpatient hospitalization. He utilized both physician assistants and nurse practitioners, and roles for occupational and physical therapists were also expanded.

The Army was downsizing and closing posts, and many hospitals were scaled back to outpatient clinics. There was also an experiment with clinics manned by contractors, and more civilians were hired to replace military personnel. Efforts were begun to share resources with other federal agencies, not just other military services, but including the Veterans' Administration. Regardless, more care had to be obtained through the Civilian Health and Medical Program of the Uniformed Services. After the standard four years as commander of Health Services Command, at age 60, Neel retired from the Army with 35 years of uniformed service.

Neel always sought to be a responsive medical commander, protecting health where possible and healing where necessary, and he was dogged in pursuit of that goal. He wrote this about medical support in Vietnam, but it was his command philosophy:

To achieve maximum effectiveness and efficiency in medical service support, with the utmost economy in the utilization of scarce health care resources, there must be strong professional medical control from the most forward to the most rearward echelon. The commander of the medical command, regardless of echelon, should function as the staff surgeon to the responsible supported commander. Medical capability must not be fragmented among subordinate elements, but rather, centrally directed and controlled by the senior medical commander. No nonmedical commanders should be interposed between the medical commander and the line commander actually responsible for the health of the command. The wellbeing and care of the individual soldier must not be submerged in, or subordinated to, the system responsible for the supply and maintenance of his equipment. The issues involved are too great to risk failure or marginal accomplishment.

#### AFTER ARMY RETIREMENT

Neel's professional experiences after military retirement kept him deeply involved in medicine. He was a Clinical Associate Professor of Family Practice at the University of Texas Health Science Center in San Antonio, Texas, and a Patient Care Coordinator for the Bexar County Hospital District, with daily involvement in utilization review, quality assurance, and risk management. He was a Professor of Occupational Aerospace Medicine for the University of Texas School of Public Health in San Antonio. From November 1977 to May 1980, Neel maintained an active private practice in occupational medicine in San Antonio.

Major General Neel is memorialized in several appropriate places. The main building at the U.S. Army Aeromedical Research Laboratory at Fort Rucker, Alabama, is named in his honor. His work in establishing this great laboratory was instrumental in providing a national resource of academic and scientific pursuit of understanding the medical and physical demands on aviation personnel. At the U.S. Army Medical Department Center and School at Fort Sam Houston, Texas, the Major General Spurgeon Neel DUSTOFF Memorial Plaza is also dedicated in honor of his contributions to aeromedical evacuation of wounded and sick soldiers from the battlefield. At the center of the plaza is a UH-1 "Huey" DUSTOFF aircraft that stands in memory of the 214 DUSTOFF personnel killed during the Vietnam War. In 2001, the Neel Pergola was dedicated at the Army Medical Department Museum at Fort Sam Houston. This large structure houses aircraft used in the conduct of Army aeromedical evacuation over the years.

On Fort Sam Houston, just across the street from the Center and School, stands the U.S. Army Medical Department Museum. Major General and Mrs. Neel dedicated their postretirement lives to the establishment and endowment

of this museum. It was Neel's vision that young lieutenants and privates would be able to spend quality time at the museum while in their basic training courses, viewing their lineage and artifacts from military medicine. To that end, Major General Neel and Mrs. Neel donated thousands of dollars and countless hours of their time to ensure that this dream came true. Mrs Neel frequently volunteered in the museum gift shop.

## CONCLUSION

Major General Spurgeon Neel will be most remembered as the ultimate gentleman and the concerned commander who had few words to say, but each word was the result of careful thought. His pioneering efforts in the use of air ambulances, particularly helicopters, produced the world's most renowned lifesaving system known to the horrors of war. Countless lives have been saved as a result of brave men and women, and their carefully crafted and designed helicopters. In particular, the "Huey" left a mark on the prosecution of combat far more important than any single combat system yet developed. Neel's vision saw beyond the four-person crew and two-bladed rotary-winged aircraft and ensured that the entire support structure behind those brave DUSTOFF warriors was designed to maximize their efficiency through training, health care, and unit design. Although Neel did not love war, he loved those who had to execute the tasks associated with it, and he loved being around them.

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by *Jane C. Morris*

## EDWARD LOUIS BUESCHER 1925–1989

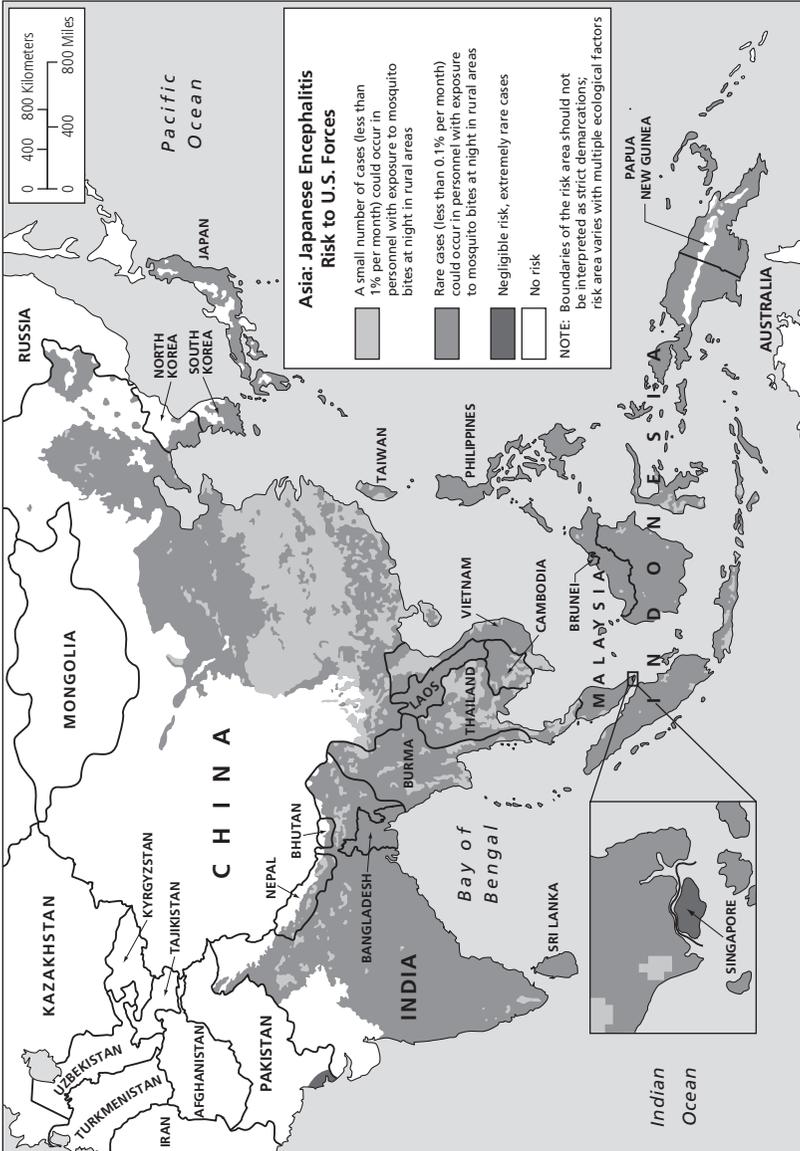
### INTRODUCTION

Edward Buescher was a doctor, soldier, and scientist known by his family, friends, and colleagues as deeply religious and interested in philosophy and nature. When he was young, he considered going into the priesthood, but the calling to science and medicine was stronger. Buescher's commitment to helping people, especially children, is evident through his determination to find vaccines for some of the most virulent diseases that plagued mankind throughout history. His research into the etiologies of Japanese B. encephalitis, rubella (German measles), and adenoviruses led to vaccines that protect our armed forces, as well as civilian populations worldwide.

Born 24 July 1925 in Cincinnati, Ohio, to Edwin B. and Geneva Summe Buescher, Edward spent his childhood observing nature and excelling at school. According to Father Eliot Nitz, civilian chaplain at Walter Reed Army Medical Center who spoke at Buescher's funeral, "He used to talk about going on the porch with his dog, Megan, appreciating and looking at the various seasons change." That sense of wonder shaped Buescher's personality and, according to those who knew him, grounded him in his faith and family. He married Elizabeth (Betty) L. Finsel on 19 June 1947. They had five children, three of whom became physicians. One daughter, Dr. Teresa Buescher, also served in the Medical Corps.

A view into Edward Buescher's family life can be seen through the words expressed in a homily after his death from kidney disease on 18 February 1989. While Buescher was a patient in the Intensive Care Unit at Walter Reed, Betty

Figure 1.  
Distribution of the threat to military operations outside of the United States of Japanese *B. encephalitis*.  
Illustration: Courtesy of the National Center for Medical Intelligence, Defense Intelligence Assessment, Fort Detrick, Maryland.  
Cartographer: Christopher Robinson.



Buescher was known to the medical staff as a tireless caregiver. As one staff member said, “No nurse could be paid enough to give the quality of your care.” One of the Buescher children described a scene that illustrated Mrs. Buescher’s determination to ensure that her husband followed medical advice: “Father said he didn’t know if he should tell me this. He was standing at the patient board on Ward 48 checking his list against the patients’ list when he heard a nurse’s aide tell the nurse captain that Colonel Buescher said he wasn’t going to physical therapy. The nurse captain said, ‘Wait until Mrs. Buescher comes; he’ll go.’ Later, guess who was pushing who down the hallway toward physical therapy with a scowl on his face?”

According to comments following Buescher’s death, Edwin and Geneva Buescher encouraged their son to excel in school and later paid for his medical education. Buescher graduated from the University of Dayton in 1945 and earned his medical degree from the University of Cincinnati, College of Medicine in February 1948. Later that year, he joined the Army Reserve and the Army Medical Corps in the Intern/Residency Training Program at Cincinnati General Hospital. He was assigned to a virus research team under Albert B. Sabin at the Children’s Hospital Research Foundation in Cincinnati. He completed his residency in virology in 1949.

Throughout his career, Buescher worked with other scientists, including Sabin, on the cutting edge of medical breakthroughs. In Japan and later at the Walter Reed Army Institute of Research (WRAIR), he focused on virus research, addressing diseases that American soldiers often encountered in Asia. He believed in collaborating with scientists at other institutions, sharing information that led to increased knowledge and faster development of vaccines. It is a testament to Buescher’s character that he was more interested in finding solutions than in taking credit for significant medical breakthroughs.

#### KOREA AND JAPANESE B. ENCEPHALITIS RESEARCH

At the outbreak of hostilities in Korea, Buescher was called to active service. He was assigned to WRAIR in 1950, where he continued training in virus research under Dr. Joseph E. Smadel. Buescher was promoted to captain on 14 May 1951. He was then deployed to Korea, where he earned a Bronze Star. After serving in Korea, Buescher moved to the Far East Command in Japan to study a virus that affected both civilian and military populations in large numbers. Japanese B. encephalitis (JE) is a flavivirus that causes brain inflammation and was a disease with major military importance, affecting the overall military fighting strength (Figure 1<sup>1</sup>). Transmitted by mosquitoes, it was endemic to Asia and the Pacific Islands during the mid-twentieth century and had infected U.S. troops during World War II.

JE posed specific problems for the Armed Forces. Lacking natural immunity, American soldiers who were deployed to Asia were susceptible to infection. Long-term effects of JE ranged from mild mood changes to severe neurological impairment. Although a crude vaccine had been developed by Dr. (Major) Albert Sabin at the direction of the Commission on Neurotropic Virus Diseases of the Army Epidemiology Board, it was only moderately effective and could cause troublesome side effects. Despite routine administration of the vaccine to U.S. forces in the Far East, JE continued to plague soldiers deployed to Asia.

Following an outbreak of JE in Korea between August and October 1950, the Army placed a priority on finding a more effective and safe vaccine. That year, three hundred cases were confirmed, and, of those, 201 were evaluated by medical teams. There were 19 fatalities. Sixteen bodies were sent to the 406th General Medical Laboratory for research. The knowledge gained through this research helped to form the foundation for later vaccination against JE. In addition, the procedures followed by Buescher and others at the 406th led to a reevaluation of policies that governed how epidemics were handled. Greater emphasis was placed on stopping the spread through animal vectors by increasing inoculation.

Buescher and W. F. Scherer (also stationed at the 406th) performed painstaking studies of the ecology of JE in both humans and animals. First Buescher and Scherer tracked the mechanisms that cause JE epidemics to occur. Then, they studied antibody response patterns of 99 patients with JE and found that, over a period of weeks, the antibodies increased in strength. It was five years before the effectiveness of the vaccine could be tested for long-term protection from JE.

#### WALTER REED ARMY INSTITUTE OF RESEARCH AND VIRUS RESEARCH

##### Rubella

Colonel Buescher returned from Japan and was assigned to WRAIR as chief of virology in 1951, where he focused on the rubella, or German measles, virus. Rubella, which means *little red* in Latin, was first identified as measles by German physician Friedrich Hoffmann in the mid-eighteenth century. Far less lethal for children and adults than regular measles, rubella can go unnoticed, and, if symptoms appear, they usually last one to three days. (Rubella is also called *three-day measles*.) However, rubella can severely affect unborn children. If a pregnant woman contracts rubella within the first half of her pregnancy, her child is at risk for congenital rubella syndrome (CRS), which causes birth defects. Epidemics of rubella occurred in Australia in 1940, in Taiwan in 1957, and reappeared in Europe and the United States from 1962 to 1965.

Throughout the 1940s, researchers found that there was a link between rubella during pregnancy and babies born with congenital diseases. In “*Congenital Cataract Following German Measles in the Mother*” (1941), Norman McAlister Gregg reported that the earlier in pregnancy a woman contracted rubella, the more severe were the effects on her baby. Buescher, Dr. Paul Parkman, and Dr. Malcolm S. Artenstein were given the difficult task of developing a vaccine that would inoculate both children and adults who had not been previously infected. Finding a control group for vaccine trials was problematic because rubella is highly contagious, and infected adults and children easily pass it along to pregnant women.

Before a vaccine could be developed, it was necessary to understand the etiology of the rubella virus. In 1961, a recruit from Fort Dix, New Jersey, was hospitalized with what was thought to be adenovirus, but upon examination, the rubella virus was present. A sample taken from this recruit formed the biological basis for research that Buescher, Parkman, Artenstein, and scientists from Harvard Medical School used to identify the rubella virus. After the virus was identified, the next stage was isolating the virus, which Buescher and Parkman accomplished in 1962.

The rubella epidemic in Europe and the United States from 1962 to 1965 amplified the drive for developing a vaccine. During 1963–1964, 30,000 infants (1% of all pregnancies in the United States) were affected by rubella, 6,250 miscarriages were attributed to CRS, and 2,100 neonatal deaths from the virus were reported.<sup>3</sup> Buescher and his colleagues continued to research the etiology of the rubella virus and found that the intrauterine form of rubella that was so damaging to unborn children was different from postnatal rubella. That discovery necessitated the process of isolating the intrauterine form of the virus and adding immunity to that form to the vaccine.

In 1967, Buescher became director of the WRAIR Division of Communicable Diseases and Immunology, a post he held concurrently with that of chief of the Department of Virus Diseases. In 1970, he was named deputy director of WRAIR, taking on additional administrative duties. During this time, 47,745 rubella cases were reported in the United States (Figure 2<sup>4</sup>). The difficulty of locating a safe control group for testing added to the delay after the virus was identified and isolated. A technique for examining the virus was developed at WRAIR. Rather than risk exposure of pregnant women to the virus from a human test population, green monkeys were infected, tested, and their kidneys used to develop cell culture. A vaccine was licensed for use in 1969.

Rubella outbreaks historically occurred every six to nine years. The rubella vaccine, which was in wide use by the 1970s, drastically decreased the

incidence of the disease and its consequences for unborn children. However, in universities, prisons, and health care settings, rubella continued throughout the 1980s. The Advisory Committee on Immunization Practices recommended that these institutions be targeted for immunization. As a result, rubella cases continued to decrease through the 1990s.

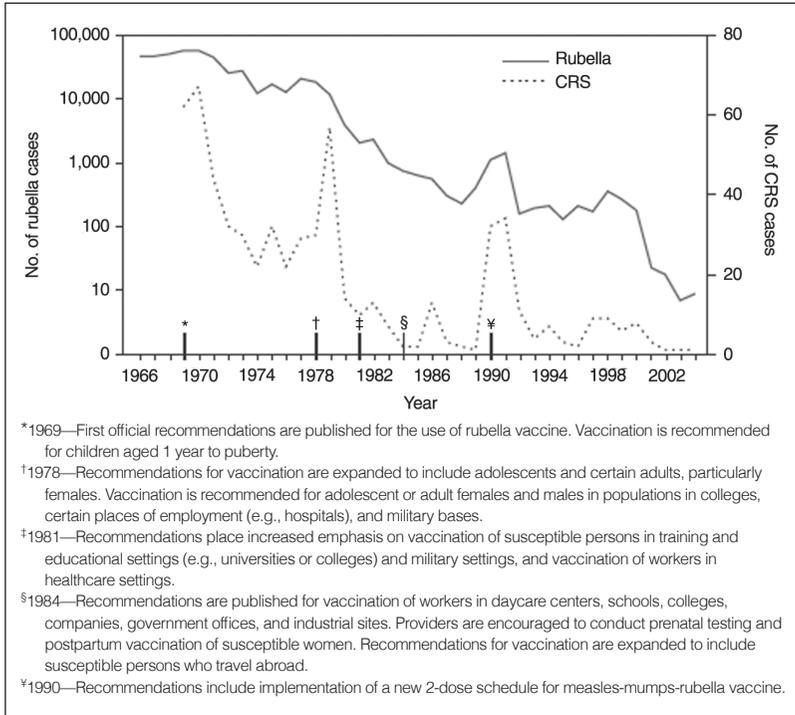


Figure 2. Number of reported cases of rubella and congenital rubella syndrome (CRS), by year, and chronology of rubella vaccination recommendation by the Advisory Committee on Immunization Practices—United States, 1966–2004. Illustration: Adapted with permission from the Department of Health and Human Services.

According to the World Health Organization, an increasing number of nations are including the rubella vaccine in their immunization programs. Soldiers who are deployed to nonvaccinated areas have protection from their required series of immunizations, but can come into contact with infected individuals. Between 1996 and 2003, the number of countries immunizing citizens increased from 33% to 57%. The Centers for Disease Control and Prevention recommend that the rubella vaccine continue to be administered to children and women of childbearing age who were not previously vaccinated, especially those born outside the United States.

### Adenovirus

Edward Buescher focused his research and collaborative skills once again in the search for a vaccine to control the spread of acute respiratory disease (ARD). Caused by a class of viruses called adenoviruses, ARD is one of the most common illnesses to infect populations, including the military. First recognized among soldiers during World War II, ARD caused a significant disruption of the fighting strength, and finding the source of the infection became a priority for Army doctors and scientists. The incidence of ARD was recognized to be highest in conditions of overcrowding and stress, which are pervasive in military life.

Adenoviruses are common among the general population and especially problematic among children, as well as the military. Spread by inhaling the virus or contact with infected surfaces, adenoviruses can cause pneumonia, bronchitis, conjunctivitis, sore throat, diarrhea, and ear infections. As a virus, antibiotics that so effectively cure bacterial infections are useless against the illnesses caused by adenoviruses. For troops stationed in tropical or temperate climates, adenoviruses spread quickly, disrupting training and missions.

In 1942, a commission was established at Fort Bragg, North Carolina, to study the etiology of the viruses that cause respiratory illness. A decade later, the virus was isolated at Fort Leonard Wood, Missouri. Examination of soldiers had identified the presence of adenoviruses in 30%–70% of recruits with ARD, and in 90% of the cases of pneumonia among trainees.<sup>5</sup> The study was moved to WRAIR in the 1950s, where M. R. Hilleman and M. R. Werner identified two types of adenoviruses: 4 and 7.

In the early 1960s, approximately 40%–50% of personnel in the northern U.S. military basic training facilities were affected by ARD, and hundreds of recruits were hospitalized. At Fort Dix, an outbreak provided an opportunity for Buescher and his colleagues to study the effectiveness of a vaccine on one of the strains of adenovirus: type 7. The vaccine proved effective and was administered from 1971 to 1996, but was discontinued when the manufacturer ceased production in 1996. At that time, a resurgence of ARD attributable to adenoviruses began. Adenoviral vaccines are now delivered orally, making them easier and more cost-effective than injected vaccines.

### CONCLUSION

It is easy to overlook the contributions of those people behind the scenes who pave the way for some of the most significant discoveries. Before there is a vaccine, for example, a virus needs to be identified and isolated. We often remember the name associated with the vaccine's creation, but are not aware of the scientists who made it possible. Although Edward Buescher is

far from a household name, he was recognized by the Army and his peers. In 1965, the Army awarded him the Gorgas Medal for his contributions to the understanding of infectious disease. He received the Legion of Merit with Presidential Citation for his general contributions to military medicine.

An example of Buescher's quiet influence on medical history can be seen through his response in the early 1970s to an inquest into funded medical research. He served on the Armed Forces Epidemiological Board (AFEB) from 1965 to 1973. The political climate in Washington during the early 1970s was marked with investigation into conflict-of-interest issues among government agencies. President Nixon appointed a panel to investigate Department of Defense Commissions, including the AFEB. A Management Survey Report by the Research and Development Command raised questions of conflict-of-interest that Buescher and others did not think accurately represented the Board's history. The programs that came under attack had, for thirty years, successfully developed epidemiological studies resulting in vaccines for the military and civilian populations. However, in order to satisfy the climate of bureaucratic reform, Buescher stressed the need for change that would enable the AFEB to survive.

One of the issues was whether AFEB members, who had interests in the institutions that received funding for research, were guilty of conflicts-of-interest. Discussions on 12–13 July 1972 at WRAIR focused on the Report, pointing out inconsistencies as well as mistakes. Given that platform, Buescher and others steered the discussions toward the history of success, the need for institutional change within the AFEB, and whether the Surgeons General supported the existence of the AFEB. Looking to the future, Buescher stressed opening up recruitment of qualified personnel for top AFEB positions and expanding the scope of military medical research to include additional research forums. As a result of this pragmatic approach to often-heated discussions, the AFEB survived the inquest. Significant changes within the organization addressed the questions of what was best for the Armed Forces and the country during a time of institutional and social change. Buescher's behind-the-scenes rationality and foresight helped to save an organization that continued to address the diseases that diminished the fighting strength.

Throughout history, the scourge of disease plagued armies and civilian populations wherever there was conflict. Soldiers carried with them viruses that were previously unknown to populations that did not have immunity. A significant example is the decimation of Native American populations by measles, smallpox, and other viruses that were brought with Europeans when they conquered the New World. In more recent years, American soldiers who

fought in tropical Asia encountered viruses such as JE and adenoviruses, which were endemic to Asia.

Vaccines, now administered soon after a soldier arrives for basic training, prevent widespread disease. The methodology used to isolate a virus and create a safe and effective vaccine is the result of meticulous work of scientists like Edward Buescher and his colleagues. As new viruses emerge and spread, the challenge is to re-create the steps taken by these scientists before the virus causes a pandemic.

In previous centuries, war and natural catastrophe were the primary agents for human migration and the spread of disease. Today, technology has created an environment in which humans travel daily from one part of the world to another, carrying with them whatever viruses and bacteria have attached themselves to their hosts. In addition, because viruses evolve, scientists are challenged to isolate each new mutation and alter the vaccine accordingly. Military stability, which is achieved through maintaining the fighting strength, depends to a great extent on containing the effect of existing and emerging viruses. In many ways, the work Buescher did in the mid-twentieth century helps today's medical scientists stay ahead of the next pandemic.

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## Acronyms and Abbreviations

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AA	Air Ambulance
AEF	American Expeditionary Forces
AFEB	Armed Forces Epidemiological Board
AFRL	Armored Force Research Laboratory
AMEDD	Army Medical Department
ARC	American Red Cross
ARD	acute respiratory disease
CRS	congenital rubella syndrome
CSH	combat support hospital
DCCS	Deputy Commander for Clinical Services
DDT	dichlorodiphenyltrichloroethane
DEFCON 3	Defense Readiness Condition, level 3
DUSTOFF	radio call sign given to the first aeromedical helicopter evacuation unit in Vietnam
JE	Japanese B. encephalitis
MASH	Mobile Army Surgical Hospital
MUST	medical unit self-contained, transportable (hospital)
NATO	North Atlantic Treaty Organization
NIH	National Institutes of Health
OSRD	Office of Scientific Research and Development
PTSD	posttraumatic stress disorder
ROTC	Reserve Officers' Training Corps
R&R	rest and recuperation
USARV	U.S. Army Vietnam
USMACV	U.S. Military Assistance Command, Vietnam
USSC	U.S. Sanitary Commission
USUHS	Uniformed Services University of the Health Sciences
WRAIR	Walter Reed Army Institute of Research



## About the Authors

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Lisa M. Budreau researched military medical history for both the U.S. Army and Navy Surgeons General from 2007 to 2010. She holds a doctorate in World War I history from Oxford University, England, and a Masters of Arts in American Studies from the University of Nottingham. Dr. Budreau, an Anglo-American, has published and lectured in Europe and the U.S. on a variety of First World War topics, and is currently the Vice President of Collections & Education and Chief Historian for the National World War I Museum in Kansas City, Missouri. She has a diverse background in cultural heritage that includes museums, teaching, and battlefield tour guiding. Her most recent book, *Bodies of War: World War I and the Politics of Commemoration in America, 1919–1933*, was published by New York University Press in 2010, and is preceded by an edited pictorial history titled *Answering the Call: The U.S. Army Nurse Corps, 1917–1919* (Government Printing Office, 2008).

Carol Byerly is an independent scholar who specializes in American political history and the history of medicine. She attended the University of Michigan (B.A. with honors, 1973), Michigan State University (M.A. in 1978), and the University of Colorado, Boulder (Ph.D., 2001). She is the author of *Fever of War: The Influenza Epidemic in the U.S. Army during World War I* (New York University Press, 2005), “The Role of the U.S. Military and the Influenza Pandemic of 1918–1919” in *Public Health Reports: Special Supplement on Pandemic Influenza* (April 2010), and a coauthor of *The Panama Canal: An Army’s Enterprise* (Center of Military History, 2009). As a contract historian for the U.S. Army Office of The Surgeon General, Office of History, she completed a book manuscript titled *Good Tuberculosis Men: The Army Medical Department’s Struggle with Tuberculosis* to be published by the Borden Institute, and a book chapter on the Army Medical Department’s care of veterans at Fort Bayard General Hospital, New Mexico, from 1899 to 1920, to be published by Florida State University Press. Byerly also served on the advisory board for

a PBS American Experience program *The Panama Canal*, which aired January 2011. She teaches American history, the history of medicine, and war and society at the University of Colorado, Boulder. Prior to entering academia, Byerly spent fifteen years in politics both in Washington, DC, and Colorado, working for three Members of Congress and as a health policy lobbyist. She also served in the Peace Corps and on the Colorado State Commission on Judicial Performance. Byerly resides in Boulder with her husband.

Stephen C. Craig, COL, MC, U.S. Army (Ret.), a retired U.S. Army Medical Officer, teaches medical history at the Uniformed Services University of the Health Sciences in Bethesda, Maryland. His interests are in British and American military medicine and public health. He completed a biography of U.S. Army Surgeon General George Miller Sternberg (1838–1915) that will be published by the Borden Institute.

Thomas W. Frank, COL, MC, U.S. Army, was born and raised in Boston, Massachusetts. Colonel Frank received undergraduate, graduate, and medical degrees from Tulane University in New Orleans, which he entered on a four-year ROTC scholarship. Commissioned a Second Lieutenant in Armor in 1983, he remained in a classroom (rather than a tank) until 1989 when he commenced an internal medicine residency at Brooke Army Medical Center at Fort Sam Houston, Texas. He served as an internist for six years before undertaking a fellowship in Allergy and Immunology at Walter Reed Army Medical Center in Washington, DC. Colonel Frank's military assignments have included the 43rd MASH in Korea, the US Army Hospital, Heidelberg, and William Beaumont Army Medical Center in El Paso, Texas, where he served as Chief of Medicine from 2004 to 2010. From October 2005 to February 2007, he was assigned as Deputy Commander for Clinical Services (DCCS) of the 14th CSH, with whom he deployed to New Orleans in response to Hurricane Katrina and to Afghanistan in support of Operation Enduring Freedom. In July 2010, he returned to clinical allergy and immunology, and is currently assigned to Landstuhl Regional Medical Center in Germany. His decorations include the Bronze Star Medal, and one or more awards of the Meritorious Service Medal, the Army Commendation Medal, and the Army Achievement Medal. He has also received the Humanitarian Service Medal, the NATO Medal, the Afghanistan Campaign Medal, the Korea Service Medal, the Overseas Service Ribbon, the National Defense Service Medal, and the Army Service Ribbon. Colonel Frank has had a long and abiding passion for the history of medicine in general and the history of American military medicine in particular. The winner of several awards for medical historical writing as a medical student, he served

as president of the Tulane History of Medicine Society and has continued to lecture extensively on military medico-historical subjects throughout his military career. An elected member of the American Osler Society, he also serves on the Faculty of the History of Medicine of the Worshipful Society of Apothecaries of London and is a member of the Order of Military Medical Merit. An Assistant Professor of Medicine at the Uniformed Services University of the Health Sciences, he is a Fellow of both the American College of Physicians and the American Academy of Asthma, Allergy, and Immunology. In 2009, he was named Consultant to the Surgeon General on the History of the Medical Corps. His wife of 22 years Susan (an R.N.) and his 13-year-old daughter Samantha, while gently chiding him for spending more time with the dead than the living, indulge his historical obsessions and eccentricities with grace and patience—and for this he is eternally grateful.

Daniel W. Gower, Jr., Ph.D., COL, U.S. Army (Ret.), received his commission in the Infantry in 1970 as a Distinguished Military Graduate of Texas A&M University. Upon completion of the Infantry Basic Course in June 1971, he attended flight training at the U.S. Army Aviation Center and School. Upon graduation, he was assigned to Fort Sam Houston and the 507th Medical Company (AA). It was at this assignment that he decided on a career in the Medical Service Corps. After graduating from the AMEDD Officer Orientation Course, he was immediately offered a command, the first of four. He served in the 25th Medical Battalion and again with the 507th Medical Company (AA). Selected for long-term civilian schooling in 1984, Colonel Gower earned two masters of science degrees: one in Aviation Safety and one in Safety Management. At the U.S. Army Aeromedical Research Lab, he conducted the Army's first scientific studies on simulator sickness. He was selected for long-term civilian schooling at the doctorate level, earning his Doctorate in Industrial and Systems Engineering, Human Factors specialty at Virginia Tech. Upon graduation he assumed command of the 16th Mobile Army Surgical Hospital. Colonel Gower's last military assignment was as the President of the U.S. Army Medical Department Board at the AMEDD Center & School. He left active duty in 1998 with a total of 96 months of command time and 147 months of active flight duty status. Following his retirement, he worked in industry supporting the AMEDD Board on the Test and Evaluation Integrated Product Team of the Joint Medical Operations–Telemedicine Advanced Concept Technology Demonstration. He rejoined the AMEDD Board as the Deputy Director in March 2004, advising on multiple test and evaluation projects and serving as the project leader for the Medical Situational Awareness in the Theater Joint Concept Technology Demonstration. He is a graduate of

the Army Command and General Staff College. His decorations include the Legion of Merit, the Meritorious Service Medal (fourth award), and the Army Commendation Medal. He has earned the Expert Field Medical Badge and the Master Army Aviator's Wings, and is a distinguished member of the U.S. Army Medical Regiment and the Order of Military Medical Merit. He also serves as the Executive Director of the DUSTOFF Association, and was President of the DUSTOFF Association from 1996 to 1997. He is a member of the DUSTOFF Hall of Fame. He is married to the former Susan Elizabeth Rock of Abilene, Texas, and has twin sons, Patrick and Colin, as well as fourteen grandchildren.

Robert J. T. Joy received a B.S. from the University of Rhode Island (1950), an M.D. from Yale University (1954), an M.A. from Harvard University (1965), and is a graduate of the Armed Forces Staff College (1968). He was trained in Internal Medicine at Walter Reed General Hospital and held a Research Fellowship at the Walter Reed Army Institute of Research (WRAIR). He served in the Army from 1954 to 1981, rising from First Lieutenant to Colonel. He was a Medical Platoon Leader and Battalion Surgeon, founding commander of the Institute of Environmental Medicine, commander of the WRAIR Research Team in Vietnam, and Director of WRAIR. He held senior staff positions in medical research in the Office of the Army Surgeon General and the Office of the Secretary of Defense. In 1976, he founded the Department of Military Medicine at the Uniformed Services University of the Health Sciences (USUHS) and was also the first Commandant. Retiring from the Army in 1981, he founded the USUHS Section, later Department of Medical History. In 1996, he became Professor Emeritus of Medical History at USUHS. He has been awarded the Distinguished Service Medal, four awards of the Legion of Merit, the Air Medal, several commendation and campaign medals, and flight surgeon's wings. Dr. Joy is a Fellow of the American College of Physicians, the American Association for the Advancement of Science, and the College of Physicians of Philadelphia; he is a member of a number of clinical, scientific, and historical societies, serving in leadership positions in several of them. He has held over 60 named lectureships and visiting professorships in the United States, England, Canada, Israel, Germany, and Australia. He served on several editorial boards and as editor of the *Journal of the History of Medicine*. He is a recipient of the Osler Medal in medical history, the Hoff Medal and the Billings Award in military medicine, the Hunter Award in tropical medicine, the Kern Award for the Association of Military Surgeons of the United States, the Clements Award in military education, the Outstanding Civilian Educator Award from USUHS, and several awards for teaching from USUHS students. He was also on the faculty of the U.S.

Air Force School of Aerospace Medicine and the Industrial College of the Armed Forces. Internationally recognized as an expert in military medical history, he has published over 125 articles, chapters, and reviews. He has been publicly acknowledged for his military medical history assistance by almost 100 monograph authors. In 2009, he was awarded a Doctor of Military Medicine (*honoris causa*) by USUHS in recognition of his impact on the discipline of military medical history worldwide.

Kenneth M. Koyle, MAJ, U.S. Army, is a Medical Service Corps officer with over 20 years in uniform. He has served as a medical evacuation helicopter pilot, a medical plans and operations officer, and as course director of the Medical Evacuation Doctrine Course at the U.S. Army School of Aviation Medicine. He has deployed to multiple operational theaters and commanded a 1st Infantry Division medical company in Iraq. Major Koyle has a master's degree in history from the Uniformed Services University of the Health Sciences and a master's degree in education from Pennsylvania State University. He currently serves as the Deputy Chief of the Army Medical Department Center of History and Heritage at Fort Sam Houston, Texas, where he resides with his wife Conni and their four children.

Sanders Marble received his A.B. from the College of William & Mary and his M.A. and Ph.D. from King's College of the University of London. He has worked for a history web site, for the U.S. Air Force, and for the Smithsonian's National Museum of American History. In 2003, he joined the Office of Medical History; in 2010, he became the historian for Walter Reed Army Medical Center and the Northern Regional Medical Command, and returned to the Office of Medical History as senior historian. He has written four books and sixteen articles or chapters on military medical history and on World War I.

Robert B. McLean, MD, COL, U.S. Army (Ret.), MHA, FACS, FACPE, CPE, was born in Hazleton, Pennsylvania, in 1935. He graduated from the University of Pennsylvania with a B.A. in zoology and an ROTC commission, and from the School of Medicine in 1961. Following an Army internship at Fort Knox, Kentucky, he completed a surgical residency at Brooke General Hospital, San Antonio, Texas, in 1966. His initial surgical assignments were to the 93rd and 36th Evacuation Hospitals in Vietnam, and to the 33rd Field Hospital in Germany. He graduated from the U.S. Army Command & General Staff College in 1971, received a master's degree in Healthcare Administration in Baylor University's military healthcare program in 1974, and served as

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Jane C. Morris is Senior Editor at Firebrand Studios in Alexandria, Virginia. For more than ten years, she worked as a freelance editor and writer in Buffalo, New York, Richmond, Virginia, and Alexandria, Virginia. She worked as liaison between authors and publishers of academic titles, specifically in history, political science, and psychology, ensuring that style, copyright permissions, and image reproduction requirements were met. Four recent publications explore the history of American immigration. In addition, Morris contracted with Cornell University; AARP; American Psychology Association; and, most recently, the Office of Medical History, Office of the Army Surgeon General, as researcher, writer, and editor. Morris’s academic interests include African and European history, especially Southern Africa. Her master’s thesis at State University of New York at Buffalo explored British relations with South Africa within the context of the British Commonwealth of Nations, 1948–1961. On a trip to South Africa in the mid-1980s, she was struck by the delicate balance in that beautiful and troubled nation. Morris lives in Alexandria, Virginia, where she enjoys birdwatching, biking, and spending time with her children and granddaughter.

John R. Pierce, COL, U.S. Army (Ret.), served on active duty in the U.S. Army Medical Corps for thirty years. His duty stations were Hawaii, Germany, Colorado, and Washington, DC. His assignments included Chief, Department of Pediatrics and residency program director, Deputy Commander for Clinical Services (DCCS), and Director of Medical Education—all at Walter Reed Army Medical Center. He also served as Consultant in Pediatrics to the Surgeon General for seven years. He is currently the Medical Inspector for the Department of Veterans Affairs, Washington, DC. Dr. Pierce is the historian for the Walter Reed Society. He co-authored a supplement to *Military Medicine* on the work of the 1900 U.S. Army Yellow Fever Board lead by Major Walter

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Richard M. Prior, LTC, U.S. Army, is an Army Nurse Corps officer with over 19 years active federal service. He currently serves as the Deputy Director of the Uniformed Services University of the Health Sciences' Family Nurse Practitioner program. He has served in Somalia in 1992 with the 86th Evacuation Hospital and in Kuwait in 2005 with the 62nd Medical Brigade. He was the Army Nurse Corps historian from 2006 to 2008 and is co-editor of the book *Answering the Call: The U.S. Army Nurse Corps, 1917–1919*.









